CHECKING LIST

1. GENERAL

1.01 This section contains a complete list of A. T. & T. Company and N.W.B. Telephone Company Practices in the "H" series, that have been approved for use in the Minnesota Area and are in effect at the date of issue of this section.

	Section Number	Issue	Subject
			GENERAL
	H10.000	B	Checking List
	H10.003	1	General Outline
	H10.101	1	Scope and Arrangement
	H10.102	1	Plan for System Issued Practices
	H10.103	1	Plan for Bell Operating Company Practices
ADD.	H12.120	A)	Floor Space Areas
	H12.120	1)	
			CONSTRUCTION AND MECHANICAL PLANT
	H32.534	A	Installation of Asphalt Composition Floor Covering
	H34.114	1	Soap Dispensing Systems
	H34.140	A	Fire Lines and Fire Line Equipment
	H34.222	1	Safety and Relief Valves
	H34.225	1	Low Water Shut-off Controls
	H34.340	1	Lighting Fixtures
	H36.115	1	Guarding Moving Parts of Machines
ADD.	H36.148	1)	Cable Openings
	H36.148	1)	
	H36.170	A	Fire Shutters
			FIRE PROTECTION
	H40.010	1	Application and Use - Fire Protection Practices
	H40.050	A	Garages
	H40.055	1	Refinishing Motor Vehicles
	H40.070	A	Renting Buildings
	H40.101	B	Fire Prevention Measures
Supplement to	WR-H40.501	A)	Extinguishing Incendiary Bombs
	WR-H40.501	A)	
	H41.040	1	Fire Protection During Construction
	H41.070	A	Building Changes
	H41.260	1	Chimneys, Smokestacks and Flues
	H41.510	B	Cable Vaults, Ducts, Slots and Holes
ADD.	H42.110	A)	Heating Equipment - Fire Protection
	H42.110	1)	
ADD.	H42.140	A)	Soldering Equipment and Wax Pots
	H42.140	1)	
	H42.210	1	Internal Combustion Engines

Section Number	Issue	Subject
H51.112	2	Maintenance of Asphalt Composition Floors
H51.117	3	Wall Washing - Painted
ADD. H51.118 H51.118	A) 3)	Wall Washing - Marble and Tile
H51.121	1	Dilution of Liquid Toilet Soap
H51.126	1	Maintenance of Window Shades
H51.128	1	Insect Extermination-General
H51.129	1	Insect Extermination - Roaches
H51.130	1	Insect Extermination - Bedbugs
H51.131	1	Insect Extermination - in Switchboards - (Including Terminal and Switchrooms)
H51.137	1	Cleaning in Battery Rooms
H51.146	1	Maintenance of Exterior Bronze Building Signs
H51.201	1	Step Ladders - Use and Care
H51.302	1	Hot Water Heating Systems
H51.303	1	Operating Steam Heating Boilers
H51.313	2	Air Filter Cell for Unit Ventilators

Section Number	Issue	Subject
ADD. H51.501 H51.501	A) A)	Maintenance of Lawn and Shrubbery
H51.601	B	Watching and Guarding Buildings
WR-H51.698	A	Building Administration Practices and Service Protection Practices Where Watchmen are Not Provided
WR-H51.699	C	Building Admittance Practices and Protective Measures at Buildings Where Watchmen Are Provided
Appendix B	C	A.T. & T. Co.'s Identification Cards
Appendix C	C	Restricted Quarters and Special Inspections
H51.905	A	Conservation of Fuel
H52.101	1	List of Standard Building Cleaning and Service Supplies
H52.201	1	List of Standard Equipment and Tools
H53.104	1	Painting - Interior Switching Equipment Protection
H53.190	A	Painting

ALPHABETICAL INDEX
DIVISIONS H10, H20,
H30, H40, AND H50

D

E

T

GENERAL OUTLINE

CHECKING LIST

DIVISIONS H10, H20, H30, AND H40

H10. GENERAL

Section Number	Issue	Subject
H10.001	1	Alphabetical Index - Divisions H10, H20, H30, H40, and H50
H10.003	1	General Outline
H10.010*	13	Checking List - Divisions H10, H20, H30, and H40
H10.050*	9	Checking List - Division H50
H10.101	1	Scope and Arrangement
H10.102	3	Plan for System Issued Practices
H10.103	1	Plan for Bell Operating Company Practices
Add. H12.110	1	Volume
H12.110	1	Volume
H12.120	2	Areas

H20. PLANNING

Section Number	Issue	Subject
H20.101	1	Column Designation
H20.111, H50.011	1	Design Loads for Telephone Buildings
H20.121*	2	Ceiling Heights for Telephone Buildings
H20.200	1	Building Planning - General Considerations
H20.220	2	Checking Routine - Building Project Planning and Design
H20.222, H50.015	1	Checking Routine - Garages and Garage Work - Centers - Project Planning and Design
H21.111	2	Selection of Building Sites
H21.215	2	Survey Information Sites for Central Offices
H22.101	1	Column Spacing in Equipment Rooms
H24.402	1	Service Sink Rooms - General
H24.501	3	Toilet Rooms - General
H24.510	2	Toilet Room Fixture Spacings
H24.520	3	Number of Fixtures Required in Toilet Rooms

H30. CONSTRUCTION AND MECHANICAL PLANT

Section Number	Issue	Subject
H30.101	2	Building Classifications by Types of Construction
H32.323	1	Selection of Stone for Exterior Wall Treatment
H32.334	2	Exterior Walls of Masonry - Moisture Penetration
H32.335	2	Parapet Walls
H32.354	1	Noise Reduction
H32.378(a)	2	Interior Finish of Rooms in Central Office Buildings
H32.405	1	Flat Roof Grading
H32.610	3	Stairway Planning and Construction
H32.770	1	Window Cleaners' Safety Belt Anchors
H34.050	1	Piping Identification
H34.106	1	Piping - Exposed and Concealed
H34.114	2	Soap Dispensing Systems
H34.150	2	Plumbing Fixtures in Toilet Rooms and House Service Closets
H34.190, H51.338	1	Relief Valves for Hot Water Storage Tanks
H34.191, H51.339	1	Relief Valves for Tankless Hot Water Heaters
H34.260*, H51.374	1	Water Treatment Open and Closed Heat Exchanger Systems
H34.271, H51.355	1	Atmospheric Environment for Telephone Equipment Space - General Considerations and Heat Release Data
H34.280, H51.372	1	Evaporative Condensers
H34.281*, H51.373	1	Cooling Towers
H34.282*, H51.376	1	Reciprocating Refrigeration Compressors for Air Conditioning Systems
H34.284, H51.353	2	Ventilation - Basement Spaces
H34.290(b), H51.321	1	Safety Valves for Low Pressure Steam Boilers

* Indicates change from last issue.

(a) Replaces cancelled Section H32.365, Structural Tile Treatment for Walls and Partitions.

(b) Replaces cancelled Section H34.222, Safety and Relief Valves.

Section Number	Issue	Subject
H30.		CONSTRUCTION AND MECHANICAL PLANT (Cont'd)
H34.291, H51.336	1	Relief Valves for Hot Water Heating Boilers
H34.292, H51.337	1	Relief Valves for Hot Water Supply Boilers
H34.293, H51.322	1	Low Water Cut-off Controls for Oil Burners
H34.311	1	Air Navigation Obstruction - Marking and Lighting for Radio Relay Towers and Buildings
H34.321	1	Safety Type Service Switchboards and Panelboards
H36.115	1	Guarding Moving Parts of Machines
H36.148, H54.302	2	Cable Openings
H36.149	1	Core Method of Forming Main Frame Cable Holes
H36.163	2	Cable Vaults - Cable Entrances, Details of Vault Construction, and Steel Work of Cable Racks
H40.		FIRE PROTECTION
H40.010	2	Application and Use - Fire Protection Practices
H40.040	3	Fire Protection for Private Branch Exchange, Teletypewriter Switching System, Nonportable Video Equipment, and Large Building Noncentral Office Power Plant Installations
H40.055	1	Refinishing Motor Vehicles
H40.201	1	Treatment for Flameproofing - Fabric Drop Cloths
H41.040, H53.110	2	Fire Protection During Construction
H41.103	2	Protection for Steel Structural Members and Reinforcement
H41.215(c), H54.341	2	Protection Against Exposure Fires
H41.230, H54.345,	1	Interior Construction to Restrict Speed of Fire
H41.260	2	Chimneys, Smokestacks, Flues and Vents
H42.110, H51.375	2	Heating Equipment - Fire Protection
H42.120	1	Ventilation of Kitchen Cooking Equipment - Fire Protection
H42.140	1	Soldering Equipment and Wax Pots
H42.210	4	Internal Combustion Engines
H43.010, H54.601	6	Distribution of Fire Protective Apparatus
H43.110	3	Water Type Fire Extinguishers
H43.120, H54.603	4	Soda-Acid Type Fire Extinguishers
H43.130	2	Foam Type Fire Extinguishers
H43.140, H54.605	5	Carbon Dioxide Type Fire Extinguishers
H43.150	1	Asbestos Gloves
H43.160, H54.333	5	Tarpaulins
H43.210	3	Standpipe and Hose Systems
H44.015	2	Fire and Safety Inspection and Advisory Services Rendered by Marsh and McLennan
H44.130, H54.405	2	Means of Egress - Inspection and Testing
H44.210*, H54.610	2	Fire Protection Apparatus - Routine Inspection and Maintenance

* Indicates change from last issue.

(c) Title changed from "Protection of Exterior Openings" to "Protection Against Exposure Fires."

CHECKING LIST
(Local Sections and Addenda)
Divisions H10, H20, H30 and H40

Section	Area and Issue Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
							Division H10 General
H10.001	-	-	-	C	-	-	Plan of Administration of "H" Series
(Add.H10.010	G	-	-	-	-	-	Checking List Local Sections and Addenda
(Add.H10.050	G	-	-	-	-	-	Checking List Local Sections and Addenda
Add.H10.103	B	-	-	-	-	-	Plan For Bell Operating Co. Practices
H10.109	-	-	-	1	1	-	Plan for Distribution of Practices, H Series, Neb., So. Dak.
							Division H30 Construction and Mechanical Plant
H32.610	-	A	-	-	-	-	Stair Steps and Walks
H34.901	A	-	-	-	-	-	Operation of Elevators
							Division H40, Fire Protection
H40.050	A	-	-	-	-	-	Garages
H40.070	A	-	-	-	-	-	Renting Buildings
H40.101	D	-	-	-	-	-	Fire Prevention Measures
Add.H41.040) Add.H53.110)	B	-	-	-	-	-	Fire Protection During Construction
H41.070	A	-	-	-	-	-	Building Changes
Add.H42.110	A	-	-	-	-	-	Heating Equipment Fire Protection
Add.H42.140	A	-	A	-	-	-	Soldering Equipment and Wax Pots
(H42.250 (IDP 917	D	-	-	-	-	-	Storage Facilities for Paints, Oils, Gasoline, Films, and Explosives
H42.310	-	A	-	-	-	-	Power Plants
Add.H42.410	-	-	A	-	-	-	Electric Wiring and Equipment
H42.410	A	-	-	-	-	-	Electric Wiring and Equipment
H43.001	D	-	-	-	-	-	Fire Protective Apparatus and Method of Fighting Fires - General
Add.H43.010} Add.H54.601}	A	-	-	-	-	-	Distribution of Fire Protection Apparatus
Add.H43.130	A	-	-	-	-	-	Foam Type Fire Extinguishers
H43.901	A	-	*	-	-	-	Fire Lines and Fire Line Equipment
H44.010	E	-	-	-	-	-	Inspection of Telephone Company Properties
App.A,H44.010	-	A	-	-	-	-	List of Telephone Co. Properties To Be Inspected By The Plant Department
App.A,H44.010	-	-	A	-	-	-	List of Telephone Co. Properties To Be Inspected By The Plant Department, Minn. Area, Northern Division
App.B,H44.010	-	-	A	-	-	-	List of Telephone Co. Properties To Be Inspected By The Plant Department, Minn. Area, Southern Division

* Not Applicable in Minnesota Area

CHECKING LIST
(Local Sections and Addenda)
Divisions H10, H20, H30 and H40

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
							Division H40, Fire Protection Cont'd
App.B,H44.010	-	-	-	-	-	A	List of Telephone Co. Properties To Be Inspected By The Plant Department
App.C,H44.010	-	-	-	A	-	-	List of Telephone Co. Properties To Be Inspected By The Plant Department
App.D,H44.010	-	-	-	-	A	-	List of Telephone Co. Properties To Be Inspected By The Plant Department
Add.H44.015	C	-	-	-	-	-	Fire and Safety Inspection and Advisory Services Rendered by Marsh & McLennan
App.A,H44.015	-	-	C	-	-	-	List of Locations To Be Inspected By Marsh and McLennan - State of Minn.
App.B,H44.015	-	-	-	-	-	C	List of Locations To Be Inspected By Marsh and McLennan - State of No. Dak.
App.C,H44.015	-	C	-	-	-	-	List of Locations To Be Inspected By Marsh and McLennan - State of Iowa
App.D,H44.015	-	-	-	C	-	-	List of Locations To Be Inspected By Marsh and McLennan - State of Nebr.
App.E,H44.015	-	-	-	-	C	-	List of Locations To Be Inspected By Marsh and McLennan - State of So. Dak.

CHECKING LIST
DIVISION H50
OPERATION AND MAINTENANCE

Section Number	Issue	Subject
H50. GENERAL		
H50.001	1	Group Cleaning Plan
H50.005	1	Elevator Service
H50.007	2	Ordering and Stocking of Building Service Supplies
‡H50.008	1	Estimating and Scheduling Building Service Work
H50.011	1	Design Loads for Telephone Buildings
H50.015	1	Checking Routine - Garages and Garage Work-Centers Project Planning and Design
H51. ROUTINE HOUSE SERVICE PRACTICES AND METHODS		
H51.006	3	Window Shades - Ordering and Installing
H51.101	4	Table of Building Cleaning Procedures and Materials
H51.102	2	Application of Anti-slip Floor Finish - Non-wax Type
H51.103	2	Sweeping - General
*H51.104.1	5	Sweeping, Dustless - Damp Cloth Method
*H51.104.2	2	Sweeping, Dustless Treated Cloth Method - Laundered Type
*H51.104.3	2	Sweeping, Dustless Treated Cloth Method - Disposable Type
*H51.105.1	2	Dusting (Floor Reach) - Damp Cloth Method
*H51.105.2	2	Dusting (Floor Reach) - Treated Cloth Method - Laundered Type
*H51.105.3	2	Dusting (Floor Reach) - Treated Cloth Method - Disposable Type
H51.106	3	Floor Waxing
H51.107	4	Floor Mopping and Scrubbing
H51.109	4	Cleaning and Protecting Resilient Floor Coverings
H51.110	2	Cleaning Hard Floors
*H51.114	1	Garage Floor Maintenance
H51.117	4	Wall Washing - Painted
H51.118	3	Wall Washing - Marble and Tile
H51.119	1	Measurement of Slip Resistance of Resilient Floors - Principles and Evaluation
H51.121	3	Dilution of Liquid Toilet Soap - (Including Cleaning of Soap Valves)
H51.124	1	Cleaning and Polishing Wood and Metal Furniture
H51.126	2	Maintenance of Window Shades
H51.146	1	Maintenance of Exterior Bronze Building Signs
H51.201	2	Stepladders - Use and Care
H51.302	1	Hot Water Heating Systems
H51.303	1	Operating Steam Heating Boilers
H51.313	2	Air Filter Cell for Unit Ventilators
‡H51.317	1	Inspection and Maintenance of Ventilating Fans
H51.321	1	Safety Valves for Low Pressure Steam Boilers
H51.322	1	Low Water Cut-off Controls for Oil Burners
*H51.330	1	Air Dryer - KS-16432, List 1
*H51.331	1	Replacement Parts and Procedures Air Dryer KS-16432, List 1
H51.336	1	Relief Valves for Hot Water Heating Boilers
H51.337	1	Relief Valves for Hot Water Supply Boilers
H51.338	1	Relief Valves for Hot Water Storage Tank
H51.339	1	Relief Valves for Tankless Hot Water Heaters
*H51.340	2-D	Compressor-Dehydrator - KS-14155, List 1 and Dehydrator - KS-14155, List 2
*H51.341	1	Piece-Part Data and Replacement Procedures - Compressor-Dehydrator KS-14155, List 1 and Dehydrator KS-14155, List 2
*H51.342	1-D	KS-16001 Dehydrator
*H51.343	2	Replacement Parts and Procedures - KS-16001 Dehydrator
*H51.344	1	Compressor-Dehydrator - KS-16321, List 1 and Dehydrator - KS-16321, List 2
*H51.345	1	Replacement Parts and Procedures - Compressor-Dehydrator, KS-16321, List 1 Dehydrator, KS-16321, List 2
*H51.346	2	KS-16001 Dehydrator and Associated Waveguide Alarms
*H51.347	1	Replacement Parts and Procedures - KS-16153 Dehydrator
*H51.348	1	KS-16153 Dehydrator
‡H51.350	1	Building Mechanical Equipment - Scheduling Routine Maintenance
H51.353	2	Ventilation - Basement Spaces
H51.355	1	Atmospheric Environment for Telephone Space - General Considerations and Heat Release Data
*H51.360	1-D	KS-16468 Dehydrator
H51.370	1	Fundamental Principles of Water Conditioning
*H51.372	1	Evaporative Condensers
*H51.373	1	Cooling Towers
*H51.374	1	Water Treatment - Open and Closed Heat Exchanger Systems
H51.375	2	Heating Equipment - Fire Protection
*H51.376	1	Reciprocating Refrigeration Compressors for Air Conditioning Systems
‡H51.395	1	Installation and Maintenance of V-Belts
*H51.397	3	Piece-Part Data and Replacement Procedures - Day-Brite Fluorescent Units - for Frame and Aisle Lighting
*H51.398	1	Piece-Part Data and Replacement Procedures - KS-15673 Fluorescent Lighting Fixtures - Frame and Aisle Lighting
‡H51.505	1	Care of Lawns and Shrubbery
H53. REPAIRS TO BUILDINGS, BUILDING EQUIPMENT, AND GROUNDS		
H53.104	1	Painting - Interior - Switching Equipment Protection
H53.105	1	Hardening and Dustproofing Concrete Floors
H53.110	2	Fire Protection During Construction
H54. INSPECTIONS		
H54.201	2	House Service Inspection
H54.302	2	Cable Openings
‡H54.310	1	Building Maintenance Inspections - Exterior and Grounds
‡H54.311	1	Building Maintenance Inspection - Interior
*H54.320	1	Maintenance of Antenna-Supporting Structures
‡H54.330	1	Inspection and Testing of Fire Shutters
H54.333	5	Tarpaulins
‡H54.340	1	Inspecting and Testing Gas Piping
H54.341	2	Protection Against Exposure Fires
H54.345	1	Interior Construction to Restrict Spread of Fire
H54.405	2	Means of Egress - Inspection and Testing
H54.601	6	Distribution of Fire Protective Apparatus
H54.603	4	Soda-Acid Type Fire Extinguishers
H54.605	5	Carbon Dioxide Type Fire Extinguishers
*H54.610	2	Fire Protection Apparatus-Routine Inspection and Maintenance

* Indicates change from last issue.
‡ Indicates "Provisional" Section.

CHECKING LIST
(Local Sections & Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
			Division H50 General				
H50.901	-	-	-	A	A	-	Heating Plant Operation

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
			Division H51 - Routine House Service Practices and Methods				
H51.004	E	-	-	-	-	-	Display of Flags
Add. H51.303	-	-	-	-	-	A	Operating Steam Heating Boilers
H51.308	-	-	-	-	-	A	Operation of Automatically Controlled Electric Heaters (C.D.O.)
(H51.698 (IDP 912 (Sec. 1	C	-	-	-	-	-	Building Admittance and Service Protection Practices Where Watchmen are not Provided
(H51.699 (IDP 912 (Sec. 2	C	-	-	-	-	-	Building Admittance and Service Protection Practices Where Lobby Attendants or Watchmen are Provided
H51.903	-	-	-	A	-	-	Electric Fans
H51.905	-	-	-	A	-	-	Operation and Maintenance of the Bird Oil Burner - South Sioux City, Nebr.
H51.905	A	-	-	-	-	-	Conservation of Fuel
H51.906	-	-	-	A	-	-	Standard Battery Room Finishes
H51.909	B	-	-	-	-	-	Disposal of Discarded Fluorescent Lamps
H51.913	-	A	-	-	-	-	Operation and Maintenance, Dunham Differential Heating Plants
H51.914	-	A	-	-	-	-	Iron Fireman Stokers
H51.915	-	A	-	-	-	-	Campbell Forced Warm Air System - Council Bluffs Garage
H51.916	-	A	-	-	-	-	Dunham Differential Heating System - Davenport, Iowa
H51.917	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Fort Dodge, Iowa
H51.918	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Dubuque, Iowa
Add. H51.918	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Dubuque, Iowa
H51.919	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Red Oak, Iowa
H51.920	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Cedar Rapids, Iowa
H51.921	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Oskaloosa, Iowa
H51.922	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Muscatine, Iowa
H51.923	-	A	-	-	-	-	Maintenance of Heating and Ventilating System - Carroll, Iowa

CHECKING LIST
(Local Sections and Addenda)
DIVISION H50

Section	Area and Issue						Title
	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	
H51.924	-	A	-	-	-	-	Maintenance of Heating and Ventilating System - Sioux City, Iowa
H51.925	-	A	-	-	-	-	Maintenance of Heating, Ventilation, and Cooling System - Estherville, Iowa
H51.926	-	B	-	-	-	-	Maintenance of Heating, Ventilation, and Cooling System - Clinton, Iowa
H51.927	-	A	-	-	-	-	Operation and Maintenance of Heating, Cooling and Ventilating System - Algona, Iowa
H51.928	-	A	-	-	-	-	Operation and Maintenance of Heating, Cooling and Ventilating System - Marion, Iowa
H51.929	-	A	-	-	-	-	Operation and Maintenance of Heating, and Ventilating System, Ft. Dodge, Iowa
H51.930	-	A	-	-	-	-	Heating, Cooling and Ventilating Systems, Charles City, Iowa
H51.941	-	-	-	-	-	A	Instructions for Maintenance of Roller Beds
H51.944	-	-	-	-	-	A	Electrically Operated Refrigerators and Water Coolers
H51.950.1	-	A	-	-	-	-	Heating and Ventilating System - Iowa Falls, Iowa
H51.988.6	-	-	-	A	-	-	Operation and Maintenance of Heating, Cooling and Air Handling System - 43rd Ave. Building, Omaha
H51.989.1	-	-	-	A	-	-	Heating, Ventilating and Air Conditioning Systems, Omaha Headquarters Building, 10th, 11th, 13th, 14th and 15th Floors. General Description.
H51.989.2	-	-	-	A	-	-	Same as above - Operation
H51.989.3	-	-	-	A	-	-	Same as above - Maintenance
H51.989.4 to H51.989.9 inclusive							Reserved for OM Headquarters Building Use
H51.990.1	-	-	-	-	A	-	General Practice Covering Scope of Heating, Cooling, and Ventilating Practices - Sioux Falls, South Dakota
H51.990.2	-	-	-	-	A	-	Operating and Maintenance of Heating System - Sioux Falls, S. D.
H51.990.3	-	-	-	-	A	-	Operating and Maintenance of Cooling System - Sioux Falls, S. D.
H51.990.4	-	-	-	-	A	-	Operation and Maintenance of Pent House Heating, Cooling, and Ventilating Unit - Sioux Falls, S. D.

CHECKING LIST
(Local Sections & Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H51.990.5	-	-	-	-	A	-	Operation and Maintenance of Basement Heating, Cooling, and Ventilating Units 1 & 2 - Sioux Falls, S. D.
H51.990.6	-	-	-	-	-	-	Reserved for Future Sioux Falls Practices
H51.990.7	-	-	-	-	-	-	
H51.990.8	-	-	-	-	-	-	
H51.990.9	-	-	-	-	-	-	
H51.991.1	-	-	-	A	-	-	The Air Conditioning System, WA-GL-RE, Omaha
H51.991.2	-	-	-	A	-	-	The Ventilation & Air Distributing System - WA-GL-RE, Omaha
H51.991.3	-	-	-	A	-	-	The Pneumatic System of Automatic Controls - WA-GL-RE, Omaha
H51.991.4	-	-	-	A	-	-	The Humidification System - WA-GL-RE, Omaha
H51.991.5	-	-	-	A	-	-	The Heating System - WA-GL-RE, Omaha
H51.991.6	-	-	-	A	-	-	The Cooling and Dehumidification System - WA-GL-RE, Omaha
H51.991.7	-	-	-	A	-	-	Reserved for Future Omaha, Walnut, Glendale Practices
H51.991.8	-	-	-	A	-	-	
H51.991.9	-	-	-	A	-	-	
H51.992.1	-	-	-	B	-	-	Operation of Heating System - Norfolk
H51.993.1	-	-	-	-	A	-	Madison, S. D., Telephone Exchange Bldg. Heating and Ventilating System
H51.993.2	-	-	-	-	A	-	Madison, S. D. Telephone Exchange Bldg. Maintenance of Heating & Ventilating Equipment
H51.994.1	-	-	-	-	A	-	Watertown, S. D. Telephone Exchange Bldg. Operation and Maintenance of Heating and Ventilating Equipment
H51.995.1	-	-	-	A	-	-	General Description of Building Air Conditioning System - Omaha - Pleasant Bldg.
H51.995.2	-	-	-	A	-	-	Operation of the Oil Fired Hot Water Boiler and Gas Fired Steam Boiler - Omaha - Pleasant Bldg.
H51.995.3	-	-	-	A	-	-	Operation of the Mechanical Refrigeration Equipment - Omaha - Pleasant Bldg.
H51.995.4	-	-	-	A	-	-	Operation of the Forced Air System and Forced Hot Water System - Omaha-Pleasant Bldg.
H51.995.5	-	-	-	A	-	-	Maintenance of Heating, Cooling and Ventilating Equipment - Omaha - Pleasant Bldg.

CHECKING LIST
(Local Sections & Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
(H51.995.6 to (H51.995.9, Inclusive							Reserved for Future Omaha - Pleasant Practices
H51.996.1	-	-	-	A	-	-	Operating and Maintenance, Heating, and Ventilating Equipment - Chadron
(H51.996.2 to (H51.996.9, Inclusive							Reserved for Future Chadron Practices
H51.997.1	-	-	-	A	-	-	General Description of Building Air Conditioning System - Grand Island, Nebr.
H51.997.2	-	-	-	A	-	-	Operating of Gas Fired Steam Boiler - Grand Island, Nebr.
H51.997.4	-	-	-	A	-	-	Operating of Forced Air System - Grand Island, Nebr.
H51.997.5	-	-	-	A	-	-	Maintenance and Operation of Air Conditioning Equipment - Grand Island, Nebr.
(H51.997.3 and (H51.997.6 to (H51.997.9 Inclusive							Reserved for Future Grand Island Practices

(Omaha - Orchard - Heating System - Operation and Maintenance)

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H51.999.1	-	-	-	A	-	-	General Description of Heating, Cooling and Ventilating System - Omaha - Orchard
H51.999.2	-	-	-	A	-	-	Operation of the Oil Fired Hot Water Boiler and Gas Fired Steam Boiler - Omaha - Orchard
H51.999.3	-	-	-	A	-	-	Operation of Mechanical Refrigeration Equipment - Omaha - Orchard
H51.999.4	-	-	-	A	-	-	Operation of Forced Air and Forced Hot Water Equipment - Omaha - Orchard
H51.999.5	-	-	-	A	-	-	Maintenance of Heating, Cooling, and Ventilating Equipment - Omaha - Orchard
(H51.999.6 to (H51.999.9 Inclusive							Reserved for Future Omaha - Orchard Practices

Division H53, Repairs to Buildings, Building Eqpt. & Grds.

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H53.101	-	-	-	A	A	-	Building Caulking
H53.190	-	A	-	-	-	-	Building Painting
H53.190	-	-	A	-	-	-	Painting
H53.901	-	A	-	-	-	-	Maintenance of Rolscreens
H53.905	A	-	-	-	-	-	Repair of Sanitary Napkin Dispensers

CHECKING LIST
(Local Sections & Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H54.310	-	B	-	-	-	-	Building Maintenance, Inspection and Repairs, Exterior and Interior
App.A,H54.310	-	A	-	-	-	-	Securing Contracts
Add.H54.320) AG25.300)	A	-	-	-	-	-	Maintenance of Antenna Supporting Structures
Add.H54.311	-	B	-	-	-	-	Building Maintenance, Inspection and Repairs, Exterior
App.A,H54.340	-	-	A	-	-	-	List of Locations For Inspection of Gas Piping, Minnesota Area

CHECKING LIST
(Local Sections & Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
							Division H50 General
H50.901	-	-	-	A	A	-	Heating Plant Operation
							Division H51 - Routine House Service Practices and Methods
H51.004	F	-	-	-	-	-	Display of Flags
(H51.698 (IDP 912 (Sec. 1	C	-	-	-	-	-	Building Admittance and Service Protection Practices Where Watchmen are not Provided
(H51.699 (IDP 912 (Sec. 2	C	-	-	-	-	-	Building Admittance and Service Protection Practices Where Lobby Attendants or Watchmen are Provided
H51.903	-	-	-	A	-	-	Electric Fans
H51.905	-	-	-	A	-	-	Operation and Maintenance of the Bird Oil Burner - South Sioux City, Nebr.
H51.905	A	-	-	-	-	-	Conservation of Fuel
H51.906	-	-	-	A	-	-	Standard Battery Room Finishes
H51.909	B	-	-	-	-	-	Disposal of Discarded Fluorescent Lamps
H51.913	-	A	-	-	-	-	Operation and Maintenance, Dunham Differential Heating Plants
H51.915	-	A	-	-	-	-	Campbell Forced Warm Air System - Council Bluffs Garage
H51.916	-	A	-	-	-	-	Dunham Differential Heating System - Davenport, Iowa
H51.917	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Fort Dodge, Iowa
H51.918	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Dubuque, Iowa
Add.H51.918	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Dubuque, Iowa
H51.919	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Red Oak, Iowa
H51.920	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Cedar Rapids, Iowa
H51.921	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Oskaloosa, Iowa
H51.922	-	A	-	-	-	-	Operation and Maintenance of Heating and Ventilating System - Muscatine, Iowa
H51.923	-	A	-	-	-	-	Maintenance of Heating and Ventilating System - Carroll, Iowa

CHECKING LIST
(Local Sections and Addenda)
DIVISION H50

Section	Area and Issue Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H51.924	-	A	-	-	-	-	Maintenance of Heating and Ventilating System - Sioux City, Iowa
H51.925	-	A	-	-	-	-	Maintenance of Heating, Ventilation, and Cooling System - Estherville, Iowa
H51.926	-	B	-	-	-	-	Maintenance of Heating, Ventilation, and Cooling System - Clinton, Iowa
H51.927	-	A	-	-	-	-	Operation and Maintenance of Heating, Cooling and Ventilating System - Algona, Iowa
H51.928	-	A	-	-	-	-	Operation and Maintenance of Heating, Cooling and Ventilating System - Marion, Iowa
H51.930.1	-	A	-	-	-	-	Heating, Cooling and Ventilating Systems, Charles City, Iowa
H51.931.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Hampton, Iowa
H51.932.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Vinton, Iowa
H51.933.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Independence, Iowa
H51.934.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Webster City, Iowa
H51.935.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Cherokee, Iowa
H51.936.1	-	A	-	-	-	-	Heating and Ventilating System, Waverly Air Force Station
H51.937.1	-	A	-	-	-	-	Heating, Cooling and Air Conditioning System, Ft. Madison, Iowa
H51.938.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Sheldon, Iowa
H51.939.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Storm Lake, Iowa
H51.940.1	-	A	-	-	-	-	Heating, Cooling and Ventilating System, Monticello, Iowa
H51.942.1	-	A	-	-	-	-	Operation and Maintenance, Heating, Cooling and Ventilating System, Boone, Iowa
H51.943.1	-	A	-	-	-	-	Operation and Maintenance, Heating, Cooling and Ventilating System, Anamosa, Iowa

CHECKING LIST
(Local Sections and Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
	Area and Issue						
H51.945.1	-	A	-	-	-	-	Operating and Maintenance, Heating and Cooling Ventilating System, Browning Exchange, Des Moines, Iowa
H51.946.1	-	A	-	-	-	-	Operating and Maintenance, Heating, Cooling and Ventilating System, Lake Manawa Bldg., Council Bluffs, Iowa
H51.947.1	-	A	-	-	-	-	Operating and Maintenance, Heating, Cooling and Ventilating System, Perry, Iowa
H51.948.1	-	A	-	-	-	-	Heating, Cooling, Ventilating System, Waukon, Iowa
H51.949.1	-	A	-	-	-	-	Operation and Maintenance of Mechanical and Electrical Systems, Telephone Exchange Building, Decorah, Iowa
H51.950.1	-	A	-	-	-	-	Heating and Ventilating System - Iowa Falls, Iowa
H51.988.1	-	-	-	A	-	-	Maintenance of Heating, Ventilating, Cooling and Sewage Disposal - Terrace Building, Omaha, Nebraska
H51.988.6	-	-	-	A	-	-	Operation and Maintenance of Heating, Cooling and Air Handling System - 43rd Ave. Building, Omaha
H51.989.1	-	-	-	A	-	-	Heating, Ventilating and Air Conditioning Systems, Omaha Headquarters Building, 10th, 11th, 13th, 14th and 15th Floors. General Description.
H51.989.2	-	-	-	A	-	-	Same as above - Operation
H51.989.3	-	-	-	A	-	-	Same as above - Maintenance
H51.989.4 to H51.989.1 inclusive	-	-	-	A	-	-	Reserved for OM Headquarters Building Use
H51.990.1	-	-	-	-	A	-	General Practice Covering Scope of Heating, Cooling, and Ventilating Practices - Sioux Falls, South Dakota
H51.990.2	-	-	-	-	A	-	Operating and Maintenance of Heating System - Sioux Falls, S. D.
H51.990.3	-	-	-	-	A	-	Operating and Maintenance of Cooling System - Sioux Falls, S. D.
H51.990.4	-	-	-	-	A	-	Operation and Maintenance of Pent House Heating, Cooling, and Ventilating Unit - Sioux Falls, S. D.
H51.990.5	-	-	-	-	A	-	Operation and Maintenance of Basement Heating, Cooling, and Ventilating Units 1 & 2 - Sioux Falls, S. D.
H51.990.6	-	-	-	-	-	-)	Reserved for Future Sioux Falls Practices
H51.990.7	-	-	-	-	-	-)	
H51.990.8	-	-	-	-	-	-)	
H51.990.9	-	-	-	-	-	-)	
H51.991.1	-	-	-	A	-	-	The Air Conditioning System, WA-GL-RE, Omaha
H51.991.2	-	-	-	A	-	-	The Ventilation & Air Distributing System WA-GL-RE, Omaha

CHECKING LIST
(Local Sections & Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H51.991.3	-	-	-	A	-	-	The Pneumatic System of Automatic Controls - WA-GL-RE, Omaha
H51.991.4	-	-	-	A	-	-	The Humidification System - WA-GL-RE, Omaha
H51.991.5	-	-	-	A	-	-	The Heating System - WA-GL-RE, Omaha
H51.991.6	-	-	-	A	-	-	The Cooling and Dehumidification System - WA-GL-RE, Omaha
H51.991.7	-	-	-	A	-	-)	
H51.991.8	-	-	-	A	-	-)	Reserved for Future Omaha, Walnut,
H51.991.9	-	-	-	A	-	-)	Glendale Practices
H51.992.1	-	-	-	B	-	-	Operation of Heating System - Norfolk
H51.993.1	-	-	-	-	A	-	Madison, S. D., Telephone Exchange Bldg. Heating and Ventilating System
H51.993.2	-	-	-	-	A	-	Madison, S. D. Telephone Exchange Bldg. Maintenance of Heating & Ventilating Equipment
H51.994.1	-	-	-	-	A	-	Watertown, S. D. Telephone Exchange Bldg. Operation and Maintenance of Heating and Ventilating Equipment
H51.995.1	-	-	-	A	-	-	General Description of Building Air Conditioning System - Omaha - Pleasant Bldg.
H51.995.2	-	-	-	A	-	-	Operation of the Oil Fired Hot Water Boiler and Gas Fired Steam Boiler - Omaha - Pleasant Bldg.
H51.995.3	-	-	-	A	-	-	Operation of the Mechanical Refrigeration Equipment - Omaha - Pleasant Bldg.
H51.995.4	-	-	-	A	-	-	Operation of the Forced Air System and Forced Hot Water System - Omaha-Pleasant Bldg.
H51.995.5	-	-	-	A	-	-	Maintenance of Heating, Cooling and Ventilating Equipment - Omaha - Pleasant Bldg.
(H51.995.6 to (H51.995.9, Inclusive							Reserved for Future Omaha - Pleasant Practices
H51.996.1	-	-	-	A	-	-	Operating and Maintenance, Heating, and Ventilating Equipment - Chadron
(H51.996.2 to (H51.996.9, Inclusive							Reserved for Future Chardron Practices
H51.997.1	-	-	-	A	-	-	General Description of Building Air Conditioning System - Grand Island Nebr.
H51.997.2	-	-	-	A	-	-	Operating of Gas Fired Steam Boiler - Grand Island, Nebr.

CHECKING LIST
(Local Sections & Addenda)
DIVISION H50

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H51.997.4	-	-	-	A	-	-	Operating of Forced Air System - Grand Island, Nebr.
H51.997.5	-	-	-	A	-	-	Maintenance and Operation of Air Conditioning Equipment - Grand Island, Nebr.
(H51.997.3 and (H51.997.6 to (H51.997.9 Inclusive							Reserved for Future Grand Island Practices
H51.998.0	-	-	-	A	-	-	Operations and Maintenance, Alliance, Nebr. Building

(Omaha - Orchard - Heating System - Operation and Maintenance)

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H51.999.1	-	-	-	A	-	-	General Description of Heating, Cooling and Ventilating System - Omaha - Orchard
H51.999.2	-	-	-	A	-	-	Operation of the Oil Fired Hot Water Boiler and Gas Fired Steam Boiler - Omaha - Orchard
H51.999.3	-	-	-	A	-	-	Operation of Mechanical Refrigeration Equipment - Omaha - Orchard
H51.999.4	-	-	-	A	-	-	Operation of Forced Air and Forced Hot Water Equipment - Omaha - Orchard
H51.999.5	-	-	-	A	-	-	Maintenance of Heating, Cooling, and Ventilating Equipment - Omaha - Orchard
(H51.999.6 to (H51.999.9 Inclusive							Reserved for Future Omaha - Orchard Practices

Division H53, Repairs to Buildings, Building Eqpt. & Grds.

Section	Co.	Ia.	Minn.	Neb.	S.D.	N.D.	Title
H53.101	-	-	-	A	A	-	Building Caulking
Add.H53.110	B	-	-	-	-	-	Fire Protection during Construction
H53.901	-	A	-	-	-	-	Maintenance of Rolscreens
H53.905	A	-	-	-	-	-	Repair of Sanitary Napkin Dispensers
Add.H54.310) Add.H54.311)	-	B	-	-	-	-	Building Maintenance, Exterior and Interior Inspection and Repairs
App.A,H54.310	-	A	-	-	-	-	Securing Contracts
Add.H54.320) AG25.300)	A	-	-	-	-	-	Maintenance of Antenna Supporting Structures
Add.H54.311	-	B	-	-	-	-	Building Maintenance, Inspection and Repairs, Exterior
App.A,H54.340	-	-	A	-	-	-	List of Locations For Inspection of Gas Piping, Minnesota Area
Add.H54.601) Add.H43.010)	A	-	-	-	-	-	Distribution of Fire Protection Apparatus
H54.901	-	A	-	-	-	-	Handling of New Buildings, Additions, Building Turnover and Building Repairs

SCOPE AND ARRANGEMENT

1. GENERAL

1.01 This section covers the scope and arrangement of the plan under which "Bell System Practices - Buildings" are prepared.

1.02 Bell System Practices - Buildings provide information for use in locating, planning, and constructing buildings for Bell System use and for the proper operation and maintenance of these buildings.

1.03 These practices are prepared for the use of engineers of the Associated Companies and their architects in planning the construction of telephone buildings and to serve as a working manual for the forces on the job who are directly responsible for the operation and maintenance work after the building is completed.

1.04 The plan under which the practices are made available to the field provides uniform and definitely located information for use throughout the System, and the effective application of standard practices will aid materially in providing satisfactory buildings properly maintained on an economical basis.

1.05 With the flexible arrangement employed the sections may be selected and bound so as best to meet the requirements for general reference, supervisory, or for specific maintenance purposes. Only such sections as apply for a particular type of work need be issued to the forces doing this work.

2. SCOPE

2.01 Bell System Practices - Buildings are divided at present into five major divisions and, if found necessary, other divisions will be added later. Each division, in turn, is further divided into subdivisions for the purpose of grouping sections together with respect to their character, the types of mechanical plant which they cover, or other classifications.

2.02 The titles of the five major divisions are shown below and defined in the paragraphs following:

Division H10. General

Division H20. Planning

Division H30. Construction and Mechanical Plant

Division H40. Fire Protection

Division H50. Operation and Maintenance

Division H10. General

2.03 This division covers the scope and arrangement, plan for issuing, indices, and other items of a general nature. It also provides for including instructions required for administering the practices and the building work generally.

Division H20. Planning

2.04 This division includes those sections which describe the general layout and arrangement of central offices and other telephone buildings. These sections are issued by the American Telephone and Telegraph Company to replace similar information which has been available in the form of circular letters and notes. Other sections in this division, covering, for example, certain equipment for operators' quarters and business offices, are prepared and issued by the local company.

Division H30. Construction and Mechanical Plant

2.05 This division includes sections which give information on items of construction and recommendations regarding quantities and types of mechanical plant which have been found desirable for telephone buildings. With the exception of certain general subjects and such specific items as lighting of operating rooms, etc., these practices are prepared and issued by the local company.

Division H40. Fire Protection

2.06 This division includes sections covering the general practice to follow in designing telephone buildings for suitable fire protection, together with the equipment for combating fires when encountered. General precautions covering instructions to employees and periodic inspection to eliminate possible hazards are also included. These practices are issued by the American Telephone and Telegraph Company and replace the preliminary notes covering "Fire Preventive and Protective Practices."

Division H50. Operation and Maintenance

2.07 This division covers the detailed methods and equipment for properly operating and maintaining telephone buildings and grounds. These practices are issued by the American Telephone and Telegraph Company.

3. INDEXING

3.01 The indexing arrangement provides for an alphabetical index and checking lists.

3.02 The alphabetical index furnishes a complete record of the sections that have been issued prior to the date of the index and it is intended for use in locating detailed information.

3.03 The checking lists which are arranged numerically provide information as to the sections current as of the date of the checking list, together with the latest issue numbers. The lists are intended to be used for verifying that any section or set of practices is up-to-date.

4. NUMBERING

4.01 The numbering scheme provides an individual number for each section. A five-digit scheme is used which permits the assignment of different section numbers up to 100,000 sections. Each section designation is composed of the letter prefix "H" and five digits. The first two digits are separated from the last three by a decimal point to facilitate reading and also to divide the subdivision number, indicated by the first two digits, from the detailed section number.

4.02 The letter prefix "H" has been assigned to all sections of Bell System Practices - Buildings to distinguish them from other series of practices and to facilitate ordering and stocking arrangements.

PLAN FOR SYSTEM ISSUED PRACTICES

1. GENERAL

1.01 This section covers the plan for System issued "Bell System Practices - Buildings."

1.02 This section is reissued to omit the definition for the rating "Provisional Standard" as this rating has been discontinued, to modify the definition for "Provisional," and to cover placing "AT&TCo" with each rating; to omit the use of yellow paper for "Provisional" sections, and to add the information covered in Part 5, "INDICATIONS OF CHANGES."

2. ISSUE NUMBERS AND RATINGS

2.01 Each section is assigned an issue number starting with 1. The issue number is raised each time the section is reissued and it is understood that the higher numbered issue replaces any lower numbered issue.

2.02 Associated with the issue number of each section, one of the following ratings is given: "AT&TCo Standard," "AT&TCo Provisional."

2.03 The rating "AT&TCo Standard" is employed on sections which have been fully approved for general use. These sections are forwarded to all Bell Operating Companies.

2.04 The rating "AT&TCo Provisional" is employed on sections which have not been fully approved because of insufficient experience, or which are intended for specific trial in one or more locations. They may have general or limited distribution depending upon the field of use.

3. ADDENDA

3.01 Addenda are used to supplement "Bell System Practices - Buildings" when the reissuance of the section may not be desirable at the time the changed information is required.

3.02 Addenda, in general, cover the following types of information:

(a) Important additions and improvements in the practices.

(b) Requirements or methods for new apparatus, equipment or systems.

(c) Important corrections in existing practices.

3.03 An addendum is issued only when there is an urgent need in the field for information normally covered in the Bell System Practices and when the section which it modifies is sufficiently up to date and of such size that a revision is not warranted at the time. The addendum should be inserted in the binder in front of the related section.

3.04 When the information is to be further changed on a section having an addendum, the addendum may be reissued but the information contained in the earlier issue is then included in the new issue so that the section will have but one associated addendum at a time.

3.05 Each addendum carries its own issue number starting with Issue 1 and this therefore may not correspond with the issue number of the section. However, each addendum indicates in the text the issue number of the section with which it is associated, and in the case of a reissued addendum it also indicates that the previous issue of the addendum is replaced. When the section proper is reissued, addenda begin again with Issue 1.

3.06 Addenda are given ratings the same as for sections but an addendum does not necessarily have the same rating as the section which it modifies.

3.07 "Standard" addenda are forwarded to all Bell Operating Companies. "Provisional" addenda may have general or limited distribution depending upon the field of use.

4. SIZE, BINDING AND COLOR

4.01 Sections of "Bell System Practices - Buildings" are furnished in size 8-3/8 x 10-7/8 inches. The binding edge is suitably punched to facilitate placing in the approved binders available for this purpose.

4.02 White paper is used for all sections; pink paper is used for all addenda.

5. DISTRIBUTION AND REPLACEMENT

5.01 It is important that the latest issues of sections be used in every case and to facilitate this purpose, checking lists are issued from time to time in order to facilitate the replacement of obsolete sections and to indicate the latest issues of current sections (except that Provisional sections are not ordinarily listed unless they are given general distribution).

5.02 "Standard" System issued sections and addenda are stocked by the Western Electric Company. "Provisional" sections and addenda are ordinarily not stocked unless they are given general distribution, although there may be exceptions to this as indicated when the material is issued. The plan for ordering, distributing, and handling the practices in the Bell Operating Company may vary somewhat for each Company and will be administered locally.

5.03 On orders for sections having associated "Standard" addenda, or "Provisional" addenda which are stocked by the Western Electric Company, the addenda will be supplied without being specifically ordered.

6. INDICATIONS OF CHANGES

6.01 Changed and added portions of sections and addenda will, when advantageous, be indicated by marginal arrows as shown in this section. The arrows will be placed in the margin opposite the binding edge.

6.02 Changes will be indicated only if the essential meaning is modified, and not for cases where wording only has been revised or the meaning is only slightly changed.

PLAN FOR BELL OPERATING COMPANY PRACTICES

1. GENERAL

1.01 This section outlines the plan for practices prepared by Bell Operating Companies in the series entitled "Bell System Practices - Buildings."

2. CLASSIFICATION AND NUMBERING

2.01 It is expected that the Bell Operating Companies will issue a majority of the sections in Division H30. "Construction and Mechanical Plant" and also certain other required sections that come within the scope of building operations but for which no sections have been issued by the American Telephone and Telegraph Company. Before issuing sections of the practices the section numbers preferably should be obtained from the American Telephone and Telegraph Company.

2.02 Each issue should be assigned a letter rather than a number, for example, the first issue of a section should be called "Issue A," the second "Issue B," etc.

2.03 Sections prepared by Bell Operating Companies should conform with the System issued practices, except that the Bell Operating Company name (or abbreviation) should appear in the place ordinarily occupied by the rating of a System issued practice. This is illustrated by Fig. 1.

SECTION H30.121
Issue A, 11-1-32
x.Tel.Co.

Fig. 1

3. ADDENDA

3.01 The information coming within the classification "Addenda," should cover such changes as may be desired in Bell Operating Company practices when the section is not reissued, or such changes or departures from existing System issued practices as may be required due to local conditions.

3.02 Addenda should bear the same numbers and titles as the sections which they modify and should be inserted in the binder in front of the related sections.

3.03 Each addendum to either a System issued or locally issued practice should carry its own issue letter starting with Issue A and this, therefore, may not correspond with the issue letter of a locally issued section. However, each addendum should indicate in the text the issue of the section with which it is associated, and if an addendum replaces another addendum, this fact should also be indicated.

3.04 Addenda prepared by Bell Operating Companies should conform with the System issued addenda except that the Bell Operating Company name (or abbreviation) should appear in the place ordinarily occupied by the rating of the System issued addenda. This is illustrated by Fig. 2.

ADDENDUM H30.121
Issue A, 12-15-32
x.Tel.Co.

Fig. 2

3.05 In case it is necessary to issue a local addendum to a System issued practice which already has a System issued addendum, the local addendum should include and replace the System issued addendum, so that not more than one addendum will be in force at any one time for a section.

3.06 If a System issued addendum is released subsequent to a local addendum, the nature of the changes will determine if the local addendum should be replaced or reissued to incorporate the new information.

4. SIZE, BINDING AND COLOR

4.01 The size of page and perforations should be the same as for System issued practices. Care should be exercised to insure that perforations for binding are accurately spaced to facilitate placing in approved binders.

4.02 In order to insure uniformity in the issuance of practices and to provide, through the use of different colored paper, a means for readily identifying the character of each section, the following color scheme is recommended:

Classification	Color of Paper
Sections	White
Addenda	Pink

5. DISTRIBUTION AND REPLACEMENT

5.01 The plan for distributing new and replaced practices prepared by Bell Operating Companies will vary somewhat for the different companies and will be administered by the companies themselves.

PLAN FOR BELL OPERATING COMPANY PRACTICES

1. GENERAL

1.01 This addendum supplements Section H10.103. It is issued to change the designation of sections and addenda issued by the Northwestern Bell Telephone Company; to make changes in the numbering, printing, distribution, and filing of practices; to amplify the information on the issuance of addenda; and to add a paragraph on the use of "Indication of Change" symbols.

2. CLASSIFICATION AND NUMBERING

2.01 Change to read: #

Unless other assignments have been obtained from the A. T. & T. Co., Northwestern Bell Tel. Co.-issued practices shall be assigned numbers beginning with .900 in the subdivision of major division in which they logically belong. If several practices are to be issued in a subdivision relating to one building or one exchange such as a group of practices covering operation of Air Conditioning Equipment and another for operation of Heating Equipment in one building or exchange, a three-digit number in the subdivision will be assigned and suffixed by another decimal and one or more digits as required for each item of equipment, e.g., --.912.1 Operation - Refrigeration Equipment - Alpha Bldg., --.912.2 Operation - Heating Equipment - Alpha Bldg. Section numbers for Area-issued practices shall be obtained from the Plant Methods Supervisor, G.O.

2.02 Change to read:

Each section is assigned an alphabetical issue designation starting with the letter "A". The issue letter is raised each time the section is reissued and it is understood that the higher lettered issue replaces any lower lettered issue, i.e., Issue B replaces Issue A.

2.03 Change to read:

Sections prepared by the Northwestern Bell Telephone Company should conform with the System-issued practices, except that the designation "N. W. Bell Tel. Co. Practices" should appear in the place ordinarily occupied by the designation "Bell System Practices." If the section does not apply to all Areas the name of the Area or Areas to which it applies should appear in the place ordinarily occupied by the rating of a System issued section.

3. ADDENDA

3.01 Change to read:

Addenda should be issued to cover such changes as are desired in N. W. Bell Tel. Co. Practices when the sections are not to be reissued immediately, or when changes or departures from existing System-issued practices are made necessary by local conditions. Addenda in general, should cover the following types of information:

a. Important additions and improvements in the practices.

b. Requirements or procedures for new apparatus, equipment or systems.

c. Important changes in existing practices.

An addendum should be issued only when there is an urgent need in the field for information normally covered in the Bell System Practices or N. W. Bell Tel. Co. Practices and when the section which it modifies is sufficiently up to date and of such size that a revision is not warranted at the time.

3.03 Change to read:

Each addendum to either a System-issued practice or a N. W. Bell Tel. Co.

practice should carry its own issue letter starting with Issue A and this therefore may not correspond with the issue letter of the section with which it is associated. The issue letter is raised each time the addendum is reissued and it is understood that the higher lettered issue replaces any lower lettered issue, i.e., Issue B replaces Issue A.

3.04 Change to read:

Addenda prepared by the Northwestern Bell Telephone Company should conform with the System-issued addenda, except that the designation "N.W. Bell Tel. Co. Practices" should appear in the place ordinarily occupied by the designation "Bell System Practices." If the addendum does not apply to all Areas the name of the Area or Areas to which it does apply should appear in the place ordinarily occupied by the rating of a System-issued addendum.

5. DISTRIBUTION AND REPLACEMENT

Add following paragraphs:

5.02 It is important that the latest issue of sections be used in every case and accordingly checking lists are issued from time to time to facilitate the replacement of obsolete sections and to indicate the latest issues of current sections.

5.03 When a revised System section is distributed it replaces the previous issue of that section and any previously issued System addenda, but does not replace addenda issued by the Northwestern Bell Telephone Company unless specific information to that effect is included in a cancellation notice or digest sheet.

5.04 When a N. W. Bell Tel. Co. Practice section is reissued it replaces the previously issued section and all addenda thereto unless information to the contrary is furnished.

5.05 Revised addenda replace only previously issued material of similar designation.

5.06 Replaced and cancelled material shall be promptly removed from all files.

Add following division:

6. INDICATION OF CHANGES

6.01 Changed and added portions of sections and addenda will, when advantageous, be indicated by a symbol in the margin away from the binding edge. The symbol "#" should be used to indicate revisions and the symbol "##" to indicate additional text.

6.02 Changes will be indicated only if the essential meaning is modified and not for cases where the text has only been reworded or rearranged.

AREAS

1. GENERAL

1.01 This section covers the definitions of building areas in order to establish uniform methods relative to the measurement of floor space.

1.02 The section is reissued to bring the wording of the definitions of building areas contained herein in line with the wording used in the Outline of Procedures Relating to House Service Expense issued with Accounting Letter M-152A-2.

1.03 Arrows are used to indicate major revisions of the text.

2. GROSS AREA

2.01 The gross area of a building is used for establishing administrative over-all unit house service and building repair expense data.

2.02 The gross area comprises all of the area measured from the inside finished surfaces of the exterior enclosing walls, including basements, penthouses and mezzanine floors but excluding attic or other similar space which has not been designed for use.

2.03 In determining the gross area no deductions should be made for partitions, inside walls, columns, elevator or other internal shafts, stairways, inside fire towers and smokestacks.

2.04 The gross area in basements should include the area of cable vaults, coal storage rooms, enclosed ash hoists, etc, which may be associated with but extend beyond the foundation walls of the building proper and which are roofed over.

2.05 Roof area, whether usable or not, entrances projecting beyond the building line, outside fire escapes, outside basement stairways, light courts, basement window pits and areas outside the building walls such as open porches, arcades, balconies, etc, should not be considered as part of the gross area of a building.

3. ASSIGNABLE OR PRODUCTIVE AREA

3.01 Assignable or productive area comprises floor space intended for occupancy including space used for auditoriums, assembly rooms, lounges, restaurants, cafeterias, conference rooms and recreational purposes.

3.02 Assignable area should be determined by measuring the area within the inside finished surfaces of the exterior walls or permanent partitions enclosing such area, with no deductions for columns, pilasters or temporary partitions wholly within the area. However, where a boundary partition or a section of such a partition separates areas for which the house service expense is chargeable to different accounts and geographical areas, the measurement should be made to the center line of such partition or wall.

3.03 The purpose of measuring to the center line of boundary partitions separating assignable areas for which the house service expense is chargeable to different accounts and geographical areas, is to keep the total assignable area constant on a floor regardless of space rearrangements.

3.04 Interior or supplementary corridors located within assignable areas, individual lavatories and mezzanine floors or interior balconies designed for occupancy should be considered as assignable areas.

3.05 Spaces usually required for telephone operations and related work and considered assignable are found under various titles. The following are some examples:

Auditoriums
Assembly Rooms
Assignment Bureau
Archives
Battery Rooms
Cable Vaults
Cafeteria
Classrooms
Commercial Office
Conference Rooms
Dining Service Space

Dispensing Machine Room
Emergency Engine Room
Employment Office
Engineering Room
Equipment Receiving
Equipment Rooms
Food Storeroom
Installation Room
Interview Room
Kitchen
Local Test Room
Locker Room
Lounges
Lunch Room
Mail Room
Maintenance Center
Medical Quarters
Offices
Operating Room
Pay Station Room
Power Room Telephone
Projection Room
Quiet Room
Recreational Rooms
Refrigerator Area
Restaurants
Service Observing Room
Smoking Room
Storage (occupant's use only)
Teller's Room
Toll Test Center
Training Rooms
Unused equipment space which may be assigned temporarily for use as offices, corridors, etc.
Visiting Nurse

4. NONASSIGNABLE AREA

4.01 Nonassignable area comprises floor space used in connection with operating and servicing the building and space not intended for occupancy.

4.02 This area includes entrance, main corridor and hall spaces, stairways, fire towers, light, vent, power and other vertical shafts, all toilet rooms, except those associated with private offices, and all space considered necessary for the operation of buildings. The latter includes space occupied by the heating plant and associated fuel storage rooms, building mechanical and electrical machinery, building supply storerooms, building shops, service closets and janitors' quarters.

4.03 Nonassignable area is not measured but is derived by subtracting the sum of the assignable areas from the total gross area of a building. The nonassignable area would therefore include the thickness of the permanent partitions enclosing main corridors, elevators, stairways, toilets, service closets, etc, as well as the equivalent floor area of elevator or other internal shafts.

4.04 Spaces usually required to provide operation and servicing of a building and considered nonassignable are often found under the following titles:

Boiler Rooms
Building Mechanics Room
Building Meter Space
Building Telephone Terminal Room
Building Workshop
Coal Bins
Corridors
Duct Shafts
Elevator Lobby and Shafts
Fire Towers
House Service Shaft
Janitors' Closets
Mechanical Equipment Room
Pump Room
Receiving Room (Building and Supplies)
Stairwells
Service Elevator Lobby
Storage (Building and Supplies)
Toilets
Tool Room
Transformer Vaults
Ventilating or Air Conditioning Room
Vestibule

5. UNOCCUPIED AREA

5.01 Unoccupied area comprises assignable area which is available for use but which has not been assigned for specific use, excluding unoccupied and unused basement area not equipped with facilities for storage purposes and not suitable for use as office quarters from the standpoint of lighting, heating, ventilation and similar structural considerations.

DESIGN LOADS FOR TELEPHONE BUILDINGS

CONTENTS PAGE

1. GENERAL

1.01 This section covers recommendation for assumption of floor carrying capacities including dead, live, and other loads to be used in the design of buildings which house various types of telephone equipment. It also covers design loads for buildings which are used in whole or in part for accounting, business, clerical and executive offices, and for garages and stockrooms.

1.02 Minimum design loads for buildings and other structures are given in local and state building codes, and also in other publications such as American Standard Building Requirements, File A58.1, by the American Standard Association and the National Building Code recommended by the National Board of Fire Underwriters. Telephone buildings, however, require special considerations which normally are not specifically covered by such codes. This section outlines these special loading requirements together with general building design loads.

1.03 *Definitions*

(a) ***Dead load*** means the weight of all permanent construction, including walls, framing, roofs, permanent partitions, and stairways of a building.

(b) ***Live load*** means the load imposed by the occupancy including telephone equipment. It does not include such factors as wind or earthquake loads.

1.04 Buildings, and all parts thereof, are designed and constructed to support safely all loads, including dead loads, without exceeding allowable stresses prescribed for the materials of construction in the structural members.

1.05 When an existing building is enlarged, or otherwise altered, all portions thereof affected by such enlargement or alteration are strengthened, if necessary, so that all loads are supported safely without exceeding the proper allowable stresses.

1.06 Where local and/or State codes, rules, and regulations call for higher requirements than those indicated or implied in this section, such authority takes precedence and its requirements are followed; where the requirements are lower, compliance with the provisions of this section is recommended.

1.07 This section is revised to bring the live load recommendations up to date because of changes in telephone equipment and experience with actual loading conditions of buildings. The most important changes are:

(1) Lighter design loads for operating rooms.

(2) The addition of design loads for electronic data processing machines.

(3) Somewhat amplified notes on battery room loads.

(4) More conservative recommendations regarding advisable reductions in live loading for column design.

1.08 Marginal arrows are used to indicate a change in the text.

2. DEAD LOADS

2.01 When estimating dead loads for the purposes of design, the actual weights of materials and construction are used. In the absence of definite information, values are assumed which are satisfactory to the authority charged with the administration and enforcement of the local building code.

2.02 Quite commonly, especially in multistory buildings, there are important weight concentrations from vertical runs of building service items such as plumbing stacks and risers, ventilating and air conditioning ducts, and electrical service feeders. These loads, permanently located and carried by structural members, are considered as part of the dead load of the building.

3. LIVE LOADS

3.01 The live loads assumed for the purpose of design are the greatest that probably will be produced by the uses contemplated. They are considered to be uniformly distributed except for known heavy concentrations where the locations are fixed. The following table lists the uniform live loads that are adequate for various types of occupancy or use. Quite frequently, because of varying occupancy, the live loading actually required will be different on the various bays of a floor. The design engineer will then exercise his best judgment, whether to recognize these differences or to design the entire floor uniformly for the heaviest of the expected loads considering uniformity of construction methods, over-all economy, and the uncertainties of future occupancy.

OCCUPANCY OR USE	LIVE LOADS LBS. PER SQ. FT.
Corridors	
Permanent	Same as floor occupancy or use.
Temporary	Usually not less than 100.
Electronic Data Processing Equipment	100 (4)
If Raised Floor is Used	70 (4)
Card File Storage (when not over framing member)	200 (4)
Card File Storage (when over framing member)	150 (4)
Employee Quarters	
Cafeterias	100 (1)
Kitchens	150 (2)
Locker Rooms	60 (1)
Lounges	60 (1)
Toilet Rooms	Same as floor occupancy or use.
Fire Escapes	100
Garages	
Cars, less than 6000 pounds gross vehicle weight	100
Trucks 6000 to 20,000 pounds gross vehicle weight	150
Trucks over 20,000 pounds gross vehicle weight	250
Mechanical Plant Areas	
Air Conditioning (machine space)	200 (2)
Boiler Rooms	300 (2)
Elevator Machine Rooms	150 (2)
Fan Rooms	150 (2)
Fuel Rooms	400
Incinerator Charging Floors	100
Switchboards, Electric	150 (2)

OCCUPANCY OR USE	LIVE LOADS LBS. PER SQ. FT.
Office Areas	
Accounting, General Space	100 (1)
AMA and Business Machine Equipment	100 (2)
Business	100 (1)
Clerical	80 (1)
Executive	80 (1)
File Rooms	
Letters	80 (3)
Cards	125 (3)
Addressograph	150 (3)
Public Spaces	100
Stairways	100
Storage	
Light	125 (3)
Heavy	250 (3)
Extra Heavy	300 (3)
Telephone Equipment Areas	
Batteries	175-300 (2) (6)
Local Test Centers	100 (1)
Main Distributing Frames	175 (2)
Operating Rooms	100 (1) (5)
Power Equipment	175 (2)
Switching and Terminal Equipment (Excluding Main Distributing Frames)	150 (2)
Vaults	250 (3)

Notes: (1) Use this load for permanent locations; where in future telephone equipment space, use appropriate equipment loading.

(2) Use actual equipment loads if greater.

(3) Increase when present or future use exceeds this amount.

(4) In machine rooms housing any of the types of data processing machines, a design load of 100 pounds per square foot is usually adequate.

Where an electronic data processing machine room is provided with a raised false floor to accommodate cabling and ducts, a design live load of 70 pounds per square foot is adequate because the raised floor distributes loading to the structural slab much more uniformly than when the various computer cabinets or machines are placed directly on the slab.

Areas for card storage files would be afforded complete flexibility by a design load of 200 pounds per square foot. If the files can be located close to some of the framing members, the live load on the slab may be reduced to 150 pounds per square foot.

(5) The construction of the modern switchboard of less weight and elimination of the platform, affords the opportunity to lighten the live load design in operating rooms. The reduction from the former 150 pounds to 100 pounds per square foot is thus made possible.

Notes: (Cont'd) (6) The battery space in telephone equipment areas presents the problem of heavy concentration and is amplified by the number of central offices being served. Batteries currently in use range in weight from 415 pounds to 1715 pounds and as previously mentioned presents the problem of concentrated loads. The placing of the lighter weight batteries on racks in tiers more than two high is not desirable because of the associated higher temperature range, the maintenance problem and the fact that their combined weights soon approximates the weight of the heavier batteries. The bays assigned for battery location are, as a rule, fully utilized and consequently should not be designed below the most severely anticipated live load usage.

3.02 Experience has shown that an assumed uniformly distributed live load of 175 pounds per square foot for main distributing frames is normally required to safely support this type of loading, occupancy and use of the area.

3.03 It will be noted that in the table in Paragraph 3.01 the live loads indicated for cafeterias, locker rooms, local test centers, lounges and office space which are in permanent locations are less than those required for such areas located in future equipment space. Therefore, economies in construction might be affected by taking advantage of these lower load requirements in the design of central office buildings if such areas are located wherever possible in a side building appendage not in line with future equipment growth.

3.04 ***Future or Temporary Loads:*** The uniform live loads of 150 and 175 pounds per square foot are somewhat in excess of the loads actually imposed by many items of equipment, but are believed to provide reasonable margins of safety with a minimum amount of special strengthening. Likewise, it appears inadvisable to provide further strength to accommodate any possible future increase in weights of equipment, temporary loads of other unforeseen developments, in view of the fact that the total actual live loads will usually be less than these minimum uniformly distributed live loads. It is contemplated that in the future, the design of equipment and the floor plan layouts will not exceed these minimum loadings.

3.05 ***Provisions for Movable Partitions:*** In buildings where movable partitions might be installed or rearranged, the specified live loads in the table in Paragraph 3.01 are usually sufficient to care for such movable partition construction.

3.06 ***Concentrated Loads:*** In the design of floors, consideration is given to the effects of known or probable concentration of load to which they may be subjected. Floors are designed to carry the noted distributed loads under Paragraph 3.01 or the following minimum concentrations, whichever may produce the greater stresses, and these concentrations are assumed to occupy areas 2-1/2 feet square and to be placed so as to produce maximum stresses in the affected members. Whenever it is necessary to store temporarily or permanently heavy equipment and supplies such as loaded cable reels etc, it should be spread out to avoid excessive concentration.

FLOOR SPACE	LOAD
Equipment and Nonequipment, Including Corridors	2000 lbs.
Garages	Maximum Wheel Load*
Trucking Space within a Building	Maximum Wheel Load*

* Increase 50% for impact if the exact wheel load for the piece of the equipment is the basis of design.

As indicated in Paragraphs 3.01 and 3.18, known concentrated loads such as equipment frames, motor-generator sets, storage batteries, AMA and business machine equipment, and similar loads are considered in each specific case.

3.07 ***Partial Loading:*** When the construction is such that the structural elements thereof act together in the nature of an elastic frame due to their continuity and the rigidity of the connections, and the live load exceeds 150 pounds per square foot or twice the dead load, the effect of partial live load such as will produce maximum stress in any member is provided for in the design.

3.08 ***Impact Loads:*** The live loads listed in Paragraph 3.01 may be assumed to include a sufficient allowance to cover the effects of ordinary impact. For special loads involving unusual impacts such as those resulting from elevators, vehicles, etc, provision is made by a suitable increase in the assumed live load.

3.09 ***Weights of Telephone Equipment:*** The preceding paragraphs refer in general to all live loads encountered in telephone buildings. The average weight of installed telephone equipment, exclusive of occupants, temporary loads, etc, is based upon actual weights of the different items of equipment used. Detailed data with regard to weights, together with information concerning spacing of batteries, power equipment, switchboards, testing equipment, switching and terminal equipment, and other apparatus are given in the Standard Floor Plan Data Sheets issued by the Bell Telephone Laboratories, Inc.

Reduction of Live Loads

3.10 ***Columns and Foundations:*** The generally accepted practice of using reduced live loadings for the design of columns, piers, foundations or bearing walls in multistory buildings is recognized and permitted by most building codes. It is based on the logical assumption that most types of occupancy will never load all bays of all floors to their maximum designed load at the same time. Various codes use different formulas for applying the reduction to different types of construction so it is not feasible to state a method of arriving at the reduced loads that will meet the requirements of all cities.

Studies made on fully occupied telephone equipment buildings, however, show a much closer approximation of actual loads to the design load in the various bays than is the case in, say, an office building. This indicates that load reduction for column and foundation designs should be rather carefully handled in equipment buildings and the following procedures are recommended:

(1) No live load reduction in buildings of three stories or less.

(2) In taller buildings the formulas of the local building codes may be followed ***except*** that no reduction should be below a minimum of 115 pounds per square foot.

In office buildings, as contrasted with equipment buildings, the likelihood of underloading in many bays should permit taking full advantage of the reductions permitted by local codes for column and foundation design.

3.11 ***Beams and Girders:*** It is suggested that no reduction of live loads for use in design of girder members, even when allowed by local building codes, be applied in the design of telephone buildings as it appears that no appreciable economy is effected.

Roof Loads

3.12 Design loads for roofs either flat or pitched include the dead load of the roof; wind or earthquake loads whichever is the longer; and snow loads. All of these loadings vary greatly in different areas and climates but they are all considered and loadings adopted that are in accord with local practice and building codes.

3.13 Roofs to be used for special purposes such as locations for lens and various types of antennas are designed for the appropriate loads.

Other Live Loads

3.14 ***Stairways:*** Inside and outside stair treads and landings are designed to support a uniformly distributed live load of 100 pounds per square foot or concentrated loads of 300 pounds spaced 3 feet center to center, each occupying an area of 1 foot wide by the depth of the tread, whichever will produce the greater stress. A safety factor of 4 is used for inside stairways, and a safety factor of 6 is used for outside stairways on the basis that outside steel stairways being exposed to the elements are subjected to possible weakening through corrosion.

3.15 ***Accessible ceilings, scuttles, and ribs of skylights*** are designed to support a concentrated load of 200 pounds occupying an area 2-1/2 feet square and so placed as to produce maximum stresses in the affected members.

3.16 ***Stairway and balcony railings,*** both inside and outside, are designed to resist a horizontal thrust of 50 pounds per linear foot applied at the top of the railing.

Floor Load Data

3.17 Floor plans showing the weights and general plan dimensions of initial and future telephone equipment are given the architect in the design stage of a new building, or of an addition to an existing building, in order to determine that the basic live loads of 150 and 175 pounds per square foot, probably used in the initial planning, are adequate for the conditions of actual loading.

4. SOIL AND HYDROSTATIC PRESSURES

4.01 ***Pressure on Basement Walls:*** In the design of basement walls and similar approximately vertical structures below grade, provision is made for the lateral pressure of adjacent soil. Due allowance is made for possible surcharge from fixed or moving loads. When a portion, or the whole, of the adjacent soil is below a free-water surface, computations are based on the weight of the soil diminished by buoyancy, plus full hydrostatic pressure.

4.02 ***Uplift on Floors:*** In the design of basement floors and similar approximately horizontal construction below grade, the upward pressure of water, if any, is taken as the full hydrostatic pressure applied over the entire area. The hydrostatic head is measured from the underside of the construction.

5. WIND PRESSURES

5.01 Buildings are designed and constructed to withstand horizontal pressures caused by wind from any direction including pressure by cyclones, hurricanes, or tornadoes where applicable.

5.02 Every exterior wall is designed and constructed to withstand such wind pressures acting either inward or outward.

5.03 ***Roofs***

(a) The roofs of all buildings are designed and constructed to withstand wind pressures acting outward normal to the surface.

(b) Roofs or sections of roofs with slopes greater than 30 degrees are designed and constructed to withstand wind pressures acting inward normal to the surface and applied to the windward slope only.

(c) Overhanging eaves and cornices are designed and constructed to withstand outward wind pressures.

(d) Adequate anchorage of the roof to walls and columns, and of walls and columns to the foundation to resist overturning, uplift, and sliding, is provided in all cases.

5.04 ***Chimneys:*** Chimneys, tanks, and towers are designed and constructed to withstand wind pressures.

5.05 ***Shielding and Unusual Exposures:*** No allowance is made for the shielding effect of other buildings.

5.06 ***Stresses During Construction:*** Provisions are made for wind stress during the construction of a building.

6. EARTHQUAKE LOADS

6.01 In general, every building is designed and constructed to withstand some lateral load from any horizontal direction.

6.02 Every building in localities where earthquakes of major or near major intensities are experienced, is designed and constructed to withstand a minimum lateral load from any horizontal direction as prescribed by local building codes.

6.03 In every building having a skeleton frame, such frame is designed and constructed to withstand a certain percentage of the force specified for the building itself in accordance with local building codes, without assistance from any walls or floors. By skeleton frame is meant a framework consisting of columns, girders, beams, and similar members supporting and transmitting all loads to foundations.

6.04 Reinforced concrete or masonry walls and all other permanent structural elements capable of providing resistance are assumed to act integrally with the structural frames in resisting the shears and movements due to the specified horizontal force, unless specifically designed and constructed to act independently.

CEILING HEIGHTS FOR EQUIPMENT BUILDINGS

1. GENERAL

1.01 This section covers ceiling heights for new buildings housing local and toll central office equipment.

1.02 The purpose of this section is to recommend minimum ceiling clearances required for telephone equipment relative to structural framing, ventilating ducts, and other overhead obstructions of the building itself. These are for consideration in the design of equipment buildings with the objective of keeping such buildings at a minimum volume and yet sufficient to provide for superstructure, cabling and mechanical air distribution associated with ventilating and air conditioning systems where required.

1.03 It is important during the building design stage for the building engineers of the Telephone Company and the architects to work together and arrive at the best method to house equipment arrangements, cabling, floor framing, and means of air distribution in order to effect minimum building story heights. This will coordinate the planning necessary for an economical building and eliminate the possibility of providing heights of stories which might not be effectively used.

1.04 This section is revised and reissued to include recommended minimum ceiling clearances in power rooms for the efficient housing of various size power plants. The adherence to these and other clearances recommended in this section will permit shorter cable runs with resultant less over-all cabling costs that greatly exceed the cost of providing modestly greater ceiling clearances. A review of P.E.L. 6260 Standard Equipment Area Floor Plans and P.E.M. 7132 Supplementary Building Information for Standard Equipment Area Floor Plans is also recommended.

1.05 Arrows indicate major revisions in the text.

2. BASIS OF CLEARANCE RECOMMENDATIONS

2.01 Because the most economical types of structural floor systems differ in various areas, and because there are numerous variations in the size and arrangement of ventilating ducts, this section specifies minimum clearances under all obstructions that are needed to insure a straightforward and economical cabling job. The building engineer and architect can then design the floor system and ducts in whatever way is most economical, so long as none of this encroaches on these minimum clearances. In the case of ducts, the clearances specified are understood to be free clearances under all protrusions of the duct structure such as flanges, bracing, hangers, reinforcing angles, or insulation.

3. MINIMUM CEILING CLEARANCES FOR CENTRAL OFFICE EQUIPMENT

No. 1 and No. 5 Crossbar and No. 1 Step-by-Step Local Equipment Rooms

3.01 A minimum clearance of 13 ft. 0 in. under all obstructions is required. This is sufficient for 303 high protector main distributing frames. For 404 high protector main distributing frames, a clearance under all obstructions of 15 ft. 0 in. is required. For double-sided 404 high protector frames and associated main distributing frames, this clearance should be increased to 15 ft. 6 in.

Toll Terminal Equipment Rooms

3.02 Where the toll terminal equipment includes broadband carrier, such as "L" carrier, it is necessary to provide a 6-in. separation between cable runs carrying certain classes of circuits. For this reason, 13 ft. 6 in. clearance is required under all obstructions. In toll terminal rooms not involving broadband carrier, it would be practicable to adhere to a 13 ft. 0 in. clearance. In view, however, of the expanding use of broadband carrier, it is recommended that 13 ft. 6 in. clearance be adopted for toll terminal equipment rooms generally.

Combined Local Dial and Toll Terminal Equipment Rooms

3.03 In the frequent situations where the same floor accommodates both local dial and toll terminal equipment, the toll clearances will, of course, govern the ceiling height.

No. 4A Toll Crossbar Equipment Rooms

3.04 Owing to the necessity of separating power cable runs from other cabling, a minimum clearance of 13 ft. 6 in. is required under all obstructions. While this clearance is adequate for most No. 4A toll crossbar equipment rooms, cases have arisen when still more clearance is required. These are usually installations involving large switchboards, where both the switchboard cabling and the 4A cabling feed to the same distributing frame. Since the need for more than 13 ft. 6 in. clearance is a function of both the size and the layout of the equipment, it is recommended that the building engineer check the probable future cabling requirements with the equipment and cabling engineers before settling on the 13 ft. 6 in. clearance.

Small Offices

3.05 In community dial offices and in main and auxiliary repeater and carrier stations where 9 ft. 0 in. frames are used, a clearance of 10 ft. 6 in. under all obstructions is usually adequate. Since many of these buildings do not require duct work and many have a flat roof structure, this results in an actual ceiling height of 10 ft. 6 in. Where a limited amount of duct work is required, for example, in main repeater stations, it may frequently be possible to install the duct work without any increase in the ceiling height. The proposed layout should be checked with the equipment and cabling engineers.

Power Rooms

3.06 The ceiling clearances cited for equipment rooms are adequate for all power rooms where these are located on equipment floors. Where power rooms are located in basements, or in a separate annex to an equipment building or in portions of floors with lower ceiling heights, the recommended ceiling clearances are as follows:

(a) Power plants which do not have overhead bus bars, e.g., 111A, 302A up to 1200 amperes capacity, 303A, 410B, 702C, etc, and all standard engines up to and including 225 kw capacity require 9 ft. 0 in. clearance.

(b) A 10 ft. 0 in. ceiling clearance is recommended for power plants which have overhead bus bars, i.e., 302A power plants over 1200 amperes capacity and the 350 kw standard engine.

(c) A 12 ft. 6 in. ceiling clearance is recommended for the 500 kw standard engine.

(d) Engine sets larger than 500 kw have not been standardized, and the ceiling heights required for such units will be governed by the dimensions of the particular make and model that is used.

Operating Rooms and Nonequipment Spaces

3.07 Operating rooms, lounges, test bureaus, assignment quarters, business offices, and other nonequipment areas located in an equipment building may be arranged in a very satisfactory manner with a finished ceiling height of 10 ft. 0 in. Where these rooms are on equipment floors the ceiling height as determined by the equipment is normally ample to provide for the installation of 10 ft. 0 in. suspended ceilings with duct work concealed above the ceiling, flush-type air diffusers, and recessed lighting fixtures if desired. Of course, ceiling height limits are not involved where the acoustic treatment is applied directly to the slab. Where such quarters are not located on equipment floors, such as an entire operating room floor or a side building appendage for nonequipment areas, it is recommended that they be designed for a finished ceiling height of 9 ft. 6 in. to 10 ft. 0 in.

Additions to Existing Buildings

3.08 Where ventilating ducts are to be installed in existing equipment rooms, it is recommended that the proposed layout be carefully checked with the equipment engineers in charge of cabling to minimize interference with present and future cable runs. Where lateral additions are being made to existing buildings, it may sometimes be desirable to consider changing the design of the floor system of the addition in order to approximate the recommended clearances. Where vertical additions are made, the new floors can ordinarily be designed for the recommended clearances.

BUILDING PLANNING - GENERAL CONSIDERATIONS

1. GENERAL

1.01 This section outlines important general considerations and basic principles which are recommended in connection with the planning of buildings.

1.02 The establishment of new central offices and the making of substantial extensions to existing buildings, as well as the provision of other spaces, are a most important part of the equipment and building work. Also of basic importance in carrying out a program of planning, design, and construction of buildings is an over-all plan of procedure - a long range fundamental plan.

1.03 Fundamental plans properly developed should be sound not only for the immediate years ahead but also for each ensuing major step taken over a long term, in line with orderly and predetermined future expansion without reaction on efficient and economical operations. This involves early coordination of the data necessary for establishing the general program of procedure and developing the plans through close contact with the various departments providing the data on which space requirements are estimated.

1.04 Considerations in connection with Central Office Planning and Fundamental Plan Work as related to Building and Equipment Matters are discussed in detail in the Notes of the Building and Equipment Conference - December 1925, and Conference of Building Engineers - April 1946, which aside from detail changes in the telephone art, still have general application at the present time.

1.05 The fundamental plan, with its various indications and quantitative data, is based upon the forecasts of a commercial survey of the geographical area of the exchange under study which provides the information and estimates required as to the character, amount and distribution of population, telephone development, etc, which are to be expected, not only at the ultimate date but also for periods intermediate between the present and the ultimate date. These are developed in considerable detail for the so-called five-year view and on a somewhat broader basis for the ten-year, fifteen-year, and twenty-year periods leading up to the ultimate date.

1.06 As to the so-called ultimate period, facilities for eighteen to twenty years is the generally accepted practice, this being the period beyond which it is not practical at any one time to attempt to make forecasts of the telephone development. In the basic design of the building, consideration should be given to provision of space for a replacing unit. Obviously it will be necessary to care for growth beyond the period for which the current Commercial forecasts are available and the buildings, as the fundamental plan cycle of estimates progresses ahead always eighteen to twenty years, will have to take up the continuing growth either by additions to existing structures or by the establishment of new centers.

1.07 The fundamental plan furnishes broad indications in regard to the most desirable arrangement of the ultimate plant and is used either as a basis for, or as a guide, in the advance planning involved in plant extension work.

1.08 In many cases more efficient use of existing space can be made if the fundamental plans for an area are known. As an example, it may be possible to limit equipment and personnel to minimum space requirements for a short period if it is known that relief will be available within a reasonable time. Also there may be cases where existing space is not being used in the most efficient manner; rearrangement and perhaps closer spacing of desks may provide the necessary margin for postponement of a building addition, or for permitting the assignment of additional personnel to the area.

1.09 The importance of long range planning, of looking ahead for a number of years, in the design of buildings and layout of equipment can not be overemphasized, and it is equally important that the needs of all organizations are anticipated before definitely deciding on a plan or arrangement.

1.10 Care and imagination in planning are essential in avoiding unsatisfactory conditions which might lead to expensive rearrangements later. It is also desirable that planning arrangements in general be made flexible to meet unforeseen requirements and contingencies in so far as is practicable.

1.11 When planning is initiated, the various departments should be consulted to fully determine their respective needs. Consideration of the data so collected will determine the general objectives such as size and shape of the building, allocation of the various spaces and arrangements for future additions or extensions. Close cooperation and coordination among the various people involved such as Commercial, Traffic, Plant, Accounting, Personnel and Engineering is vital to successful planning of buildings. Most of the Companies have a Building Planning Engineer who is responsible for this coordination and for review on a continuing basis of the space requirements in all Company buildings, owned and leased, and for initiating consideration of any new construction early enough to meet the relief requirements.

1.12 Equipment developments, such as toll dispersion, switchboard centralization and customer dialing arrangements, influence central office planning, while many changing factors enter into the determination of the proper procedure for planning office and other spaces not involving equipment.

1.13 In connection with the over-all planning of buildings it is believed to be essential that defense measures be given consideration - especially for buildings located in critical target areas and for those buildings which serve atomic energy and key military installations. Some of the factors which are given consideration in this connection are:

(1) Provision of a personnel shelter area within the building. This is usually dual purpose space rather than being reserved solely for emergency use as a shelter area.

(2) Protection of certain regular or emergency switchboard positions and toll testboard which it may be necessary to man at times of disaster.

(3) Provision of protective location for emergency power equipment.

(4) In connection with laying out equipment floor plans, the locating of common equipment towards the core of the building or in other comparable areas away from the exterior walls to provide a measure of protection from blast pressures and debris. In the event of a major disaster, if the common equipment and a part of the other equipment in the over-all train remains intact it is expected that the capabilities of furnishing service will be greatly improved.

(5) Elimination of building features that may become hazardous in a disaster such as the use of solid panels in lieu of glass in doors, the elimination of transoms and borrowed lights in partitions, etc.

(6) Recommendations as regards defense considerations in connection with the selection of sites for central offices are outlined in Paragraph 2.03(g) of this section.

1.14 The primary considerations with respect to building construction are (1) the lowest possible cost, consistent with actual needs of equipment and personnel and (2) the most efficient use of available space.

2. EQUIPMENT SPACES

2.01 Schedule

(a) A coordination schedule is developed on the basis of Commercial surveys and fundamental plan studies. The schedule as set up in detail includes dates for starting and completing the various important steps which will be involved in the project from the time it is first considered until the office is placed in service.

(b) The program of coordinating the various actions in connection with the establishment of a central office includes the following general procedures:

(1) Determination of type of equipment to be used and the date when it is required for service. Unless other factors are overruling, normally, the completion of the building is timed to coordinate with the equipment shipping schedules to avoid carrying unused space in a new building for any appreciable length of time.

(2) Recommendation for and purchase of lot.

(3) Information from the Commercial people on line and station estimates and classification on which the traffic study is based.

(4) Data from Traffic people on the traffic study.

(5) Determination of equipment requirements.

(6) Office space requirements from departments other than equipment needs.

(7) Preparation of study floor plan sketches.

(8) Review of layouts with the departments involved.

(9) Development of final plans after general approval of management.

2.02 Planning

(a) The necessity for doing something is established first, then the need is shown for doing the particular thing proposed rather than any one of several alternatives. The fundamental plan will generally indicate the alternatives, however, these should be sought out and developed for consideration.

(b) A case is developed for showing the need for a new building or addition at the time proposed. Under conditions of high building costs it is desirable to recover existing building space instead of replacing it. Utilization of older buildings for office space, public offices, operating quarters, etc, should be considered.

(c) Careful planning is important to make most effective use of space in the initial building without affecting flexibility for future expansion. In the average case, shortening of the initial building period to four or five years and adding space later as required involves no important economic penalty. Advantages of deferred capital requirements and benefit of more frequent review of growth estimates generally outweighs disadvantages of more frequent engineering and disturbance caused by more frequent building additions. It is recognized that certain projects do not lend themselves to shorter building periods. However, it is evident that the greatest opportunity for reducing capital requirements is to build less, and sound judgment should be depended upon in deciding the proper building interval in a given case. When high building costs prevail it is generally the case that a saving can be effected at least in building costs by erecting a building which would be extended within a relatively short period.

(d) Consideration should be given to the fact that future space requirements frequently have a bearing on the economies which may be developed in the initial building. For instance, where the space requirements for the ultimate period are only a fraction more than for the initial period, as in the case of some Community Dial Offices, it would doubtless prove economical in most cases to provide ultimate space requirements in the initial building.

(e) For equipment spaces, data should be available indicating how the estimated space requirements were determined. In the case of space to be provided for the accommodation of the equipment, both local and toll, the data in general should include information on which the estimates are based. The locations for traffic operating centers and associated dining and rest facilities, and spaces required therefor are included in the study.

(f) For spaces other than equipment, it is necessary to develop whether or not it is proper, all things considered, to provide for these requirements in the proposed equipment building rather than elsewhere in buildings owned or in leased quarters.

(g) Section H20.220 of Bell System Practices, Checking Routine - Building Project Planning and Design provides a general outline of suggested principles to be considered in the planning and design of telephone buildings.

2.03 Selection of Site

(a) The economical location of the central office site is determined from the indications of the fundamental plan.

(b) Where new central offices are contemplated, early consideration should be given to the location of the wire center. This will greatly facilitate the search for real estate, particularly in those cases where there is little vacant property available or where modification of zoning regulations may be necessary. For a number of reasons it may not be practicable to secure a suitable site at the theoretical wire center, in which case a selection is usually made by weighing the outside plant considerations for each available lot against the advantages the proposed lot may offer as a site for the new building.

(c) The proper size of a lot is of equal importance to the matter of its location. In addition to being properly located, the lot should be of liberal size to provide for orderly expansion to the ultimate building and for unforeseen contingencies. The area of the site required to accommodate a given central office building is determined largely by consideration of the equipment space required in the new building ultimately. The space required for other than equipment purposes and the indications of the fundamental plan as to possible changes in the exchange boundaries are also important factors to be considered. In determining the suitability of available sites it is highly desirable to have in hand a well considered tentative floor plan layout for the ultimate building. This layout would embody an estimate of the space units which must be housed, the relationship these bear to each other and the extent to which each one must be enlarged eventually.

(d) In purchasing new lots consideration is given to the marked tendency on the part of many municipalities and other governing authorities, such as County Planning Commissions, to restrict the use to which property within certain boundaries may be put, the heights of buildings, the proportion of the total lot area which may be occupied by the completed building including requirements for certain minimum setback distances from the property lines to the building, and to require, in certain instances, the provision of off-the-street parking facilities in connection with the building.

(e) The time factor inherent in acquiring land, with the attendant processes of negotiation, title search, survey, zoning and subsoil tests, should be recognized.

(f) Factors to be considered in the selection of a site are outlined in Section H21.111 of Bell System Practices, Selection of Building Sites for Central Offices.

(g) The current and apparent future international situation emphasizes the need for consideration of the following additional factors which would appear to be of particular significance in the cities which have been designated as critical target areas and in other cities which serve important military or atomic energy installations.

(1) Consideration of dispersed locations to the extent practicable with sufficient separation so that the chance of severe damage to more than one building is greatly lessened in the event of an enemy air attack, sabotage or other disasters. Separation of five miles or more is desirable, however, separation to a lesser degree is better than none at all.

(2) Consideration of locations away from defense plants, air bases, oil refineries, etc, which constitute likely targets or which are hazards from the standpoint of explosions and fires.

(3) Consideration of locations away from highly congested areas where most of the buildings are not of fire-resistant construction. Such areas may burn in a fire storm or conflagration as a result of an enemy attack through the initiation and spread of fires from an atomic, high explosive or incendiary attack.

2.04 Requirements

(a) Major functions and services to be considered are as follows:

Local dial.

Intertoll dialing.

Toll terminal.

Local and toll switchboards. Switchboard requirements reduced as extended area service or nationwide customer toll dialing is introduced, either by means of CAMA or FACD equipment. Plans should provide for the re-use of such space.

Local and toll test centers.

Cable entrances, in accordance with Bell System Practices AG40.60, AG40.61, and AG40.62.

Centralized AMA. Centralized AMA requires about 10 to 15 per cent more frame space at the tandem office, in addition to switchboard positions required in the operating room when the operating is done at the tandem location.

Traffic and Plant Quarters.

Dining service.

Coin Counting center.

Commercial - Public and Record.

Other nonequipment offices.

Garage service.

Plant Maintenance space.

Western Electric installation space.

Accounting Center and Quarters. Accounting Center provides space for the machines for processing messages completed by CAMA as well as local AMA equipment in other offices.

Construction to minimize building maintenance and house service costs.

2.05 Size of Building

(a) The proper size of the initial building and the capacity of the ultimate to which it must be capable of being extended are determined in the study of the floor plans with the consideration of the fundamental data and the availability and cost of land.

(b) Recommendations regarding the limiting of the initial building period are contained in Paragraph 2.02(c) of this section.

(c) The proper size of the initial building is more readily apparent than looking into the future to judge the ultimate. The problem in the initial is generally to avoid overbuilding, while in the ultimate is to insure flexibility to continue expanding until the pattern of the fundamental plan takes up the growth in newly opened centers.

(d) It is the objective to obtain a layout which is good initially and over a long term from the standpoint of economical equipment, installation and maintenance. A good plan is economical of floor space and permits spare initial space to be adapted to other uses until needed for equipment without jeopardizing its usefulness for equipment. The objective of flexibility should also be kept in mind to meet unexpected conditions.

3. OTHER SPACES

3.01 Planning

(a) For the sound consideration of space requirements other than for telephone equipment it is equally important to develop a Long Range Plan in order to formulate positive plans for making office, garage or storeroom space available at the time needed. Such a plan would comprise a current and long range view study of existing space both owned and leased, tending toward more efficient and economical utilization.

(b) The recommendations contained in Paragraphs 2.02(a), (b), and (c) of this section are generally applicable to the planning of nonequipment spaces as well as to equipment spaces.

(c) A general outline of suggested principles to be considered in the planning and design of garages and garage work centers is contained in Section H20.222, H50.015, Checking Routine, Garages and Garage Work Centers, Project Planning and Design, of Bell System Practices.

(d) Section H20.220 of Bell System Practices, Checking Routine, Building Project Planning and Design provides a general outline of suggested principles to be considered in the planning and design of telephone buildings.

(e) Close cooperation among the various people involved, such as Commercial, Traffic, Plant, Accounting, Personnel and Engineering, is also vital to nonequipment space planning as well as to central office planning and the recommendations in this respect which are contained in Paragraph 1.10 of this section apply equally to all types of spaces.

(f) Consideration is given to the provision of space normally used for other purposes which is suitable as a general shelter area for personnel during an emergency, particularly for buildings situated in designated critical target areas and in buildings serving areas that contain likely targets such as atomic energy and key military installations.

(g) Notes entitled "Accounting Space and Building Requirements" are currently under preparation which will be of assistance in connection with the planning and design of buildings for Accounting offices.

3.02 Selection of Site

(a) Factors to be considered in the selection of a site are outlined in Section H21.111 of Bell System Practices, Selection of Building Sites for Central Offices.

(b) Certain special considerations in connection with the location of and the selection of sites for garages and garage work centers are contained in Section H20.222, H50.015 of Bell System Practices, Checking Routine, Garages and Garage Work Centers, Project Planning and Design.

(c) Recommendations regarding the selection of an Accounting office location and site are contained in section one, "Selection of an Accounting Office Location and Site" of the notes entitled "Accounting Space and Building Requirements" mentioned in Paragraph 3.01(f). This section of the notes was issued to all Chief Engineers and Comptrollers by letter of July 30, 1953.

(d) The defense considerations recommended in Paragraph 2.03(g) are equally important and applicable to the location of nonequipment space as well as equipment space. The locations of storeroom and garages are important in planning for disaster operations. It is to be expected that all available Company vehicles and supplies will be needed in the event of a disaster whether natural (such as storms, earthquakes or floods) or otherwise (such as enemy air attacks, sabotage, conflagrations or explosions). Storerooms or garages in target area cities are included in defense planning as possible locations of emergency switchboard positions, rendezvous points for off-duty Company employees returning to work after a disaster, Company operating centers for directing restoration work, etc.

3.03 Requirements

(a) Major functions and services to be considered are as follows:

Headquarters, Division, District, Local Accounting centers.

Space for Accounting Personnel.

Coin Counting centers.

Commercial - Public, Record and others.

Plant work - Lounge and supervisory space.

Medical.

Garages and storerooms.

CHECKING ROUTINE

BUILDING PROJECT PLANNING AND DESIGN

1. GENERAL

1.01 This section furnishes a general outline of suggested principles to be considered in the planning and design of telephone buildings. A checking routine is recommended for the analysis of specific building projects to determine the design requirements with consideration of the factors which affect the utility, cost and appearance of the building.

1.02 It is important to the control of building projects that consideration be given to the principles of initial planning in regard to site selection and scope of the project. The review of building projects by application of a checking routine before plans and specifications are submitted for bids, provides an additional control to the project.

1.03 Although many of the items included in this section are covered in detail elsewhere in Bell System Practices, it is thought that a tabulation of the items or questions to be considered will be helpful in the application of a checking routine.

1.04 The size and importance of the office and the character of the community require the individual consideration of each project.

1.05 This section is revised and reissued to include additional recommendations, changes in certain wording and rearrangement of the text. Arrows are used to indicate changes throughout the text.

2. SELECTION OF BUILDING SITE

2.01 Factors to be considered in this section are outlined in more detail in BSP Section H21.111, Selection of Building Sites for Central Offices, and Section H21.215, Survey Information.

2.02 Requirements in regard to type and use of proposed building.

(a) Liberal size for orderly expansion and unforeseen contingencies.

(b) Location with consideration of theoretical ultimate wire center.

(c) Location in relationship to outside plant.

(d) Zoning and building code restrictions.

(e) Availability of public facilities. (Water, sewer, electricity, etc.)

(f) The general situation with respect to comfort and safety of employees such as availability of parking facilities for employees' automobiles and accessibility to adequate public transportation. This is particularly important in the case of a building which will house an operating center, revenue accounting office or district office.

(g) Consideration given to the character of the neighborhood as regards the safety of employees reporting and leaving at night.

(h) Location of operating centers in areas having favorable employment conditions as regards the availability of prospective employees.

(i) Downtown business locations for operating centers usually less desirable from both the employment and transportation viewpoints.

(j) Consideration of accessibility to the public and the availability of public parking when business offices are involved.

(k) Desirability of location for present or future public office.

(l) Favorable neighborhood reaction to the project.

(m) Influence of surroundings upon the architectural design of the building.

(n) Usefulness for disaster operations in the event of natural disaster or an enemy attack.

2.03 Avoidance of hazardous locations.

(a) Flood hazard of sites near streams.

(b) Adequacy of storm sewer facilities where available.

(c) Consideration of the type and occupancy of adjacent buildings and surrounding area from fire exposure and fire spread standpoint.

(d) Location as far away from most likely targets for enemy action as practicable.

(e) Hazards of locations near aircraft landing areas.

(f) Possibility of leaks from gas mains entering building through underground cable duct.

(g) Vibration effect on equipment and explosion hazard of locations on heavily traveled streets and railroads.

(h) Lot selection to permit outside transformer vault for heat dissipation and explosion pressure venting.

2.04 Building design factors - reaction on cost.

(a) Bearing capacity of the soil and type of foundation required.

(b) Slope and contour of lot with consideration of drainage problems, retaining walls, etc.

(c) Natural and established grades in relation to proposed floor elevations.

2.05 Site conditions affecting building costs.

(a) Rock excavation.

(b) Soft bottoms requiring pile foundations.

(c) Sheet piling and pumping in soft or wet excavation.

(d) Subsurface water (waterproofing and pumping).

(e) Excessive cut or fill excavation.

(f) Excessive landscaping requirements.

3. PLANNING

3.01 Building period.

(a) Avoidance of overbuilding by reduction of area and volume of initial structure to minimum.

(b) Objective of high ratios of productive area to gross area and volume.

(c) Consideration of initial period of perhaps four to five years where lateral extension can readily be made.

(d) Advantages of deferred capital requirements and benefit of more frequent review of growth estimates thought to outweigh disadvantages of more frequent engineering and disturbance by earlier building addition.

(e) Temporary use of space not occupied initially.

(f) Deferring construction of part of cable vault if cable entrance is at one end of building.

3.02 Seasonal planning.

(a) Planning for seasonal construction in cold climates to avoid outside work in winter.

(b) Consideration of deferment where possible, consistent with above, especially if costs should indicate downward trend.

3.03 Scope of work.

(a) Early consideration of scope of work and design with architect.

(b) Decisions as to type of construction, materials and mechanical and electrical equipment.

(c) Planning the project development with the architect.

(d) Early review of planning with the departments involved.

3.04 Working drawings.

(a) Advantage of complete plans and specifications. Possible reuse on other projects.

(b) Use of typical design for smaller buildings. (CDO, repeater stations, radio buildings, etc.)

(c) Reuse of mechanical and electrical detail sheets, stairway and toilet layouts, etc.

3.05 Requirements and considerations.

(a) General

(1) Importance of making prompt use of new plant and fullest practicable use of existing plant, salvaging existing buildings for reuse where applicable.

(2) Comparative costs of structural steel and reinforced concrete construction.

(3) Advantages in use of standard manufactured products.

(4) Use of portable partitions in consideration of flexibility, salvage and convenience during rearrangements.

(5) Selection of materials and design to reduce number of crafts involved and ease of coordination problems.

(6) Consideration of future growth of building in locating stairways, basement areaways, ventilating and heating equipment, etc.

(7) Importance of spacing columns for maximum efficiency in the utilization of equipment floor space. (BSP Section H22.101, Column Spacing in Equipment Rooms.)

(b) Office space

(1) Recheck of space requirements before contract is let to allow for changes in plan, organization changes, etc.

(c) Ceiling heights

(1) Early check of structural, ventilating and fundamental cabling plans for coordination and to conserve ceiling heights (BSP Section H20.121, Ceiling Heights for Equipment Buildings).

(2) Possible basement floor all on one level unless boiler height requires lower level boiler room floor.

(3) Possible design of permanent office, quarters and nonequipment areas in lighter construction with lower ceiling heights.

(4) Consideration of use of main distributing frame 300 protectors high where appropriate in smaller offices and where balance in layout of floor plan and length of property indicate the soundness.

(5) Ceiling height requirements for new buildings housing toll and central office equipment are outlined in BSP Section H20.121, Ceiling Heights for Equipment Buildings.

(d) Equipment entrances

(1) Standard 4-ft. by 8-ft. window openings with sash removed provide satisfactory and flexible entrances and are less costly and hazardous than special door openings. Reduction in number and size of windows as a protective measure against fire and blast hazards may require consideration of a separate equipment entrance.

(2) Beam or concrete anchor pads for hoisting arrangements located on roof above general equipment entrances selected as most convenient. Where hoisting beam is provided, retractable type is preferable.

(e) Smaller offices

(1) High cost per line offset by simpler treatment and low cost materials.

(2) Use of local contractors, labor and materials, where available, for lower costs.

(3) Possible use of prefabricated structures either in whole or in part, (asbestos shingles over wood, or metal; or concrete block with cement paint finished surfaces).

(f) Public relations

(1) Public office arranged to provide feeling of quietness, warmth and welcome to the public without the appearance of extravagance in space or decoration. Avoidance of steps where practicable and provision of clear convenient window display space are desirable.

4. DESIGN

4.01 General

(a) Construction and maintenance economies of simplified general design of buildings.

(b) Avoidance of eccentricities of architectural design.

(c) Minimum window requirements and reduced glass areas for increased safety to equipment and reliability of service in times of fire, storm, explosion, earthquake, or sabotage in war; window treatment and maintenance expense reduced and heating and cooling design loads lowered.

(d) Consideration of surrounding structures, with simplified design where exposed to stores, garages, etc., approximate flat roofs (BSP Section H32.405, Flat Roof Grading) and minimum parapet walls (BSP H32.335, Parapet Walls).

(e) Minimum size penthouse to reduce exterior wall treatment cost (BSP H32.334, Exterior Walls of Masonry). Economical treatment of penthouse stairs or consideration of use of outside stairway or fire escape for access to penthouse if appearance not controlling.

(f) Avoidance of heavy or elaborate office and quarters treatment (cornices, paneling, etc.).

(g) Restriction on size of lobbies and corridors requiring treatment for appearance. Cutoff areas requiring special treatment from other areas.

(h) Importance of landscaping design in producing satisfactory appearance of building. Consideration of surrounding area in addition to building in landscape treatment.

(i) Omission of items from general contract involving special design such as built-in clock, furniture, fixtures, etc.

4.02 Excavation and grading

(a) Importance of consideration of need for basement or partial basement. Cost of rock excavation, shoring, pumping, water-proofing, etc., factors to be considered.

(b) Substitution of overhead cabling to C.D.F. to eliminate splicing pit in community dial offices.

(c) Postpone improvement of part of lot where lot is large and area and surroundings permit.

(d) Possibility of grading around building to keep areaway construction to minimum.

4.03 Masonry

(a) Stone use limited to that justified by site conditions and character of surroundings. Costs controlled by amount of stone, depth and overhang of cornice, if any, thickness of coping or band course, mouldings, panels, balconies, porches, ornamental columns, etc.

(b) Avoidance of brickwork specialties such as Flemish bond, herringbone pattern, quoins, and raked joints.

(c) Concrete (BSP Section H32.378 Interior Finish of Rooms in Central Office Buildings).

(1) Importance of knowledge of soil and bearing conditions in structural design.

(2) Finishing requirements reduced with use of smooth, tight forms.

(3) Omission of fill on concrete floor slab.

(d) Glazed tile (BSP Section H32.378).

(1) Considered for wall surface treatment after initial cost and maintenance comparison with other finishes.

(2) Possible use of salt-glazed or unglazed tile at lower cost.

(e) Concrete blocks (BSP Section H32.378).

(1) Considered for use in partitions and exterior wall back-up.

(2) Quality of block important to avoid later dusting, shrinkage, spalling and rust spots.

(f) Temporary rear walls and areaways to reduce cost and facilitate later removal.

(g) Concrete for curbing rather than stone where acceptable at street or property lines.

4.04 Waterproofing and damp-proofing limited to requirements with consideration of topography of lot and subsoil conditions.

4.05 Marble, tile and terrazzo (BSP Section H32.378).

(a) Avoidance of special treatment, mouldings, panels, curved surfaces, floor patterns, etc.

(b) Requirements of surface finish in determining type of material to be used.

4.06 Lath and plaster (BSP Section H32.378).

(a) Omission on surfaces where character of occupancy permits and appearance not controlling.

(b) Control of costs by reducing ornamental plastering, cornices, pilasters, panels, etc.

(c) Application of acoustical tile to ceiling slab avoiding, where possible, more costly suspended ceiling. Suspended ceiling is sometimes preferable in operating rooms.

4.07 Carpentry and millwork.

(a) Omission of trim on door and window openings, etc.

(b) Avoidance of special millwork designs and special mouldings.

(c) Elimination or reduction of heavy cornices, wainscots or other trim where possible.

(d) Omission of transoms and borrowed lights where not necessary.

(e) For cost and maintenance considerations avoidance of use of shutters where used only for appearance.

4.08 Roofing and sheet metal.

(a) Consideration of minimum roof fill for slope to run off water (BSP Section H32.405).

(b) Possible use of hanging gutter, if any required, on temporary walls or where appearance is not controlling.

4.09 Structural steel and miscellaneous metal work.

(a) Control of amount of bronze, aluminum or iron grilles, handrails, or ornamental metals.

(b) Limitation of extent of initial ironwork in length or width of cable vault to fit immediate needs (BSP Section H36.163).

(c) Limitation of amount of iron in balustrades to requirements. (BSP Section H32.610.) Use of lightweight design.

(d) Avoidance of heavy moulded handrails and newel posts.

(e) Simple fire escape design to meet local codes.

(f) Minimum height flagpole on roof for saving on costly tilting apparatus and maintenance considerations. Possible installation of flagpole, where required, in front or side yard.

4.10 Doors and windows.

(a) General use of nonferrous materials for exterior doors or metal work, where possible, to reduce maintenance costs.

(b) Use of unit door frames instead of bucks and trim where possible.

(c) Stock windows and their mouldings more economical and generally more readily available.

(d) Flush doors or with a minimum of mouldings considered more desirable.

(e) Use of wood doors where fire protective requirements are otherwise met; and aluminum or wood doors for special treatment of entrance less costly than bronze doors.

(f) Window shades installed at a lower cost initially and more easily maintained than venetian blinds. For ventilation, double center hung type shade provides light and permits air control. Venetian blinds are sometimes preferable for operating rooms, lounges and quiet rooms.

4.11 Glass and glazing.

(a) Consideration of less costly translucent type glass for upper sash of metal and wire glass windows.

(b) Limitation of size and number of mirrors and shelves in toilet rooms.

4.12 Painting.

(a) Hand soil marks less apparent on darker color door finishes.

(b) Consideration of deferment of painting interior basement walls, and other areas where possible, to avoid inclusion in the general contract. Omission of painting in cable vault.

(c) Appropriate floor covering as required for business offices.

4.13 Floor covering (BSP Section H32.378).

(a) Consideration of omission under general contract except where part of architectural design.

(b) Use of standard grade patterned linoleum with burlap back in switchrooms as compared to heavier types.

4.14 Hardware.

(a) Finish hardware simplified where locks or closing devices are not required.

(b) Linoleum or rubber kickplates and push-plates less costly than metal types, and more easily maintained. Consideration of omission under general contract.

4.15 Plumbing.

(a) Floor drains kept to minimum for maintenance considerations, and in toilet rooms located inconspicuously out of path of travel.

(b) Tank type toilets generally more economical in use of water than flush valve type in small cities and towns.

(c) Consideration of use of metal toilet stalls, and limitation stall height to requirements.

(d) Individual soap dispensers preferable to central tank systems except in larger toilets (BSP Section H34.114).

(e) Initial toilet room fixture installation to minimum requirements (BSP Section H24.520).

(f) For equipment installation force, consideration of provision of temporary fixtures to be reused later at other locations.

(g) Consideration of enameled iron wash basins for smaller offices, rather than vitreous china (BSP Section H34.150).

(h) Wall urinals with drainage openings below the water level more easily maintained than those with opening covered only when the urinal is flushed.

(i) Desirability of arranging toilet rooms above one another or with minimum offsets in multistory buildings.

4.16 Heating, ventilating and air conditioning.

(a) Review of amount of radiation to avoid possible overdesign, and to allow for heat emission from central office equipment.

(b) Use of single boiler in certain buildings with additional boilers added later for ultimate period.

(c) Omission of vacuum return pump where possible in smaller buildings or avoidance of duplicate pumps in larger buildings.

(d) Use of unit ventilators and packaged air conditioning units instead of central systems in certain areas.

4.17 Electrical work.

(a) Check of plans for number and location of electrical receptacles and lighting fixtures. Consideration of equipment frame receptacles in determining requirements.

(b) Avoidance of specially designed or elaborate lighting for entrances, business offices and display windows.

(c) Check of size and routing of electrical conduit to provide economical runs.

(d) Normal ceiling lighting generally considered adequate for toilets.

(e) Fluorescent lighting fixtures not generally extended to areas where the quality and amount of light is not important, or where the lighting only occasionally used.

(f) Location of transformers on poles or on plot outside of building where appearance and size permit.

(g) Consideration of provision of underfloor duct for telephone and power distribution in spaces with heavy concentration of desks and office machines such as in accounting offices, plant service centers, etc.

4.18 Fire Protection (BSP Section H41.230).

(a) Early review of plans with Marsh and McLennan for fire protection recommendations.

(b) Consideration of wall, enclosure and partition design in accordance with the National Building Code, where not in conflict with local requirements.

(c) Limitation in use of rolling steel fire shutters to requirements as determined by Marsh and McLennan.

(d) Windows, under present practice, not recommended to be automatic self-closing.

CHECKING ROUTINE

GARAGES AND GARAGE WORK-CENTERS

PROJECT PLANNING AND DESIGN

1. GENERAL

1.01 This section furnishes a general outline of suggested principles to be considered in the planning and design of garages and garage work-centers. A checking routine is recommended for the analysis of specific building projects to determine the design requirements with consideration of the factors which affect the utility, cost and appearance of the building.

1.02 It is important to the control of building projects that consideration be given to the principles of initial planning in regard to location, site selection, and scope of the project. The review of building projects by application of a checking routine before plans and specifications are submitted for bids, provides an additional control to the project.

1.03 Many of the items listed in BSP Section H20.220, Checking Routine - Building Project Planning and Design, are applicable to the design and planning of garages and garage work-centers as well as to telephone buildings and are included in this section. It is thought that a tabulation of the items or questions to be considered will be helpful in the application of a checking routine.

1.04 The varying factors involved in developing well-balanced elements of utility, economy and appearance when selecting sites and preparing plans for garages and garage work-centers require the individual consideration of each project.

2. SELECTION OF GARAGE LOCATION

2.01 As a guide in determining garage locations, study plans are made of the work operations of Plant Installation, Maintenance, Construction and Repair Forces to be used as a basis for determination of the proper size and desirable location of garages prior to the acquisition of sites. A cost comparison of contemplated sites and a review of the items outlined in the succeeding paragraph are included in this analysis.

2.02 Factors to be considered in determining location:

(a) Location with minimum travel time to reduce labor cost and vehicle expense, unless available sites are excessive in cost and it is advisable to acquire land in a less accessible area.

(b) Influence of surroundings upon the architectural design of the building. Garages are frequently located in industrial or commercial areas where architectural treatment may be further simplified resulting in more economical construction.

(c) Reactions of adjacent property owners.

(d) The situation with respect to comfort and safety of employees. Accessibility to transportation facilities.

(e) Requirements and economy of combining associated plant offices, storeroom and garage at one location. The establishment of garage work-centers by locating offices for foreman, supervisors and even district offices in conjunction with garage facilities has localized plant operations and improved efficiency. In this way the supervision is nearer to the actual plant operations.

(f) Method and cost of handling supplies and need for plant storeroom.

(g) Community growth trend and direction as affecting motor vehicle operations and permanency of garages at location selected.

(h) Present and future boundaries of divisions, districts, etc.

(i) Size and number of garages for a given community and their relation to existing or contemplated central offices, other offices, storerooms, garages and work centers, rail lines for adjacent pole yards, street car and bus routes, arterial highways, etc.

(j) Usefulness for disaster operations in the event of natural disaster or an enemy attack.

(k) Cost of land and building at each site. Include cost of garage operating personnel and equipment in studies used to determine number of garages. Several plans are studied of larger and smaller installations at various locations before the most efficient types and sizes are selected.

(l) Deed, zoning and building code regulations.

(m) Fire or other hazards due to surrounding buildings and class of occupants.

(n) Wide street for safe exit and entrance.

(o) Avoidance of fronting on main arteries.

(p) Avoidance of congested districts.

(q) Efficiency of operations and house service costs.

(r) Availability of suitable commercial repair shops.

(s) Proposed or possible future city planning or road construction which might affect the lot by changes in width or grades of the sidewalk or street.

(t) Possible future changes in the character or development of the neighborhood.

3. SELECTION OF SITE

3.01 Factors to be considered in this section are outlined in more detail in BSP Section H21.111, Selection of Building Sites for Central Offices and Section H21.215, Survey Information.

3.02 Requirements with respect to type and use of proposed building.

(a) Adequate size for present and future needs for offices, employee facilities and parking, number of vehicles, storage of materials, supplies, poles, cable, hardware, trailers, etc., and unforeseen contingencies. Size of an average lot in suburban areas for a 30-car garage may be approximately 120-foot frontage with a depth of at least 200 feet. This will provide space for a driveway alongside the office portion of the building and space for employees' cars. The additional depth is required to provide for future growth, for storage of trailers and for storage of outside plant material. In outlying areas a ground plot of three to four times the size of the building, according to ground usage, is usually satisfactory. Conditions at each site, of course, will govern appropriate size of lot.

(b) Sufficient land area where feasible so that building may be set back about 15 feet from curb at entrance to permit view of street for safety in entering traffic and to allow a suitable turning radius.

(c) Where an associated pole yard is required, consideration is given to obtaining land where a railroad siding can be made available.

(d) Availability and capacities of water and gas mains, electric distribution systems and storm and sanitary sewers.

(e) Corner lot advantageous: more flexibility in arranging entrances to yard and garage. Increased natural light and air. Decreased fire exposure.

(f) Interior lot satisfactory if it extends through to parallel street, or driveway access or easement is obtainable.

(g) Interior lot with exit to one street should provide for minimum of 12-foot driveway along outside wall of building if practicable.

(h) Employee parking is provided where economically practicable or where ground is held for future telephone use and preparation costs are not excessive.

(i) Zoning and building code restrictions.

(j) Favorable neighborhood reaction to the project.

3.03 Avoidance of hazardous locations.

(a) Flood hazard of sites near streams.

(b) Good drainage. Adequacy of storm sewer facilities where available.

(c) Consideration of the type and occupancy of adjacent buildings and surrounding area from fire exposure and fire spread standpoint.

(d) Location as far away from most likely targets for enemy action as practicable.

(e) Hazards of locations near air craft landing areas.

3.04 Site conditions affecting building costs.

(a) Bearing capacity of the soil and type of foundations required.

(b) Slope and contour of lot with consideration of drainage problems, retaining walls, driveways, excessive cut or fill excavation, etc.

(c) Natural and established grades in relation to proposed floor elevations.

4. PLANNING

4.01 Scope of work.

(a) Early consideration of scope of work and design with architect.

(b) Decisions as to type of construction, materials and mechanical and electrical equipment.

(c) Planning the project development with the architect.

4.02 Working drawings.

(a) Advantage of complete plans and specifications. Possible reuse on other projects.

(b) Use of typical design for smaller garages.

(c) Reuse of mechanical, electrical, and plumbing detail sheets, gasoline tank and pump layouts, etc.

4.03 Requirements and considerations.

(a) General

(1) Importance of making prompt use of new plant and fullest practicable use of existing plant, salvaging existing buildings for reuse when applicable.

(2) Comparative costs of construction based on the use of the various applicable structural materials.

(3) Advantages in use of standard manufactured products.

(4) Selection of materials and design to reduce number of crafts involved and simplify coordination problems.

(5) Consideration of possible future growth of the garage in locating auxiliary spaces, heating and fueling equipment, etc.

(b) General garage plan.

(1) A rectangular building plan for parking area more efficient as regards cost per vehicle, with offices, etc., in separate lean-to with lower ceiling height. T and L-shaped arrangements or other irregular plans usually more costly per vehicle to be parked.

(2) Two rows of vehicles served by one vehicle aisle or four rows of vehicles served by two vehicle aisles are economical of space.

(3) Parking at right angle: 1-1/2 feet minimum between vehicles. An average parking area of 8 feet width is ordinarily used in calculating space for small vehicles.

(4) Width of garage generally 60 feet for one vehicle aisle with two rows of vehicles.

(5) Double aisle garages generally 110 feet minimum to 120 feet maximum width with separate entrance doors for each aisle, both front and rear. Parking area free of obstructions by placing interior roof columns only at line where two rows of vehicles meet (55 to 60-foot truss spans).

(6) Aisle width should be equal to length of larger vehicles to be parked, excluding consideration of one or two exceptionally long trucks.

(7) It is desirable for trucks to be headed into wall to permit night loading of supplies from aisle.

(8) Vehicle parking areas are limited preferably to one floor level because of cost factors and ramp construction.

(c) Garage capacity

(1) Although the layout for a specific location is governed by the needs, conditions and fleet make-up of the particular locality, generally the following types of buildings will be most suitable.

(a) Single aisle garage with lean-to (10 to 50-car capacity).

(b) Double aisle garage with lean-to (40 to 100-car capacity).

(2) Garages built initially with capacities of 10 to 40 cars are usually of the single aisle type, whereas capacities of over 40 cars are generally built with double aisles having two entrances at front and two at the rear. However, lot size and shape available or other conditions may indicate a modification of these basic types.

(3) Initial layout plans are prepared so that they may be expanded, if required, by providing additional bays at the rear and by changing the size of office and related facilities in the lean-to accordingly.

(d) Auxiliary space

(1) Offices, training room, employee facilities, locker rooms, storerooms, toolrooms, etc., most economically provided by building one-story lean-to along the side wall of garage with lower ceiling height (usually 8 feet). However, two-story additions for office space also have been used in some cases with satisfactory results. In other cases a two-story District Office Building has been erected, for example, on the front of the lot with a one-story garage at the rear.

(2) Additional detail regarding the layout and arrangement of attended storerooms is contained in Section 61.001 of Supply Operating Practices.

(e) Construction tool storage

(1) Space is provided for storage of construction equipment not in daily use such as pumps, generators, blowers, long ladders, ropes, blocks, etc. This may be located in lean-to, in garage proper enclosed with wire mesh partition, or in shed in yard, based on local conditions.

(f) Loading platform

(1) Platform attached to building at transport truck bed height with outside ramp and door leading to storeroom has been found practicable for ease of handling supplies where such facilities are required. Platforms built recently have been equipped with a cast-iron bumper. This bumper protects the platform but is severe on a truck which is forced against it too rapidly. It is possible to bolt a substantial wood bumper to the metal bumper if protection of the trucks is desired.

(g) Yard paving and driveways

(1) Heavily traveled areas such as entrance drives are usually hard surfaced. Generally, yard paving is of crushed rock or gravel except for those portions where travel is heavy necessitating use of black top or concrete.

(2) Concrete paving strips are provided in some yards as pads for the open storage of certain items such as cable reels, conduit, etc.

(3) Paving is considered at rear of garage which could be removed easily if garage is extended.

(4) Yard is adequately drained away from the garage building.

(5) Driveway curves at curb line are of sufficient radius to permit easy entrance of vehicles into traffic lanes.

(h) Smaller garages

(1) High cost per vehicle offset by simple treatment.

(2) Use of local contractors, labor and materials, where available, for lower costs.

(3) Consider use of prefabricated metal structures for economy.

5. DESIGN

5.01 General.

(a) Construction and maintenance economies of simplified general design of garages.

(b) Avoidance of eccentricities of architectural design.

(c) Consideration of surrounding structures.

5.02 Excavation and grading.

(a) Appropriate design of garage and appurtenant facilities to avoid excessive excavation, fill and grading costs.

(b) Consideration given to deferring improvement of part of lot where lot is larger than current requirements and area and surroundings permit.

5.03 Footings.

(a) Bottom below frost line and have proper bearing area. Appropriate design of building to avoid excessive foundation cost.

5.04 Floors.

(a) Garage floor reinforced concrete usually 5 inches or more thick, 1/8- to 1/4-inch slope per foot to drain to center of vehicle aisle. Provision of natural drainage of entire floor to permit hose cleaning and avoid need for squeegeeing of the floor is recommended. Every effort should be made to obtain a uniform surface without depressions where water will collect. Desirable to steel trowel floor finish to produce a hard dense surface which is as impervious as possible to penetration of oil and grease drippings thereby facilitating sweeping and cleaning. Marking of the floor in sections with edging tools is not recommended. A concrete floor is preferred which is entirely smooth except for expansion joints required for large areas. Consideration is given to surface hardening treatment for floors as outlined in BSP Section H53.105.

(b) If multistory garage can not be avoided, grade of ramp for light vehicles should not exceed 13 per cent and preferably 10 per cent. Surface finish ramps with an abrasive such as carborundum, and ribbed at a 45° angle, V-shaped to center of ramp to aid traction and drainage.

(c) Offices, etc., 4-inch concrete, except storerooms with heavy floor loads.

(d) Consideration given to the provision of a walkway about 3 feet wide in garage adjacent to office space about 4 inches to 5 inches higher than garage floor; office floor to be at the raised level. Walkway should terminate short of the materials door to storeroom to facilitate movement of hand supply trucks from storeroom to garage. Storeroom floor should be at same level as garage floor.

(e) Concrete finished floors in all areas without floor coverings to save first cost and maintenance, except offices where asphalt tile is considered. Asphalt tile (greaseproof) used in important storerooms.

(f) Curved, circular wheel guards at steel H columns with a minimum horizontal extension of 4 inches offer added protection to vehicles and eliminate dirt accumulations.

5.05 Walls.

(a) Avoidance of face brick, terra cotta and other costly finishes is recommended.

(b) Common brick exterior is recommended if appearance controlling. Face brick front considered only if necessary to conform to adjacent buildings.

(c) Reinforced concrete with minimum finishing usually satisfactory and economical.

(d) Neat, well-pointed concrete block masonry will usually give a good appearance.

(e) Quality of block important to avoid later dusting, shrinkage, spalling and rust spots.

(f) Waterproofing cement paints above grade on exterior of concrete block walls recommended to decrease porosity and improve appearance.

(g) Exterior walls of uniform height on all sides of garage proper, as outlined in Paragraph 5.07 (a) (4) are recommended.

5.06 Ceiling height.

(a) Twelve feet to trusses, or equal to door height if greater, recommended.

(b) Minimum ceiling height reduces construction cost and heating requirements.

5.07 Roof structure.

(a) Framing

(1) Wood bow-string truss - low original cost but higher in maintenance and heating.

(2) Metal bow-string truss - economical steel type but parallel chord steel truss may result in less heating volume.

(3) Beam and girder or flat slab construction - provide low roof with minimum volume to be heated, but are usually higher in first cost for a 60-foot span.

(4) Where bow-string trusses are used, the cost of construction may be reduced and appearance improved if the roof surface on each end bay is sloped downward from the top of the last bow-string truss to a horizontal roof line at the end walls. This arrangement permits exterior walls of uniform height and avoids high masonry walls at gable ends.

(b) Joists and sheathing

(1) Wood joists and wood sheathing - not fire resistive.

(2) Steel joists with precast gypsum slabs or precast concrete slabs more costly but not combustible.

(c) Roofing material

(1) Built-up roofing on solid sheathing or steel deck is recommended.

(2) Insulation is considered where advisable. Two-inch thickness rigid insulation provides savings in heating cost.

5.08 Doors.

(a) Vehicle door width usually 12 to 14 feet as required. Height 12 feet for telephone trucks or higher based on State regulations for maximum height of vehicles if commercial freight trucks are to enter.

(b) Overhead type doors generally used, electrically operated in larger garages with opening controls at strategic points and closing controls only at locations where clear view through doorway is possible. A red flashing safety light on electrically operated doors is helpful in preventing accidents.

(c) Both sides of door-jambs are protected with wheel guards to a height of 3 feet.

(d) Front and rear vehicle doors in garage are provided where possible.

(e) Pedestrian sidewalk and door are provided separate from vehicle entrance.

5.09 Windows.

(a) Commercially projected steel sash adequate and economical.

(b) Wired glass for fire protection, recommended particularly in walls which are adjacent to combustible structures or other exterior exposure.

(c) Bottom of window frames in garage section are located above projecting ladders on vehicles.

(d) Glass block lighting usually not economical and does not permit ventilation.

(e) Minimum windows in garage area are provided as required for adequate ventilation. Natural lighting advantage secondary - vehicle servicing generally a night operation.

(f) Heat loss in northern climates, and fire exposure are considered when determining number of windows.

5.10 Partitions in auxiliary space.

(a) Cinder or stone concrete block.

(b) Non-combustible wallboard over studding.

(c) Lath and plaster over studding or plaster on masonry in finished areas.

5.11 Ceiling finish of auxiliary space.

(a) Mineral board or lath and plaster.

5.12 Toilet wall surface.

(a) Painted masonry. Smooth salt glazed tile wainscot at wash basins is considered in important large garages.

5.13 Toilet stalls.

(a) Metal recommended because of moderate first cost and low maintenance.

5.14 Skylights.

(a) Skylights are avoided where possible because of cost, heat loss and continuous maintenance.

(b) Consideration given corrugated wire glass or Plexiglas flush with roof surface when effect of skylights is considered necessary.

5.15 Heating.

(a) Heating plants for garages should be cut off from the building by an unpierced fire wall (except for heating pipes) and fire resistive ceiling, with door entrance only from outside.

(b) Types of Heating Systems:

(1) Steam-heating preferred for larger garages. Coal-fired boiler equipped with stoker of bin feed type. Oil or gas fuel preferable to coal if economically practicable. Unit steam heaters in garage area and direct steam radiation in lean-to. Vacuum return pump. Hot water provided by coil in boiler and adequate storage tank. Boiler equipped with aquastat and necessary controls for providing hot water in nonheating season.

(2) Direct fired overhead unit heaters, gas, electric or oil installed at least 8 feet above floor, usually placed at truss height. Safe distance from adjacent combustible materials.

(3) Hot air or warm air systems designed in accordance with the requirements of the National Board of Fire Underwriters, Pamphlet No. 88, are sometimes employed because of economic considerations. Recirculation of vapors or odors from garage into office spaces is avoided.

(4) Gravity warm air systems not used because of fire hazard.

(c) Heating systems should be installed in accordance with the requirements of the National Board of Fire Underwriters.

(d) Automatic heat shutoff when garage doors are open is considered.

(e) The provision of means of controlling office and garage spaces at differing required temperatures is recommended. Lower temperature usually maintained in garage area.

(f) The provision of partitioned vehicle servicing area, if economical in heating layout, is recommended.

(g) Walls, floor and ceiling of heater room (including domestic hot water heater space) are of noncombustible materials as outlined in the National Building Code.

5.16 Ventilation.

(a) Local ordinances may require facilities for ventilating garages - some cities have regulations requiring special exhaust systems.

(b) If engines are to be run during repairs in service space, underfloor suction ducts with flexible hose for vehicle exhaust pipes are recommended.

(c) The requirements for occasional ventilation, either by natural or mechanical means, made necessary by operating conditions is contained in National Board of Fire Underwriters Pamphlet No. 88.

5.17 Electrical work.

(a) Five-foot candle light intensity usually provided for general illumination in garage.

(b) Incandescent or fluorescent - original cost versus cost of electricity.

(c) Fluorescent lighting fixtures not generally extended to areas where the quality and amount of light is not important or where the lighting is only occasionally used.

(d) Lighting circuits are arranged to minimize cost of electricity.

(e) Vehicle servicing areas require supplementary lighting.

(f) Storeroom areas require supplementary lighting for material selection and repair work. Lighting should be arranged to meet storeroom requirements.

(g) Use of paints with high reflectance on walls and underside of roof improves lighting.

(h) Three-prong polarity grounded electric outlets for power tools and drop lights located at least four feet above the floor are provided around the garage.

(i) Electrical installation should conform with National Electrical Code.

5.18 Plumbing.

(a) Number of fixtures determined by maximum number of persons as covered in BSP Section H24.520.

(b) Consideration given to facilities for women at work-centers.

(c) Toilet fixtures are arranged to make most efficient use of building space and piping for water and waste. Urinals with water seal above all drain openings to facilitate cleaning are recommended.

(d) Showers provided where justified by need.

(e) Water piping installed in garage area for car washing purposes.

(f) Trough drains, or individual floor drains along center line of vehicle aisle and equipped with slotted cover (not perforated cover) are recommended.

(g) Wash fountain is considered where economical rather than individual wash basins.

(h) Janitor's service sink and storage provided in separate small room opening to garage area.

5.19 Gasoline tank and pumps.

(a) Underground storage tank is provided.

(b) Size of tank governed by number of vehicles served.

(c) Storage requirements for a minimum of two weeks is provided.

(d) Cost factor is considered - price of gasoline dependent upon quantity delivered at one time.

(e) Gas pumps located preferably on an elevated concrete island in the open yard, and gassing of trucks done outside.

(f) Island is of sufficient height and size to protect pumps.

(g) If pumps must be within garage, a long filler hose for outside servicing is provided.

(h) Portable gasoline tanks are avoided where possible.

(i) Lubricant storage in separate room or underground.

(j) Handling of gasolines, oils and flammable liquids, and location of storage tanks in accordance with the standards of the National Board of Fire Underwriters, Pamphlet No. 30.

5.20 Compressed air.

(a) Outlets along walls and on center columns for inflating tires are provided.

(b) Air compressor motor of explosion-proof type unless located at height of 4-feet or more above the floor.

(c) Local regulations concerning location of compressor are observed; however, it should not be placed where high room temperatures exist.

5.21 Vehicle lift.

(a) Where vehicle servicing operations are to be performed, consideration is given to the provision of a two-column vehicle lift installed so as to be at floor level when in the lowered position.

(b) A lift is preferably installed in a corner of the garage or in lean-to space if available.

(c) Installation at about 45° angle to aisle to expedite placing of vehicle on the lift is recommended.

5.22 Fencing.

(a) Fence usually essential to protection of supplies and equipment. Fences seven feet in height with three strands of barbed wire at the top to provide additional protection against vandalism and theft have been used.

(b) Woven wire fabric and wood or steel posts generally used. Chain link fence more costly.

(c) Consideration is given to fencing only minimum area required, leaving portion of land for future development when needed.

5.23 Fire protection.

(a) Wired glass in windows will furnish considerable resistance to a fire in an adjacent building, and may afford some protection in the case of interior fires by assisting in excluding oxygen.

(b) Wired glass should be placed in metal window frames.

(c) Automatic sprinkler system would provide additional fire protection for building and contents especially where wood roof construction is used or where there is a large concentration of vehicles.

(d) Heat actuated fire signaling devices, less costly than sprinklers, sometimes are used on combustible ceilings to quickly detect fire and automatically close an electrical circuit to sound an alarm.

(e) Portable fire extinguishing equipment as recommended in BSP Section H43.010, for putting out incipient fires when personnel are on duty.

(f) Extinguishers should be located where they will not be damaged by trucks.

(g) Extinguisher locations clearly marked on columns or walls at height visible above parked vehicles.

(h) Repair work involving open flames or other hazardous work done only in a room separated from storage section by a fire wall. Outside entrance to repair room where possible, otherwise entrance should be equipped with an approved self-closing fire door in tight fitting frame.

(i) Bell System Practice, Section H40.055, covers the requirements for painting vehicles in Company garages.

(j) Good practice requirements for construction and protection of garages is discussed in the National Building Code and in Pamphlets Nos. 30 and 88 issued by the National Board of Fire Underwriters.

(k) Fire and safety inspection and advisory services rendered by Marsh and McLennan are covered in BSP Section H44.015.

6. PREFABRICATED METAL GARAGES

6.01 Various types of prefabricated metal buildings are being manufactured which may be suitable for garages in some locations. This type of construction provides low cost garaging. Some are sufficiently well constructed that the structure would not suffer the expense of shortened useful life. Where such an economical design can be used, it should save money in capital investment; and yet it does not appear to be so cheap as to be too costly in future operation and maintenance. Greatest economy can be obtained in prefabricated metal garages when heating is unnecessary and simplest construction can be used.

6.02 The stock design which seems to be most efficient for garages is 60 feet wide, varying in length, with columns along the walls every 16 feet. It will accommodate two lines of vehicles parked at right angles to the side walls with an aisle down the center. A separate lean-to may be included for office and toilet space. The standard ceiling height to underside of garage trusses would be 12 feet. An overhead door could be placed in each end of the garage and any suitable window arrangement could be provided.

7. OPEN-SHED TYPE GARAGES

7.01 A low cost open-shed type of garage has been used to some extent in warm climates. Those built generally have been of galvanized sheet metal on wood or steel frame, using gravel or sea shells for floors. The roof supports are located so as to provide proper spacing of vehicles for maximum use of space. The columns are placed back from the front roof line with cantilever roof construction to facilitate parking.

7.02 In several instances these sheds have been erected at the rear of the lot behind a central office building. However, they are often built as part of a group of buildings to serve as a complete work-center. Other facilities included in the work-center, such as plant offices, storerooms, training rooms, wash rack, vehicle servicing structure, etc., are of the same general type of construction except that office spaces are finished with wallboard on interior of walls and ceiling and asphalt tile on floors.

SELECTION OF BUILDING SITES FOR CENTRAL OFFICES

1. GENERAL

1.01 This section covers factors to be considered in the selection of central office building sites that will allow the developing of buildings with well balanced elements of utility, economy and appearance.

1.02 This section is revised and reissued to include additional recommendations and important considerations with respect to offices located in cities which have been designated as critical target areas and/or which serve important military or atomic energy installations. Arrows are used to indicate changes throughout the text.

1.03 Although the information contained in this section is applicable in general to sites for other types of telephone buildings, factors to be considered specifically for such buildings will be outlined in separate sections. Certain special considerations in connection with the location of and the selection of sites for garages and garage work centers are contained in Section H20.222, H50.015 of Bell System Practices, Checking Routine, Garages and Garage Work Centers, Project Planning and Design. Recommendations regarding the selection of an Accounting office location and site are contained in section one, "Selection of an Accounting Office Location and Site" of the notes entitled "Accounting Space and Building Requirements." This section of the notes was issued to all Chief Engineers and Comptrollers by letter of July 30, 1953. The defense considerations recommended in Paragraph 3.19 are equally important and applicable to the location of non-equipment space as well as equipment space. The locations of storerooms and garages are important in planning for disaster operations. It is to be expected that all available Company vehicles and supplies will be needed in the event of a disaster whether natural (such as storms, earthquakes or floods) or otherwise (such as enemy air attacks, sabotage, conflagrations or explosions). Storerooms or garages in target area cities are included in defense planning as possible locations for emergency switchboard positions, rendezvous points for off-duty Company employees returning to work after a disaster, Company operating centers for directing restoration work, etc.

1.04 The time factor inherent in acquiring land, with the attendant processes of negotiation, title search, survey, zoning and subsoil tests, should be recognized.

1.05 Experience has indicated the importance of selecting a definite plot sufficiently early in the project schedule to permit ample time for the preparation of surveys, test borings, test pits, etc. On the other hand, it is usually not desirable that land for a new location be acquired years in advance of its need because of the probability of changes in outlook as to future development and other similar changes during the period the property is held. To avoid possible inflation of prices, investigations of sites and purchase of property are carried out on a confidential basis.

1.06 Generally speaking, the economical location of the central office site is determined from the indications of the fundamental plan.

1.07 Where new central offices are contemplated, early consideration should be given to the location of the wire center. This will greatly facilitate the search for real estate, particularly in those cases where there is little vacant property available or where modification of zoning regulations may be necessary. For a number of reasons it may not be practicable to secure a suitable site at the theoretical wire center, in which case a selection is usually made by weighing the outside plant considerations for each available lot against the advantages the proposed lot may offer as a site for the new building.

1.08 The proper size of a lot is of equal importance to the matter of its location. In addition to being properly located, the lot should be of liberal size to provide for orderly expansion to the ultimate building and for unforeseen contingencies. The area of the site required to accommodate a given central office building is determined largely by consideration of the equipment space required in the new building ultimately. The space required for other than equipment purposes and the indications of the fundamental plan as to possible changes in the exchange boundaries are also important factors to be considered. In determining the suitability of available sites it is highly desirable to have in hand a well considered tentative floor plan layout for the ultimate building. This layout would embody an estimate of the space units which must be housed, the relationship these bear to each other and the extent to which each one must be enlarged eventually.

1.09 In general, the acquisition of a liberal amount of land affords opportunities for orderly expansion to accommodate growth and unforeseen contingencies, provides ample light and air, reduces fire exposure, permits flexibility in arranging the building on the lot and allows for appropriate landscaping. In this connection, the need for employee parking facilities, particularly in residential sections, is not overlooked.

1.10 Corner locations and sites partly or entirely surrounded by streets have certain advantages over interior locations such as:

(a) Greater opportunities for favorable public attention.

(b) Increased natural light and air.

(c) Decreased fire exposure.

(d) Better facilities for bringing in outside cables.

(e) Opportunities for flexibility in providing electric, water, gas and drainage services to the building.

(f) More flexibility in arranging entrances to the building.

1.11 In the case of building sites for community dial offices, consideration is given to available locations on secondary streets in order to obtain maximum economy in these small offices; possible fire hazards on adjacent property, however, are to be minimum.

1.12 The selection of central office building sites in cities which are likely targets for an enemy attack or near installations which are likely to be subject to attack or sabotage, require special considerations in addition to the usual factors. Some of the more important considerations are outlined in Paragraph 3.19. It is not suggested that the selection of building sites be based primarily on defense considerations, however, it is suggested that defense factors be included along with the usual considerations that are normally applied.

2. PLOT SIZES

2.01 While the size of a plot selected for a given project is usually dependent on numerous factors, it is desirable as mentioned under Paragraph 1.09 that the lot area be liberal for the structure involved, particularly in the case of an interior plot. Except for community dial office buildings in outlying districts, experience indicates that a minimum length (or depth) for a plot is about 150 feet, and for the larger offices 200 feet is preferable. Plot widths are usually determined by considering the fundamental layout plans with a view of obtaining generous surrounding light and air space, driveway and parking facilities. For a community dial office building, a plot of about 50 feet by 100 feet generally is sufficient.

3. FACTORS TO BE CONSIDERED

3.01 Deed, zoning and building code restrictions, fire regulations and possible reaction from neighbors are limiting factors.

3.02 In purchasing new lots consideration is given to the marked tendency on the part of many municipalities and other governing authorities, such as County Planning Commissions, to restrict the use to which property within certain boundaries may be put, the heights of buildings, the proportion of the total lot area which may be occupied by the completed building including requirements for certain minimum setback distances from the property lines to the building, and to require, in certain instances, the provision of off-the-street parking facilities in connection with the building.

3.03 The theoretical ultimate wire center serves as a guide in determining the general vicinity considered most desirable for a central office location. In many instances, however, because of lack of sites, excessive high prices for those that are available, or for other reasons, it may be advisable to acquire land at some distance from the designated center. The search for such sites is preferably directed toward that portion of the area which offers the best potential prospects for future development.

3.04 It is suggested that comparisons be made of all properties to be considered with regard to:

(a) Propriety of location with respect to wire center of central office area, i.e., distance removed, etc.

(b) Cost of plots.

(c) Cost of building at each site.

(d) Outside plant considerations at each site.

3.05 Proposed or possible future civic improvements which might affect the lot by changes in the width or grades of the sidewalk or street are considered.

3.06 Probable future change in the character or development of the neighborhood is important.

3.07 The proximity of unfavorable surroundings productive of dirt, noise and vibration, such as a heavily traveled street intersection, a traction line, a noisy or dirty industrial plant, or general lack of neighborhood cleanliness is taken into account. Clean and quiet surroundings are most desirable.

3.08 The proximity of electric power installations such as electric traction lines, power generating stations or substations, the ground potentials of which may impair transmission, is an important factor. This condition is usually more serious in outlying districts where ground potentials may be higher and tend to extend over wider areas due to the absence of subsurface piping, etc.

3.09 Exposure to fire or other hazards on adjacent property are to be minimum. From the standpoint of eliminating gas leaking into buildings, particularly from high pressure mains and especially into community dial offices, either following along Telephone Company underground cable duct or permeating through the soil, selection of a site not in proximity to gas mains is important. If it is impractical to select a site away from gas piping, a plot is chosen, if possible, so that the underground cable duct into the building does not cross gas lines. This insures against gas leaking through ducts over and above plugging and sealing the ducts at the building.

3.10 Drainage conditions of the site and surrounding area with particular reference to possible flooding due to inadequate sewers, overflowing streams or other abnormal surface water conditions are not overlooked.

3.11 Availability and capacities of water and gas mains, electric distribution systems and storm and sanitary sewers are evaluated.

3.12 Natural and established grades and levels are compared with reference to their effect on both the proposed floor elevations and the cost of the proposed building, including any excess excavation or fill for grading.

3.13 Subsurface conditions as they affect the excavation, foundation and basement floor level with respect to grade, also as regards subsurface conduit, gas and water lines are important. Particular attention is given to the bearing capacity of the soil, to subsurface water conditions and to the presence and character of rock as related to cost of sheet piling, pumping or caisson foundations. Data are usually available in offices of local civic authorities. If, however, such data are inadequate or if subsurface conditions are otherwise in doubt, it may be desirable, if possible, to obtain an option on the property until test pits or borings may be made.

3.14 Sites having bed rock at or near grade usually possess maximum stability against quake movement.

3.15 The size and shape of the plot with regard to future extensions to the building and the desirability of landscaping treatment are factors.

3.16 The influence of surroundings upon the architectural design of the building are considered from the standpoint of developing favorable public reaction and, also, for the suitability of a public business office if one is contemplated.

3.17 The general situation with respect to comfort and safety to employees, parking facilities for employees' automobiles and accessibility to public transportation is important.

3.18 Plots located near aircraft landing areas and airways, which might require night lighting together with painting for daytime marking or limitations on height of structures, preferably are not selected for central office building sites when other properties are available.

3.19 In designated critical target area cities, areas serving atomic energy installations, key military installations or other locations as deemed necessary, selection of building sites to the extent practical in accordance with the following factors:

(a) Dispersion Plans

(1) Consideration of dispersed locations to the extent practicable with sufficient separation so that the chance of severe damage to more than one building is greatly lessened in the event of an enemy air attack, sabotage or other disasters. Separation of five miles or more is desirable, however, separation to a lesser degree is better than none at all.

(2) Consideration of areas away from installations that are likely to be sabotaged or which are likely targets in the event of an enemy attack.

(3) Consideration of locations away from defense plants, air bases, oil refineries, etc, which constitute likely targets or which are hazards from the standpoint of explosions and fires.

(b) Fire Storm and Conflagration Potentials

(1) Consideration of residential areas where the building density is less than 20 per cent and likely to remain this way by reasons of zoning laws, etc.

(2) Consideration of locations away from highly congested areas where most of the buildings are not of fire-resistant construction. Such areas may burn in a fire storm or conflagration as a result of an enemy attack through the initiation and spread of fires from an atomic, high explosive or incendiary attack.

(3) Consideration of the particular part of the more congested areas where the surrounding structures are predominantly of fire resistant construction.

(4) Consideration of areas free from places where explosives and flammable materials are manufactured, stored or used.

(5) Consideration of areas with wide streets that would serve as possible fire breaks.

3.20 Careful check of these factors should be made by the Building Engineer before making commitments.

COLUMN SPACING IN EQUIPMENT ROOMS

1. GENERAL

1.01 This section covers column spacing in equipment rooms for new buildings housing crossbar and/or step-by-step central office equipment.

1.02 The purpose of this section is to recommend column spacing with regard to the structural framing for equipment buildings. These spacings are for consideration in the design of equipment buildings with the objective of effecting economies in building construction by improving the efficient use of equipment floor space.

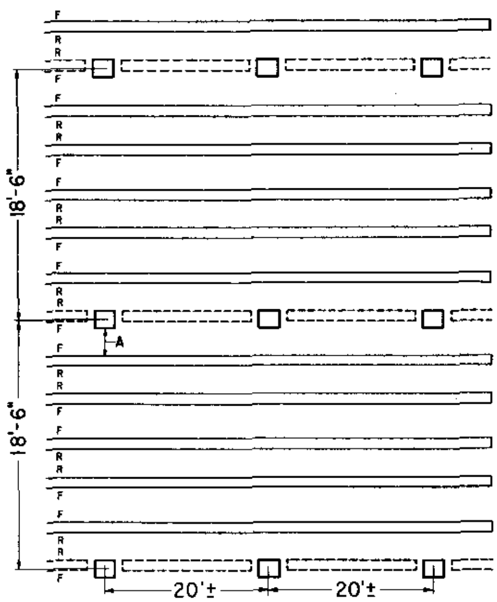
1.03 It is important that early in the building design stage the engineers of both the Telephone Company and the architects collaborate in arriving at the best method of structural framing as related to the equipment arrangements to assure maximum efficiency in the utilization of floor space.

2. COLUMN SPACING FOR CROSSBAR EQUIPMENT

2.01 Aisle Dimensions: As a result of a recent review of the matter of aisle spacing for crossbar frames, it is recommended that widths of 30 inches be adopted for maintenance aisles, and 23 inches in No. 5 crossbar and 24 inches in No. 1, tandem and toll crossbar offices for wiring aisles in new installations of crossbar frames. These aisle dimensions will permit the accommodation of five rows of frames between columns in an 18'-6" span, and in addition a partial row in line with the columns.

2.02 Column Spacing: It is recommended that column spacings of 18'-6" be used in the width of the building (at right angles to the run of the frames) for crossbar frame bays in No. 1 and No. 5 crossbar offices, and in crossbar tandem and crossbar toll offices. This departure from the former practice of using spans that are multiples of 4 feet and resulting in a 20-foot minimum span for five crossbar frames in a span will achieve appreciable saving in building size. Fig. 1 indicates a typical arrangement of crossbar frames and aisles with 18'-6" span.

CROSSBAR SYSTEMS
TYPICAL LAYOUT OF CROSSBAR FRAME BAYS WITH NARROW AISLES AND 18'-6" COLUMN SPACINGS



Aisle Dimensions - F to F or Maintence = 30"
R to R or Wiring = 23" for No. 5 Crossbar
= 24" for No. 1, Tandem & Toll Crossbar
Frame Width - 10½" - No. 5, 10" - No. 1, Tandem & Toll Crossbar
Dimension "A" - Columns 18" Wide - 22½"
Columns 20" Wide - 20½"

Fig. 1

2.03 M.D.F. Bays: The reduction in span covered in Paragraph 2.02 is not applicable to the M.D.F. bays, which normally include the number group and translator equipment of the No. 5 system. The 30-inch aisle is not intended to apply to the L.D.F., block relay and translator frame rows of the No. 1 crossbar system. The special requirements of this equipment are indicated in the Bell System Floor Plan Data Sheets.

2.04 Toll Terminal Equipment Bays: The practicability of applying an 18'-6" span to bays accommodating toll terminal equipment is currently under study. New projects which include such equipment, if they involve consideration of reduced column spacing at the location of toll terminal equipment are considered individually.

2.05 Aisle Clearance at Columns: Free-standing columns in the equipment rooms necessarily restrict aisle clearances at these locations. In view of the reduced aisle dimensions recommended in Paragraph 2.01, it is desirable to maintain clearances at not less than indicated as dimension "A" in Fig. 1. It is recommended, therefore, that the column dimension measured in a direction perpendicular to the run of the frame be kept to 18" or less and should not in any case exceed a maximum of 20". These dimensions assume that ventilating ducts, conduit, pipes, etc., will not be permitted to encroach on the minimum clearances recommended.

3. COLUMN SPACING FOR STEP-BY-STEP EQUIPMENT

3.01 Aisle Dimensions: The use of standard aisle dimensions as indicated in Fig. 2 and in the Bell System Floor Plan Data Sheets will permit the accommodation of five rows of frames in an 18'-6" span, plus a partial sixth row in line with the columns if desired.

3.02 Column Spacing: It is recommended that column spacings of 18'-6" be used in the width of the building (at right angles to the run of the frames) for frame bays in step-by-step offices. The use of the 18'-6" span will reduce the areas required for step-by-step equipment frames in new offices and will achieve appreciable savings in building size.

3.03 This plan, in addition, will facilitate economical layouts of crossbar equipment in the building if the installation of such equipment becomes desirable at some future date.

3.04 Fig. 2 illustrates the application of this spacing to step-by-step equipment layouts and indicates the location of frames with respect to columns of various sizes, with the resulting clearances.

3.05 M.D.F. Bays: It is not intended that the recommended 18'-6" span covered in Paragraph 3.02 be applied to the M.D.F. bays which normally include the I.D.F. in a step-by-step layout and which are designed to meet the special requirements of this equipment as indicated in the Bell System Floor Plan Data Sheets.

3.06 Aisle Clearance at Columns: The dash lines in Fig. 2 indicate the minimum clearances between the frames and the face of the columns recommended in the Bell System Floor Plan Data Sheets. Where the column dimension at right angles to the run of the frames is 14" or less, satisfactory clearances are obtained when the frames in line with the columns are centered on the columns. With column widths of 16" or more,

STEP-BY-STEP DIAL SYSTEM
TYPICAL LOCATION OF FRAMES
WITH 18'-6" COLUMN SPACINGS

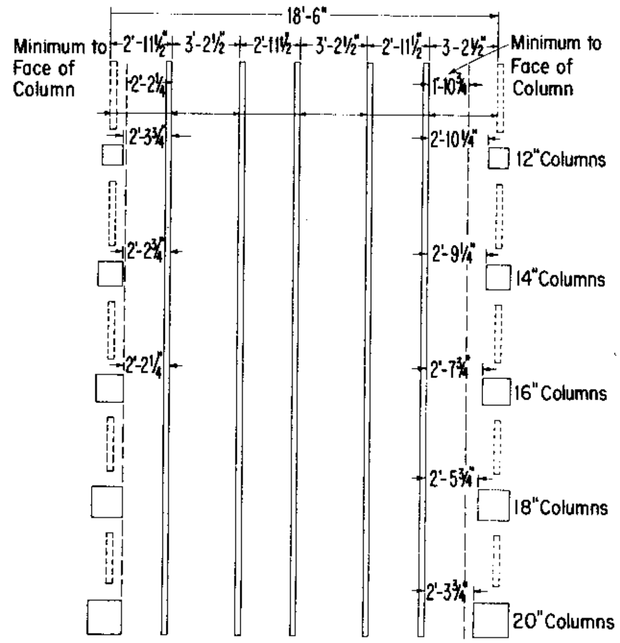


Fig. 2

the frames in line with the columns are offset from the center lines of the columns by varying amounts, in order to obtain the necessary clearances between the frames and the columns at both sides of the span.

3.07 Although Fig. 2 indicates that adequate minimum aisle clearances can be obtained with columns up to 24" in width, it is recommended that the column dimension measured in a direction perpendicular to the run of the frames be kept to 18" or less and should not, in any case, exceed a maximum of 20". These dimensions assume that ventilating ducts, conduit, pipes, etc., will not be permitted to encroach on the minimum clearances. This limitation is required for layouts of crossbar equipment in an 18'-6" span and adherence thereto will preclude difficulties in obtaining efficient use of equipment space in case it becomes desirable to install crossbar equipment in the building at some future date.

4. CONSIDERATIONS COMMON TO BOTH CROSSBAR AND STEP-BY-STEP EQUIPMENT

4.01 Other Requirements: It may occasionally be desirable to adjust certain column spacings in the equipment spaces because of operating room or other requirements on other floors.

An operating room for two lines of switchboard can generally be laid out in a space the width of two 18'-6" bays. Clerical desks and tables can usually be located in the center of such a room. In such cases, the clearances and aisle space for each line of switchboard will approximate the minimum dimensions recommended in Traffic Engineering Practices, Division J, Section 2, Traffic Space Requirements - Operating Rooms. An operating room for one line of switchboard requires a minimum width of 20 feet and normally a 20-foot bay is provided.

4.02 Longitudinal Column Spacing: The equipment floor space is most efficiently used if the column spacing in the direction of the length of the building (parallel to the run of the frames) is in the order of 20 feet or an even multiple of two feet. This dimension is varied to some extent as required by such considerations as the length of the initial building, the contemplated ultimate extension and the necessity of keeping columns out of cross aisles.

4.03 Longitudinal Column Dimensions: The dimensions of columns measured in the direction of the length of the building (parallel to the run of the frames) is held to a minimum consistent with the cross section of the structural members plus fireproofing. Ducts, pipes, etc., which are sometimes furred in with the column are not normally permitted to encroach on the longitudinal clearance between columns in equipment spaces. These procedures are intended to minimize the length of the reduced portions of the aisles.

TOILET ROOMS - GENERAL

1. GENERAL

1.01 This section outlines suggestions for the general treatment and finishes of toilet rooms and the factors to be considered in their planning in telephone buildings.

1.02 The practice is reissued and the text generally revised to provide additional recommendations for lighting, treatment of walls and floors and the ventilation of toilet rooms.

1.03 Variations from the recommendations may be required by local ordinances, or may be necessary in large headquarters buildings or small offices in outlying areas, where special conditions are not unusual.

1.04 Typical toilet room layouts including mounting heights of the fixtures and various toilet room accessories are outlined in B.S.P. Section H24.510, Toilet Room Fixture Spacings. The requirements for the various fixtures and accessories based upon the number of persons assigned to their use, are covered in B.S.P. Section H24.520, Number of Fixtures Required in Toilet Rooms. Suggestions as to types of plumbing fixtures and fittings are described in B.S.P. Section H34.150, Plumbing Fixtures in Toilet Rooms and House Service Closets.

2. LOCATION

2.01 Toilet rooms are generally located as far as practicable, in or adjoining the core or the stair area of the building. In addition to the desirability of this location from the standpoint of accessibility for building personnel, it is generally considered a location which will offer a minimum of interference with future equipment growth.

2.02 Locations opening directly into equipment areas, or where equipment aisles are used as passageways to toilets, are avoided where practicable, to reduce the exposure of the equipment to lint and dirt.

2.03 It is considered advisable not to locate toilet rooms above equipment space or where a leak in the piping or fixture overflow may result in damage to the equipment. The arrangement of toilet rooms one above another, where feasible, provides the most economical and practical method of plumbing, and with toilets on successive floors the probability of damage from leaking water is reduced. Where it is necessary to locate toilet rooms above equipment space the floor area is treated as outlined in Part 3.

2.04 Where men's and women's toilet rooms are adjacent on the same floor, the entrances are located as remote from each other as practicable to afford maximum privacy.

3. WATERPROOFING

3.01 The floors of toilet rooms above equipment areas, and in other locations where it is considered advisable, are made watertight to minimize the hazard of overflow or leaks. In general, applied waterproofing compounds are not recommended for this purpose because of the possibility of cracks developing in the floor slab. Experience indicates that the application of a continuous rustless metal pan directly to the structural floor slab provides a more satisfactory waterproofing treatment. Pans are constructed of sheet lead, soft sheet copper or like material, and are extended over the entire area of the toilet room floor including adjacent piping space.

3.02 Floor drains installed in toilet rooms with waterproofed floors are preferably discharged into a service sink or similar open receptacle to avoid the problem of dry traps and the possible backflow from the sewerage system. To minimize the possible accident hazard and for appearance, it is considered advisable to locate floor drains out of the general path of travel.

3.03 In toilet rooms where the provision of floor drains is not practicable, consideration is given to the use of exterior wall scuppers.

4. WATER SUPPLY CONTROL

4.01 To provide for emergency and maintenance conditions water supply branches to each toilet room are equipped with shut-off valves located in an accessible place and suitably designated. In larger toilet rooms it is considered advisable to provide shut-off valves within or adjacent to the immediate area and readily accessible in emergency and for maintenance.

5. VENTILATION

5.01 The requirements for the ventilation of toilet rooms are usually determined by local or state ordinances and the procedures recommended in this section are for the general consideration of the problem.

5.02 Natural ventilation, through windows opening to outside air, is generally provided for toilet rooms in smaller buildings and in other buildings where adequate window area is available. However, the ventilation of toilet rooms involves the process of exhausting air in addition to air supply, and under conditions of limited ventilating area, undesirable window location and in cold climates, natural ventilation is not entirely satisfactory.

5.03 For toilet room windows opening to the outside and where uniform appearance is a factor, it is suggested that consideration be given to the use of fine mesh inside screens rather than obscure glass.

5.04 Skylights are considered equivalent to a window for ventilation purposes when provided with fixed or movable louvers with openings of the net openable area required of the window.

5.05 Mechanical exhaust systems are generally provided for toilet rooms where ventilation by natural means is not practicable. For larger toilet rooms and where appearance is controlling, duct systems are installed with the vent stack extended through the roof. Toilet ventilating systems are entirely independent of other building ventilating systems. Low speed window exhaust fans are also considered for toilet rooms where acceptable. Louver openings in walls or doors for positive draft in connection with mechanical exhaust systems are not generally desirable and are often prohibited under local ordinance.

6. LIGHTING

6.01 Sufficient illumination is provided for easy visibility of all parts of the toilet room including the compartment area. With the provision of adequate ceiling lighting and planned light distribution, supplemental lighting, as for example at mirrors and wash basin areas, is not generally required.

6.02 For toilet rooms having outside windows, the lighting requirements are determined with consideration of the amount of daylight provided, particularly in buildings where the toilet room is used only during daylight hours.

6.03 In smaller toilet rooms having high ceilings it is considered desirable to have the lighing fixtures at a level which permits ready maintenance. The lowered light source also tends to reduce the high ceiling effect in these locations. Wall mounted fixtures, if otherwise acceptable, are recommended to avoid the use of the long pendants of ceiling hung fixtures.

7. VESTIBULES AND STALLS

7.01 Toilet rooms having more than one toilet are provided with entrance vestibules to screen the interior from view, except where the room layout or location does not require a screened entrance. A women's toilet accessible from adjoining lounge or locker room, or a men's toilet in the basement or opening directly into a room occupied only by men, do not require vestibule entrances.

7.02 Where not required to be ceiling high the vestibule partition is generally of the same material as the toilet stalls. The partition is preferably not less than six feet high and two feet wider than the entrance door where space permits.

7.03 Stall partitions of marble are generally considered for use in larger buildings where special treatment is desired. In addition to their pleasing appearance, they provide a permanent partition which is readily maintained.

7.04 Flush type metal stall partitions with baked enamel or porcelain finishes have also proven satisfactory and are used where the cost of marble does not appear to be justified.

7.05 Wood type stalls are suggested for use in leased quarters and in smaller toilet rooms where acceptable.

Doors

7.06 Toilet stall doors and doors in stall height vestibule partitions are usually flush type and of wood or metal. Wood doors are generally used with marble or wood stalls and metal stall and vestibule partitions are equipped with metal doors.

7.07 Where it is considered desirable, vision openings are provided in vestibule doors.

Hardware

7.08 Hardware for toilet rooms is generally of chromium plated cast bronze. For toilet rooms in small offices or leased quarters, less expensive hardware of chromium plated wrought bronze is considered satisfactory.

7.09 Toilet stall doors are equipped with coil spring or gravity hinges arranged to hold the door open when the stall is unoccupied. More reliable operation is obtained where two spring hinges are used with each door rather than a single spring hinge and a pivot hinge. A combination coat hook and rubber tipped bumper, and a latch are normally provided on the stall side of each door.

7.10 Vestibule doors are equipped with coil springs or gravity hinges arranged to return the door to the closed position. Push plates and pull handles are provided as required.

7.11 Service sink stall doors are equipped with coil spring or gravity hinges arranged to return the door to the closed position. Pull handles are provided and where locking is required cylinder locks are generally used.

8. TOILET ROOM FINISHES

Walls and Wainscot

8.01 Walls are generally finished with plaster above a vitreous tile, ceramic glazed tile or marble wainscot, stall partition high. An alternate wainscot height of 4'-0" to 4'-6" permits the installation of mirrors and towel dispensers directly on the cap without scribing the wainscot. Projecting caps are not recommended and all free edges of the wainscot should be rounded.

8.02 Where a toilet room is designed for future extension, consideration is given to omission of wainscot treatment of the wall to be removed. In toilet rooms which due to the building layout are considerably larger than necessary for the number of fixtures required, the wainscot treatment is limited to the general area of the fixtures.

8.03 An alternative treatment for toilet room walls is the use of structural hollow clay tile partitions having a glazed surface finish. This treatment provides an easily maintained permanent surface finish from floor to ceiling. The use of structural tile is considered for appropriate locations and where the relative cost is not inconsistent with plastered walls and tile wainscot. Additional information in regard to color and surface quality ranges is outlined B.S.P. H32.378, Interior Finish of Rooms in Central Office Buildings.

8.04 In smaller buildings in outlying areas where the unit cost of tile or marble may be relatively high, wainscot is generally provided only at the rear of wash basins and urinals.

8.05 The walls of rooms having one toilet are plastered and a vitreous tile or ceramic glazed tile wainscot is generally provided, particularly on walls adjacent to wash basins and urinals. Alternate wainscot finishes of materials used in domestic installations are not considered sufficiently impervious for easy maintenance and permanence.

Ceilings

8.06 In general, toilet room ceiling finishes are similar to the finish of equipment room ceilings in central office buildings. The ceiling structure is formed to provide reasonably smooth exposed concrete surfaces which are painted.

8.07 In the arrangement of toilet rooms one above another the exposed piping at the ceiling is covered with insulation as required and both covered and uncovered piping is painted with the ceiling.

Floors and Base

8.08 Toilet room floors are generally level with adjacent floors to eliminate tripping hazard, for convenience and to permit the passage of mop trucks where used. This condition may be obtained normally by using wall type fixtures or by exposing waste piping on the ceiling below where one toilet room is above another or over the basement.

8.09 Unglazed tile of highly vitreous composition and terrazzo are generally used for floor finishes. Terrazzo surfaces have a tendency toward staining and pitting and are not as readily repaired as the tile surfaces. Traffic marks are more apparent on extremely light finishes and the extremely dark shades of terrazzo tend to change color in traffic lanes.

8.10 In general, bases are of the same material as the floor finish. Where glazed structural tile walls are used, base units of the same material in a darker shade are considered.

8.11 Tile or marble plinths are suggested for door openings trimmed with wood.

8.12 A non-slip rustless metal door saddle is provided at each toilet room door. Where marble is used for the toilet stalls or wainscot, door saddles of the same material are considered.

8.13 Floors of rooms having one toilet should be as non-absorptive as practicable consistent with the cost justifiable under the conditions. Asphalt tile or linoleum, with rubber base are generally satisfactory. Asphalt tile is suggested for toilet rooms on ground floors as being less impervious to moisture from the ground. Wood or concrete are not considered sufficiently impervious from a sanitation standpoint.

BUILDING CLASSIFICATIONS

BY TYPE OF CONSTRUCTION

1. GENERAL

1.01 This section outlines suggested classifications for buildings based on types of construction generally common to Bell System buildings. The classes are arranged in the order of their fire resistance rating, and afford advantages of uniformity and brevity in identifying basic structural characteristics.

1.02 This section is revised and reissued to include additional information. Arrows are used to indicate changes throughout the text.

2. CLASSIFICATIONS

2.01 Fire Resistive, often referred to as "Fireproof": A building with all walls of masonry or reinforced concrete, with all floors and roof of reinforced concrete or of hollow tile arches and having a structural frame of reinforced concrete or of structural steel which is encased in concrete or masonry for protection against the effects of heat.

2.02 Light Noncombustible: A building with all walls, floors, and roof constructed of incombustible materials and having a structural steel frame which is unprotected against the effects of heat. Typical of this class is a structure framed with exposed steel members and having cement floors and corrugated sheet metal covering on the sides and roof.

2.03 Mill Type, also known as "Slow-Burning" or "Heavy Timber": A building with walls of brick or other substantial masonry and having interior structural framing, floors, and roof of heavy timbers arranged to avoid thin sections, sharp projections, or inaccessible spaces.

2.04 Brick-joist: A building with walls of brick or other substantial masonry and having interior structural elements, floors and roof of wood of smaller dimensions than required for "Mill Type" construction.

2.05 Frame: A building with wood walls, roof and interior framing elements whether or not the walls and roof have an incombustible exterior finish such as brick veneer, stucco, corrugated sheet metal, or asbestos shingles.

2.06 Where the construction of a building involves a combination of two or more of the foregoing structural classes, an individual description would usually be required for identification.

3. COMBUSTIBLE MATERIALS

3.01 In important new construction combustible materials are to be avoided where practicable and preference given to fire-resistive types. Recently developed building materials such as precast concrete, asbestos fiberboard, sheet metal roof decking, etc, may warrant consideration.

3.02 In small buildings, such as community dial offices, wood construction might be used for economy or for other reasons, but the roof covering and exterior wall surfaces are preferably of fire-resistive material. Examples of hazardous combustible materials are flammable insulation or acoustical materials and duct insulating materials (including the paper coverings). The basic material of some insulating products are fire resistive but are covered with paper and asphalt compounds which are fire hazards.

EXTERIOR WALLS OF MASONRY

MOISTURE PENETRATION

1. GENERAL

1.01 This section covers the general subjects of design and construction of exterior masonry walls above grade from the standpoint of resisting cracking and moisture penetration. Of numerous factors which influence the resistance of walls to cracking and leakage, the most important from Bell System experience appears to be the quality of workmanship. This is particularly evident where walls are exposed to prolonged driving rains and wide variations of temperature.

1.02 The suggestions outlined in this section may be considered applicable generally to nonbearing panel and curtain walls of skeleton framed structures as well as to load bearing walls. It is recognized that walls of structures in localities subject to earthquakes or hurricanes require special reinforcing treatment, the details of which are generally covered by provisions of local Building Codes.

1.03 This section is revised and reissued to include additional recommendations, changes in certain wording and rearrangement of the text. Arrows are used to indicate changes throughout the text.

2. CONSTRUCTION

2.01 Experience indicates that resistance to moisture penetration in walls above grade has been proportionate to their ability, due to strength and ruggedness, to accommodate movement, and at the same time to avoid rupture resulting from normal vibration or expansion and contraction. Good qualities of resistance to cracking are usually attained by constructing the walls solidly, without voids, using appropriate masonry units, properly mixed mortar, solidly filled joints and vigilant inspection. The permeability of masonry walls to moisture penetration appears to depend almost wholly upon the quality of workmanship. The use of standard quality units and first class workmanship are the first requirements for weather-tight masonry walls. While the selection of brick for exterior walls is often influenced to some degree by considerations of color and texture for architectural effect, it is important that qualities of durability be taken into account. Bricks that are unduly soft or porous, or that have a considerable content of calcium sulfate are usually subject to excessive surface erosion. Tests for these properties are suggested where the characteristics of brick under consideration for a given project are in doubt.

2.02 Concrete masonry units such as block, brick and tile have been successfully used in telephone buildings as backing for exterior brick walls, for constructing interior partition walls and for constructing exterior walls of repeater stations, community dial offices, garages, and storerooms. Concrete masonry lends itself to a variety of surface finishes for both exterior and interior walls. Painted concrete blocks would appear to be a satisfactory wall finish for switchrooms. Painted concrete block walls have been used extensively for interior partitions in certain accounting center buildings.

2.03 Where concrete masonry is used as backup or partitions in structural frame buildings, the masonry should be securely anchored to the structural members by adequate rustless metal ties. Where one concrete masonry wall joins another, either of concrete masonry, cast-in place concrete or other masonry, the two walls should be securely bonded with a masonry bond or with very substantial metal ties. This also applies to partition walls. Joining two walls together without bonding or tying, regardless of the masonry material used, will usually result in the formation of cracks. The provision of a limited number of beveled vertical joints extending the full height of the wall where concrete masonry is used in exposed partitions of lengths in excess of fifty feet is usually effective in limiting cracking due to temperature stresses to these joints.

2.04 It is important that maximum durability of bond between brick and mortar be obtained to resist separation cracks. Experience indicates that the bond strength is generally greatest where bricks having moderate absorption are used with lime-cement mortar or with certain premixed (patented) masonry mortars. Numerous views have been advanced as to the proper ingredients required to produce satisfactory mortar, such as using seasoned slacked lime, - also the percentages of lime and cement considered most desirable.

There seems to be some thought that a volume of lime equaling the volume of cement is a normally maximum lime content. This is on the basis of avoiding excessive erosion due to weathering and of maintaining a reasonably high compressive strength of the mortar consistent with securing proper bond as indicated above. Consideration might be given to certain admixtures of hardening and waterproofing compounds that may have been found to reduce mortar shrinkage and efflorescence and to increase the bond strength. Thorough mixing of the mortar is essential in acquiring uniform, homogeneous and workable consistency; also it tends to reduce initial shrinkage. Mortar should have high water-retaining capacity and plasticity. To insure a good bond the brick should have a low rate of suction when placed in the wall. To secure this low rate of suction, when absorbent bricks are used, they should be thoroughly wetted and not allowed to dry out before they are placed in the wall. The wetting of absorbent bricks before laying, the use of mortars of moderate or high water-retaining capacity and the use of bricks of high absorption as backing for bricks of low absorption are essential aids in obtaining walls which are resistant to moisture penetration. These aids are not of significant value, however, unless accompanied by a careful filling of the mortar joints.

2.05 In constructing solidly built walls free from voids, all joints, both vertical and horizontal, are completely filled with mortar, and the use of cored, hollow or porous brick or hollow tile is generally avoided. It is desirable that the size of backup brick match that of the face brick as closely as practicable in order that all courses and joints may be maintained uniform throughout the wall and permit proper bonding with brick headers. Tight joints are essential to watertight masonry. Bed joints should be full and level and not furrowed. Head joints should be carefully buttered to fill the joints solidly. Face brick should be back-plastered before the backup units are laid to provide a barrier to any water which may find its way through the outside four inches of the wall.

2.06 The amount of water which will enter cracks in the face of the wall can be reduced, if all joints on the exterior face of the wall are tooled to give a concave finish. This should be done with a round tool slightly larger than the joint, before the mortar hardens, and with pressure sufficient to compress the mortar and create a firm bond between the mortar and the units at the face of the wall. Raked, stripped and struck joints greatly increase the chance for the development of leaks. In making these joints, there is a tendency to open up the body of the mortar and draw it away from the masonry unit, forming small ledges upon which water can collect. Joints that are excessive in width, rough cut, struck or raked out tend to accumulate water for capillary induction to the wall interior. For average conditions it is expected that joints will be in order of 3/8 inch, but are preferably not over 1/2 inch in width. Joints which are uniform and tooled with pressure slightly concave or flush have provided the most satisfactory weathering qualities.

2.07 Further procedures to assure rapid shedding of rain from exterior wall surfaces include the minimizing of projecting masonry courses and cornices, or avoiding them entirely. Where they occur, consideration might be given to flashing their upper surfaces with lead coated copper dripped at outer edges. Projecting sills are provided with drip grooves under their outer edges; also, the use of slip sills (same width as window opening) is generally avoided since they do not afford adequate bond with the wall masonry. Sills are preferably wider than the wall opening.

2.08 Moisture penetration around window frames is minimized by providing flashing at window heads and by caulking with oakum followed with elastic caulking compound to solidly fill the joint between frames and masonry reveals. Special attention directed to making the heads of windows tight against moisture penetrating between the masonry and the lintel, and between the lintel and the window frame, will be an important factor in reducing maintenance.

2.09 Plaster applied directly to inside surfaces of solid walls is subject to disintegration by dampness in the wall or by condensation due to low temperature of the wall when the room air is moist and relatively warm. This condition would be particularly prevalent in switchrooms where induced humidity is provided during the winter season. Furred surfaces of hollow tile or galvanized lath arranged for plastering, or of structural glazed tile so installed as to provide an air space are recommended to avoid moisture penetrating to the finished wall surface, also to prevent condensation.

2.10 As regards the smaller types of buildings such as community dial, which generally have gable or hip roofs and relatively minor areas of exposed wall, various types of wall construction have been employed which differ from the foregoing procedures. Whether or not the small structures can justify the same treatment as the larger types may depend upon local conditions. In some cases 8-inch thick outer walls and 4-inch thick inner walls have been constructed, leaving 2-1/2 inches air space between and bonding the separated walls with rustless metal ties.

2.11 In general, walls that feature, for example, running bond, vertical indented or projecting architectural motifs involving continuous vertical joints, corbeling, or that otherwise require considerable cutting of the bricks, have not proved satisfactory from the standpoint of resisting moisture penetration.

2.12 Due to the severe exposure of roof structures such as stair bulkheads and penthouses, it is suggested that consideration be given to entirely encasing them with sheet copper having standing seams to accommodate movement due to temperature changes. The exposed surfaces of stair bulkheads may be materially reduced by inclining their upper surfaces to correspond with the rake of the stairs.

2.13 Spandrel waterproofing membrane composed of bituminous saturated fabric has been found to disintegrate, whereas sheet copper has indicated good qualities of durability.

2.14 Where the foregoing procedures conflict with, or are exceeded by corresponding requirements of local or state legislation, the legislated requirements should, of course, apply.

3. TEMPORARY REAR WALLS

3.01 In connection with the construction of temporary rear walls and other walls subject to removal and relocation by reason of growth, consideration is given to the use of fire resistant materials which are economical as to first cost, are readily removed, and are wholly or partially salvageable for relocation and re-use.

3.02 Materials and methods which have been used satisfactorily for this purpose include steel decking placed vertically, concrete block, hollow tile, prefabricated concrete panels, and in locations of mild climates, steel studs with metal lath and cement plaster. This is not intended to be a complete listing of all the materials and methods but does indicate some of the many possibilities in this connection, keeping in mind, however, the requirements for fire and weather protection.

PARAPET WALLS

1. GENERAL

1.01 This section covers general recommendations to be considered in the design and construction of masonry parapet walls and includes suggestions for the treatment of exterior walls where parapet construction is not required. Parapet walls, being subject to most severe exposure, require not only careful designing but particular attention to details and workmanship during construction to assure maximum resistance to the weather.

1.02 This section is reissued principally to modify the height recommendations for parapet walls and to include suggestions for the treatment of exterior walls where parapet construction is not required.

1.03 Construction above the roof level for the protection of fire walls, party walls and exterior walls of masonry, is not generally required on telephone buildings of fire-resistive construction. However, for the safety of personnel having ready access to roof areas and for fire protection in certain locations, parapeted exterior walls or protective fence have been provided where access is normally available to roof.

1.04 Where the procedures recommended in this section do not meet the requirements of local or state codes or ordinances, the legislated requirements are applicable.

2. MASONRY WALLS

2.01 Height: To reduce the area of exposure to weather, it is desirable that masonry parapet walls are limited in height consistent with local code requirements and the function of the wall as outlined in Paragraph 1.03. The height is usually limited by ratio to wall thickness and generally is not in excess of three feet.

2.02 Thickness: Parapet walls are usually no thinner than the building wall immediately below, except that a nominal thickness of 12 inches need not be exceeded.

2.03 Provision for Expansion: Where straight runs of parapet walls are of major length without breaks to accommodate movement due to variations in temperature and moisture content, consideration is usually given to the provision of expansion joints at convenient intervals, extending full height of the parapet. For measures to prevent pressures against parapets due to expansion of the roof fill, reference should be made to B.S.P. Section H32.405 Flat Roof Grading.

2.04 Coping: Material for the coping on parapet walls is usually selected for qualities of durability and appearance. Where used for appearance, natural stone having the permanency of limestone is suggested. In some cases glazed vitrified tile coping having overlapping hub joints or rustless sheet metal may be suitable. Copings of cast stone, reinforced concrete, sandstone or similar soft stone are not normally recommended due to relatively poor weathering characteristics.

2.05 From the standpoint of durability, it has been found that copings about 4 inches thick are generally desirable. They are cut on top to shed water toward the roof, project at least 1-1/2 inches on each side of the wall and overhanging edges are provided with clean-cut continuous drip grooves in the order of 5/8 inch deep. It is desirable that copings be set in a full bed of mortar without voids. Before the stones are set, their abutting edges are coated with such material as white shellac or bakelite varnish to prevent absorption of the elastic caulking compound oils into the stone. Joints are uniformly 3/8 inch wide, and those that occur at intervals of 15 to 18 feet are provided with expansion joint gaskets shaped to fit the stone profile and set back 3/4 inch from sides and top. Intermediate joints are filled solidly with mortar and raked out to a depth of 3/4 inch. All joints are then filled with elastic caulking compound. Consideration might be given to protecting the caulking compound from exposure to weather by providing lead joint shields for the exposed length of each joint. In localities subject to earthquakes, special consideration is given to additional anchoring of the coping stones.

2.06 Tile copings are set generally the same as stone copings, except the overlapping hub joints are solidly filled and pointed with mortar only.

2.07 For suggestions covering construction items of masonry, mortar and joints for parapet walls, reference should be made to B.S.P. Section H32.334, Exterior Walls of Masonry-Moisture Penetration.

2.08 Flashing: Sheet copper not lighter than 16 ounce is suggested for parapet flashing due to its qualities of permanence and workability. The advantages of a relatively low parapet wall and reduced maintenance costs may well justify consideration of protecting its entire back surface with copper. It is important that the cap flashing, after extending up the rear face of parapet, be carried across top of the wall, extended about 1 inch beyond the outer face and bent downward. If the exposed copper lip might cause objectionable staining where light colored brick or stonework is involved, the use of lead coated copper for the exposed lip would be in order. Prior to placing the flashing, it is suggested that the wall upper surface be painted with asphaltum followed with a full bed of elastic compound into which the through flashing is set. The exposed flashing on the rear of the parapet is usually provided with standing seams to accommodate temperature movement, and is placed with sufficient clearance from the wall and open at the bottom to permit "breathing" of the masonry. The overlap at base flashing is made ample to prevent rain from being blown in to the brickwork. Wind weaving is avoided by anchoring the wall flashing at suitable intervals just above the base flashing. Flashing under the coping is usually crimped or otherwise deformed to afford bonding.

2.09 Piers on the roof side of parapet walls where required to encase stub wall columns, pipes, etc., may be extended to the same height as parapets and provided with similar flashing and coping.

2.10 Consideration is usually given to the provision of copper lined scupper openings in parapet walls appropriately located to prevent roof flooding in the event of leader drain stoppage.

2.11 Consistent with architectural limitations, it is desirable from a maintenance standpoint to either minimize the projection of masonry cornices or avoid their use entirely. The mortar or caulking in vertical joints of masonry cornices is subject to loosening and dropping out, resulting in leakage at these points. To overcome this, the upper surface of cornices might be covered with lead coated sheet copper provided with transverse standing seams to accommodate expansion, and with a drip at outer edges. Cornice decks that occur above roof level are pitched toward the wall, and scupper openings provided at deck level. Decks of cornice that occur below roof level are pitched away from the wall. These provisions, from a cost standpoint, are additional reasons for avoiding the use of cornices.

3. ALTERNATIVE TREATMENT

3.01 A parapet wall effect which does not accentuate building height is obtained by terminating exterior walls as projecting cornice or coping slightly above the roof level. Pitched to turn drainage toward the roof and level with the roof fill at the inside face, the upper surface is finished as part of the roof.

3.02 Buildings designed with the flat roof overhanging the exterior walls are satisfactory in locations where appropriate and permissible.

3.03 Parapet walls have been omitted on the rear of one and two-story buildings where appearance is not controlling. Roof drainage can be provided by a hanging gutter on the rear wall with the entire roof sloped to the gutter.

3.04 It is considered desirable that roof areas are not generally accessible to personnel other than those required for maintenance of roof facilities. Metal railing is used, where considered advisable on low parapeted roofs, particularly to enclose the areas adjacent to roof access.

INTERIOR FINISH OF ROOMS IN CENTRAL OFFICE BUILDINGS

1. GENERAL

1.01 This section outlines suggestions for the general treatment and finish of floors, walls, columns and ceilings of various rooms and spaces common to central office buildings of fire-resistive construction. It is intended as a reference in providing desirable elements of utility, appearance and economy of maintenance, also in minimizing hazards to equipment.

1.02. This section is revised and reissued to remove the previously suggested use of structural tile for walls in central offices and to include several recommendations pertaining to interior walls, partitions and floors in telephone buildings.

1.03 Arrows are used to indicate revisions in the text.

2. FLOORS

2.01 Floor areas which can be finished as an integral part of the slab forming the structural floor are considered preferable to finish surfaces bonded to the hardened slab or laid independently over a fill. Through joints where required in floor finishes should be flush and level to reduce dust accumulations and prevent irregularities in applied surface coverings.

2.02 Pipes and conduit to be concealed in the floor are generally run in the thickness of the structural slab. Cinder fill between the finished floor and the slab to accommodate underfloor duct work is not considered necessary and is generally not being provided.

Concrete Floor Surfaces

2.03 Concrete floors for cable vaults, boiler rooms, power rooms, and other interior areas not finished with a floor covering material, are generally of good quality and steel troweled so that surface treatments are not necessary. Too much water or excessive troweling tends to bring out moisture and float soft cement to the surface, producing powder. The use of an applied hardener is recommended where the concrete floor is subject to excessive dusting under traffic. The application of an approved hardener is as outlined in Section H53.105, Hardening and Dustproofing Concrete Floors. Where the floors in these areas are painted, runners are sometimes provided to protect the finish in the traffic lanes.

2.04 Floors which are to be painted, treated with a hardener or finished with a resilient covering should be thoroughly dried out. Moisture in concrete floors has a disintegrating effect on linoleum particularly. Moisture tests of new floors should be made before application of a covering, and the recommendation of the manufacturer should be followed.

Resilient Floor Coverings

2.05 Concrete floors are usually covered with sheet linoleum, asphalt, vinyl-asbestos or rubber tile. This treatment provides the desirable features of attractive appearance, quietness and comfort underfoot, and a smooth surface relatively easy to maintain. The materials offer a wide range of colors and decorative effects, but solid colors, in extremely light or dark shades tend to show traffic marks more readily. Pattern designs of the various contrasting colors are considered more easily maintained.

2.06 *Vinyl-asbestos tile* is comparable in cost to linoleum. It has the advantage of being less subject to damage from indentation than asphalt tile. It is also available in a wider range of colors and can be used below and above grade.

2.07 *Linoleum* provides a lasting surface, quiet and resilient underfoot. It is relatively easy to maintain with a minimum of surface joints.

2.08 ***Asphalt tile*** has a lower initial cost than linoleum and its higher resistance to underfloor moisture permits use on floors below grade or on the ground, where linoleum is not suitable. A treated tile at higher cost is available for use in areas where regular asphalt tile would be damaged by grease or oil.

2.09 ***Rubber floor coverings*** while very durable under heavy traffic are relatively higher in cost and require more careful maintenance to preserve the appearance. However, they are more resilient and slip resistant than linoleum or asphalt tile, and are considered for use in public offices and areas justifying special treatment.

Applied Hard Surface Finishes

2.10 ***Terrazzo*** floor finishes are considered desirable in entrance halls to larger buildings, from the standpoint of durability, appearance and maintenance. Terrazzo floor surfaces in toilet rooms are not as easily maintained as unglazed tile floor surfaces because of the tendency of the terrazzo toward staining and pitting. Traffic marks are more apparent on the extremely light shades of terrazzo finishes and the extremely dark shades require special maintenance. Aggregates containing marble chips of contrasting colors provide an attractive and more readily maintained surface. Abrasive particles added to the aggregate to provide additional slip resistance are preferably black or very dark initially because of their tendency to darken under traffic.

2.11 ***Unglazed tiles*** of highly vitreous composition are used on floors in toilet rooms, and in kitchens and associated areas. Tiles treated in manufacture to provide slip-resistive surfaces are used in the kitchen areas. The use of the larger tiles closely set is suggested to reduce the amount of porous filler exposed in the surface joints.

2.12 Where entrance hall floors are recessed for floor mats, the recess should be 3/8-inch deep for corrugated perforated type, and 1/2-inch for the link type.

2.13 In general, bases are of the same material as the floor finish, except that a marble base is usually provided with marble tile flooring. Rubber set-on base is used with linoleum, asphalt, or rubber floor coverings.

2.14 Materials for treads and platforms of stairs are described in Section H32.610, Stairway Planning and Construction.

3. WALLS

3.01 Structural glazed tile treatment is suggested for consideration for walls and partitions for certain toilet rooms as outlined in Section H24.501, Toilet Rooms — General, also for house service compartments and kitchen space where permissible.

3.02 Structural concrete masonry units using preferably lightweight aggregates and set in cement lime mortar provide economical interior walls and partitions in telephone buildings. The use of reasonably smooth block together with the application of a suitable paint or coating generally provides a very satisfactory and pleasing surface. It is recommended that walls and partitions of these units be anchored firmly at ceilings and abutting columns because of possible shrinkage of the units in curing. It is suggested that this type of wall treatment be considered for temporary partitions requiring a fire-resistive rating and at permanent locations where acceptable.

3.03 When using concrete forms or blocks caution dictates that only properly cured material should be used. The use of cured material will reduce the hazard of cracking due to curing shrinkage; however, shrinkage control joints are also recommended. The use of tooled joints might be considered in preference to flush or bagged joints.

4. CEILINGS AND COLUMNS

4.01 Satisfactory finishes are obtained where columns and ceilings to be exposed are formed and poured to provide smooth surfaces. Where for decorative purposes however it is necessary to conceal concrete surfaces there are many products on the market today which will provide a smooth surface. The available smooth surfaces are subject to less dirt collection, which results in less maintenance cost.

4.02 The corners of columns, girders and beams are generally chamfered, adding to the finished appearance of exposed concrete surfaces. It is suggested that plastered partitions abutting concrete columns be kept back from the face of the column not less than the depth of the chamfer to avoid maintenance problems otherwise resulting from the poor bond and different expansion qualities of concrete and plaster.

4.03. In general, the ceilings and columns of basements, switchrooms, power rooms, quarters and toilet rooms have their exposed concrete surfaces formed to provide reasonably smooth surfaces.

4.04 To obtain smooth surfaces on exposed concrete it is important that the form work be constructed in a manner to provide a minimum of irregularities in the finished concrete surface. Forms are lined with plywood, tempered masonite or equal material, with a minimum of joints, and are cleaned and inspected before the concrete is poured. Triangular members for chamfering square corners of columns, beams, girders, etc, are usually provided in the form work. Before lining materials are reused they are thoroughly cleaned and inspected. It is important that all form linings be oiled with form oil in accordance with current specifications issued by the Portland Cement Association. The form structure is built true to line and level and securely braced to prevent movement or warping during subsequent operations. It is suggested that careful check be maintained during pouring operations, to detect possible faults in the form structure. In order to free the concrete of voids and air pockets, it is agitated while still plastic by mechanical vibrators, hand spading or rodding. Forms are removed as early as permissible after the pour to permit removal of fins and the more prominent irregularities. With careful supervision of the form construction and concrete application, reasonably smooth surfaces are obtained and carborundum grinding is not generally warranted. The application of cement wash or grout to produce uniform surfaces is generally unsatisfactory because of the tendency of such applications to dust and scale. If a painted or enameled surface is required, it is suggested that prior to painting, the surface be treated with a neutralizing solution of magnesium fluosilicate as described in Section H53.105. The application is permitted to dry and any excess crystals are brushed off before painting.

Acoustic Surfaces

4.05 Consideration is usually given to the provision of acoustic treatment at ceilings of rooms where reduction in the anticipated noise level is indicated to obtain favorable service performance and working conditions. Such rooms include, for example, operating rooms, test desk rooms, assignment bureaus, public business and record offices, accounting space wherein noisy machines are employed, certain dining rooms and cafeterias. Detailed suggestions on the general subject of acoustic treatment are outlined in Section H32.354, Noise Reduction.

FLAT ROOF GRADING

1. GENERAL

1.01 This section covers the use of dead-level or graded flat roofs of fire-resistive telephone buildings and is intended as a reference for general procedures in arranging details of the roof construction.

1.02 Arrows in the margin indicate changes in the text.

1.03 This section is reissued to suggest taking advantage of improved roofing materials and techniques which allow dead-level roof construction with reduced risk of leakage. The use of a dead-level roof affords several economies, particularly in buildings where vertical growth is planned. With the use of dead-level roof construction, the cost of fill material, the labor to install it and the cost of removal at the time of additional vertical expansion are eliminated.

1.04 Where roof drains are provided it is recommended that the flat roof be slightly pitched for an area of two to three feet in the vicinity of and towards the roof drain. This usually can be accomplished within the roof insulation without disturbing the structural slab. The type and number of drains would be determined by the amount of rainfall experienced in the area.

1.05 For dead-level roofs where no parapet wall is used a slight pitch away from the roof edge or a slight pitch from the gravel stop and coping is suggested to prevent dirty roof water from washing down over the face of the building.

1.06 Where there is an abnormal amount of traffic on a dead-level roof protective measures such as the installation of duckboards or walks might be considered.

2. ROOF FILL

2.01 Where pitched roof is used it is desirable that minimum depth of fill consistent with insulating value be provided at low points (leader outlets), also that the fill at ridges be limited to provide a slope sufficient to assure positive drainage. Minimum volume of fill facilitates its removal in connection with building additions, and reduces requirements for step flashing. It is suggested that the fill material have thermal insulation value as well as the qualities to facilitate easy removal.

2.02 Experience indicates advantages in sloping the fill to drain from the roof center toward the outside walls. This arrangement permits wider distribution of runoff with more leader outlets and with scuppers; in general, it also reduces the height of exterior walls.

3. EXPANSION JOINTS

3.01 Liberal use of expansion joints extending entirely through the fill is considered effective in preventing damage to surrounding parapet walls by accommodating fill movement due to variations in temperature. Also, to further avoid pressure due to expansion, no fill or insulating materials are permitted to come in contact with parapet walls.

4. PERMANENT ROOFS

4.01 Except for references to fill removal, the foregoing provisions are intended to apply to flat roofs of buildings that have attained their ultimate height as well as those designed for future additional stories. However, where it is preferred to use pitched roofs for buildings that are at the ultimate height the use of dead-level roofs for buildings where future stories are to be added may prove advantageous.

SOAP DISPENSING SYSTEMS

1. GENERAL

1.01 This practice covers the arrangements recommended for use in telephone buildings for dispensing liquid toilet soap. These arrangements are of two general types: the individual unit type consisting of small soap receptacles each equipped with a dispensing valve, and the central tank system comprising one or more storage tanks from which the soap is piped to dispensing valves.

1.02 This practice is reissued to recommend stainless steel rather than chromium finished brass for the metal parts of dispensing units, valves and wall tanks and to include a few other changes as indicated by the marginal arrows.

2. INDIVIDUAL UNITS

2.01 Individual units should be used chiefly in toilet rooms having up to about three wash basins and in larger toilet rooms where connections from a tank are not feasible. They comprise a dispensing valve in combination with a reservoir having a capacity of about one pint. The metal parts of the dispensing valve are stainless steel and the reservoir is glass, vitrified enamel or monel metal depending upon the unit selected. The units should be securely attached to withstand the strain caused by pushing the plunger and so located that spilled soap drains into the wash basin.

3. CENTRAL TANK SYSTEMS

3.01 Small wall mounted stainless steel tanks of two and one-half or five gallons capacity are intended primarily for use in toilet rooms having more than one wash basin in buildings having only a few toilet rooms or where the daily soap consumption is beyond the capacity of the individual unit on the basis of 65-75 persons per unit. These tanks should be mounted, preferably in janitors' closets, adjacent to toilet rooms and in an accessible location for draining and filling. They should be mounted with the top about 7 feet from the floor. Larger tanks located at strategic points (usually near the top of the building unless its height requires intermediate tanks) for serving several or all of the toilet rooms are generally more economical for medium and large size buildings. In determining the proper size tank to use, one quart of diluted soap per day should be allowed for each 150 persons to be served and consideration should be given to a suitable refilling interval. In order to avoid any possibility of the liquid soap becoming rancid, the refilling interval should ordinarily not exceed about one month.

3.02 In order to have available a suitable receptacle in which the diluted soap may settle for several days before being used, twin tanks should be provided in connection with all of the large installations. The tanks should be mounted on a platform 12 inches to 15 inches high and be provided with covers. Two outlets, each with a suitable valve, should be provided from each tank. One outlet should be connected at the bottom of the tank for drawing off the settled sediment into a bucket. This outlet should not be connected to a soil line. The other outlet should be connected to the supply line and the opening to it should be above the bottom of the tank in order to prevent sediment getting into the supply line. The distance from the bottom of the tank to the supply outlet depends upon the height of the tank and the hardness of the water, information regarding which may be obtained from the municipal water department. The outlet height should be approximately 1 inch for each foot of tank height for water of a hardness not exceeding 10 grains per gallon. The outlet height should be proportionately higher for harder waters. A simple gauge, actuated by a float, should be provided with these tanks. For the two and three gallon tanks and the individual units, the soap settling should be cared for in separate vessels in the house service quarters.

3.03 Supply lines between the tanks and the soap dispensing valves should be as straight and free from bends and fittings as practicable in order to avoid sediment accumulations. Clean-outs in the supply lines should be provided at suitable intervals. It is also desirable that the lines be so graded that the system may be completely drained. Piping should be concealed as far as practicable, otherwise it should be painted the same color as the walls. A shut-off valve should be located on each floor or in each large toilet room to facilitate maintenance. The soap dispensing valves operate satisfactorily at supply line pressures up to 100 pounds. However, the system should generally be designed so that supply line pressures will not exceed 60 pounds. Where building heights would result in higher pressures if one tank were used, additional tanks should be installed or suitable pressure reducing valves used. In all cases the tank should be located above the level of the valve outlet as the valve will not draw the liquid soap upward.

4. MATERIALS AND FIXTURES USED

4.01 Tanks: Two and one-half and five gallon capacity wall mounted tanks of stainless steel are available through commercial plumbing supply channels.

4.02 Tanks of larger capacity, where required, should also be obtained locally. Commercial 35 or 55 gallon steel drums are suitable and should be unpainted on the inside.

4.03 Piping: Black iron or black steel piping and fittings should be used for the supply lines and shut-off valves between the tanks and the various soap dispensing valves. Black iron piping and fittings are least affected by liquid soap. Copper or brass should not be used as the soap attacks these metals.

4.04 Valves: The soap dispensing valve which is a part of the individual dispensing unit and the valves which are used with the tank systems should both be of the type which delivers lather and both should be stainless steel. Individual units including the dispensing valve as mentioned and dispensing valves for use with tank systems are available through the regular supply channels.

4.05 The valves for use with the tank systems are obtainable either in a vertical type suitable for mounting directly on the wash basin or in a horizontal type. However, the vertical type is preferable from the standpoints of operation of the valve, appearance, draining into the basin and the avoidance of a bumping hazard in washing.

RELIEF VALVES FOR HOT WATER STORAGE TANKS

1. GENERAL

1.01 This section describes A.S.M.E. Standard pressure and temperature relief valves, spring loaded types, recommended for installation on hot water storage tanks to prevent excess pressure and temperature in the tank under all conditions of operation.

1.02 This section includes recommendations for minimum and maximum relief valve sizes and installation of relief valves. In addition, it advises of a device for vacuum relief for use only where required by local and/or state regulation.

1.03 This section is issued to place relief valves for hot water storage tanks in a separate section. Pressure relief valves for hot water storage tanks were mentioned under Section H34.222, Issue 1, March 1944, Safety and Relief Valves, which is replaced by Section H34.290, Issue 1, January, 1952, Safety Valves for Low Pressure Steam Boilers. It also includes recommendations for temperature relief and for vacuum relief where required together with methods of installation not covered in the replaced section.

1.04 This section applies generally to new installations. In existing installations non-standard relief valves need not be replaced and installed in accordance with this section provided they are of the spring loaded type, are in operative condition, are testable by means of a substantial integral lifting lever and have no shutoff valve or other obstruction between the tank and the relief valves or on the discharge side of these valves.

If, however, there is any doubt as to the effectiveness of an existing valve, it is recommended that a new valve be installed as outlined herein.

1.05 Hot water storage tanks referred to in this section include:

(a) Tanks in which hot water is stored but is heated in a separate hot water supply boiler or heater used exclusively for that purpose.

(b) Tanks in which hot water is stored but is heated by means of heat exchanging devices, either inside or outside the tank, connected to the building heating plant or to a separate steam boiler provided for that use.

(c) Tanks of storage type gas fired, electric, and oil fired water heaters.

1.06 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPES

2.01 Each hot water storage tank is provided with A.S.M.E. Standard relief valves set by the manufacturer to discharge at a pressure not more than 15 pounds higher than the maximum working pressure stamped on the tank and to discharge when hot water from tank is at a temperature not higher than the boiling point of water at atmospheric pressure; the temperature relief closes when temperature of hot water has been reduced approximately 35 degrees lower than relief temperature. Only where required by local and/or state authority is relief for vacuum in a tank provided; this type of device relieves vacuum instantly at a minus pressure not greater than 1 inch of vacuum.

2.02 A standard combination pressure and temperature relief valve or two individual relief valves, one for pressure and one for temperature, may be used. The use of individual valves is recommended. (See Paragraph 5.03.)

2.03 The standard valves are of the spring loaded type without disc guides below the seat or pressure side of the valve. If the valve is an individual pressure relief or a combination pressure and temperature relief, it has a substantial integral lifting device.

2.04 The standard individual temperature relief valve is an automatic type in that it discharges hot water until the hot water has been reduced to a temperature below the atmospheric boiling point, then the valve closes; its capacity is governed by the maximum heating rate of the hot water heating equipment.

2.05 Standard relief valves have seats and discs of non-corrosive materials.

2.06 Each standard individual pressure and temperature relief valve and combination pressure and temperature relief valve has a relief outlet connection.

2.07 Where vacuum relief is required, valves of the ball check type are not allowed for this purpose. Vacuum relief devices do not have relief outlet connections as none is necessary. A vacuum relief valve is made of materials that will not corrode or hold fast to the seat after prolonged use.

2.08 Pressure and temperature relief valves are selected with a rating in relieving capacity in British Thermal Units per hour at least matching the gross output of the heating medium for the water of the storage tank in British Thermal Units per hour to prevent excess pressure and increase in water temperature in the tank above the relieving temperature under all conditions of operation such as improperly prolonged firing of the heating source, a bottled up system, etc.

3. MINIMUM AND MAXIMUM INLET SIZE

3.01 The inlet size of standard relief valves used in connection with hot water storage tanks is not smaller than 3/4-inch iron pipe size and not larger than 2-inch iron pipe size.

3.02 Where the capacity of a hot water storage tank requires the size of a relief valve to be larger than 2-inch iron pipe size, two or more relief valves are installed to provide the required capacity. Cross-sectional areas of tappings in tanks for relief valves and of piping used in this connection are at least equal to the total cross-sectional area of the valves.

4. MARKINGS

4.01 Each standard relief valve is plainly labeled with the manufacturer's name or registered trade mark and the letters "A.S.M.E. Standard."

4.02 In addition to the foregoing markings, other markings are as follows:

(a) On combination pressure and temperature relief valves, the pressure in pounds per square inch, the temperature in degrees Fahrenheit, and relieving capacity in British Thermal Units per hour at which the valve is set to discharge.

(b) On an individual pressure relief valve or on an individual temperature relief valve, the pressure in pounds per square inch or temperature in degrees Fahrenheit, and relieving capacity in British Thermal Units per hour at which the valve is set to discharge.

4.03 These data are usually stamped or cast on a plate securely attached to the casting so as not to be obliterated in normal service.

4.04 In the case of a vacuum valve or other approved device used to prevent a vacuum in the tank, any vacuum valve or similar device bearing the mark of a recognized manufacturer is acceptable.

5. INSTALLATION

5.01 An individual temperature relief valve or a combination pressure and temperature relief valve is installed directly on top or within 12 inches of top of a hot water storage tank in a tapping in tank. Such valves may be placed on the flow pipe from top of tank within 8 inches, developed length, from top of tank and within 2 inches of flowing water. The tapping or piping is not smaller in cross-sectional area than the cross-sectional area of the inlet of the valve.

5.02 An individual pressure relief valve is installed in the hot or cold water supply above tank between control valve and tank and this piping is not smaller in cross-sectional area than the cross-sectional area of the inlet of the valve. If installed in this manner on the cold water supply, contact of the valve disc with hot water is eliminated thus reducing the possibility of the valve leaking.

5.03 It is recommended that a standard individual temperature relief valve and a standard individual pressure relief valve be installed in preference to a combination pressure and temperature relief valve; the temperature relief valve is installed on the tank and the pressure relief valve is located in the cold water piping as described in Paragraphs 5.01 and 5.02, respectively. The installation of the pressure relief valve on the cold water supply piping reduces the tendency for the build-up of scale which might interfere with the operation of the valve.

5.04 The relief outlet is connected with discharge piping, brass or copper, sized full area for this outlet connection. The discharge piping is run within the building and terminates at an open plumbing fixture where available or in the basement within 12 inches of the floor. This piping pitches down from the valve it serves to prevent trapping of water. If piping is run into the drainage system, it is not connected directly but as an indirect waste. Terminating end of discharge piping is cut at 45 degrees to prevent its being capped or plugged, thus insuring free relief discharge. Where two or more valves are connected to same discharge, the pipe area is not less than area of valves it serves. This arrangement of the discharge adequately protects personnel and property.

5.05 Where required, a vacuum relief valve is installed on the cold water supply piping to tank above tank; where cold water supply enters below top of tank from a water supply located below tank, the supply pipe is raised to above top of tank forming a loop and the vacuum valve is placed on top of loop above tank.

5.06 To further insure functional operation of the relief valves at all times, no shutoff or cutout valves or any means of obstruction are installed between the relief valves and the tank or on the discharge piping.

6. MEANS FOR TESTING

6.01 The integral lifting lever on the standard combination pressure and temperature relief valve and individual pressure relief valve provides a means for manual testing. By hand operating the lever, the valve disc is raised and the valve will discharge if in operable condition.

WATER TREATMENT

OPEN AND CLOSED HEAT EXCHANGER SYSTEMS

1. GENERAL

1.01 This section outlines some conditions to be considered in planning equipment and water piping for water treatment of heat exchanger systems. Included in such systems are hot water heating systems, water chiller systems and water-cooled condensing systems used in air conditioning installations.

1.02 The control of corrosion, scale, algae, fungi, and sludge is essential to obtain maximum life and performance of the equipment used in these systems. The water to be used in a system should be analyzed by a reliable water testing laboratory or water treatment company to determine the need for a water treatment program. In addition, consideration should be given to the nature and extent of air-borne pollution to which an evaporative condenser or cooling tower may be exposed. The location of equipment of this nature should be guided by the location of building chimney, the type of fuel used and the prevailing wind direction.

1.03 The Engineering Department through the Building Engineer should:

(a) Make the decision after consultation with the Plant Department whether treatment is to be provided.

(b) Reach an agreement with the Plant Department on the method of treatment to be used.

(c) Provide the equipment required as part of the mechanical equipment of the building.

(d) Provide the initial supply of chemicals.

(e) Check for satisfactory installation and operation before turnover to the Plant Department.

(f) See that adequate operating instructions are provided for Plant Department use.

1.04 The Plant Department through its Superintendent of Buildings has the responsibility of administering the water treatment program.

2. REFERENCES

2.01 The following BSPs contain information on related subjects:

H34.280 Evaporative Condensers
H34.281 Cooling Towers
H51.370 Fundamental Principles of Water Conditioning
H51.371 Water Treatment — Air Conditioning Systems (to be issued)

2.02 The sentences defining corrosion and scale and the entire paragraph defining sludge have been reprinted by permission from HEATING — VENTILATING — AIR CONDITIONING GUIDE — 1956, Chapter 43.

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3. DEFINITIONS

3.01 *Corrosion* is destruction of a metal by chemical or electrochemical reaction with its environment.

3.02 *Scale* is a deposit formed from solution directly in place upon a confining surface. In general, hard water tends to form scale, especially when subjected to successive heating and cooling. In most cases, scale is the insoluble carbonates of calcium and magnesium.

3.03 *Sludge* is a water-formed sedimentary deposit. It usually does not cohere sufficiently to retain its physical shape when mechanical means are used to remove it from the surface upon which it deposits. Sludge is not always found at the place where it is formed. It may at times be hard and adherent and baked to the surface on which it has deposited.

3.04 *Algae and fungi* are types of plant life which may grow in circulating systems. They tend to form slime on the surfaces of the system.

3.05 The *pH-value* is a term used to describe the degree to which a water is acid or alkaline. Neutral water has a pH of 7. The pH-values range from 0 to 14, those less than 7 being acidic and those above 7 being alkaline. However, the pH-value is a logarithmic function, not a straight line function. Thus a pH of 4 indicates a solution ten times more acidic than one having a pH of 5, and 100 times more acidic than one having a pH of 6. A pH of 9 would indicate a solution ten times more alkaline than one having a pH of 8.

3.06 *Once Through System* — The condenser water passes through a heat exchanger absorbing heat and increasing in temperature before being discharged to waste.

3.07 *Closed Recirculating System* — The water circulates through a heat exchanger where it absorbs heat, rises in temperature, then circulates through another heat exchanger where its temperature is lowered.

3.08 *Open Circulating System — Cooling Towers* — The condenser water passes through a heat exchanger absorbing heat and increasing in temperature. The water then flows to water cooling equipment such as atmospheric (natural draft) towers or mechanical draft towers. As water passes through the tower, a portion of it evaporates thereby cooling the remainder. Loss of water through evaporation tends to concentrate the salts, since the salts do not evaporate. In addition, a small amount of water is lost through drift. Automatically fed make-up water replaces that lost for these reasons.

3.09 *Open Circulating System — Evaporative Condenser* — The water, recirculated from a sump, is sprayed over hot refrigerant piping where it absorbs heat and increases in temperature before returning to the sump. As this water is again sprayed over the piping, it is cooled by evaporation, aided by an induced air movement. Water losses occur in evaporative condensers for the same reasons as in cooling towers.

4. ECONOMIC CONSIDERATIONS

4.01 Chemical feeding and control devices, as well as the chemicals used in a program, are expensive. The cost of such devices and the chemicals may influence the design of the condenser water system for smaller installations. Closed systems usually require less costly feeding devices and fewer chemicals than the open systems.

4.02 Where serious water problems occur, consideration should be given to the use of air-cooled condensers. Not only is this consideration recommended for small systems, but also for large ones, particularly where there are serious water problems. Air-cooled condensers have been used satisfactorily for systems as large as 200 tons. They have two disadvantages — the amount of power required to handle the necessary air volumes and the fact that their capacity is at its lowest on the hottest days. The choice between installation of a water treatment system and the use of air-cooled condensers should be governed by the result of a cost comparison, with due consideration for the fact that personnel must be available to administer a water treatment system.

5. SPECIFYING THE WATER TREATMENT PROGRAM

5.01 The following items are considered as essential in any water treatment program specified by a water treatment company:

(a) A written report of the water analysis, which should include the determinations, usually in parts per million, of calcium, magnesium, silica, iron, bicarbonate, sulfate, chloride, total hardness as calcium carbonate, total solids, and pH.

(b) The chemical names of the water treatment compounds recommended for use.

(c) The concentration of chemical and pH to be maintained in the water.

(d) That chemicals recommended and the apparatus used to feed these chemicals comply with municipal and state health codes.

(e) That chemicals recommended will have no detrimental effect on nonmetallic materials such as rubber, plastic, etc, often used in water systems.

(f) That chemicals recommended will not cause delignification of wooden parts sometimes used in cooling towers.

(g) The amount of continuous bleed-off, water run to waste, from open circulating water systems required to limit scale formations.

6. SUMMARY OF WATER TREATMENT CONTROLS

6.01 Table 1 is a summary of water treatment controls for various types of heat exchanger water systems. This table is condensed from "Carrier Document 2D-7." It may be necessary to use one or several of the treatments listed depending on what a water analysis shows to be the most economical. Certain of the listed items may prove to be too costly in some cases.

7. CHEMICAL FEEDING

7.01 The preferred way to add chemicals to large open recirculating systems is by means of an electric driven, positive displacement mechanical feeder. This type feeder should be connected so as to operate only when the recirculating water pump is running. Such a feeder should be considered for systems larger than 100 tons. Other factors may make it desirable to use this type pump on systems smaller than 100 tons. For example, where it is desirable to locate the chemical treatment equipment in a basement equipment room for easy access by maintenance personnel, this type of pump may be used advantageously.

7.02 Bypass feeders can be used for adding chemicals to closed systems. In this case the chemicals are added manually and in one shot. Bypass feeders usually are not used on open systems due to the lack of good control. Fig. 1 shows one type of bypass feeder.

TABLE I

Summary of Water Treatment Controls

WATER PROBLEM	SYSTEM		
	CLOSED RECIRCULATING	ONCE THROUGH	OPEN RECIRCULATING
Scale Control	No Control Required	1. Pretreatment a. Sequestering Agent b. pH Adjustment	1. Bleed-off 2. Pretreatment a. Sequestering Agent b. pH Adjustment c. Ion Exchange
Corrosion Control	1. Deaeration 2. Corrosion Inhibitors	1. Corrosion Inhibitors 2. pH Control	1. pH Control 2. Corrosion Inhibitors
Algae Control	No Control Required	No Control Usually Required	1. Manual Cleaning 2. Chemical Algaecides

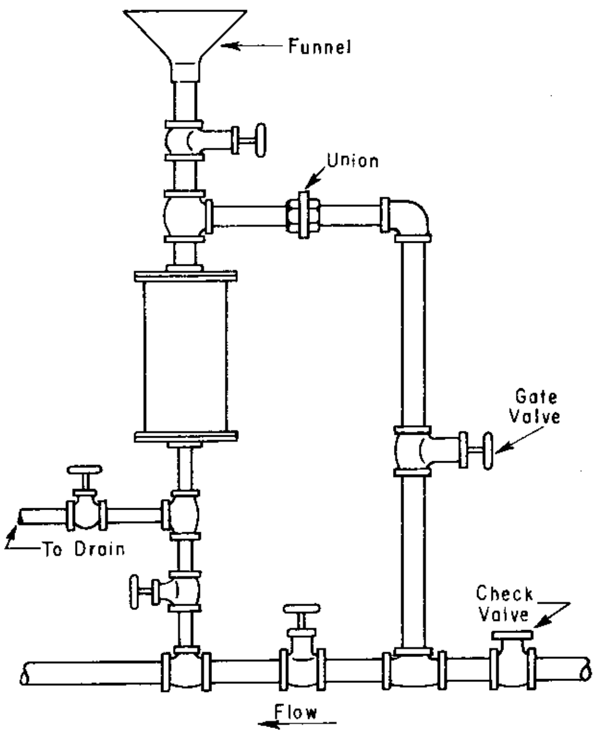


Fig. 1 – Bypass Feeder

7.03 On small open-type systems where the cooling tower or evaporative condenser is accessible, the chemicals may be fed by gravity to the sump from a tank mounted above the sump. Because a continuous drip of the chemical solution would be too small for proper adjustment, a timer and solenoid valve may be used to allow chemicals to be fed for two minutes or so during each hour of tower operation. The chemicals must be in solution in the tank in order to be fed into the system. The rate of flow of the solution will depend on the amount of water used as the solvent. Since the solution will flow for only two minutes each hour, the flow will be great enough to be regulated satisfactorily by means of a globe valve. Fig. 2 shows this arrangement. A second solenoid valve regulates bleed-off. If the tank can not be elevated above the sump of the tower, then a small pump may be installed as shown in Fig. 3 to feed the chemical solution into the system. This pump would not be as expensive as the type mentioned in Paragraph 7.01.

7.04 Fig. 4 shows one type of feeder which can be purchased commercially. This type unit can be used singly or in groups. It is to be placed in the bottom of the cooling tower or evaporative condenser and arranged so that the top cup is always full of water when the circulating pump is running. The proper rate of flow is obtained by using the proper size of orifice. The chemical is replaced by removing the empty can and placing a new can of chemical in its place.

7.05 There are certain devices on the market today which claim to control scaling and corrosion by electric current or magnetism. These are not recommended. They should not be confused with those devices which are based on scientific principles, such as the magnesium rod placed in hot water storage tanks for the control of rust.

7.06 The most accurate way to add acid for pH control to assist in scale control is to use an electric driven, positive displacement mechanical feeder controlled by an electronic pH controller. However, this equipment is quite expensive and its use should be limited only to the extremely large systems requiring the addition of acid. Intermittent dosages by manual feeding or excess concentrations from the use of inexpensive feeders can be harmful to the system.

7.07 Hot water heating systems as a general rule do not need chemical treatment. These systems tend to have a small amount of scale formed in the piping and this helps protect it against possible corrosion. Chilled water systems should have some provisions made for treatment against corrosion. There is a tendency for all the dissolved oxygen in the water to unite with the metal in the pipe over a period of time. In this case, it would probably be more economical to provide a chemical feeder than a deaerator. It should be remembered that for a closed system the best policy is to prevent as little change of water as possible. For this reason, unnecessary leaks should be detected as early as possible and eliminated.

8. PIPING

8.01 In open-type circulating systems it is necessary to allow a small percentage of the water to discharge to a drain in order to pre-

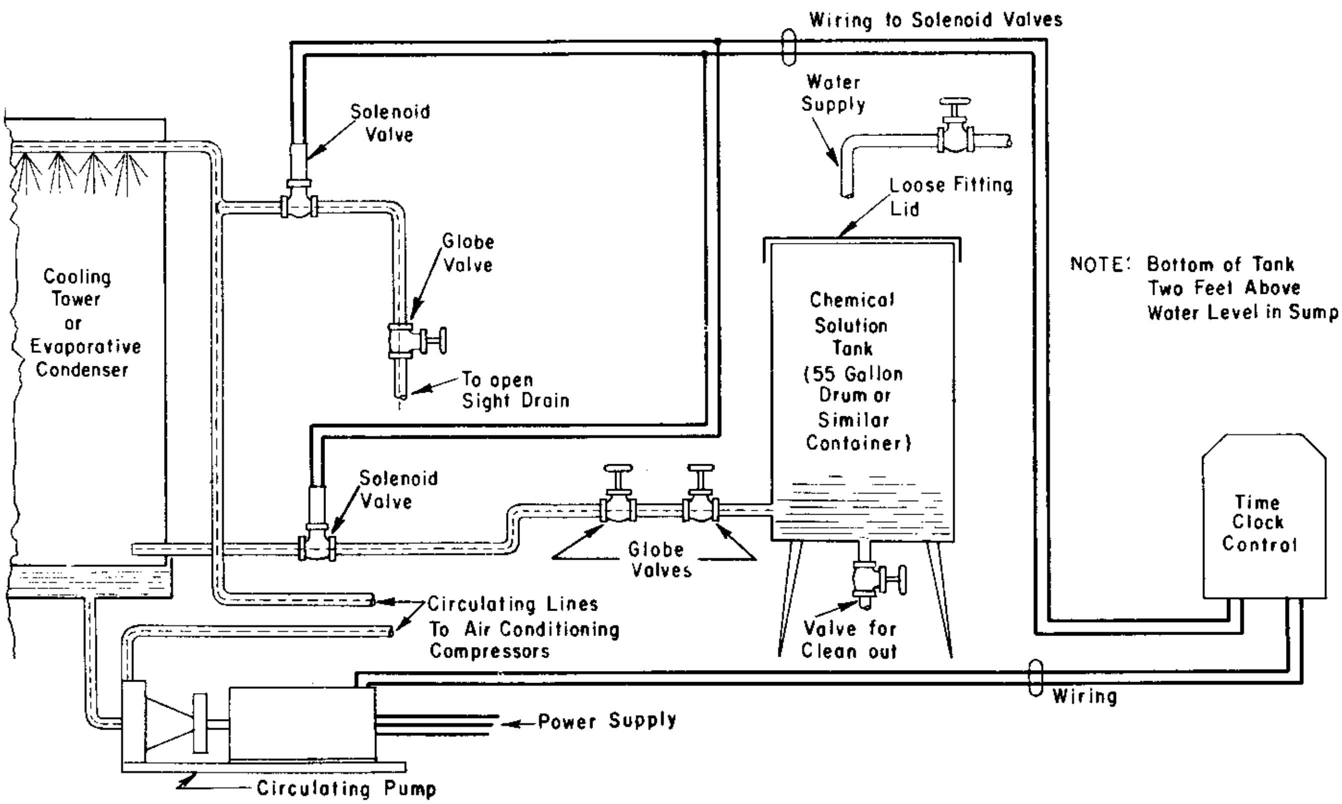


Fig. 2 – Timer – Solenoid Valve Gravity Chemical Feed System

vent the build-up of minerals in the water. This is known as bleed-off. For easy control on small systems this can be done by installing a funnel or pan with a rectangular sliding cover and with a line running to a drain. This pan should be installed in the path of the spray. The amount of bleed-off can then be regulated by opening or closing the cover. A means of diverting the bleed-off water into a separate container should be provided so that the amount of bleed-off can be measured. In general, where bleed-off is to be continuous, facilities sized to bleed-off one per cent of the water circulated should be provided. The actual bleed-off can then be regulated as required. There may be cases where the chemical content of the water or the temperature drop through the water-cooling device may require a larger bleed-off than one per cent. A bleed-off line taken directly off the circulating pipe is not recommended where the bleed-off is less than ½ gallon per minute because of the likelihood that the valve regulating the amount of bleed-off will become clogged. In these cases, and in other cases where an intermittent bleed-off is desirable, the solenoid valve and timer arrangement, mentioned in Paragraph 7.03, is recommended. This must be sized as required by the frequency of solenoid operation and volume of bleed-off necessary.

8.02 When a positive displacement pump is used to add water treatment chemicals in solution to a cooling tower, the pump discharge line should be connected to the condenser water line to the tower. The connection should be made at a point in the condenser water line after the water has passed through the condenser water pump and the condenser.

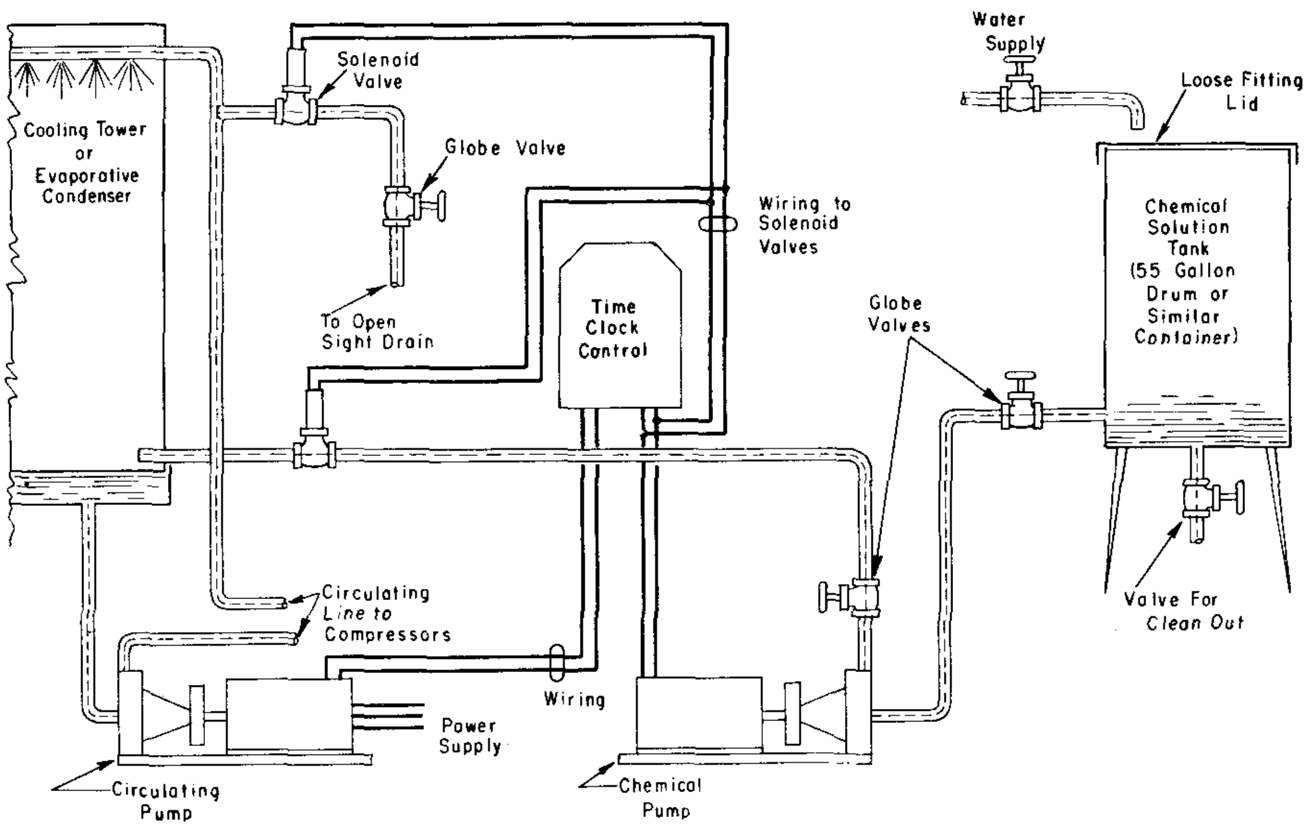


Fig. 3 – Timer – Solenoid Valve Pumped Chemical Feed System

8.03 Fig. 5 shows a commercially manufactured device for regulating the amount of bleed-off. This type device is located in the bottom of the cooling tower or evaporative condenser. Water should overflow the top cup whenever the circulating pump is running. The orifice can then be changed to give the desired rate of bleed-off. This method would be used where the bleed-off rate is less than ½ gallon per minute. Depending upon the condition of the water, this would be used for systems of about 70 tons or less.

8.04 On open-type systems provide an air gap between the system and the water supply. Closed systems which have the water supply connected directly to them should be treated with chemicals in such concentration that the resulting solution is not poisonous. The use of chemicals in poisonous concentrations in boiler water or chilled water systems may require the use of expensive make-up water controls to prevent the possibility of the treated water from backing up into the potable water supply.

8.05 A fouling factor is usually applied in designing equipment. This fouling factor is the allowance made for a small amount of deposits on the piping and equipment which slows down the rate of heat transfer. Table 2 is taken from "Carrier Document 2D-7" and lists suggested fouling factors for industrial equipment operated 24 hours a day and cleaned every 6 to 12 months. This table should be used only as a guide to help select the correct fouling factor. Equipment manufacturers usually give a fouling factor when listing the performance data of their equipment.

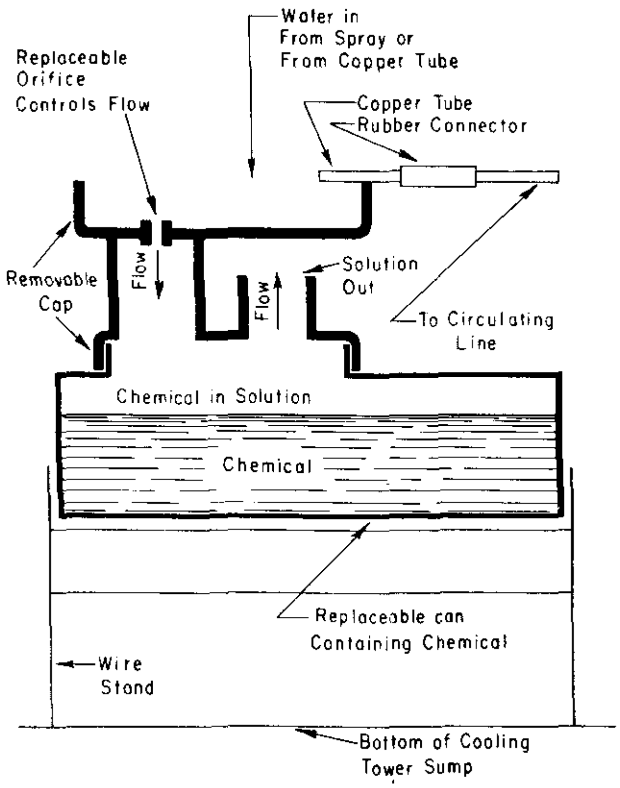


Fig. 4 – Cross Section of a Simple Manufactured Feeder

9. EQUIPMENT SELECTION AND DESIGN

9.01 When designing condenser water systems select equipment and a design criteria which will minimize or be less susceptible to the damaging effects due to failure or lack of water treatment. Included in the following paragraphs are suggestions for the selection of some of these items of equipment.

9.02 ***Equipment to Minimize Scaling***

(a) Avoid the use of finned coils for evaporative condensers. It is difficult to remove the scale between the closely spaced fins. Acid cleaning damages the fins.

(b) Select slightly oversized condensing coils in hard water areas to permit operation at lower condensing and water temperatures. Lower water temperatures are less conducive to scaling.

(c) Select shell and tube condensers with removable water boxes to facilitate inspection and scale removal from the coils by mechanical means. Avoid the use of heat exchangers which pass the water through the shell rather than through the coils, since this type is usually difficult to descale and clean.

(d) When evaporative condensers are used, design so the condenser fan is cycled, not the spray pump. Continuous operation of the sprays will eliminate successive wetting and drying of the coils and decrease scale deposit.

9.03 ***Equipment to Minimize Corrosion*** — Aluminum is susceptible to corrosion and is effectively protected by chemical water treatment only if the treated water washes all of the aluminum surfaces. Avoid the use of aluminum tube coils when recirculated water is pumped through the coils. Aluminum cooling towers will require a protective coating of paint to prev the pitting type of corrosion.

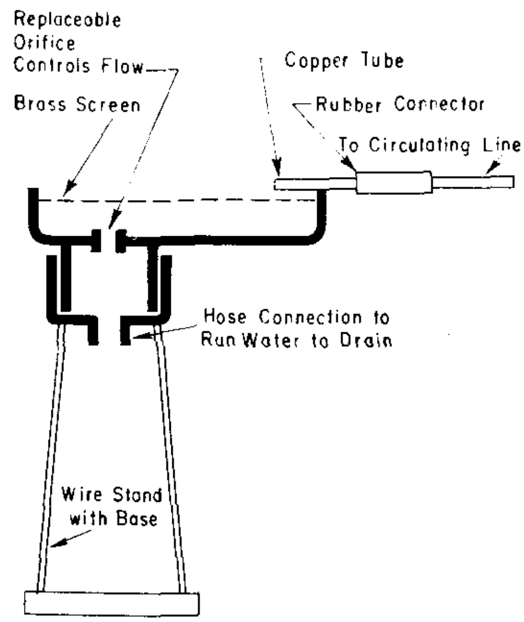


Fig. 5 – Cross Section of a Simple Manufactured Bleed-off Regulator

TABLE II

Suggested Fouling Factors for Selecting Equipment

Temperature of heating medium Temperature of water	0 to 240°F 125°F or less	
WATER SOURCE	WATER VELOCITY FT./SEC.	
	3 feet or less	over 3 feet
Sea Water	.0005	.0005
Brackish Water	.002	.001
Cooling Tower and Spray Pond Treated Make-up	.001	.001
Untreated Make-up	.003	.003
City (Great Lakes)	.001	.001
River Water	.002	.001
Minimum	.003	.002
Mississippi	.003	.002
Delaware, Schuylkill	.003	.002
East River and New York Bay	.003	.002
Chicago Sanitary Canal	.008	.006
Muddy or Silty	.003	.002
Hard Water (over 260 parts per million)	.003	.003
Hard Well Water (over 260 parts per million)	.003	.003
Well Water (less than 260 parts per million)	.002	.001

9.04 ***Equipment to Minimize Algae*** — When spray coil dehumidifiers are used in locations where algae is expected to be a problem, avoid the use of six- or eight-row coils. It is difficult to clean algae growth from between the fins on the inner rows of coils. Four-row coils would be preferred for such an installation.

9.05 ***Miscellaneous Equipment and Design Considerations***

(a) The location of a cooling tower or evaporative condenser with relation to sources of atmospheric pollution is important. Combustion products from stacks close to the tower or condenser may react with the water to make it corrosive. Vegetation products may be carried into such equipment, especially when it is located at ground level, and clog strainers, causing operating difficulties.

(b) Provide adequate drains so that draining the system will not take excessive time. Drain from bottom of pan permits easy removal of dirt and debris. Provide a hose bib for hosing down the cooling tower or evaporative condenser after they have been drained.

(c) Provide nonclogging spray nozzles located so they can be easily removed and cleaned. Arrange spray nozzles to provide adequate water distribution over tubes or slots.

(d) Provide easily opened access doors at locations which are accessible to maintenance personnel and yet provide access to the equipment needing maintenance. Also provide drift eliminators which can be easily removed for maintenance. Eliminators should be provided where excessive windage losses are likely to occur. This is especially true where chromates are used, since they have staining characteristics.

(e) When the size of the installation requires chemical feeding apparatus, provide a type that is easy to service.

(f) Provide a plugged tee in the condenser water lines to package units at the units. This will make chemical (acid) cleaning of the condensers easier if it becomes necessary.

10. SUMMARY

10.01 The need for a water treatment program should be determined by an analysis of the water made by a competent laboratory or water treatment company. When the need is established, recommendations for the treatment program should be obtained from one or more competent water treatment companies. Such recommendations should include the result to be attained, the name and quantity of each chemical to be used and the method of adding them.

10.02 When all parties concerned with the design and operation of the system have knowledge of the potential water problems during the planning stages of a job, adequate chemical feeding devices for treatment can be built into the system when it is installed.

10.03 The problem of controlling corrosion, scale, and biological deposits can be reduced through the proper selection of equipment used in the condenser water system.

10.04 Local ordinances should be investigated to see if chemical treatment is restricted or whether any restrictions might govern the installation of chemical feeders.

ATMOSPHERIC ENVIRONMENT FOR TELEPHONE EQUIPMENT SPACE

GENERAL CONSIDERATIONS AND HEAT RELEASE DATA

1. GENERAL

1.01 A number of Bell System Practices will be issued under the collective title of "Atmospheric Environment for Telephone Equipment Space" of which this is the first covering "General Considerations and Heat Release Data." Subsequent practices will pertain to other phases of conditioning the air.

1.02 The engineering objective in providing a controlled environment is to obtain improved equipment performance with reduced maintenance costs, offsetting in whole or part the annual charges for the control equipment.

1.03 These practices will cover the requirements for conditioning the air in terms of the degree of control necessary or economically warranted based on experience with existing types of central office equipment operating under varying environmental conditions. They will outline what is believed to be the most suitable means of providing the desired control for air distribution, air movement, atmospheric impurities, humidity and temperature when such control is indicated. It does not necessarily follow that all equipment space will require similar treatment since each location must be studied individually to determine the degree of control which can be economically provided as related to the savings which may be expected in maintenance from such an installation.

1.04 This practice is primarily intended to present engineering data which will be useful in the design of mechanical ventilating systems, with or without cooling, for attended central office equipment space such as dial switchrooms and the AMA space in which the tape processing equipment is located. It is not intended for application to unattended equipment space such as Community Dial Offices, Repeater Huts, Power Rooms and other plant equipment spaces. Also, it is not intended that this practice be applied to the problems of providing comfort air conditioning for Operating Rooms or general office space.

1.05 The "Heating-Ventilating-Air-Conditioning Guide" published by the American Society of Heating and Air Conditioning Engineers is suggested as a reference for additional technical data.

2. NEED FOR A CONTROLLED ENVIRONMENT

2.01 It is recommended that windows of equipment spaces be kept closed at all times to minimize the amount of dust in the outside air which might enter the switchrooms. Dust of a fibrous nature causes open contact troubles. That of an abrasive nature causes impairment of contact treatment; wear on base metal or other contacts; and wear on bearing surfaces. The latter is particularly important with respect to panel and step-by-step apparatus. With closed window operation, it is generally considered necessary for reasons of personal comfort, to install a ventilating system to provide fresh air in motion, to remove stagnant air and odors, and to remove heat generated by the equipment, lights, and personnel. These conditions relate principally to warm weather operation, yet some ventilation is required during cold weather. Ventilation with outside air may adversely affect central office equipment performance as a result of both its dust and moisture content unless precautions are taken to control these conditions within the ventilating system.

2.02 Dial apparatus is designed to operate satisfactorily at room ambient temperatures up to 130°F. Generally, any apparatus which generates enough heat to affect its operation is equipped with a blower to disperse this heat into the room. With this arrangement, room ambient temperatures will rarely exceed 130° F if mechanical ventilation, without cooling, is provided.

2.03 Extreme variations in relative humidity affect the performance of dial equipment because of dimensional changes of nonmetallic materials such as phenol fiber and phenol fabric, paper insulation of panel multiple banks, and cork on panel drive rolls. Under the worst conditions, adjustments are unstable and maintenance effort is increased. Wintertime humidity control minimizes the electrostatic attraction of the dust particles to contact springs and wiring. The latest types of dial apparatus are less subject to adjustment instability and perform more satisfactorily under varying humidity conditions than apparatus used in older dial systems.

2.04 Variations in relative humidity also affect the paper tapes processed in AMA centers. It is suggested that the space occupied by the AMA tape processing equipment be air conditioned with cooling and humidity control in accordance with the design data set forth in Paragraph 3.02(b) and (c).

3. DESIGN OBJECTIVE

3.01 The following engineering criteria are recommended for the design of ventilating systems intended to control the environment in attended central office and AMA center space.

3.02 Temperature and Humidity Control

(a) Summer - Ventilation Only - Maintain a room condition with a maximum of 10° F above the maximum design dry bulb temperature as listed for various localities in the A.S.H. & A.E. "Guide." When room conditions exceed 65 per cent relative humidity, automatically control the ventilating system to deliver a maximum of recirculated air. This will tend to reduce the relative humidity within the room thereby minimizing the detrimental effects which extreme variations in relative humidity have upon switching equipment.

(b) Summer - Ventilation with Cooling - Maintain a room condition having a maximum of 55 per cent relative humidity. To maintain room conditions lower than 55 per cent relative humidity will substantially increase the cost of the refrigeration equipment and operating costs disproportionately to the benefits realized. Maintain a room temperature not lower than 13° F below the maximum design dry bulb temperature as listed for various localities in the A.S.H. & A.E. "Guide." However, a reduced temperature differential is recommended for the lower outside temperatures. Cool air supplied to the room should not be more than 18° to 20° F below the room dry bulb temperature.

(c) Winter - Maintain approximately 35 per cent relative humidity in central office and AMA center spaces. A gradual reduction in relative humidity for short periods of time may be advisable to minimize window condensation as the outside temperatures fall. Double glazing may be helpful in reducing condensation in colder climates.

3.03 Filtration: Research conducted by the Bell Telephone Laboratories indicates that 4 inches of KS-7406 glass wool filter media are adequate to minimize open contact equipment troubles due to dust. The four inches of media are obtained by placing two KS-7406 glass wool filters, each 2 inches thick, in tandem in the filter frame. The second filter will remove approximately 25 per cent of the dust by weight which passes the first filter. Standard household type filters are not recommended. The KS-7406 filter has a graduated pack coated with an adhesive oil which makes these filters more efficient. When the filters require servicing, the filter unit on the dirty air side is discarded, the second filter is moved forward and a new filter installed on the clean air side. More efficient filters may be desirable in areas where the air is contaminated with large quantities of fine dust particles. Generally, electric type filters are not required except for a few locations having extremely large dust concentrations in the air.

3.04 Ventilating Systems - With or Without Cooling: Mechanical ventilation provides a filtered air supply for apparatus areas when closed window operation is practiced. The choice of a large air volume ventilating system or a smaller air volume system with cooling will depend upon a comparison of first costs, operating expenses, and maintenance costs. Without cooling, 8 to 12 air changes per hour may be required to meet the design limits outlined in Paragraph 3.02(a). With cooling, approximately 4-1/2 or 5 air changes per hour will usually meet the limits of Paragraph 3.02(b). Concentrations of high heat producing equipment may require more air changes than indicated for either type of system. Most ventilating systems are designed to deliver a mixture of recirculated and outside air in varying proportions. Since the greatest percentage of dust removed by air filters is dust in the outside air, maintenance costs for filter changes will be reduced if the volume of outside air handled by a system is kept at a minimum consistent with local building and health codes. Systems with cooling generally provide up to 25 per cent of their capacity as outside air. More, up to 100 per cent, may be desirable at certain seasons to reduce the operating costs for the cooling equipment; however, filter maintenance would increase. The handling of larger air volumes requires a greater number of filters and larger duct sizes for air distribution. Low face velocities for air discharge diffusers tend to reduce dust impingement on near-by apparatus.

4. EQUIPMENT HEAT RELEASED

4.01 The average heat released by various types of central office and AMA equipment is listed below. Other information relative to the heating or cooling load needed in the design of ventilating systems may be found in the A.S.H. & A.E. "Guide."

	Watts per Sq Ft of Floor Space
Step-by-Step System	.75 (1) (4) (7)
Panel System	1.25 (1) (4)
Local Crossbar Systems	1.35 (1) (4) (7)
Crossbar Tandem Systems	2.00 (1) (4) (7)
Toll Crossbar Systems	2.50 (1) (2) (4) (7)
Large Repeater Station	3.00 (1) (3) (4)
AMA Accounting Centers Equipment	4.00 (5)

Equipment	Watts per Unit	Watts per Bay (4) (6)	
N-1 Carrier	350 per Term.	1050	
0-1 Carrier	150 per Term.	600	
0 or N Thru Channel Unit	Deduct 11 watts per channel unit		
ON Junction Equipment	48 per Group	336 Max	
E2 Repeater	3.8	23-inch Bay	570 Max
E3 Repeater	3.4	23-inch Bay	510 Max
2400-2600 Cycle SF	18	540	
43A Telegraph		Max	Min
Channel Term. Nonserv. Board	24	764	468
Channel Term. Service Board	30	870	735
Loop Pad (Avg)	10	-	-
Filament Pot	5	-	-
96A1 Telegraph Loop Repeater	24	Max of 36 per Bay 870 Watts	
144-Type Coupling Units			
144A1	15	40 Max per Bay 600	
144B1	20	40 Max per Bay 800	
144C1	20	40 Max per Bay 800	
143A2 Regenerative Repeater	32	30 Max per Bay 960 With Filament Pots 1110	

(1) Average watts per square foot per hour of switchroom space based on a 24-hour period.

(2) 2.50 watts per square foot for toll crossbar systems includes a concentration of 17 watts per square foot in the card translator area. Special attention is required for card translators. If partitioned off from the toll switchroom, deduct the following watts from the switchroom space and treat both the switchroom and enclosed area accordingly.

Home translator - 1000 watts per translator per hour.
Foreign Area Translator - 600 watts per translator per hour.
Emergency Translator - This is a substitute for either type of translator. It is only used when either a Home or Foreign Area Translator has failed. Hence, the Emergency Translator does not affect the total heat released by this type of equipment.

(3) May vary from 2 to 15 watts depending on type of equipment.

(4) Add heat released by lights, an average value of which might be one watt per sq ft. However, the heat released by lights may vary depending upon the light intensity engineered for the space.

(5) Heat released only when the AMA equipment is operated during working hours. Add heat released by lights which may vary depending upon the light intensity engineered for the space.

(6) Recommended maximum watts per bay of equipment when equipment layout is based on minimum aisle widths. This does not include the heat generated by lighting.

(7) Recommended maximum watts per square foot of floor space when equipment layout is based on a 20' by 20' building bay. If something other than a 20' by 20' building bay is used for the layout of the identical telephone equipment, multiply the watts by the ratio of the area of the 20' by 20' building bay to the area of the building bay used.

COOLING TOWERS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the operation and maintenance of mechanical draft cooling towers used for air conditioning systems.

2. DESCRIPTION

2.01 A cooling tower cools the water which has been used in the condenser of the refrigeration equipment for extracting heat from the refrigerant. It cools the water sufficiently for reuse and thereby minimizes the amount of water consumed for this purpose. Its place in an air conditioning system is illustrated in Fig. 1.

2.02 Cooling is accomplished by exposing the condenser heated water to outside air so that the water loses heat partly by transfer of sensible heat to the cooler air, but mainly by evaporation of a portion of the water.

2.03 The tower consists of an enclosure of wood, metal or asbestos cement board. Water is admitted to the top of the enclosure and is sprayed or dripped down over a series of slatted decks to be accumulated in a water basin at the bottom of the tower. Means are provided for forcing air through the sprays of falling water. The cooled water is accumulated in the basin of the tower and is returned to the condenser for recirculation.

2.04 Cooling towers are divided into two general types, natural draft and mechanical draft. The natural draft tower relies on prevailing winds, or on chimney effect for air flow through the tower. The mechanical draft tower is equipped with one or more fans to supply the required quantity of air. Disadvantages inherent in the natural draft tower, e.g., large size, spray nuisance, dependence on natural conditions, etc, generally preclude the use of this type for telephone buildings. This practice is accordingly concerned only with the mechanical draft cooling tower.

2.05 The mechanical draft towers are also divided into two general types, forced draft, illustrated in Fig. 1, and induced draft, illustrated by Figs. 2 and 3. In the forced draft tower the fan is located in the air inlet to the tower. In the induced draft the fan is located in the air outlet from the tower.

2.06 The path of air flow through the tower serves to further classify the mechanical draft tower. In the crossflow tower, air flows horizontally across the path of the falling water. In the counterflow tower, illustrated by Fig. 2, air flows vertically upward counter to the path of falling water. The doubleflow tower, illustrated by Fig. 3, has air flowing in horizontally from both ends of the tower, then upward through the fan discharge.

2.07 Various means are used to break up the water into fine particles in order to expose greater water surface to the cooling action of the tower. Spray headers illustrated in Figs. 1 and 2 break the water in fine drops. In another arrangement, illustrated in Fig. 3, the warm water is fed to a distribution basin located at the top of the tower. The floor of this basin is equipped with a number of uniformly spaced ceramic distribution nozzles. Another method, not illustrated, simply utilizes overflowing troughs to distribute the water.

2.08 The water is distributed over a series of staggered slatted decks, called the fill, which retards the rate at which it returns to the catch basin and serves further to break up the water into fine drops. The fill may be of metal, wood or asbestos cement boards.

2.09 Air flowing through the tower will entrain small water particles. Water lost due to this effect is called drift loss. Baffles, called drift eliminators, in the air stream leaving the tower impede the air flow so the small water particles impinge on the eliminator plates and drop back into the tower, thus minimizing drift loss.

2.10 The water basin of the cooling tower is equipped with a float valve to prevent the water from falling below a certain level, and an overflow pipe to prevent the water from rising above a certain level. There is also a drainpipe for emptying the basin, and a screened sump for the pump inlet to screen out debris. Each of the items is illustrated in Figs. 1, 2 and 3.

3. OPERATION

3.01 As noted, the water in a tower is cooled mainly by evaporation of a portion of the water as it passes through the tower. The latent heat required to evaporate a pound of water is approximately 1000 Btu. This heat is taken from the water which does not evaporate and results in a loss of sensible heat. As the water surrenders sensible heat, its temperature will drop one degree per pound for each Btu surrendered. Applying the above figures, the heat absorbed by the evaporation of one pound of water will cool 100 pounds of cooling tower water 10°.

3.02 The cooling tower theoretically can continue to cool the tower water until the water temperature reaches the wet bulb temperature of the air passing through the tower. When this limiting temperature is reached, evaporation ceases. However, a cooling tower designed to cool water to the wet bulb temperature would be of infinite size, so in actual practice, towers are designed to "approach" the wet bulb temperature. The closer the final water temperature approaches the wet bulb temperature, the larger the tower must be for a given capacity. The actual temperature difference between the final temperature of the water cooled by the tower and the wet bulb temperature is called the <u>Approach</u> of the tower. For air conditioning applications, towers are sized to provide an approach of 5° to 10°, usually 7.5°.

3.03 The warm water is fed to the tower and cooled to a certain approach to the wet bulb temperature, the temperature difference between the inlet water and the outlet water is called the <u>Cooling Range</u> of a tower. Cooling towers used for air conditioning applications are sized to provide a cooling range of 5° to 15°, usually 10°.

3.04 As an illustration, a tower which received water at 95° and cooled it to 85° at an ambient (surrounding) wet bulb air temperature of 78° would have a 10° range (95° -85°) and a 7° approach (85° -78°). Manufacturers will supply range and approach figures for their towers under various wet bulb temperatures and cooling loads.

3.05 The water cooling tower is generally used with the larger capacity refrigerating systems. Its alternate water saving device, the evaporative condenser is usually made in sizes up to 100 tons. Good design requires that the evaporative condenser be installed near the refrigeration equipment. A cooling tower, on the other hand, may be remotely located from the refrigeration equipment. Thus the tower is well suited for installations in which package units are mounted on various floors of a multistory building, or where the refrigeration equipment is in the basement and the tower is on the roof. It is also used with centrifugal compressors, in which the refrigerant circuit must be kept short.

3.06 During conditions of light load on the refrigerating system, or when outdoor wet bulb temperatures are low, the cooling tower water temperature will drop. When such conditions occur, the capacity of the cooling tower exceeds requirements and is out of balance with the load on the refrigeration system. Abnormally low water temperature in the condenser causes abnormally low compressor discharge pressure. As the discharge pressure drops, the compressor tends to lose its oil to the refrigerant piping system, creating difficulties in compressor lubrication with the possibility of plant shut down.

3.07 To minimize potential trouble of this kind, the fans in the cooling tower may be controlled, either by a pressure controller on the compressor discharge line, or by a temperature controller in the condenser water line from the cooling tower. Such controls will maintain satisfactory compressor discharge pressure.

3.08 Another method of controlling the temperature of the cooled water from the tower is by means of a modulated by-pass valve which by-passes water from the warm water line to the cooled water line without circulating through the cooling tower. The modulated valve is operated by a modulating type temperature controller in the cooled water line from the tower.

3.09 Normally, operation of the refrigeration equipment and the tower is unnecessary in the winter season, and the tower is drained to prevent damage by freeze-ups. However, sometimes on warm winter days the outside air intake ducts are too small to dissipate the heat developed in telephone equipment rooms, and the temperatures in the switch rooms may rise to an uncomfortable degree. If careful study shows increasing the capacity of the outside air ducts to be impractical, it will be necessary to operate the refrigeration equipment and the tower during the winter season. Whenever the outdoor temperature drops below the freezing point, ice will form on the intake louvers and the fill of the tower. Shutting down the tower fan will in most cases melt the ice. One method of preventing ice formation on the tower when operation during freezing weather is necessary is to provide a by-pass arrangement around the spray heads or distribution deck. The warm water coming from the condenser is valved off from the spray heads or distribution deck and piped directly into the collection basin in such a way as to create a swirling motion of the water in the basin. The fill and the air intake louvers remain dry and thus can not form ice. The warm condenser water swirling into the basin prevents the basin from freezing over.

4. CAPACITY RATINGS

4.01 Cooling tower capacity ratings are listed by the manufacturer in table form or in a series of rating curves. The tables or curves specify the amount of refrigeration in tons of capacity that the tower will handle under various conditions of wet bulb temperature, inlet water temperature and gallons per minute of water circulated through the tower. The range and approach of the tower under varying conditions will also be found in the tables or curves.

4.02 Cooling towers are sized to remove 15,000 Btu's per hour per ton of refrigerating capacity. Since a refrigerating system absorbs only 12,000 Btu's per hour per ton, the extra 3000 Btu's capacity of the tower is provided to remove the heat added in compressing the refrigerant, and the heat added by the tower circulating pump.

4.03 It is possible to make a rough test on the performance of the tower to determine if it is functioning properly. The following information is required.

(a) Cooling range of the tower. This is found by subtracting the temperature of the outlet water from the temperature of the inlet water of the tower.

(b) Weight of the water circulated through the tower per hour. This may be measured by several means. If a pitot tube measuring device is available the flow of water through the inlet pipe may be measured. If pump capacity curves are available, the amount of water pumped may be determined by noting the total pumping head on the pump pressure gauges and reading rate of flow corresponding to the head on the pump curve.

(c) Wet bulb temperature of outside air.

(d) Approach. This is found by subtracting the wet bulb temperature from the outlet water.

4.04 The information gathered will give the operating capacity of the cooling tower when substituted in the following formula:

$$\text{Cooling cap. in tons of refrig.} = \frac{\text{Wt. of water circulated per hr x range}}{\text{15,000 Btu/hr/ton}}$$

The result obtained may be checked against the manufacturer's rating tables to see if the tower is performing satisfactorily.

4.05 As an example of the above test, assume a tower serving a 300 ton refrigerating system operating at full capacity. The measured rate of water flow is 900 gallons per minute (gpm). The inlet water temperature is 95° the outlet water temperature is 85° and the wet bulb air temperature is 75°. Substituting in the formula, the solution is:

$$\text{Cooling cap. in tons of refrig.} = \frac{\text{900 gpm x 8.33 lbs/gal x 60 min/hr x } 10^{\circ} \text{ range}}{\text{15,000 Btu/hr/ton}}$$

$$\text{Cooling cap.} = \frac{4,498,200}{15,000}$$

Cooling cap. = 299.9 tons

The manufacturer's table for this tower rates it at 300 tons with a 10° range and 10° approach at a wet bulb temperature of 75°. This corresponds with the test results so the tower is operating properly.

4.06 If the measured cooling range is greater than specified for the tower it is an indication that the rate of water flow is less than design rate. Generally, cooling ranges and water flow rates follow the following table:

Flow Rate	Cooling Range
2 gpm/ton	15°
3 gpm/ton	10°
4 gpm/ton	7.5°

If the measured approach of the tower is greater than specified it is an indication that the tower is not performing properly. A higher than normal approach may be caused by any of the troubles listed in the trouble chart under the symptom of high head pressure.

5. AIR REQUIREMENTS

5.01 Mechanical draft cooling towers require from 300 to 400 cfm of air per ton of capacity for efficient functioning. Obstructions near the tower which restrict the free entry of air, or which cause recirculation or short-cycling of discharge air into the air inlet of the tower will adversely affect tower efficiency.

6. WATER LOSSES

6.01 Cooling towers circulate from two to four gallons of water per minute per ton of refrigerating capacity. Approximately 1% of the water circulated is evaporated for every 10° of tower cooling range.

6.02 Since a cooling tower is sized to remove 15,000 Btu's/hour per ton of refrigerating capacity, and since one pound of water absorbs 1000 Btu's in evaporating, the evaporation loss of a tower is 15 pounds or 1.8 gallons per hour per ton of capacity.

6.03 Drift loss through entraining of small water particles by air flowing through the tower is minimized by drift eliminators in the discharge air stream and is negligible in a well designed tower. Drift from a redwood tower may stain surroundings due to the water leaching tannin from the redwood.

6.04 Blow down or bleed loss is an intentional loss to a drain and is adjusted to limit the concentration of solids caused by evaporation of the water. It is further described under water treatment in this practice. Bleeding may be accomplished by means of a small valved line from the warm water inlet pipe of the tower to a drain. It may be necessary to provide a solenoid valve in series with the bleed adjusting valve if the bleed line continues to flow when the pump is off and the tower is inoperative. The electrical connections of the solenoid should be tied into the pump starting control to operate only when the circulating pump operates. Another method of bleed-off utilizes a collecting funnel installed in the overflow pipe of the tower in the path of the water falling through the tower. The rate of bleed is adjusted by means of a sliding lid on the rectangular top rim of the funnel. This type is especially suited for smaller rates of bleed where silt or debris might clog a small bleed line.

7. WATER TREATMENT

7.01 The municipal water used to fill the cooling tower and to make up water losses may be broadly classified as either hard or soft. Generally, reservoirs supplied primarily by the surface run-off water or rainfall have soft water. Sources supplied by underground streams and wells contain dissolved minerals and are hard. The hard water tends to form scale in the tower circulating system and damage the wood in the cooling tower. Soft water tends to be corrosive to the metal in the circulating system due to its dissolved oxygen and carbon dioxide content. Treatment is generally necessary, either to control scale formation or corrosion.

7.02 The municipal water supply with its dissolved solids and gases may not have serious scale forming or strongly corrosive characteristics. However, the water which evaporates from the tower in normal operation is pure water. The mineral impurities remain behind and increase in concentration, thus changing the characteristics of the water. It is possible, through evaporation, for the tower water to contain twenty times as much dissolved solids as the make-up water supply. The number of times the amount of dissolved solids in the tower water is increased over the amount of dissolved solids in the make-up water is called the Cycles of Concentration. The most basic and simplest step in controlling scale or corrosion is to bleed a portion of the concentrated tower water to a drain and dilute the remainder with fresh make-up water. The amount of bleed needed to provide various cycles of concentration is given in the following table:

Cycles of Concentration to be Maintained	Bleed-off Rate, gal. per hr. per ton of refrig. cap.
2	1.80
3	.90
4	.60
5	.45
6	.33
7	.30
8	.26
9	.22
10	.20

Scale Control

7.03 If the municipal water supply is hard, as the concentration builds up, the water becomes harder, and the solids tend to precipitate out as scale on the high temperature surfaces of the circulating system, the water side of the condenser tubes. The scale retards the transfer of heat from the refrigerant gas to the cooling tower water, thus decreasing condenser efficiency and causing high compressor head pressure.

7.04 Several methods of controlling scale formation are possible. With moderately hard water, by bleeding to provide two to three cycles of concentration, a thin protective scale may be built up on the condenser tubes without seriously impairing condenser efficiency. However, with this method, the pH control and the bleed rate adjustments are very critical to prevent the scale from continuing to build up. Generally, scale formation is more easily controlled by adding polyphosphates in concentrations of three to five ppm. To prevent possible corrosion by this method eight to ten ppm of chromate are added with the polyphosphate. The bleed rate should be adjusted to provide from three to five cycles of concentration and the pH value adjusted to 6.5 to 7.5 for wooden towers, or 6.5 to 8.5 for metal towers.

7.05 If the water supply is very hard (over 180 ppm calcium carbonate) it will probably be necessary to neutralize some of the alkalinity in the water with sulphuric acid to adjust the pH value to the recommended range. The three to five ppm polyphosphate and eight to ten ppm chromate should also be added. With this method of treatment, the number of cycles of concentration allowable is generally five to eight.

7.06 As an alternative to the treatment suggested in Paragraph 7.04, the make-up water supply or some portion of it may be fed through a Zeolite exchange softener which reduces the hardness content of the water.

Corrosion Control

7.07 Corrosion or rusting is the loss of metal in the water circulating system, due either to chemical or electrochemical action. It may be in the form of broad, generally corroded areas, or in the form of severe localized pitting. Corrosion is accelerated by dissolved oxygen in the cooling water and by water having pH values below seven. The oxygen content and the acidity of the water tend to build up because of the oxygen and acid forming gases present in the air drawn through the tower.

7.08 Chromate concentrations of 300 to 500 ppm afford acceptable corrosion protection within a pH range of 7 to 8.5 for cooling tower circulating systems. The wooden portions of the tower are least susceptible to deterioration at a pH value of 7.2. An effective and less expensive method of protecting both wood and metal in contact with the tower water is to use a mixture of ten ppm polyphosphate, and 160 ppm chromate maintaining a pH value of 6.5 to 7.5. Bleed-off should be adjusted to maintain five to eight cycles of concentrations. The pH value, which normally tends toward the acid side, may be adjusted by addition of caustic soda or soda ash. If the tower is not constructed of wood, the same chemical treatment may be used with a pH range of 6.5 to 8.5.

Algae and Slime

7.09 Algae is a form of plant life, greenish in color, which multiplies rapidly in water exposed to light. Slime is a form of organic life which flourishes in dark portions of the water circuit. Both growths will impede water circulation and insulate heat exchange surfaces if allowed to grow.

7.10 Algae and slime may be removed by scrubbing manually, by hosing down with a high pressure hose, or by poisoning with chemicals. Since the use of chemicals does not require shutting down the system, it is the preferred means of control.

7.11 Sodium pentachlorophenate seems best suited for use as an algaecide. It is highly toxic to algae and slime life and has no corrosive effect on the tower or circulating system in the concentrations recommended. Sodium pentachlorophenate may be used in the slowly soluble block form for continuous treatment, or in powdered form for shock treatment. Experience will determine which treatment is more effective. For continuous treatment, a concentration of 20 to 30 ppm of sodium pentachlorophenate is maintained in the circulating water. If this does not turn the algae from a green to a brown color after a few days, shock treatment in the order of 100 ppm should be used about once a week.

7.12 Other commonly used algaecides are copper sulphate and chlorine. Copper sulphate may cause serious corrosion of steel in the circulating system if improperly used. Chlorine as a hypochlorite is very effective, but losses of the chemical are high when the water is aerated in passing through the tower. This results in high costs and difficulties in maintaining proper proportions.

Wood Preservation

7.13 Deterioration of the wood in cooling towers may be caused by any of three forms of attack: chemical action, biological action and mechanical disintegration.

7.14 One form of chemical attack removes lignin, the binder that holds the wood fibres together. Wood subject to this attack forms long, whitish, loosely bonded fibres on the surface. This form of attack occurs in alkaline waters which have either strong concentrations of sodium carbonate or high chlorine content. It is controlled by keeping the pH of the water below 7.5, proper bleed to limit the sodium carbonate concentration, and by keeping the chlorine content below one ppm.

7.15 A rarer form of chemical attack removes cellulose, a substance similar to lignin from the wood, resulting in a surface condition of long reddish brown fibres. It is caused by the acid in water with a pH value below 5. Maintaining the pH of the water within the limits of 6.5 to 7.5 will prevent this form of attack.

7.16 Biological attack is caused by various microscopic organisms such as bacteria and fungi. Redwood normally contains certain extractives toxic to these organisms and resists biological attack unless these protective extractives are leached out by chemical attack. If the leaching action has occurred, the wood should be protected from biological attack by treating the water with an algaecide.

7.17 Biological attack may reveal itself in three different conditions of the tower wood. Delamination of the wood may occur in which the softer grain of the wood erodes and the hard grain stands out in ridges. Another form of biological attack causes a soft, punky center under a sound exterior. A third form of attack does not change the appearance of the wood, but weakens the fibres so that the wood breaks cleanly across the grain instead of with a normal splintering action.

7.18 Mechanical disintegration sometimes occurs in the section of the tower exposed to alternate wetting and drying action. The wood absorbs water with its dissolved salts when wet, and is ruptured by the crystallization of the salts as the wood dries out. Damage to the wood from this action may be minimized by proper bleed to limit the concentrations of salts, and by periodically scraping or hosing down salts which form on the surface of the alternately wet and dry wood sections.

7.19 More complete information on water treatment will be found in BSP H51.370 "Fundamental Principles of Water Conditioning" and BSP H51.371 "Water Treatment, Air Conditioning Systems." The latter section describes water analysis, types of treatment and procedures for evaluating the effectiveness of the treatment program.

Precautions

7.20 The chromate compounds used for water treatment are poisonous. Hands must be washed well after contact with this chemical.

7.21 Sodium pentachlorophenate also is poisonous and care must be exercised in handling it. Dust from the chemical is irritating to mucous membranes and both the dust and water solution may be irritating to the skin if exposure lasts longer than five minutes.

8. PREVENTIVE MAINTENANCE

8.01 The preventive maintenance procedures outlined in this practice apply generally to all cooling towers. For more specific information, refer to maintenance manuals published by the tower manufacturer or by the supplier of the materials used for maintenance, e.g., packing materials, oils, greases, etc. Characteristics of various lubricants are covered in BSP A710.012, "Materials - Greases, Oils and Cleaning Fluids." Details of fan and bearing maintenance are covered in BSP H51.317, "Inspection and Maintenance of Ventilating Fans."

8.02 A daily visual check may be made to detect abnormal operating conditions or incipient troubles. The daily check would cover:

(a) Unusual noise.

(b) Circulating pump gauge pressures.

(c) Inlet and outlet water temperatures.

(d) Electric motor temperatures. (Hand test)

(e) Proper flow and distribution of water.

(f) Float valve functioning.

(g) V-belt and coupling appearance.

(h) Water treatment facilities.

(i) Condition of suction screen.

8.03 Periodic maintenance routines are listed in the following chart.

8.04 Maintenance Schedule for Cooling Towers

Item	Routine	Minimum Frequency	Materials Used
Ball bearings in fans, pumps and electric motors.	Lubricate as per instructions in BSP H51.317 or manufacturer's instructions.	Every 3 to 6 months	Short fiber medium consistency all purpose soda soap basegrease or manufacturer's recommendations.
	Flush out, check for roughness or excessive play. Relubricate.	Every 3 years	Flush with mineral spirits. Relubricate, filling bearing 1/3 full of grease as above.
Sleeve type bearings in fans, pumps and electric motors.	Check oil cup level. Add oil if necessary. See BSP H51.317 for instruction.	Monthly	SAE 20 oil for ambient air temperatures of 30° to 90°F or manufacturer's recommendations.
	Drain and flush bearings. Check for wear, scoring, excessive play, oil slinger ring operation, seals. Refill with oil.	Every 3 years	Flush with mineral spirits. Refill with oil as above.
Fan drive reducing gear box.	Stop fan, and after several minutes check for proper gear box oil level. Add oil & check for leaks if low. Drain completely and refill if high. (Water contamination raises oil level.)	Weekly	Use oil as specified by manufacturer. The oil type is generally found on the name plate of the gear box, and is a waterproof oil with a specific gravity higher than water.
	Drain sample of gear box oil and check for water droplets or white or yellow streaks indicating moisture contamination. Drain and refill if moisture is found.	Monthly	Manufacturer's recommendation as above.
	Change gear box oil.	Every 3 months of operation	Manufacturer's recommendation as above.
	Check coupling tightness.	Every 3 months	
	Drain and disassemble gear box, checking shaft play, worn areas on gear teeth, corrosion. If found satisfactory reassemble and fill completely with oil to prevent corrosion during idle period. Cover with tarpaulin.	At annual shutdown	Manufacturer's recommended oil.
	Drain gear box oil and refill to proper level.	Annual start-up	Manufacturer's recommended oil.
Tower Basin	Check pump intake screen for breaks, clogging.	Weekly	
	Check for silt or debris in basin and clean if necessary.	Monthly	High pressure hose, stiff brush. If a wet pick-up vacuum cleaner is available, tower need not be drained to clean silt and debris.
	Test water treatment concentration, pH value, bleed rate.	Weekly	pH measuring kit, chromate comparator kit. Chloride test kit.

Item	Routine	Minimum Frequency	Materials Used
	Drain, clean thoroughly, check for deterioration or corrosion. Make replacements, or repairs found necessary on inspection. Paint where necessary.	At annual shutdown	High pressure hose, stiff brush for cleaning or vacuum pick-up.
	Close drains, refill to swell wood.	Two weeks before annual start-up.	
	Tighten basin bolts, caulk where necessary to stop leaks.	At annual start-up	Oakum and pitch, or caulking compound.
Tower distribution basins, troughs, nozzles, fill louvers and eliminators.	Check for proper, even break-up and distribution of water flow over fill. Clean if necessary.	Monthly	High pressure hose, stiff brush.
	Clean thoroughly, check for deterioration or corrosion, replace, repair or repaint as necessary.	At annual shutdown	High pressure hose, wire brush, scraper.
Fan	Visually check for fan blade damage. Check weep holes in hollow blades for clogging. Check while in operation for vibration or tower sway indicating unbalance.	Weekly	
	Check mounting bolt tightness, pulley set screws.	Monthly	
	Check belt alignment, tightness, and condition.	Monthly	
	Clean blades, paint if necessary. Check fan balance.	At annual shutdown	
	Remove belts and store in protected location. Paint pulley sheaves to prevent corrosion.	At annual shutdown	Rust preventive paint.
	Replace belts.	At annual start-up	
Pump	Check stuffing box for proper leakage.	Monthly	
	Repack pump. Be sure to remove packing behind metal lantern seal ring. Be sure lantern seal ring is replaced in proper position. Install rings with joints staggered.	At annual shutdown	Square graphited asbestos packing cut in rings with diagonal joints. Pump packing tool.
	Check coupling alignment, coupling tightness, bushing condition.	At annual shutdown	

Item	Routine	Minimum Frequency	Materials Used
	Drain water from pump, leaving drain plug out.	At annual shutdown	
	Replace pump drain plug.	At annual start-up	
	Overhaul pump, inspect shaft, impeller and wearing seal rings.	Every 3 years	New pump gaskets.
Electric motors	Clean windings by removing end bells.	Every 3 years	Vacuum cleaner or blower, soft brush.
Controls for electric motors. <u>Caution: Be sure power is OFF before performing routines.</u>	Check condition of contacts. Replace when silver thickness is reduced to 1/3 of original size. File large projections. Surface conditions similar to rough sandpaper are satisfactory. Do not file smooth.	Monthly	
	Check braided shunts to moving contacts for broken or burnt strands. Replace if damaged.	Monthly	
	Operate moving contacts by hand to check for binding or improper meeting of contact surfaces.	Monthly	
	Check tightness of all electrical connections. Check fuse clips and switch contacts for tightness or discoloration of copper indicating poor contact.	Annually	
	Wipe magnet sealing surfaces in starter box.	Monthly	Lint free cloth, slightly moistened with oil.

9. TROUBLES

9.01 Since the function of a cooling tower is to cool water used by the condenser in a refrigeration system, any trouble in a tower generally results in warmer water being supplied to the condenser. With warmer water in the condenser, the discharge pressure gauge of the compressor will rise. Thus the discharge pressure gauge of the compressor indicates the relative efficiency of the cooling tower.

9.02 Trouble Chart for Cooling Tower

Symptom	Trouble	Possible Cause	Remedy
High head pressure. Liquid refrigerant in bottom of condenser or receiver very warm. Compressor may cut out on high head pressure.	1. Insufficient air through tower. (Less than 300 to 400 cfm/ton of capacity.)	a. Blown fuses, tripped overload relays, or tripped vibration switch	a. Find cause of failure, repair, and replace fuses or reset overload relay or vibration switch.
		b. Motor and fan running backwards.	b. Reverse motor leads. If not a new installation, check for recent power changes. If a single phase capacitor start motor, check for stuck centrifugal starting switch in the motor.

Symptom	Trouble	Possible Cause	Remedy
		c. Low voltage to fan motor. (Over 10% difference in actual and rated voltage is bad for motor.)	c. Increase wire size. Consult Power Co. Change taps on owned transformers.
		d. Fan drive shaft or fan drive coupling broken.	d. Replace drive shaft or coupling.
		e. Gear box frozen or binding.	e. Repair gear box.
		f. Loose motor pulley or fan pulley.	f. Align pulleys and tighten set screws.
		g. Fan belts slipping or broken.	g. Adjust belt tension or replace belts with matched set.
		h. Pitch setting on fan blades changed due to loose set screws.	h. Reset pitch on blades to proper angle and tighten set screws. Check motor current afterwards to stay within motor current rating.
		i. Obstructions in fill, louvers or eliminators.	i. Clean fill, louvers and eliminators.
	2. Insufficient water circulation.	a. Clogged strainers in circulation piping.	a. Clean strainers.
		b. Clogged pump intake screen.	b. Clean screen. If algae, see Sec. 7.
		c. Clogged spray nozzles.	c. Clean nozzles.
		d. Scale in lines or condensers.	d. Chemically remove scale, treat water to prevent recurrence.
		e. Pump coupling loose or broken.	e. Repair or replace coupling, check alignment.
		f. Eroded pump impeller.	f. Replace impeller.
		g. Pump packing too tight or binding on shaft.	g. Loosen or replace packing. Check for damage to shaft.
		h. Low voltage to pump motor.	h. Increase wire size; consult Power Co.
		i. Blown fuses or tripped overload relay.	i. Find cause and replace fuses or reset relay.
		j. Pump motor running backwards.	j. Change power leads. If not a new installation, check recent power change-over.
		k. Float valve stuck closed.	k. Repair float valve.
	3. Insufficient water breakup.	a. Spray nozzles, distribution nozzles or distribution troughs clogged with algae or debris.	a. Clean, treat water for algae if necessary. See Paragraphs 7.07 through 7.12.
		b. Collapsed, broken, missing or warped fill.	b. Replace or repair fill.

Symptom	Trouble	Possible Cause	Remedy
	1. Tower discharge air recirculating into tower intake.	a. Intake and discharge of tower too close.	a. Install baffle or duct work to separate intake and discharge areas.
		b. Discharge air leaves at too low velocity.	b. Increase fan speed or fan blade pitch; do not overload fan motor in making change.
Noisy opereration.	1. Complaint of building occupants or neighbors.	a. Gear box or fan drive shaft worn or out of alignment.	a. Repair or realign.
		b. Pump, fan or drive motor bearings worn.	b. Replace bearings.
		c. Fan unbalanced.	c. Balance fan.
		d. Pump or fan coupling worn or broken.	d. Repair coupling.
		e. Fan belts loose.	e. Adjust belt tension.
		f. Three phase motor operating on single phase due to faulty wiring or blown fuse.	f. Repair wiring or replace fuse.

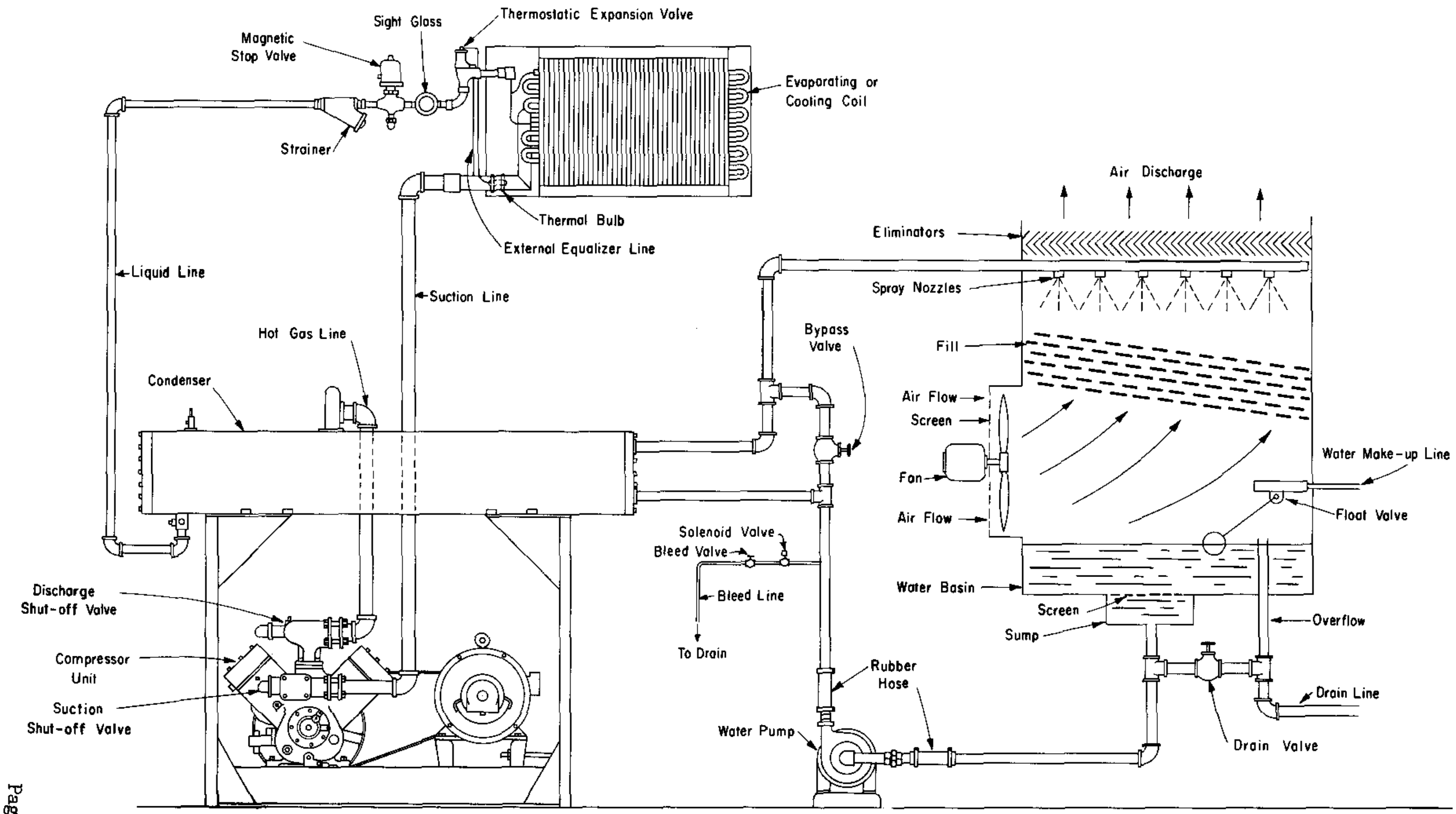


Fig. 1 - Forces Draft Cooling Tower Serving Refrigeration System

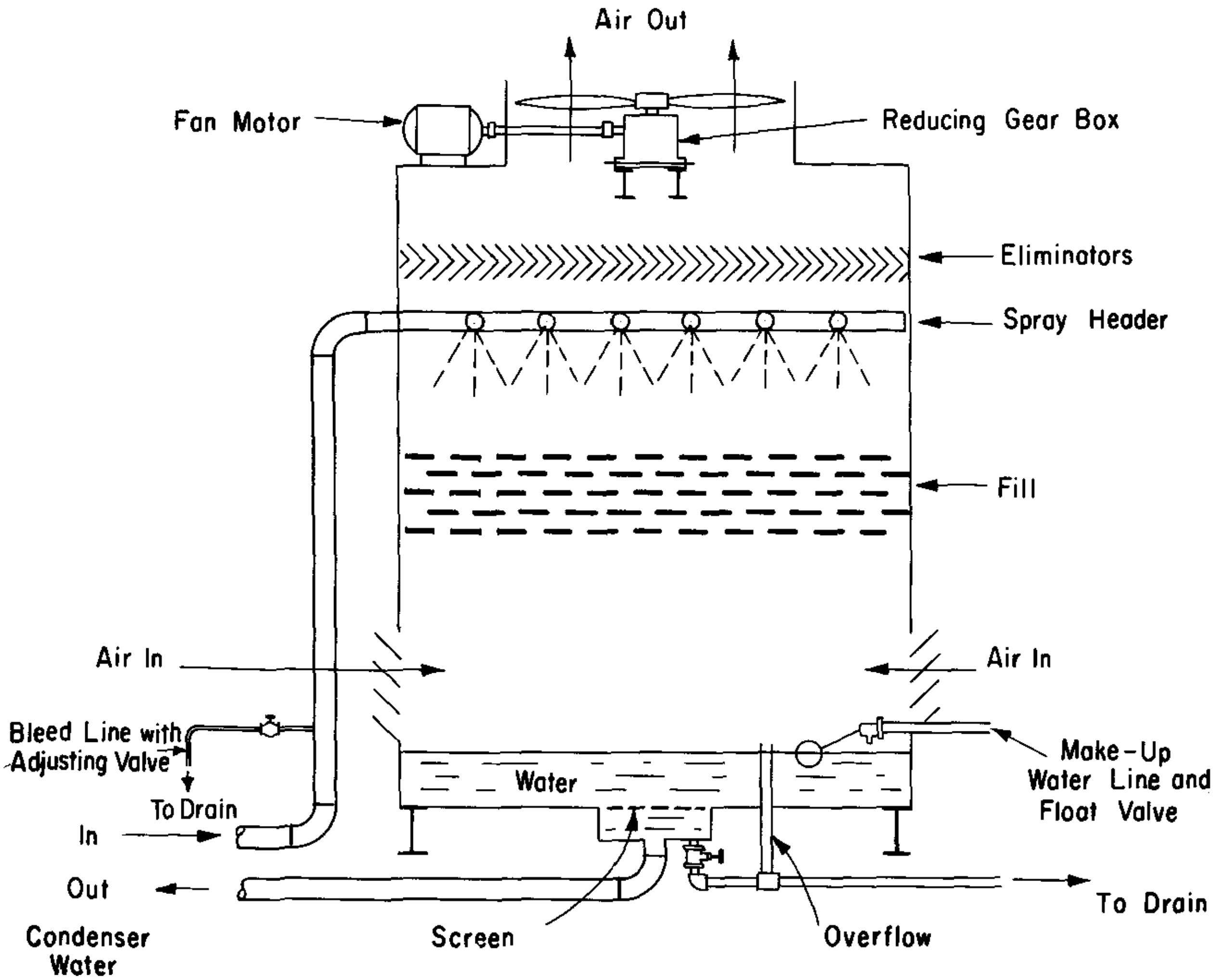


Fig. 2 - Induced Draft Counter-Flow Cooling Tower

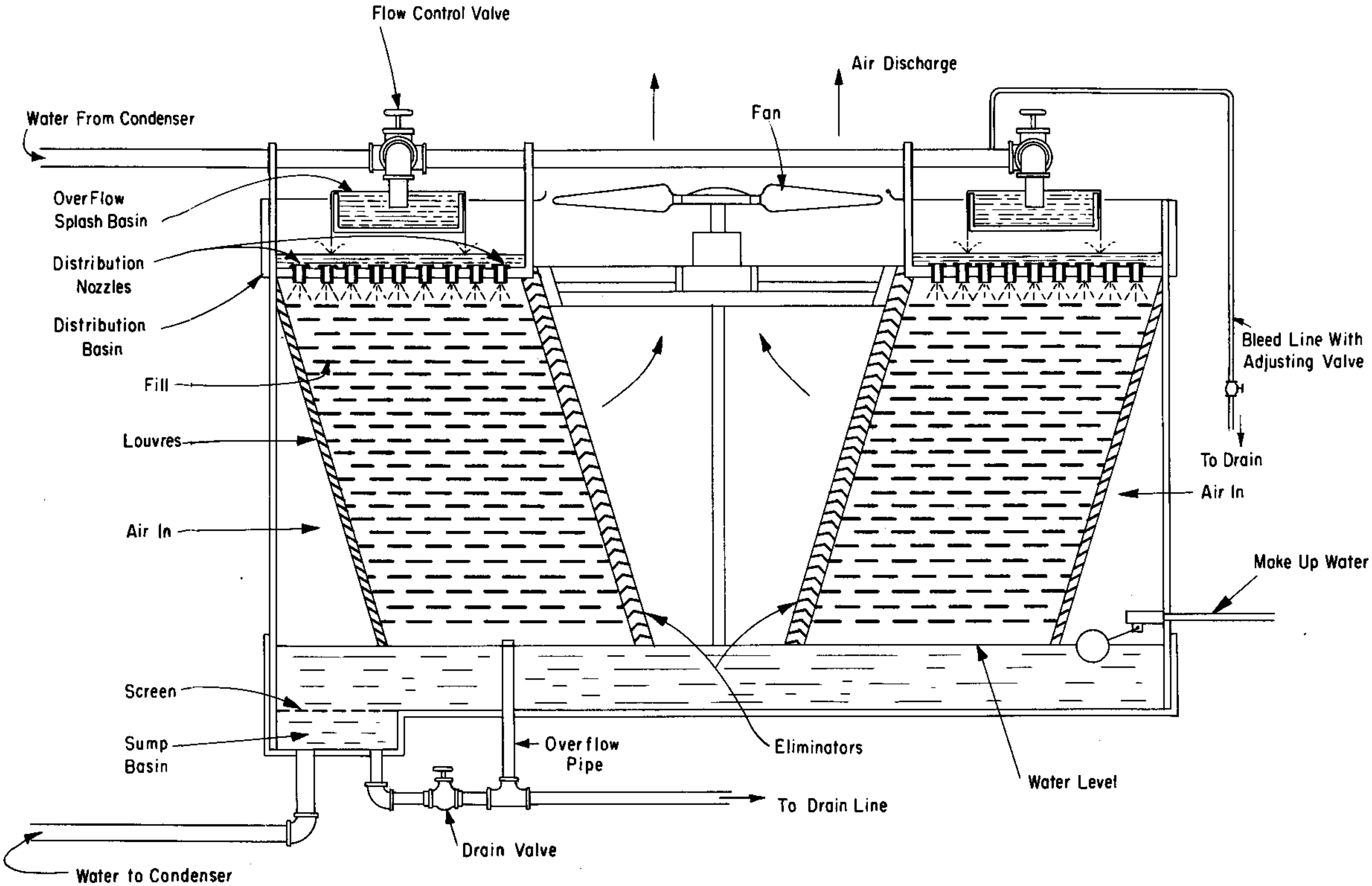


Fig. 3 - Induced Draft Double Flow Cooling Tower

VENTILATION

BASEMENT SPACES

1. GENERAL

1.01 This practice covers procedures suggested for the ventilation of power rooms, engine rooms, transformer vaults, cable vaults, boiler rooms, coal storage vaults, oil tank enclosures and gas meter compartments located in basements of telephone buildings.

1.02 The section is reissued to include additional recommendations pertaining to explosion protection and to provide reference to other Bell System Practices relative to the general subject. For operation and maintenance application, the section is dually numbered with this issue and the same issue number is assigned for uniformity.

1.03 The procedures are intended to apply primarily to future buildings, but may be considered, where advisable, for improving existing conditions.

1.04 In order to avoid the possibility of transmitting noxious or explosive gases from the basement to other parts of the building, it is desirable that no portion of the basement space be connected to the recirculatory system of any ventilating plant serving stories above the basement. As an additional precaution, it is advisable wherever practicable, to seal off cable ducts, pipe shafts and similar openings in the basement area to reduce the possibility of explosive pressures penetrating to upper stories.

1.05 The recommended standards for the construction of fire-resistive basement walls and partitions are outlined in B.S.P. Section H41.230, Interior Construction to Restrict Spread of Fire.

1.06 The recommendations pertaining to transformer vault design and explosion venting are based in general, upon the National Fire Codes; Volume V, National Electrical Code, and Volume II, The Prevention of Dust Explosions (Appendix B).

1.07 Where these suggested procedures are exceeded by local or State codes the legislated requirements are followed.

2. TRANSFORMER VAULTS

2.01 The requirements for vaults and their design based upon the type and capacity of the transformers, are outlined in National Fire Codes, Volume V - National Electrical Code, of the National Fire Protection Association. In telephone buildings the vault enclosure of transformers is generally considered advisable for the protection of building personnel and to prevent damage to the building or contents in the event of fire, escape of harmful gases or possible transformer explosion.

Location

2.02 Transformer vaults are generally located where they can be ventilated to the outside air without the use of flues or ducts. Where adjoining lot space or public space is available and may be used for this purpose, transformer installations outside the building have the advantages of being more readily vented for heat or gas dissipation and the release of pressures resulting from possible transformer explosion. Basement installations are preferably located adjacent to an exterior wall with vents opening directly into an areaway, or if above grade, to the outside.

2.03 General fire-protective recommendations for consideration in connection with transformer installations within telephone buildings are outlined in B.S.P. Section H41.230, Interior Construction to Restrict Spread of Fire.

Heat and Gas Dissipation

2.04 For the dissipation of heat, vaults are provided with adequate ventilation to prevent transformer temperatures in excess of the values prescribed in American Standards for Transformers, Publication C57.1 of the American Standards Association. Vaults ventilated to outdoor air without the use of ducts or flues, have a combined net area of all ventilating openings of not less than 3 square inches for each KVA of transformer capacity in service, except that the net area is not less than 1 square foot for any capacity under 50 KVA. In the event it is necessary to use ducts or flues for dissipation of heat, the ventilation area is determined as above, with consideration of the adequacy of the air supply and draft effect of the duct or flue. The duct or flue construction is recommended to conform to the requirements for cable vault vents outlined in Paragraph 3.03.

2.05 Vaults ventilated by natural circulation of air may have roughly half of the total area of required openings in one or more openings near the floor and the remainder in one or more openings in the roof or upper exterior wall; or all of the area of required openings may be provided in one or more openings in or near the roof. It is desirable that no openings for ventilation be constructed through an interior wall common to the vault and the building.

2.06 Ventilation openings are located as remote as practicable from doors, windows, fire escapes and combustible material. Openings are covered with durable gratings, screens or louvers, according to the treatment required to avoid unsafe conditions.

2.07 If automatic dampers are used in the ventilation openings in exterior walls of vaults containing oil-insulated transformers, the actuating device should function at a temperature resulting from fire and not at a temperature which might prevail as a result of an overheated transformer or bank of transformers. It is important that the unintentional closing of the automatic damper be avoided.

2.08 Incombustible insulating liquids used in some transformers, when decomposed by the electric arc in a transformer failure, evolve non-explosive gases which, however, if not released, can build up sufficient pressures to burst the tank, as oil can do, releasing liquid and gas in large amounts and for considerable distances. Ducts or flues for ventilation may serve to distribute the highly objectionable gases if extended through other building areas and it is desirable that direct outside ventilation be provided wherever practicable. Transformers rated in excess of 25 KVA and using non-flammable insulating liquid are furnished with a pressure relief vent and provision is made for absorbing the gases generated by arcing inside the case by a connection to a chimney or flue especially constructed for the purpose or, preferably, openings or vents from the transformer enclosure directly to outside air.

Explosion Relief Venting

2.09 The procedures for explosion relief venting outlined in the following paragraphs, where provided, eliminate the requirements for heat and gas dissipation described in the preceding paragraphs. It is important, however, where explosion relief venting is provided that any ducts or flues formerly used for heat and gas venting, are closed off at the vault wall or roof with construction equivalent to the walls enclosing the vault.

2.10 Vault construction to withstand explosion pressures includes the provision of suitable openings or vents to release explosive gases, and to direct the force of the explosion in a manner which will afford maximum safety to personnel, with a minimum hazard to telephone equipment and the building structure.

2.11 The size of the openings or vents required to release explosion pressures safely is influenced by the expected intensity of an explosion, the shape and strength of the vault, and the location and type of vent used. In the absence of data on the ratio of free open area to vault room volume which will satisfactorily vent transformer vaults of all types, it is suggested that openings of vents be provided on the basis of known ratios for mild to moderate explosion hazards.

2.12 Where adequate venting area may be provided it is recommended that the net area of openings or vents be in the order of 1 square foot for each 80 cubic feet of vault content. Openings or vents of this ratio can be expected to prevent the building up of explosion pressures in excess of 300 pounds per square foot on the walls and roof of a cubicle shaped enclosure, in the explosion of gases of mild to moderate force intensity.

2.13 The walls and roof of transformer vaults are preferably of 6-inch reinforced concrete securely anchored together and to the floor. Where masonry walls are used, they are recommended to be of solid brick, reinforced and securely joined to the floor and roof of the vault. In the event of higher ratios of net area of openings or vents, consideration is given to vault construction to withstand higher explosion pressure. It is suggested that a reasonable factor of safety be included in the design of transformer vaults.

2.14 Wall openings for venting directly to outside air are generally equipped with louvers. Additional venting may be provided, if necessary, by the installation of the louvers and outside entrance door with light construction and wall anchorages which will release in the low pressure limits of an explosion. The use of ventilated sash hinged to swing outward under predetermined pressure from within; fixed sash or perhaps wood louvered panels with light wall anchorages; scored glass or light wall panels are also considered where acceptable. However, with the use of vent closures which will be blown out in an explosion, it is important that protection against flying material be provided.

2.15 In the event it is necessary to extend explosion vent ducts within the building all portions of the ducts are constructed, preferably of reinforced concrete or steel shell, to conform to the requirements for the vault walls and roof.

3. CABLE VAULTS

3.01 The following measures are intended as a reference in providing adequate ventilation and incidental protection against explosion hazards in cable vaults or fire in the general basement.

3.02 Recommended procedures for the design and construction of cable vaults are outlined in B.S.P. Section AG40.60, Conduit Underground Entrances to Central Office Buildings and B.S.P. Section H41.230, Interior Construction to Restrict Spread of Fire.

3.03 Ventilation: Vent flues 8 inches to 12 inches in diameter or rectangular flues of equal capacity extending from the vault ceiling to the roof are recommended for each cable vault. The flues are usually spaced - one at each end of the vault and intermediately at every other wall column, the larger flues being used for the wider vaults. It is desirable that joints in the flue linings be made as tight as practicable. Flues constructed with rigid, impervious and non-corrosive duct such as compressed asbestos-cement pipe have the advantage of specially formed pressure-tight joints. In order to guard against possible leakage of gas between the cable vault and the story above, it is desirable that each initial length of flue lining at the vault ceiling be placed in position prior to pouring the surrounding structural floor slab. In certain instances, cable vaults are ventilated by means of openings through the exterior wall. In such cases these openings are equipped with louvers and wire mesh screen to prevent the intrusion of foreign objects into the vault and are protected by a fire damper constructed of 1/4 inch steel plate held open by a fusible link. It is desirable that these openings face on an unexposed side yard located on company-owned property. It is recommended that the location of such openings on street fronts be avoided.

3.04 Explosion Protection: The following measures are suggested for consideration in guarding against penetration, accumulation and ignition of explosive or flammable gas in cable vaults and in house cable ducts. The transmission of such gas to and from the vault may be minimized by the following provisions:

(1) Plug airtight all underground and house cable ducts, both cabled and empty, where they terminate in the vault. In this connection it may be desirable to design the vault termination of house cable ducts so as to facilitate plugging; also, to set each initial duct unit in place prior to pouring the surrounding structural floor slab to assure integral tightness.

(2) Construct solidly the partitions separating cable vault from basement, making them tight at floor, ceiling and adjacent walls. Other than the entrance doorway, provide no openings between the cable vault and other basement space. Promptly and tightly cement up or otherwise permanently seal all shrinkage, settlement or other cracks that occur at any time in or between walls, partitions, floor slabs, etc.

(3) Place no gas piping in cable vaults or within the construction enclosing them. Arrange cable vault drains, where possible, to discharge into a sump-pit. Direct connection of the vault drain to the sewerage system is undesirable since the drain trap water seal is subject to evaporation.

(4) Avoid locating electric switches inside the cable vault. Switches controlling cable vault electric lights are mounted on the basement side of vault partition adjacent to the entrance door. Equip electrical outlets for soldering pot connection within the vault with special "receptacles with plugs" approved by the Underwriters' Laboratories, Inc., for use in hazardous locations. Explosion-proof lighting is not generally required in cable vaults.

(5) It is recommended that any detected odor of gas be immediately reported, investigated and the leak corrected. Gas may seep through ground into the vault from gas mains in the streets or alley.

4. HEATER ROOMS

4.01 Heater rooms are generally considered hazardous locations and it is important that they be adequately cut off from other basement areas. The boiler room enclosure is also considered desirable because of the adverse draft effect of the building shaftways and of central ventilating equipment or emergency power equipment operating in adjacent areas. For these reasons, it is recommended that the boiler room door be maintained in the closed position and that a separate boiler room air supply be provided from outdoors.

4.02 The provision of an opening adequate in size and properly located between the heater room and outside air generally affords both satisfactory ventilation for the room and ample air supply for heater combustion. It is desirable that the opening be louvered, screened and of such size that its net open area will approximate that of the associated chimney flue. The opening is usually provided by louvering a portion of heater room window or by piercing an adjacent outside wall. Where neither of these methods is practicable, a metal intake duct is installed to connect a remote exterior opening with the heater room. It is customary, of course, to equip such ducts with self-closing fire dampers where they pierce fire walls or fire partitions, also at the outside opening if these are an external fire hazard. Most effective room ventilation is usually obtained by locating the air intake opening as remote as practicable from the heater and breeching air damper.

5. POWER ROOMS

5.01 Where basement power rooms can not be furnished with window openings sufficient to afford adequate natural ventilation, the provision of induced ventilation is suggested. Power exhaust units are, as a rule, sufficient for normal size rooms; large rooms, however, may require powered units in both intakes and exhausts. The ventilation openings are usually furnished with louvers and screens, and if accessible from outside they are equipped with bar guards. Filters are usually provided only in intake openings. Locating the room exhaust openings as remote as possible from the intakes is effective in obtaining maximum air circulation, and in certain instances may require the provision of metal ducts. The number of air changes per hour will, of course, depend upon the relative amount of heat producing equipment in the room.

6. INTERNAL COMBUSTION ENGINE ROOMS

6.01 It is expected that the recommendations contained in Bell System Practice Section AA360.015 entitled, "Ventilating Equipment for Rooms Having Engine Driven Generators - Power Systems" will be followed in providing for dissipation of heat during periods of engine operation. Although the enclosure of diesel engine alternator sets is not normally required, it is recommended that the installation be made with consideration of possible enclosure later if necessary, and arrangement made for future supply of ventilation and combustion air. Where internal combustion engines are located in open basement spaces in the vicinity of boiler rooms, it is suggested that appropriate measures, such as keeping the boiler room door normally closed, be taken to prevent the action of powered exhaust units from adversely affecting the boiler drafts. Air intake openings to engine spaces are amply screened and louvered to prevent the induction of dirt and rain.

6.02 In order to avoid the accumulation of explosive vapors in rooms enclosing gasoline engine driven generators, two vent openings to the outer air are usually provided, each being about 100 square inches in area. These supply and exhaust openings are located generally near the ceiling and remote from each other - the exhaust being equipped with a sheet metal duct arranged to terminate about 6 inches above the floor. Gasoline engine rooms having one or more windows may be readily provided with vent openings by substituting louvered metal panels for upper lights of glass.

6.03 Where the foregoing procedures conflict with or are exceeded by corresponding provisions of local or state legislation, the legislated provisions should, of course, apply.

7. COAL STORAGE VAULTS

7.01 In order to avoid the possibility of spontaneous ignition in stored coal, particularly bituminous coal, it is necessary to exclude, as far as practicable, air, heat and moisture from the storage space. This is on the basis that oxygen is required to originate and maintain combustion, also that its action is aggravated by the presence of heat and moisture. Coal which has been oil treated to reduce dust in handling is particularly subject to spontaneous ignition and storage in large quantities is not recommended.

7.02 Ventilation for coal vaults is therefore undesirable, and it is suggested that all practicable measures be taken to make the vaults reasonably tight against penetration or introduction of air, moisture and heat. Coal chute covers are usually sealed with appropriate gaskets; cracks, sleeves, etc., in surrounding walls are cemented up and entrances made reasonably airtight. Leaks in water and steam pipes, valves and connections within the vault are corrected, and pipes carrying cold water are insulated to preclude condensation. Steam or hot water lines located where they are subject to being covered with coal are protected, for example, with a covering of concrete.

7.03 Suggested procedures for the installation of heating equipment and additional information related to this practice are outlined in B.S.P. Section H42.110, Heating Equipment - Fire Protection.

8. GAS METER COMPARTMENTS

8.01 From the standpoint of minimizing damage to meters and the hazard of escaping gas entering the building due to leaky connections at meters and shutoff valves, it is desirable that gas meters be located in separate compartments or vaults ventilated directly to the outside air. It may be desirable also to place water meters in the same compartment from the standpoint of having all meters at one location.

8.02 Gas meters should be adequately supported and connected to piping in such a manner as not to exert undue strain on the connections.

SAFETY VALVES FOR LOW PRESSURE STEAM BOILERS

1. GENERAL

1.01 This section describes A.S.M.E. Standard safety valves, spring loaded types, recommended for installation on low pressure (15 pounds or less) steam boilers used for heating systems or hot water supply systems, to prevent excess pressure in the boiler under all conditions of operation.

1.02 This section includes recommendations for minimum and maximum safety valve sizes and installation of safety valves, and it also applies to boilers operating under vapor conditions.

1.03 This section replaces Section H34.222, Issue 1, March 1944, Safety and Relief Valves. It is issued to place safety valves in a separate section. The replaced section also dealt with pressure relief valves for hot water storage tanks, hot water heating boilers and hot water supply boilers which are now outlined in the following sections:

(a) Section H34.190, Issue 1, January 1952, Relief Valves for Hot Water Storage Tanks.

(b) Section H34.291, Issue 1, January 1952, Relief Valves for Hot Water Heating Boilers.

(c) Section H34.292, Issue 1, January 1952, Relief Valves for Hot Water Supply Boilers.

It also includes additional information on method of installation not mentioned in the replaced section.

1.04 This section applies generally to new installations. In existing installations non-standard safety valves need not be replaced and installed in accordance with this section provided they are of the spring loaded type, are in operative condition, are testable by means of a substantial integral lifting lever, and have no shutoff valve or other obstruction between the boiler and the safety valves or on the discharge side of these valves.

If, however, there is any doubt as to the effectiveness of an existing valve, it is recommended that a new valve be installed as outlined herein.

1.05 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPE

2.01 Each low pressure steam boiler is provided with one or more A.S.M.E. Standard safety valves of the spring pop type and so constructed that the valve cannot be reset to release at a pressure greater than 15 pounds.

2.02 Seals are attached in such a manner as to prevent safety valve from being taken apart without breaking the seal.

2.03 The standard valve has a substantial integral lifting device. The seats and discs are of non-corrosive materials.

3. MINIMUM AND MAXIMUM INLET SIZE

3.01 The inlet size of standard safety valves used on a boiler is not smaller than 3/4-inch iron pipe size and not larger than 4-1/2-inch iron pipe size.

3.02 Where the capacity of a boiler requires the size of a safety valve to be larger than 4-1/2-inch iron pipe size, two or more safety valves are installed to provide the required capacity. Cross-sectional areas of openings in boilers for safety valves, and of connecting piping when used, are at least equal to the total cross-sectional area of the valves.

4. MARKINGS

4.01 Each standard safety valve is plainly labeled with the manufacturer's name or registered trade mark, the letters "A.S.M.E. Standard" and with the pressure in pounds per square inch at which it is set to blow. These data are usually stamped or cast on a plate securely attached to the casing so as not to be obliterated in normal service.

5. INSTALLATION

5.01 A safety valve is installed on a steam boiler in the opening provided by the boiler manufacturer for this purpose. (See Paragraph 3.02.)

5.02 To insure functional operation of the safety valve at all times, no shutoff and cutout valves or any other means of obstruction are installed between the safety valve and the boiler.

6. DISCHARGE PIPE

6.01 Where a discharge pipe is used, the cross-sectional area is not less than the full area of the safety valve outlet or the total of the outlets of the valves discharging thereinto.

6.02 No shutoff of any description is placed on the discharge pipe between the safety valve and the atmosphere.

6.03 The discharge pipe is run and terminated in such a manner that its end cannot be plugged, capped, frozen or obstructed in any way and so arranged as to properly protect persons and property.

7. MEANS FOR TESTING

7.01 The integral lifting lever on the standard safety valve provides a means for manual testing. By hand operating the lever, the valve disc is raised and the valve will discharge if in operable condition.

RELIEF VALVES FOR HOT WATER SUPPLY BOILERS

1. GENERAL

1.01 This section describes A.S.M.E. Standard relief valves, spring loaded types, recommended for installation on hot water supply boilers to prevent excess pressure in the boiler under all conditions of operation.

1.02 This section includes recommendations for minimum and maximum relief valve sizes and installation of these relief valves.

1.03 This section is issued to place relief valves for hot water supply boilers in a separate section. Pressure relief valves for hot water supply boilers were treated in Section H34.222, Issue 1, March 1944, Safety and Relief Valves, which is replaced by Section H34.290, Issue 1, January 1952, Safety Valves for Low Pressure Steam Boilers. It also includes recommendations for installation not mentioned in the replaced section.

1.04 This section applies generally to new installations. In existing installations non-standard relief valves need not be replaced and installed in accordance with this section provided they are of the spring loaded type, are in operative condition, are testable by means of a substantial integral lifting lever, and have no shutoff valve or other obstruction between the boiler and the relief valves or on the discharge side of these valves.

If, however, there is any doubt as to the effectiveness of an existing valve, it is recommended that a new valve be installed as outlined herein.

1.05 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPE

2.01 Each hot water supply boiler is provided with A.S.M.E. Standard pressure relief valve set by the manufacturer to release at a pressure not to exceed the maximum allowable working pressure of the boiler.

2.02 Standard pressure relief valves are of the spring loaded type without disc guides below seat and have a substantial integral lifting device. Seats and discs are of non-corrosive material.

2.03 Each standard pressure relief valve has a relief outlet connection.

2.04 The relief valves are selected with a rating in relieving capacity in British Thermal Units per hour at least matching the gross output of the hot water supply boiler in British Thermal Units per hour to prevent excess pressure under all conditions of operation such as improperly prolonged firing, a bottled up system, etc.

3. MINIMUM AND MAXIMUM INLET SIZE

3.01 The size of standard pressure relief valves used in connection with hot water heating boilers is not smaller than 3/4-inch iron pipe size and not larger than 2-inch iron pipe size.

3.02 Where the capacity of a hot water heating boiler requires the size of a relief valve to be larger than 2-inch iron pipe size, two or more relief valves are installed to provide the required capacity. Cross-sectional areas of the openings in the boilers for relief valves, and of the connecting piping when used, are at least equal to the total cross-sectional area of the valves.

4. MARKINGS

4.01 Each standard pressure relief valve is plainly labeled with the manufacturer's name or registered trade mark, the letter "A.S.M.E. Standard," the pressure in pounds per square inch at which it is set to release and the relieving capacity in British Thermal Units per hour. These data are usually stamped or cast on a plate securely attached to the casting so as not to be obliterated in normal service.

5. INSTALLATION

5.01 A pressure relief valve is installed on a hot water supply boiler in the opening provided by the boiler manufacturer for this purpose. (See Paragraph 3.02.) The purpose of this pressure relief valve is to provide individual protection for the supply boiler and is in addition to the pressure relief device described in Section H34.190, Issue 1, January 1952, Relief Valves for Hot Water Storage Tanks.

5.02 The relief outlet is connected with discharge piping, brass or copper, sized full area of this outlet connection. The discharge is run within the building and terminates at an open plumbing fixture where available or within 12 inches of the boiler room floor. This piping pitches down from the valve it serves to prevent trapping of water. If piping is run into the drainage system, it is not connected directly but as an indirect waste. Terminating end of discharge piping is cut at 45 degrees to prevent its being capped or plugged, thus insuring full relief discharge. Where two or more valves are connected to same discharge, the pipe area is not less than area of all valves it serves. This arrangement of the discharge adequately protects personnel and property.

5.03 To further insure functional operation of the relief valves at all times, no shutoff or cutout valves or any means of obstruction are installed between the relief valves and the boiler or on the discharge piping.

6. MEANS FOR TESTING

6.01 The integral lifting lever on the standard pressure relief valve provides a means for manual testing. By hand operating the lever, the valve disc is raised and the valve will discharge if in operable condition.

LOW WATER CUT-OFF CONTROLS FOR OIL BURNERS

1. GENERAL

1.01 This section describes a type of control recommended to be used to stop oil burners of steam boilers before the water in the boiler drops to a dangerous level and prevents further operation of the burner until the water in the boiler is returned to a safe level. This form of control is commonly known as a low water cut-off.

1.02 This section replaces Section H34.225, Issue 1, February 1945, Low Water Shut-off Controls. It is issued to place this type of control for oil burner in a separate section. It also includes recommendations for method of installation not mentioned in the replaced section. Low water cut-off controls for gas burners and mechanical stokers will be covered in separate sections.

1.03 This section applies to both new and existing oil burner installations in steam boilers. The use of an approved automatic device for shutting down an oil burner associated with a steam boiler if low water occurs in the boiler is recommended by the National Board of Fire Underwriters in Pamphlet No. 31, Paragraph 6, Section 20.

1.04 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPE

2.01 Each steam boiler is equipped with a low water cut-off which automatically stops the operation of the oil burner before the water line drops below the lowest safe water level of the boiler. It may be a separate control or in combination with an automatic water feeder on the boiler.

2.02 Each separate low water cut-off control has a sediment chamber, or if in combination with an automatic water feeder the sediment chamber on the water feeder serves the purpose. An A.S.M.E. approved blow-down valve is used at bottom of the control or water feeder, and this allows the draining of the float chamber of the control or water feeder faster than it flows in from the boiler, thus permitting a check of operation. Also, this blow-down feature provides a means for ridding the unit of sludge, rust and scale which might impair its effective operation. Self-cleaning low water cut-off devices are not recommended.

2.03 Low water cut-off controls in both the separate type and the type in combination with an automatic water feeder automatically reset when a safe water level is restored and allows the burner to start if low water has been the only cause for cutting off the burner. Each type is obtainable with an alarm feature to identify a low water shut down and with a manual reset in place of an automatic reset if either or both are desired.

3. INSTALLATION

3.01 A low water cut-off is connected electrically into the main oil burner supply circuit in such a manner as to shut off the electric power supply to the burner in the event the water level falls to 1/2 inch in the gauge glass of the boiler and restores this power supply when the water level is raised above the 1/2-inch level.

3.02 A separate low water cut-off control may be attached directly either to:

(a) The boiler or water column connections with the bottom equalizer connection of non-ferrous metal, or to

(b) The gauge glass connections using a Y with the gauge glass piping connected to the straightway tapping of the Y and the control connected to the branch of the Y with both equalizer connections of non-ferrous metal. The connecting pipe and fittings are of the size of the fittings in the device if practicable, but need not exceed 1-inch iron pipe size and in no case may they be less than 1/2-inch iron pipe size.

3.03 Regarding the installation of automatic water feeders for boilers, it is recommended that they be attached directly either to boilers, to water column connections or to gauge glass connections as prescribed in Paragraph 3.02 for a separate low water cut-off control. Under this arrangement, where the low water cut-off device is in combination with an automatic water feeder, the requirements recommended for installation of a separate low water cut-off control described in Paragraph 3.02 are fulfilled.

3.04 The blow-down valve of a separate low water cut-off control, or if in combination with an automatic water feeder the blow-down valve of a water feeder, is connected with a vertical straightway drain sized full area of valve connection. This drain is terminated so that the condition of the discharge may be observed, and end is cut at angle of 45 degrees to prevent its being fitted with a plug or cap.

4. MEANS FOR TESTING

4.01 The blow-down valve at the bottom of an individual low water cut-off control or, if in combination with an automatic water feeder, the blow-down valve of the water feeder provides a means for manual testing. By opening this valve, the float chamber of the control or water feeder can be drained of water faster than it flows into it from the boiler, thus causing a condition of low water in the boiler and permits a check on the operation of the low water cut-off mentioned in Paragraph 2.03.

AIR NAVIGATION OBSTRUCTION MARKING AND LIGHTING FOR RADIO RELAY TOWERS AND BUILDINGS

1. GENERAL

1.01 This section covers the requirements for air navigation obstruction marking and lighting in connection with the design and construction of radio relay towers and buildings.

1.02 All tall structures, which are so located as to present a potential hazard to air traffic, are required by law to display painted markings and warning lights of a type and in a manner as covered in specifications prepared by the Federal Communications Commission (F.C.C.). The specification to be followed for each structure requiring this lighting depends upon the height of the structure and its location with respect to established airways and airfields, and is established by the Company in consultation with the F.C.C. To meet each of the specifications applicable to the various types of radio relay buildings and towers, circuit and equipment drawings covering arrangements of obstruction lighting and associated control equipment have been prepared. The Company selects the appropriate plan and arranges for its installation as part of the building or towers.

1.03 Specifications for obstruction marking and lighting of antenna structures of the Federal Communications Commission outline in detail the requirements for the painting and lighting of antenna structures, temporary warning lights during construction, inspection of tower lights and associated control equipment, recording of tower light inspections in the station record, cleaning and repainting, time when lights shall be exhibited, spare lamps, lighting equipment, and painting and lighting existing structures. Copies of this specification can be obtained from the office of Federal Airways, Civil Aeronautics Administration, Department of Commerce or from the Government Printing Office.

1.04 These specifications contained in Subpart C of Part 17, Rules Concerning the Construction, Marking and Lighting of Antenna Towers and Supporting Structures became effective March 30, 1953 and may be subject to change or revision from time to time.

2. OBSTRUCTION MARKING AND LIGHTING

2.01 In general, antenna structures are painted with alternate bands of aviation surface orange and white and are lighted with standard F.C.C. obstruction lighting when:

(a) They require special aeronautical study; or

(b) They exceed 170 feet in height above the ground.

(c) The F.C.C. may modify the above requirements for painting and/or lighting of antenna structures, when it is shown by the Company that the absence of such marking would not impair the safety of air navigation, or that a lesser marking requirement would insure the safety thereof.

2.02 The continuously lighted 111-watt lamp enclosed in an aviation red prismatic globe is covered by Drawings SD-81113-01 and ED-81498-01. The 300-millimeter flashing beacon employing two 620-watt lamps enclosed in a red Fresnel lens, with or without side-lighting, is covered by Drawings SD-81114-01 and ED-81499-01.

2.03 Control: The control equipment for obstruction lighting is wall mounted and so arranged that immediate alarms are indicated upon the failure of this apparatus, lamps, etc. The equipment is designed for operation from 115-volt service obtained from a distribution cabinet served by the reserve engine alternator set. In cases where the commercial ac power supply is such as to make its use necessary, a 230-115 volt transformer is available on an optional basis to give the desired voltage. This transformer is furnished and installed by the Company.

LIGHTING FIXTURES

1. GENERAL

1.01 Lighting fixtures for manual, dial, and toll central offices are covered by P.E.C. 511, attaching Bulletin 441. Additional arrangements for small step-by-step offices are covered by P.E.C. 556, attaching Bulletin No. 480, and by P.E.L. 1914.

1.02 This Practice outlines certain changes in the fixtures specified in Bulletin 441.

2. REFLECTORS

2.01 Reflectors previously referred to as the X-ray Nos. 3, 11, 696 and 778 are now covered by a specification which provides for other commercial reflectors and allows for certain wider limits in construction. A change has also been made in the exterior finish of the reflectors to specify an aluminum finish as compared with a bronze or dark green finish previously furnished.

2.02 Five code numbers are assigned comparing to four in Bulletin 441. Four of these correspond to the four X-ray codes in the bulletin and cover reflectors that are the equivalent to or can be used interchangeably with the X-ray reflectors. The fifth code is similar to the X-ray No. 11 reflector except that it has a round opening as compared with the oval opening of the No. 11 reflector. The round opening reflector requires slight changes in the trough assembly and these changes are shown on Drawing ED-91111-01. This drawing shows arrangements for both types of reflectors and replaces Drawing ED-90506-01 previously showing the trough assembly.

2.03 The code numbers and list numbers, together with the corresponding X-ray reflectors which they replace, are as follows:

Reflector per KS-5461-01, List 1.

3-1/4" x 4-1/2" mirrored bowl type reflector for use in wiring aisles of step-by-step offices. Corresponds to X-ray No. 3 reflector.

Reflector per KS-5461-01, List 2.

4-3/4" x 7-1/2" mirrored cone type reflector for use in apparatus aisles of step-by-step offices and in aisles of toll offices. Corresponds to the X-ray No. 696 reflector.

Reflector per KS-5461-01, List 3.

3-1/2" x 5-7/16" mirrored angle type reflector for use in the distributing frame lighting trough per Drawing ED-91111-01. Corresponds to the X-ray No. 11 reflector.

Reflector per KS-5461-01, List 4.

6" x 7" mirrored angle type reflector for use at message register racks and at traffic register racks located in apparatus rooms. Corresponds to the X-ray No. 778 reflector.

Reflector per KS-5461-01, List 5.

3-7/16" x 5-1/2" mirrored angle type reflector for use in distributing frame lighting trough. Requires lighting trough per Drawing ED-91111-01.

CABLE OPENINGS

1. GENERAL

1.01 This section covers the requirements for openings associated with standard cable holes in floors and walls or partitions, cable shafts, cable sleeves, and cable slots under distributing frames and between columns.

1.02 This section is reissued for the following reasons:

(a) To include information contained in addendum of previous issue of the section.

(b) To revise certain parts of the text to include a brief description of all drawings referring to cable openings listed in Paragraph 2.01.

(c) To increase the clearance between floor opening and the outside of sheet metal type cable hole sheathing.

(d) To provide tapered floor openings for cable sleeves.

(e) To require openings for future use to be packed with canvas bags of mineral wool.

(f) To include reference to cable vault walls.

(g) To describe a method for providing temporary closures for cable openings in floors.

Arrows are used to indicate changes throughout the text.

1.03 A cable opening is required where a cable run passes through a floor, wall or partition in a telephone building. The openings consist of cable holes in floors and walls or partitions, cable slots in floors, cable shafts, cable sleeves in floors, and floor openings in cable ducts.

1.04 The providing or cutting of openings is arranged for by the Telephone Company, unless otherwise specified. In case of walls or partitions, where it may not be practicable to determine the location or size of the cable opening at the time the locations and sizes of floor openings are determined, the wall or partition openings may be cut at the time of equipment installation. Any unused cable opening in the floor is provided with a cover plate flush with the floor. (See Paragraph 1.07.)

1.05 Except for cable holes using sheet metal type sheathing, openings for cable holes are provided or cut to the exact dimensions shown on the floor plan and floor plan data sheets. In the case of cable holes using sheet metal type sheathing, usually holes of less than one square foot in area in floor, the actual opening is provided or cut 3/16 inch larger all around than the finished hole shown on the floor plan drawings.

1.06 Fascia angles required for cable hole and slot openings in fire resistive floors and cable hole openings in fire resistive walls or partitions are furnished and installed by the Telephone Company. The outer faces of the legs of these angles are flush with sides of opening and floor, ceiling or wall surface. The legs flush with floor, ceiling, wall or partition are drilled and tapped by the Telephone Company, as indicated on the drawings referred to in Paragraph 2.01, to facilitate installation of sheathing and covers. The tapped holes are protected by inserting temporary screws prior to placing the concrete and floor material.

1.07 Flush cover plates required for the unused portions of cable openings in the floor together with the necessary support angles fastened to the vertical legs of the top fascia angles are furnished and installed by the Telephone Company.

1.08 Design requirements for standard cable hole sheathings are covered in a section of Division AA380 of the Bell System Practices.

1.09 Installation requirements for cable hole and cable slot sheathing, closing details and cable sleeves together with power cable supports in shaftways are covered in Section AA614.003, Sheathing for Cable Openings - Installation.

1.10 A method of forming cable openings in reinforced concrete floors under main distributing frames by use of removable aluminum cores is described in Section H36.149, Core Method of Forming Main Frame Cable Holes. This method is both economical and practicable, and is offered for consideration when arranging for cable openings under main distributing frames.

2. DRAWINGS

2.01 The following standard drawings with subjects indicated give the necessary information to the Telephone Company for providing the cable openings included in this section.

Subject	Drawing No.
Cable hole sheathing, angle type construction, for cable holes in fire resistive type floors.	ED-90980-01
Cable hole sheathing, sheet metal type, for cable holes in fire resistive and combustible floors.	ED-90004-01
Cable hole sheathing, angle type construction, for cable holes in mill type and wood joist floors.	ED-90005-01
Cable hole sheathing for fire resistive and combustible walls and partitions and for floor openings in cable ducts.	ED-90006-01
Sheathing for cable slot between columns or series of cable holes between columns.	ED-90878-01
Power cable shaft. Closing arrangements and supporting of cable runs.	ED-90578-01
Power cable shaft. Supporting units for cable runs.	ED-90679-01
Cable slot sheathing, channel type, for cable slot beneath I.D.F. in fire resistive type floors.	ED-90979-01
Main Distributing Frame. Closing framework and cover for slot under frame for outside cable.	ED-90627-01
Protector frame assembly, double sided, showing closing framework for slot beneath protector frame.	ED-90274-01
Cable sleeve in floor for switchboard and power cable.	ED-90591-01
Enclosure for vertical cable run adjacent to column.	ED-90579-01
Cable hole sheathing, channel type construction, for cable holes in fire resistive type floors.	ED-92116-01

3. CABLE HOLES

Angle Type Sheathing

3.01 Drawing ED-90980-01 provides for angle type sheathing for cable holes in fire resistive floors based upon the openings having top and bottom fascia angles. The sheathing fastened on the top fascia angles, is comprised of angles to which the top cover is fastened by means of inverted angles, the bottom cover being fastened directly to the bottom fascia angles.

3.02 Drawing ED-90005-01 provides for angle type sheathing for cable holes in mill type and wood joist floors. Top and bottom fascia angles are not required for the floor opening.

3.03 Angle type sheathing is the kind generally used for cable holes.

Channel Type Sheathing

3.04 Drawing ED-92116-01 indicates channel type sheathing for cable holes in fire resistive floors. The sheathing is of channels, fastened on the top fascia angles, and the top cover is fastened directly to the channels.

3.05 Channel type sheathing is a special set of sheathing designed specifically for use in switchboard cable turning sections.

Sheet Metal Type Sheathing

3.06 Drawing ED-90004-01 shows sheet metal type sheathing for cable holes in floors. This type of sheathing does not require any fascia angles in the opening as the sheet steel sheathing extends through the opening a few inches above floor and below ceiling. This allows the bottom cover to be supported by angles attached to the sheathing. The top cover is fitted around the sheathing and above the sheathing angles. These angles are fastened to floor with expansion bolts or wood screws depending on whether floor is concrete or wood.

3.07 In order to obtain approximately 1/8-inch clearance between the outside of the sheet steel sheathing and the sides of the floor opening, the Telephone Company provides an opening 3/16 inch larger all around than the finished hole size shown on the floor plan drawings.

Sheathing for Walls and Partitions

3.08 Drawing ED-90006-01 provides for sheathing for cable holes in walls and partitions, and also for floor openings in cable ducts. The sheathing for cable holes in fire resistive walls or partitions is based on fascia angles at both wall surfaces. Unused portion of opening in shaft walls is covered with steel plate furnished and installed by the Telephone Company.

3.09 Methods of providing cable hole openings in walls and partitions of special construction such as glass, metal, etc., must be worked out for each specific case and should be discussed with the Western Electric Company prior to the sheathing installation.

4. CABLE SLOTS BETWEEN COLUMNS

4.01 Drawing ED-90878-01 shows sheathing for cable slot between columns or series of cable holes between columns.

4.02 With the practice of carrying power cables on standard cable racks, the use of cable slots between columns permits more direct runs of power and switchboard cabling as compared with the practice of using shafts. It also provides a greater degree of flexibility in caring for the cabling between equipment floors. Under this plan a number of slots between the columns parallel to and nearest the lengthwise center line of the building are provided. Recommended locations for the slots regarding power cables which will best provide for the initial and ultimate cabling needs of the equipment floors are shown on the standard floor plan data sheets. The construction of the slot and covers are such that, if required, frames can be installed over unused portions. A bulkhead is provided as a part of the sheathing to separate the used from the unused portion.

4.03 The bottom cover plate for a continuous cable slot is furnished in sections, the length of each of which is approximately 2'-9". This conforms with the standards for the top cover plate and will ordinarily make it unnecessary to remove more than one section of cover plate, at both top and bottom, for each cable run installed.

4.04 Drawing ED-90878-01 also has notes in regard to the reuse by the installer of the bottom cover plate in those cases where this plate, covering the unused portion of the slot and furnished by the Telephone Company, is No. 12-gauge sheet steel.

5. CABLE SHAFTS

5.01 There will be cases in some buildings where cable shafts will still be required. Drawings ED-90578-01 and ED-90679-01 cover certain closing arrangements and supporting units. Any necessary steel floor plate is furnished and installed by the Telephone Company.

6. CABLE SLOT BENEATH I.D.F.

6.01 Drawing ED-90979-01 provides for sheathings, channel type, based on the openings having top and bottom fascia angles.

7. CABLE SLOT BENEATH M.D.F.

7.01 Drawing ED-90627-01 indicates the method of closing the slot beneath the M.D.F. The floor opening requires top fascia angles only. Steel angle stringers are used for fastening the cover stringers of 1/4-inch asbestos lumber. As a further aid in closing, the slot covers are furnished in sections, 8 inches in length, cut to fit around the angle uprights of the M.D.F. The sections are not precut to fit around the cable inasmuch as the size and number of cables per vertical vary.

7.02 The M.D.F. closing framework is furnished by the Western Electric Company only when specified.

8. CABLE SLOT BENEATH DOUBLE SIDED PROTECTOR FRAME

8.01 Drawing ED-90274-01 indicates the closing details which are furnished in all cases as part of the frame. The floor opening requires top fascia angles only. The cover is furnished in sections. Two kinds of sections are available, one precut to fit around four 202-pair terminating cables, and the other blank for use at unequipped verticals and for cutting on the site to fit irregular cable terminations. The equipment questionnaires provide for the Telephone Company specifying the number of each cover section required for the protector frame verticals ordered.

9. CABLE SLEEVE IN FLOOR

9.01 Drawing ED-90591-01 covers a floor sleeve for switchboard and power cable where the cable capacity of the sleeve is sufficient for the ultimate requirements. It may be used beneath desks and at other places where a small number of cables are involved.

9.02 A tapered opening is provided in the floor for this sleeve.

9.03 This sleeve is limited to a maximum 4-inch inside diameter in a 5-inch hole.

10. ENCLOSURE FOR VERTICAL CABLE RUN ADJACENT TO COLUMN

10.01 Drawing ED-90579-01 covers the enclosure of vertical runs located adjacent to a column, such as where a cable run passes through non-equipment space. Such enclosures are provided with an opening on both sides of the cable racks to facilitate the work of the installer. The fire resistive construction and finish of the enclosure are governed by the local conditions. Such enclosures are provided by the Telephone Company.

11. FIRE PROTECTION FOR CABLE OPENINGS

11.01 In closing cable openings in floors, walls or partitions of fire resistive telephone buildings, canvas bags containing mineral wool are packed around the cables to prevent drafts from carrying smoke, flames or heat through the openings in case of fire except in the case of the slots beneath the M.D.F. and protector frame (see Paragraph 11.05), cable openings in enclosed shafts and cable sleeves. Cable openings through combustible type floors, with the exceptions stated above, also are packed with bags of mineral wool, but in holes through combustible walls and partitions this protection is not required. The bags are of eight-ounce canvas and are filled about three-quarters full with mineral wool so as to be about 12" x 12" x 1" in size per Specification KS-5048.

11.02 Cable holes in fire resistive floors are packed tightly with canvas bags of mineral wool to a depth of approximately 8" above the bottom cover plate. Cable holes in combustible floors are packed to a depth of 4". In fire resistive walls and partitions, all available space around the cable runs is packed with canvas bags from cover to cover of the cable hole.

11.03 When installing the bags of mineral wool each horizontal layer of bags is arranged so as to overlap the space between the bags in the layer beneath and to fit tightly against the cable runs and sides of the cable hole. It will not be practicable to close completely all small openings by this method but the arrangement will effectively cut off drafts and will be satisfactory from a fire protection standpoint. In the case of small cable holes, the bags are folded as necessary to permit them to be fitted in the limited space provided.

11.04 The closing of cable holes in floors, walls or partitions and cable slots in floors provided for future use is done by the Telephone Company. Such openings are packed tightly with canvas bags of mineral wool in accordance with Paragraphs 11.01 to 11.03.

11.05 In central office buildings where outside underground cables require cable racking, a cable vault separated from other parts of basement by a fire resistive wall is provided. In general this is based on the following:

(a) Protects cables from possible fire originating in general basement.

(b) In locations where M.D.F. is in first story directly above the cable racking in basement, provides a fire barrier between general basement and equipment space in which M.D.F. is located. From a fire protection standpoint, this makes the cable vault a part of the frame room.

Fire resistive ratings and protection of vertical openings in cable vault walls are covered in Section H41.230, Interior Construction to Restrict Spread of Fire.

12. TEMPORARY COVERS FOR CABLE OPENINGS IN FLOORS

12.01 It is good practice for the Telephone Company to place all permanent top and bottom cover plates and canvas bags of mineral wool in cable holes and slots at the earliest possible time in the construction of buildings to provide adequate fire and accident protection at these locations during the construction and equipment installation periods.

12.02 Temporary covers for cable openings are furnished and installed by the Telephone Company during the construction of a building where such openings are not provided with permanent covers in this period. During the equipment installation as cables are added, the installer modifies these temporary covers as necessary until the regular closing details are installed. These temporary closures may be constructed of materials such as cement-asbestos boards, treated wood, wire baskets with canvas bags of mineral wool, and pine boards.

12.03 In order to be sufficiently fire resistive, all temporary closures are comparable in fire resistive rating to a cement-asbestos and pine board cover over a basket containing bags of mineral wool. For example, if pine boards are used, a cement-asbestos board of at least 1/8" thickness, or its equivalent in fire protection, is attached to the underside of the pine boards. Cement-asbestos boards are available which can be nailed to wood and cut easily so that sections of the cover can be removed when cables are being installed. Board covers are usually secured to cleats so that the cover can not be accidentally moved on the opening.

12.04 In addition to the temporary cover, bags of mineral wool as described in Paragraphs 11.01 to 11.03 are packed tightly to a depth of at least 6" into wire or metal lath baskets under the cover. The baskets are not to be dependent upon wood portions of the closure for support in case the wood is removed or destroyed.

12.05 All covers are to be of adequate strength and securely fastened in place. They should not be unfastened or removed except when it is necessary to work in the cable holes or slots, or to place the permanent sheathing or cover plates.

12.06 The closures should always be replaced at night if workmen are not on the job. Western Electric Company installation practices cover the use of temporary guard rails around the cable holes through which cables are to be run, and its practice is to use temporary closures during the progress of its work in placing the cables.

CABLE OPENINGS

1. GENERAL

1.001 This addendum supplements Section H36.148, H54.302, Issue 2.

1.002 This addendum is issued to revise Paragraph 3.08 in Part 3.

3. CABLE HOLES

3.08 ***Sheathing for Walls and Partitions:*** Drawing ED-90006-01 provides for sheathing for cable holes in walls and partitions and also for floor openings in cable ducts. The sheathing for cable holes in fire resistive walls or partitions is based on fascia angles at both wall surfaces. In situations where the walls of the switchroom are exposed masonry, without plaster, the sheathing can be attached directly to the wall without the use of an angle iron frame. Fig. 4 in Issue 10 of Drawing ED-90006-01 illustrates this alternative method. Unused portion of opening in shaft walls is covered with steel plate furnished and installed by the Telephone Company.

CABLE VAULTS

CABLE ENTRANCES, DETAILS OF VAULT CONSTRUCTION, AND STEEL WORK OF CABLE RACKS

1. GENERAL

1.01 This section covers details of cable vault construction, assembly, and anchorage of cable rack steel work and typical cable entrances to central office buildings.

1.02 This section is reissued primarily to direct attention to changes in the installation of cable rack steel work.

1.03 The details of underground entrances to central office buildings, with or without cable vaults, cable rack installation, and cable vault construction are described in BSP's AG40.60, AG40.61, and AG40.62.

APPLICATION AND USE FIRE PROTECTION PRACTICES

1. GENERAL

1.01 Bell System Practices — Buildings — Fire Protection are issued for the use of the Telephone forces in connection with fire protection matters relating to the design, construction, protection and maintenance of Telephone Company buildings, either owned or leased. Their purpose is to aid in preventing and extinguishing fire and to ensure the proper safeguards required for the safety of the building occupants.

1.02 These practices represent the best method for handling telephone fire protection matters, as determined by past experience. However, they can serve only as a guide, since completely specific rules can not be set down for every case.

1.03 These practices are divided into five main headings as follows:

H40. General
H41. Design and Construction
H42. Mechanical Plant
H43. Protective Apparatus
H44. Inspection

1.04 ***Application to Existing Buildings:*** Fire Protection Practices relating particularly to design, construction and mechanical plant are intended primarily for new projects. In the case of existing buildings which do not come up to the recommendations, the question of whether any work should be done will have to be considered for each specific case based upon occupancy, structural conditions or other items affecting the fire risk and the cost involved.

1.05 This section is reissued for the following reasons:

(a) To change the basis for the Advisory and Inspection Services of Marsh and McLennan from a dollar value basis to one based on occupancy, size and exposure.

(b) To recommend various inspection intervals for different groups of buildings.

(c) To include a suggested form for preparation of inspection lists.

1.06 The reasons outlined in Paragraph 1.05 are covered in detail in Section H44.015.

1.07 Arrows indicate revisions in this section.

2. REFERENCES

2.01 Fire Protection Practices for telephone buildings follow closely the regulations and recommendations of the National Board of Fire Underwriters, as covered in their publications. These publications of which there are approximately fifty may be obtained from the National Board of Fire Underwriters at 85 John Street, New York City. Where special cases occur which are not covered in the practices, the above-mentioned publications should be referred to. In some cases, it has appeared desirable to modify the published regulations or recommendations because of the nature of telephone buildings, and when this occurs, the practices should be followed.

2.02 ***Lists of Inspected Appliances:*** In addition to the regulations and recommendations mentioned in Paragraph 2.01, it is expected that only approved appliances as listed in the following pamphlets issued by the Underwriters' Laboratories and revised periodically will be used in telephone buildings.

List of Inspected Fire Protection Appliances.

List of Inspected Gas, Oil and Miscellaneous Appliances.

List of Inspected Electrical Appliances.

List of Appliances Inspected for Accident Hazard.

3. LOCAL CODES AND ORDINANCES

3.01 Where state or local legislation, codes or regulations regarding fire protection are more severe than the recommendations given in the practices, the state or local regulations should, of course, also be conformed to.

4. SUBMISSION OF BUILDING PLANS FOR REVIEW

4.01 The Advisory Services of Marsh and McLennan in fire protection matters are available to furnish advice with respect to plans and specifications for new buildings, for extensions to existing buildings, and for important alterations.

4.02 The suggested use of Marsh and McLennan Advisory and Inspection Services with their respective time intervals are covered in detail in Section H44.015, Issue 3, dated November, 1959.

5. FIRE REPORT ROUTINE

5.01 Under the Advisory Services, Marsh and McLennan receive and review reports of all fires in telephone properties, and assist in investigating and analyzing specific fires upon request.

5.02 In the event of any fire in any part of any building occupied by the Telephone Company, a fire report blank, Form 19.40, should be filled out *at once* and forwarded by the Telephone Company to Marsh and McLennan, Incorporated, 70 Pine Street, New York 5, New York.

5.03 In filling in the fire report blank, it is essential that the known cause of the fire, and the action taken to prevent a similar occurrence be clearly stated in the report.

APPLICATION AND USE FIRE PROTECTION PRACTICES

1. GENERAL

1.01 This addendum specifies a change in the procedures for reporting fires in telephone company owned or occupied buildings.

Changed text:

5. FIRE REPORT ROUTINE

5.02 In case of any fire occurring in or outside a building owned or occupied by the telephone company of if the building, equipment or contents are threatened by damage from heat, water or smoke a telephone report shall be made immediately to the General Plant Manager. The General Plant Manager will in turn notify the Chief Engineer and the Plant Operations Supervisor by telephone.

5.03 The District Plant Superintendent shall prepare Form 19.40 in five copies, assign a serial number, complete all required information as to cause of fire, and action taken to prevent a similar occurrence. Four copies shall be forwarded to the General Plant Manager who will retain one copy and forward three copies to the Chief Engineer. The Chief Engineer will in turn furnish a report to Marsh and McLennan, Incorporated, 70 Pine Street, New York 5, New York.

NOTE: Form 19.40 may be obtained from the Chief Engineer.

FIRE PROTECTION FOR PRIVATE BRANCH EXCHANGE, TELETYPEWRITER SWITCHING SYSTEM, NONPORTABLE VIDEO EQUIPMENT, AND LARGE BUILDING NONCENTRAL OFFICE POWER PLANT INSTALLATIONS

1. GENERAL

1.01 This practice outlines recommendations for the provision of fire protective apparatus at PBX, TTY switching system, nonportable video equipment, and noncentral office power plant installations. The recommendations are intended to apply to new installations. In the case of existing installations, the question of providing the proper fire protective apparatus should be considered for each specific case.

1.02 This section is reissued principally to include recommendations for nonportable video and noncentral office power plant installations; provision of portable tarpaulins where a maintenance man is in regular attendance; and to transfer certain information to the table which was formerly in the numbered paragraphs. For any installation covered by this section it is considered undesirable, from the standpoint of possible acid damage to the equipment, to have any soda-acid extinguishers in these spaces.

2. FIRE PROTECTIVE APPARATUS

2.01 The accompanying table indicates the fire protective apparatus which is recommended for general use in these installations. Apparatus in accordance with this table is also recommended during the period of equipment installation.

2.02 The following practices give detailed information on the description, location, mounting, method of operation, and maintenance for the fire protective apparatus recommended in this practice.

Section H43.110 - Water Type
Section H43.140 - CO_2 Type
Section H43.150 - Asbestos Gloves
Section H43.160 - Tarpaulins

Carbon Dioxide-Type Fire Extinguishers

2.03 When the table specifies that carbon dioxide extinguishers are located "One per 30 ft. Travel," it is expected that they will be located so that a unit can be reached by a travel of 30 ft. or less from any point in the room.

2.04 Carbon dioxide extinguishers are located on walls, partitions or columns, giving preference to the wall locations where practicable.

Water-Type Fire Extinguishers

Asbestos Gloves

Portable Tarpaulins

2.05 Water-type extinguishers, asbestos gloves and portable tarpaulins are located as indicated in the table.

3. AUTOMATIC SPRINKLERS

3.01 In cases where the building on a subscriber's premises is now or will be equipped with an automatic sprinkler system and it is necessary to install the equipment in these spaces, it is considered inadvisable for the Telephone Company to approach subscribers with any plan to remove, omit or alter the sprinklers as normally installed in these spaces. Experience has indicated that this protection is often desirable in the classes of buildings in which these installations are made and the possibility of damage due to sprinkler leakage is not considered controlling.

TABLE

(See Note 1) Type of Installation	Space Occupancy	Carbon Dioxide Extinguisher	(See Note 2) Water Extinguisher	Asbestos Gloves	(See Note 3) Tarpaulin Container with 2 Tarpaulins	Location of Extinguishers
Dial or Manual PBX Large TTY Switching System Non-portable Video Equipment (with maintenance man in regular attendance)	PBX Operating Room PBX Equipment Room TTY Equipment Room	1 per 30' of Travel Minimum of 2 per Room		1 Pair per Gas Extinguisher		On Walls, Partitions or Columns
			2 to each 5 Gas Minimum of 1 per Room		1 per Room	Near Entrance Doors Travel not more than 100'
	Separate Power Room Video Equipment Space	1 per 30' of Travel Minimum of 2 per Room or Space		1 Pair per Gas Extinguisher	1 per Room or Space	Near Entrance Doors
Dial PBX Over 1000 Lines Manual PBX Over 5 Positions Large TTY Switching System Non-portable Video Equipment Large Building Power Plant (without maintenance man in regular attendance)	PBX Operating Room PBX Equipment Room TTY Equipment Room Video Equipment Space Bldg. Power Plant Space	1 per Room or Space		1 Pair per Gas Extinguisher		Near Entrance Door or Switchboard
Dial PBX 1000 lines or less Manual PBX 5 positions or less						
Frame Room in large building for terminating house cables	Frame Room	1 per Room		1 Pair per Gas Extinguisher		Near Entrance Door

Note 1. While the Table indicates the fire protective apparatus recommended for various sizes of typical installations, the limits set up are, of course, flexible and some variation in these limits may be justified in specific cases.

Note 2. Water extinguishers are not suitable for use on fires involving live electrical equipment such as power boards and power plant apparatus.

Note 3. While portable tarpaulins are not generally provided for unattended installations, cases may occur where the hazard of water damage due to the type of construction of the building or arrangement of the plumbing may justify their provision. Portable tarpaulins are usually stored in metal containers which are large enough to accommodate two tarpaulins.

GARAGES

1. GENERAL

1.01 This practice outlines the general procedure to be followed for fire protection in garages. The general conditions within the garage only are recommended herein, as construction, fire protective devices, etc., are covered elsewhere.

1.02 It is particularly important that the recommendations herein be followed, as violations may have a decided effect upon the insurance rates on the building and possibly increasing rental rates.

2. GENERAL GARAGE CONDITIONS

2.01 It is desirable that garages be occupied for storage purposes only. Where repair work is done motor parts must not be washed in gasoline or naphtha. Kerosene, Dearboline, Tarkoline or other approved commercial washing fluids shall be used.

2.02 Open fires shall not be used in car storage rooms either for repairing or carbon burning. If possible, all such work should be done elsewhere, or in a room cut off from the garage in a standard manner.

2.03 Open fires include arc lights, blow torches, blacksmith forges, oxygen burners for carbon burning, and gas plates or gas jets.

2.04 All electric lights for use around cars shall have guards, keyless sockets and approved type cords. All electric switches, cutouts, generators, motors, etc., shall preferably be four feet above the floor.

2.05 No Smoking signs shall be posted conspicuously in garages.

2.06 Metal waste cans shall be provided for the storage of oily waste and rags.

2.07 Metal lockers of the approved ventilated type shall be provided for workmen's clothes.

3. FILLING CARS WITH GASOLINE

3.01 The methods of filling cars, in order of preference, are as follows:

(1) All filling outside of the garage
(2) Inside filling with standard (Underwriters Laboratories Labeled) pump and hose with tank buried outside, properly vented, and with no exposed piping.

(3) Standard (Underwriters Laboratories Labeled) portable tank and hose.

3.02 Pumps and tanks shall have only one spigot with standard hose (not over 10 feet in length) attached and with quick shut-off valve at end of hose.

3.03 Open cans for gasoline shall not be used.

REFINISHING MOTOR VEHICLES

1. GENERAL

1.01 This section outlines recommended fire prevention practices in connection with refinishing motor vehicles in company garages.

1.02 The various processes required in connection with refinishing motor vehicles involve the use of materials which under certain conditions of temperature give off highly flammable vapors or gases and also when discharged from a spray gun in finely atomized form may be more or less readily ignited. As these factors represent a definite fire hazard, it is essential that rigid fire protection precautions be followed.

1.03 All state or local legislation, codes or regulations should be conformed to and any necessary permits secured.

2. REFINISHING MOTOR VEHICLES

Room Construction

2.01 When motor vehicles are refinished in company garages, the work should be performed in a separate room.

2.02 This room should be located on an outside wall and separated from the remainder of the building by fire resistive partitions constructed of either 4-inch brick walls, 3 inches of reinforced concrete, 4-inch hollow tile walls, or the equivalent.

2.03 Doors in these partitions should be equal in fire resistance to the partitions and should be of the self-closing type. Preferably two exits with doors opening outward should be provided and located as far apart as practicable. The entrance for vehicles may be considered as one exit if it has hinged doors opening outward.

Refinishing Procedures

2.04 The details for painting schedules, recommended materials, etc., are covered in sections of Bell System Practices, Motor Vehicles and Construction Apparatus, Series "J." The various operations involved in the finishing may include paint removing, cleaning and sanding with solvents, mixing paints, painting vehicles by spray guns or brushes and the storage of materials.

2.05 Gasoline should not be used for cleaning and sanding operations due to the danger of lead poisoning in case it contains tetraethyl of lead and also because of its low flash point. For these operations, solvents with flash points over 100° F. should be used.

2.06 Spray paint operations should be performed in accordance with the recommendations of the National Fire Protection Association, entitled "The Spray Application of Flammable Finishing Materials," which are based on the regulations of the National Board of Fire Underwriters covering "Paint Spraying and Spray Booths."

2.07 Containers of a total capacity not exceeding two gallons can be opened and their contents mixed in the refinishing room provided that the ventilation is in operation. All other mixing operations should be carried on outside of the building or in proper storage or mixing rooms.

3. VENTILATION

3.01 For cleaning, paint removing and brush painting operations, the air circulation in refinishing rooms should be sufficient to maintain a continuous removal of vapors. This may involve the provision of mechanical ventilation.

3.02 For spraying operations the air in the room should be changed at least once every three minutes by means of a mechanical ventilating system.

3.03 Fans and exhaust outlets should be located near the floor. If a direct motor driven fan is used, the motor should be of the non-sparking induction type and should be so located as to prevent vapors and dust coming into direct contact with it. If a belt-driven fan is used, the motor should either be located outside of the refinishing room or at the ceiling.

3.04 The supply of air entering the room should be at least equivalent to the exhaust capacity provided.

3.05 Ducts, pipes and stacks, where provided, should be of substantial construction with joints riveted and soldered or otherwise made tight. They should extend as directly as possible to the outside air, through either the side of the building or the roof, and preferably not through other rooms. They should not be connected to other ventilating or collecting systems.

3.06 Ducts, pipes and stacks should be properly supported and should have at least a six-inch clearance where passing through wood floors, roofs, partitions or in close proximity to them or other combustible material. Inspection openings and clean-out holes of sufficient size should be provided at elbows and other places where accumulations may be expected if not otherwise easily accessible.

4. LIGHTING AND ELECTRIC INSTALLATIONS

4.01 Artificial lighting should be restricted to electricity. All electrical equipment and installations should be in accordance with Article 500 of the National Electrical Code. All wiring should be in conduit and the electric lights in the refinishing room should be protected by explosion-proof globes and be so located and arranged as to prevent spray from coming into contact with them. Portable lamps should not be used unless they are of the explosion-proof type.

4.02 Switches and fuses or other electrical controlling devices should be located outside of the room. If outlets are located inside the room, they should be of the explosion-proof, arc-breaking plug type.

4.03 All conduit, motors, shafts, belts, etc., should be electrically grounded in an effective manner.

5. HOUSEKEEPING

5.01 The refinishing room should be kept free from all unnecessary combustible materials and refuse.

5.02 The floors should be thoroughly cleaned at least once a day and in case the room is not in use daily, it should be cleaned at the end of the refinishing operations. All fans, ducts, side walls and ceilings should be kept as clean as practicable at all times.

5.03 When cleaning, care should be taken to use implements that will not create sparks. Wherever practicable, surfaces to be cleaned should be sprayed or otherwise wet down with water before cleaning. Sweepings or deposits from rooms, ducts and stacks should be placed in covered metal receptacles and disposed of as promptly as possible.

5.04 Metal waste cans with self-closing covers should be provided for all waste and rags which have come in contact with priming and surfacing coats, paints, varnishes and other finishing compounds.

6. FIRE PROTECTION

6.01 No open flame or spark producing device of any kind should be permitted in the refinishing room or in close proximity to the same.

6.02 For heating purposes indirect systems such as steam or hot water should be used.

6.03 The room should be protected by a standard wet pipe automatic sprinkler system. The sprinklers should be kept free of paint residue. In buildings not sprinkler equipped, the system in the refinishing room can be connected to the domestic water supply line.

6.04 Exhaust pipes and stacks unless very short or small should be equipped with one or more approved sprinklers so located that the entire interior will be protected.

6.05 Fire protective apparatus of the foam or soda acid type should be provided.

6.06 Smoking should be prohibited in any room used for the refinishing of motor vehicles or the storage of flammable finishes. Suitable signs containing the words "No Smoking" should be prominently displayed at each entrance and in the room.

7. REFERENCES

7.01 Reference may be made to the following publications issued by the National Board of Fire Underwriters and the National Fire Protection Association.

(a) Paint Spraying and Spray Booths.

(b) Containers for Storing and Handling Flammable Liquids.

(c) The Spray Application of Flammable Finishing Materials.

(d) National Electrical Code.

7.02 Bell System Practices, Motor Vehicles and Construction Apparatus, Series "J."

RENTING BUILDINGS

1. GENERAL

1.01 This practice outlines the conditions to be considered when renting buildings for exchange or other quarters by the Telephone Company.

2. FIRE EXPOSURES - EXTERIOR

It is desirable that exposure, of the building under consideration, be as light as possible. In general if combustible adjacent buildings are at least 40' distant the exposure is sufficiently limited.

3. BUILDING OCCUPANCY

It is desirable that buildings occupied for telephone purposes be not shared by other tenants whose business or housekeeping habits create a fire hazard. Extra hazardous occupancies of adjacent buildings should be avoided if possible.

4. CHARACTER AND CONSTRUCTION OF THE BUILDING

The following items should be considered from a fire hazard standpoint:

HEATING PLANT: Is it safe, with combustible ceilings and walls at the boiler or furnace adequately protected? Is boiler room cut off from balance of the building with fireproof door and walls?

ELECTRIC WIRING: Is the wiring in good condition. Does it comply with the National Electric Code and local ordinances?

ATTIC AND BASEMENT SPACE: Are they clean with no accumulations of rubbish or combustible material?

PROTECTED EXPOSURES: Are doors and windows which create an exterior exposure to fire from other buildings protected by standard Underwriters steel shutters and fire doors?

STORAGE OF HAZARDOUS MATERIALS: Are there any considerable quantities of gasoline, oils, paints, films, or explosives of any nature stored near the building under consideration?

FIRE PREVENTION MEASURES AND FIGHTING CENTRAL OFFICE FIRES

1. GENERAL

1.01 This section provides some general fire preventive measures to be observed in all telephone building or telephone company occupied buildings and instructions concerning fire fighting methods within those buildings.

2. FIRE PREVENTION MEASURES

2.01 Recent figures indicate that smoking was the greatest single contributing cause to accidental fires that occurred on Telephone Company premises. As an aid to prevention of fires that might occur in connection with employees smoking, the following measures shall apply:

a. Smoking shall be prohibited in operating rooms, battery rooms, cable vaults, garages dispensing gasoline, storage rooms containing inflammable materials, elevators and any other quarters such as combined equipment and operating rooms that may be designated by the appropriate supervisor.

b. Only metal or other non-combustible ash trays, smoking stands or sand urns shall be used in quarters where smoking is permitted or at entrances to quarters where smoking is prohibited.

c. In employees lounge quarters, the placing of ash trays on chairs or davenports should be discouraged because of the possible hazard that may result from upsetting ash trays, and the danger from live cigarettes falling from the ash trays onto the upholstering. Smoking stands placed adjacent to this type of furniture will aid in eliminating the placing of ash trays on furniture.

d. Only "safety" type matches shall be used on Company premises. Refer to Section H41.250 regarding the storage of a supply of matches.

2.02 Although fires in accumulated trash and rubbish are one of the more common types of fires, they can be eliminated or prevented to a great extent by good housekeeping. Accumulations of waste paper or rubbish should be kept at a minumum and contained in approved types of receptacles within rooms or storage areas especially provided for this purpose. Waste paper may only be kept in non-combustible containers such as metal waste baskets or cans with solid sides with the bottoms raised from the floor and kept within a room of non-combustible construction properly isolated from the rest of the building by a 6" brick or tile wall. The room should be equipped with a fire door of the underwriters' approval type having self-closing devices and fusible links. Two or more soda acid or water type fire extinguishers should be kept in this area, depending upon the quantity of inflammable material usually present.

2.03 Storage of Combustible Material - Storage of paints, paint removers, thinners, oils, gasoline, films, matches and explosives is covered by Section H42.250. In addition, the following shall govern the storage of other combustible materials:

a. Packing Materials - In general the storage of large quantities of combustible packing material shall be avoided. Excelsior shall not be used for packing materials and shall not be stored on the premises.

b. Empty packing boxes shall not be allowed to accumulate. Only a sufficient number needed for the next return shipment of material shall be retained.

c. Oily waste, rags or dust mops shall be kept in self-closing metal cans with riveted or crimped (not soldered) joints.

Used waste and oily rags should be disposed of promptly.

d. Other types of inflammable refuse shall be kept in approved receptacles of heavy galvanized iron with tight fitting covers overlapping 1", with feet or supports raising the bottom off the floor.

e. Storage of any combustible material should be limited to those quantities needed for a particular job that will be used quickly. All such material shall be stored so as not to contact steam pipes or hot pipes and must be 18" from any smoke pipe and not near any fuel or gas jets.

2.04 Storages of Stocks and Supplies - Metal lockers, closets and shelving is preferable for storage of supplies, however, where wooden lockers, shelving or closets have been furnished, they should not be discarded except that no combustible supplies shall be kept in wooden lockers or supply closets. All supplies and stocks shall be kept in neat and orderly arrangement. Aisles, doorways, fire escapes, areas around or access to fire protection equipment must not be blocked by storage of supplies and materials.

2.05 Decorations - In general, only non-combustible decorative materials should be used in telephone offices and buildings. Cotton should never be used as decorative material. When the use of some inflammable materials as decorations is unavoidable, they should be carefully secured to prevent it from contacting lamps or other heat producing articles. Lights shall not be wrapped or covered by any inflammable material. Lamp shades shall be of non-combustible material only. Use of paper streamers, dry leaves, grasses, grains, corn stalks and other highly combustible materials as decorations should as a general rule be prohibited. If their use is justified by any unusual circumstances, the hazard should be recognized and extra precautions taken such as providing additional fire extinguishers and the establishment of temporary non-smoking areas.

2.06 The use of Christmas trees or evergreen wreaths and decorations within telephone buildings should be recognized as hazardous and proper fire preventive measures should be taken. Christmas trees should be placed in the type of holder or stand wherein the base of the tree can be kept immersed in water. This will aid in preventing the tree from drying out and will serve to reduce the fire hazard.

2.07 Smoking should be discouraged and if practicable prohibited in the immediate vicinity of Christmas trees or similar type decorations. Additional fire extinguishers should be placed in the decorated areas and the employees familiarized with the method of operating of the extinguishers.

2.08 Only ornamental electric lights of the types "Listed and Approved" by the Underwriters Laboratories shall be used. All electrical connections between the ornamental lights and the building wiring shall conform to the National Electrical Code. Decorative lighting systems shall be turned off when employees are not in the room.

2.09 It is the responsibility of the Plant Department Supervisor to determine that all decorations within or on the telephone building have been placed in conformity with the foregoing requirements.

2.10 Other preventative measures in the operation and maintenance of buildings to be observed are:

a. Openings, masonry cracks in basement walls, and openings around entrance pipes or conduits should be sealed against the entrance of gas. Other sections of these practices describe methods for testing for the presence of gas and precautions to be observed if gas is detected.

b. Cable ducts and cable openings in cable vaults shall be sealed as provided in Outside Plant Construction practices.

c. Cable vaults shall not be used as storage areas. Open flames and combustible materials are not to be used in cable vaults.

d. Floor drains not regularly in use should have the traps filled with lubrication oil (S.A.E. 30) to avoid unsealing of the trap by evaporation of the water. Consideration should be given to removing or permanently sealing with cement all floor drains not in use.

3. FIRE FIGHTING METHODS

3.01 The Plant Department is primarily responsible for the training of all employees in the use of fire fighting equipment, particularly those traffic employees in central office buildings where Plant employees are not in 24 hour attendance. The Plant Department should provide the Traffic Department with a list of the appropriate Plant personnel to be called in event of a fire during unattended hours.

3.02 Plant Practice, Part 9, Section 800 provides a formal training course to be used for training of all employees in the use of fire protective equipment. In lieu of the formal training or in addition to it, it is suggested that a demonstration of the operation of the various types of extinguishers be arranged at the time the extinguishers are to be renewed or recharged. At the same time, the use of the asbestos gloves and protective tarpaulins may be illustrated. Reference should be made to the above section for instructions on use of fire protective apparatus.

3.03 While the training of employees in the use of fire fighting apparatus is essential, personal safety and the avoidance of injury or loss of life when engaged in fighting fires is of primary importance. Orderly exit of all personnel not needed in the fighting of the fire should be stressed. This should include local instructions relating to the location of emergency exits, the closing of fire doors or shutters and the application of audible alarms.

3.04 It should be emphasized that the Fire Department should be called promptly in the event of a fire unless it is immediately obvious that the fire can be controlled without their assistance.

3.05 Consultation With City Fire Authorities -

a. In order that fire authorities may be more helpful in fighting central office fires with the least possible amount of damage to the equipment, it is essential that they be acquainted with our methods and the necessity of safeguarding the equipment from damage by water.

b. The supervisory forces in charge of the central office shall become acquainted with the local fire authorities in their immediate vicinity to a degree that will permit discussing the general problem of coping with a central office equipment fire.

c. Each year, preferably during October, the supervisor in charge of the central office shall arrange for the local fire authorities to visit the central office, on which occasion the supervisor shall carefully and fully explain to them the reaction on our service that would result from damage to equipment by water outside of the immediate fire zone.

d. Also, at this time and on each subsequent visit the supervisor shall acquaint the local fire authorities with the location of the various central office fire stations, the main gas and electric service cut-off points and other protector equipment such as tarpaulins, stand pipes, fire hose lines, fire pumps and types of extinguishers which are provided and are to be used for fire fighting and protective purposes in central offices.

3.06 Responsibilities in Case of Fire

a. In order to effectively direct the operations of combating a fire, the fire fighting personnel together with their responsibilities must be clearly established, so that the fire fighting operations may be carried on in a quick and orderly manner. Supervisors shall be responsible for proper training of employees in fire prevention and fire fighting methods provided for in these and other practices.

b. In the event of a fire, the Plant employee in charge of the office involved shall immediately assume full authority as "Director" of all fire fighting operations and continue this authority until relieved by a higher ranking supervisor.

c. In order that central office Plant employees may be quickly assembled in the event of a central office fire, the fire alarm bell system, if available, shall be operated.

d. In the event of the fire alarm being sounded for a central office fire, or if no alarm is provided, upon advice, all Plant employees shall immediately assemble at the scene of the fire, fire station or at the local test desk for instructions.

e. The city fire department when called will upon their arrival assume full authority for directing fire fighting operations, thereby relieving the Plant forces who shall thereafter direct their efforts toward safeguarding the equipment from damage by fire and water.

f. The Plant employee in charge of a building which is involved in a fire shall be responsible for:

1. Reporting the fire immediately to the fire department, except for incipient fires that can, in the opinion of the man in charge, be extinguished with the equipment on hand.

2. The discoverer of a fire shall, in addition to attacking it at once, with whatever appears to be the most efficient appliance available, immediately summon the Plant central office force or supervisor.

3. Requesting the local power and light company to immediately assign a man to service the high tension disconnect switches where primary electric service is terminated in transformer vaults within the buildings.

4. The closing of all fire barriers for the protection of the building, in case of fires in adjacent or surrounding buildings.

5. Directing, when necessary, the exit from the building of all employees in a quiet and orderly fashion.

6. Closing the main gas cut-off valve on the street side of the meter and opening the main power and light switches at the service panel switchboard when, in his judgment, this action is necessary, or at the request of the city fire authorities.

7. Covering the equipment with tarpaulins or other protection, where, in his judgment, this action seems necessary.

8. Reporting the fire to his immediate supervisor.

9. Keeping the General Plant Manager advised (through the lines of organization) at all times as to the status of a fire, either in the Telephone Building or in buildings adjacent thereto.

g. The calling of the city fire department will result in no harm if the fire is extinguished before they reach the scene while on the other hand their assistance is most urgently needed, if the fire has not been put out in the meantime. City fire authorities are fully in accord with this procedure.

h. Extreme care shall be exercised to insure that fire fighting appliances are delivered to the scene of the fire before being brought into play.

i. Additional units of fire fighting equipment shall be brought immediately to the scene of the fire and held ready for use if necessary.

j. Tarpaulins and other protective covers which are available shall be used to the fullest extent in safeguarding the equipment or service outside the immediate fire zone.

k. A complete first aid kit shall be immediately brought to the scene of the fire in order that accidental burns may be promptly treated.

3.07 Procedure after a fire

a. After a fire, immediate steps shall be taken to turn on the main light and gas service, if it had been turned off during the fire and it is known the building end of the light or gas service is free of trouble. Also, proceed to ventilate the fire zone and remove any water, sand, chemical, debris, etc., from the building.

b. An immediate survey shall be made of the damage caused by the fire and any discharge fuses, which may have been removed shall be replaced as rapidly as may be safely done. All appropriate action shall be taken at once to restore the equipment to service.

c. Immediately following a fire, the Plant employee in charge of the building or office shall make a full and complete report to the General Plant Manager through the lines of organization. If the intermediate supervisors cannot be reached in the order of organization the report shall finally be made direct to the General Plant Manager.

d. It is of extreme importance to refill or replace at once all fire fighting appliances which had been operated, including fuses on fire doors, and fire windows, and to thoroughly dry out and rerack all standpipe hose, in order to restore the full complement of fire fighting and protective equipment as quickly as possible.

4. RECHARGING SCHEDULE - FIRE EXTINGUISHERS

4.01 Soda acid and foam type extinguishers shall be recharged annually and the date of recharge entered on the tag which is attached to each unit. All extinguishers in each district shall be recharged as of the date shown in the following schedule which has been arranged to spread orders on the Western Electric Company for recharging material.

4.02 Schedules:

Date	Area	District
April 1	Minn.	St. Paul - Dwtn.
April 1	Minn.	St. Paul - Suburban
April 1	Minn.	Rochester
April 1	Minn.	Redwood Falls
June 1	Minn.	St. Cloud
June 1	Minn.	Detroit Lakes
Aug. 1	Minn.	Duluth
Sept. 1	Minn.	Minneapolis-North
Sept. 1	Minn.	Minneapolis-Central
Sept. 1	Minn.	Minneapolis-South
April 1	Iowa	Des Moines
June 1	Iowa	Waterloo
June 1	Iowa	Mason City
July 1	Iowa	Sioux City
July 1	Iowa	Spencer
Aug. 1	Iowa	Davenport
Aug. 1	Iowa	Cedar Rapids
Sept. 1	Iowa	Council Bluffs
April 1	So.Dak.	Sioux Falls
May 1	Nebr.	Omaha - Dwtn.
May 1	Nebr.	Omaha - Suburban
June 1	Nebr.	Grand Island
Aug. 1	So.Dak.	Western
Sept. 1	Nebr.	Fremont
Sept. 1	Nebr.	No. Platte
May 1	No.Dak.	Bismarck
June 1	No.Dak.	Minot
July 1	No.Dak.	Fargo
Sept. 1	No.Dak.	Grand Forks
April 1	So.Dak.	Aberdeen
April 1	So.Dak.	Huron

4.03 Orders for recharging material shall be forwarded approximately two weeks prior to the date shown in the schedule in order that the extinguishers can be recharged on the specified dates.

5. WEIGHING SCHEDULE

5.01 The Plant Department shall establish a definite schedule for weighing carbon dioxide extinguishers and the gas cartridges in water type extinguishers according to the stipulation in the Bell System Practice covering each type. These should be weighed at least annually and recorded on the tag on each extinguisher.

FIRE PROTECTION DURING CONSTRUCTION

1. GENERAL

1.01 This section outlines certain precautionary measures intended to minimize the possibility of fire as well as the hazards due to fire in buildings under construction, and is offered as a guide in arranging for such protection.

1.02 The recommendations in this practice are based in general on the National Fire Codes of the National Fire Protection Association, Volume III - Building Construction and Equipment, and the National Building Code recommended by the National Board of Fire Underwriters. These recommendations cover a broad range of building operations, and it is therefore expected that each project will be considered individually to determine which measures are applicable thereto. In general, projects involving alterations or enlargements to buildings in service are considered to be of prime importance from the standpoint of providing thorough fire protection.

1.03 This issue includes a general revision and expansion of the practice to conform to present recommendations. Marginal arrows, indicating changes in the text, are omitted in this issue because of the extensive general revision of the text. For operation and maintenance application, this section is double numbered with this issue and the same issue number is assigned for uniformity.

1.04 Buildings in course of construction are inherently more hazardous, regardless of the type of construction employed, than when completed. Building alteration and demolition hazards are also more severe. Fires which are not discovered and extinguished in the incipient stage during construction operations are likely to spread more rapidly in the absence of provisions for the limitation or extinguishment of fire in the completed structure and can involve heavy losses in revenue from delayed completion of the project. Construction operations can be made reasonably safe from destructive fire by planning for fire protection in the project estimates in advance of the work, providing the necessary facilities and project responsibility when the work is started and throughout the construction period.

1.05 Where the following procedures conflict with or are exceeded by corresponding requirements of local or state legislation, the legislated requirements should, of course, apply.

2. SITE PREPARATION

2.01 Brush, trees, tall grass, debris and rubbish are removed from the site prior to the start of construction operations.

2.02 Site preparation includes the safe location of temporary buildings and storage areas in relation to their hazards and the probability of damage to the building under construction.

3. FIRE LINES

3.01 Where the provision of fire lines or standpipes is included in new buildings, additions, extensions or major alterations, it is important that they be completed promptly as the work progresses and made available for use, including the installation of fire hoses. Standpipes should be installed as the construction progresses, in such a manner that they are always ready for fire department use to the topmost floor that construction has been installed. For buildings four stories and higher, except as otherwise indicated in BSP Section H43.210 - Standpipe and Hose Systems, standpipes are provided with a siamese fire department connection on the outside of the building at the street level, are conspicuously marked and are equipped with at least one standard hose outlet at each floor. All standpipe connections are designed to fit the local fire department equipment. This procedure may, in some cases, require the temporary placement of certain piping and accessories.

4. ACCESS TO FIRE EXTINGUISHING EQUIPMENT AND EXITS

4.01 It is important that free access be provided and maintained at all times from the street to fire hydrants and to outside connections for standpipes or other fire extinguishing equipment, whether permanent or temporary. No material or construction equipment should be placed within ten feet of such hydrants or connections nor between them and the center line of the street.

4.02 Free access should also be maintained at all times to control valves and hose on fire lines within the building, and to all portable extinguishers.

4.03 Signs designating the location of fire extinguishing equipment and standpipe connections are conspicuously displayed.

4.04 For projects involving alterations or enlargements to existing buildings in service it is essential that all necessary measures be taken to maintain full exit facilities at all times. For example, the removal of a fire escape should not be undertaken until equivalent exit facilities are provided elsewhere. Also, present means of egress should be kept free from all materials, equipment or other obstructions.

5. PORTABLE FIRE EXTINGUISHERS

5.01 A liberal distribution of portable fire extinguishers throughout the areas under construction is desirable from the standpoint of controlling incipient fires promptly. It is important that at least one extinguisher be provided at each tool house, temporary office, storage room, dressing room or workshop on the premises.

5.02 The description, use, mounting, operation and maintenance of types of extinguishers approved for the protection of telephone buildings and equipment are covered in Sections H43.110 to H43.140, inclusive, of Bell System Practices. The general procedure to be followed in distributing fire protection apparatus throughout telephone buildings upon completion of construction is outlined in Section H43.010 of Bell System Practices. Where the location of certain types of extinguishers is subject to low temperatures suitable precautions should be taken to prevent their freezing.

5.03 The instruction of workmen in the proper use of fire extinguishing equipment is desirable.

6. WATCHMAN'S SERVICES

6.01 For major new building projects or for extensions, additions or important alterations to existing telephone buildings where the service could be seriously impaired by a fire, the services of a watchman to cover all periods when workmen are not on the premises is usually given favorable consideration. A thorough inspection of the entire project is suggested at the close of each day's work by a person instructed for that purpose, and he should report conditions to the watchman on duty. Periods when the construction operations are shut down, such as week ends, holidays and lunch periods require better coverage and at more frequent intervals than during working hours.

7. FIRE WARDEN

7.01 A qualified person should be appointed as a fire warden and vested with authority to supervise the installation and maintenance of the recommended fire protection equipment and fire prevention measures, the removal of all unnecessary combustible material and waste, and the supervision of adequate watchman and supervisory service. The contractor's superintendent or assistant superintendent ordinarily is appointed and acts as the fire warden except in large building projects when the appointment of a full time fire warden or a combination safety engineer and fire warden is warranted.

7.02 During working hours operations of workmen should be checked frequently to determine whether appliances, soldering coppers, extension lights, flammable liquids, torches, welding and metal cutting apparatus, wax pots, etc., are being used safely and such corrective measures as are necessary from time to time are taken promptly.

7.03 Alterations carried forward during use of the structure warrant even greater supervision and care on the part of the Telephone Company, their architects and contractors, for safety of life and property, due to the inherently hazardous nature of construction operations.

8. HEATING DEVICES

8.01 The permanent heating equipment should be installed and put in operation as soon as practicable.

8.02 The use of stoves, salamanders, tar pots, etc., inside the building is generally prohibited.

8.03 If, through necessity, the use of such devices is required within the structure, special precautions are taken to minimize the additional hazard.

8.04 When salamanders or other temporary heating devices are used, if a temporary heating plant is impracticable and until a permanent plant is installed, they are substantially constructed, stable, not readily overturned, and restricted to the use of coal, coke or kerosene oil as fuel. They should be under the constant supervision of an attendant on every floor where they are in use, and for so long as they are in use.

8.05 Such devices are so located that there is a clearance of not less than 6 feet above, nor less than 2-1/2 feet on all sides between such device and unprotected woodwork or combustible material, equipment or construction, nor are they placed within 10 feet of tarpaulins or canvas covers.

8.06 Salamanders or other temporary heating devices should not be set on combustible flooring or platforms unless thoroughly insulated therefrom by a bed of sand or cold ashes not less than 4 inches thick, or by other efficient protection, extending at least 2 feet horizontally beyond such devices on all sides. The legs of such devices, which should be at least 12 inches long, should rest on the insulation and should not extend through it.

8.07 Requirements for the construction and mounting of salamanders and heaters are outlined in National Fire Codes, Volume III, Building Construction and Equipment, of the National Fire Protection Association, Page 556, Paragraph 6.

8.08 Where practicable, gas or electric space heaters, steam heat, or Underwriters Laboratories labeled oil heaters are preferable to salamanders.

9. PROTECTION OF STRUCTURAL MEMBERS

9.01 It is important that all structural steel members of fire resistive buildings be encased in fireproofing material as rapidly as structural conditions will permit. No such structural members should be left exposed for unduly long periods.

9.02 No part of the building is used for the storage of combustible material until such fireproofing of that part has been installed.

9.03 In every building of reinforced concrete construction, as soon as practicable after the elapse of the required setting time of the concrete, forms of combustible material are stripped from the concrete and promptly removed from the building.

9.04 No part of a reinforced concrete building is used for the storage of combustible materials until combustible forms have been removed in that part of the building.

10. SCAFFOLDING AND FORM WORK

10.01 Wood scaffolding is a potential fire hazard which may cause extremely heavy fire damage if accidentally ignited. Consideration should be given on projects of appreciable size or of valuable construction and content, to the use of scaffolding constructed of fire-resistive materials, and any lumber used may be given a flameproof treatment.

10.02 The use of structural steel shapes or steel piping for scaffolding, and metal forms for concrete work has the advantage of eliminating fire hazards from these sources.

10.03 It is particularly desirable to use suspended scaffolding, made of noncombustible supports and flameproofed planking, wherever possible, in order to minimize the amount of scaffolding that may be exposed in case of fire.

10.04 Wood forms for concrete work are usually removed from the premises as soon as they are taken down, with the exception of such members as are suitable and intended for reuse. Rigid requirements and supervision for the processes of form installation and removal so as to avoid any accumulation of forms on the floors between shores when being moved from floor to floor and especially the prompt removal of all broken forms, etc., from floors occupied by shores and forms in place, are most important.

10.05 No part of a building where forms are in place should be used for the storage of flammable materials of any kind.

11. RUBBISH REMOVAL

11.01 It is important that any accumulations of rubbish, debris, waste lumber or other flammable materials be removed promptly from the premises. If such removal is unavoidably delayed, the hazard may be reduced by frequently and thoroughly wetting down. Disposal of materials by burning on or near the premises should not be permitted. Combustible waste and rubbish should be removed at least daily.

11.02 Rubbish chutes are considered undesirable because of their potent flue action in spreading fire. Rubbish is preferably removed via material hoist or elevator.

11.03 Particular attention is directed to the immediate disposal of flammable materials used in packing, such as excelsior, sawdust, wood shavings, straw, etc., and of empty paint containers.

12. WELDING AND CUTTING

12.01 Where electric or gas welding or cutting work is done above or within ten feet of combustible material or above space that may be occupied by persons, interposed shields of

FIRE PROTECTION DURING CONSTRUCTION

1. GENERAL

1.01 This addendum outlines procedures to be followed by Telephone Company exchange forces in connection with building, or building equipment repairs, or building additions, when work is performed by outside workmen.

Note 1: Some projects may be executed on an informal request basis by the local Plant forces, while others may be executed per contract according to specifications under the supervision of the Chief Engineer.

Note 2: For procedures involving Western Electric Company workmen see Bell System Practices, Section A309.302 and Addendum.

1.02 References in this practice to the "Foreman" should be interpreted to mean the foreman or other individual in charge of the work for the contracting firm, and references to the "Wire Chief" means the Exchange Wire Chief, Chief Switchman, Chief Toll or Local Tester, or other Telephone Company supervisors delegated with the responsibility for the building or building equipment involved.

1.03 The following practices point out specific safety measures which should be observed when work of this nature is under way. The Wire Chief should review those practices which are appropriate in connection with any proposed work and be guided accordingly.

Section No.	Title
H34.284	Ventilation of Basement Spaces.
H36.148	Cable Openings.
H40.010	Fire Protection Practices.
H40.050	Garages.
H40.101	Fire Protection Practices.
H40.201	Flame Proof Treatment.
H41.215	Fire Protection Exterior Openings.
H41.510	Fire Protection Cable Vaults, etc.
H42.110	Fire Protection Heating Equipment.
H42.120	Fire Protection Kitchen Ventilation.
H42.140	Fire Protection Solder and Wax Pots.
H42.250	Fire Protection Storage of Inflammable Materials.
H43.001	Protection Apparatus.
H43.010	Distribution of Fire Protective Apparatus.

2. PROCEDURE PRIOR TO START OF WORK

2.01 Prior to the start of each job, the Wire Chief will confer with the Foreman (and also a representative of the Building and Equipment Engineer's force when desirable) and review the scope of the work to be done. The Foreman will outline his plan for the conduct of the work and a joint agreement reached as to the detailed procedures to be followed in executing informal requests and executing contract work in compliance with specifications under the direction of the Chief Engineer. The development of these plans will usually involve such items as:

a. A careful review of the work to be done to determine at what points our commercial power supply and the Telephone Company's battery and signaling power supply wiring and equipment may be involved.

b. Particular consideration given to fire preventive measures, such as the safe storage of inflammable materials such as oils, paints, and thinners, emphasis being placed on the hazards in connection with the use of torches, plumbers' furnaces, and other open flame devices, heaters, etc. See Section H42.250, Storage of Inflammable Materials.

c. Analysis of all other possible service hazard conditions which could within reason be considered as hazards to the building, equipment, or telephone service.

d. An agreement as to necessary precautions and protective measures required at points considered hazardous and specific plans to employ them when required.

e. An agreement as to which phases of the job should be performed during light load periods, if any.

2.01 If the work is extensive, the Wire Chief will prepare in duplicate a brief outline of the plans agreed to and furnish one copy to the Foreman, retaining the duplicate copy for his files.

2.02 Should more than one contractor be engaged at the same time in the same building, similar arrangements may be required with each.

2.03 In instances where the Wire Chief is unable to reach a mutually satisfactory agreement with the Foreman on job procedure, he should seek advice from his immediate supervisor.

3. PROCEDURE SUBSEQUENT TO START OF WORK

3.01 Subsequent to the starting of the job, the Wire Chief shall be constantly alert to determine that the plans, as previously agreed to, are carefully followed by the Foreman and Telephone Company employees alike, making such changes as may be currently required.

4. INFORMING TRAFFIC AND COMMERCIAL DEPARTMENTS

4.01 The Wire Chief is responsible for informing the local Traffic and Commercial Department supervisory personnel regarding the nature, scope, and schedule of such work to be performed in the quarters occupied by these departments and handle all negotiations between these departmental heads and the Foreman to effect the best possible arrangements.

BUILDING CHANGES

1. GENERAL

1.01 A prompt report should be made to the Chief Engineer by the Plant Department of the construction of or changes in the occupancy of buildings adjacent to a building containing telephone equipment or in any part of a building containing telephone equipment, provided these changes have an appreciable affect on the structure or the relative fire hazards.

1.02 Changes in telephone buildings covered by approved job orders or estimates need not be reported.

PROTECTION FOR STEEL STRUCTURAL MEMBERS AND REINFORCEMENT

1. GENERAL

1.01 This section outlines desirable procedures for protecting steel structural members and reinforcement in buildings of fire resistive construction against the effects of fire and corrosion.

1.02 The following suggestions are in general based on the Building Code recommended by the National Board of Fire Underwriters. Where, however, corresponding requirements of local or state codes conflict with or are more severe than those covered herein, the legislated regulations should, of course, prevail.

1.03 It is recommended that dial central office buildings and toll buildings be of fire resistive construction. For the purpose of this recommendation, a fire resistive building is defined as a building with all exterior, bearing and interior fire walls of masonry or reinforced concrete, with all floors and roof of reinforced concrete and having a structural frame of reinforced concrete or of structural steel which is encased in concrete or masonry for protection against the effects of heat. Except for community dial offices, office buildings, and garages, construction utilizing steel decking, open truss steel joists, open web joists and similar methods, even though protected with expanded metal lath and plaster or non-flammable board, etc., is not considered to be fire resistive within the meaning and intent of this recommendation.

1.04 This section is revised and reissued to define and recommend fire resistive construction for dial central office buildings and toll buildings. Arrows are used to indicate changes in the text.

2. PROTECTION

2.01 Experience indicates there are definite advantages in covering structural steel members and reinforcement with stone concrete. As compared with coverings of brick, hollow tile, cinder blocks and similar materials, stone concrete provides equal protection against fire with considerably less thickness. Also, there is evidence that stone concrete is preferable to other coverings including cinder concrete for protection against corrosion. The use of the various lightweight aggregates such as those composed of pumice, expanded mica, volcanic glass, slag, burned clay, etc., in concrete is not recommended for the fireproofing of structural members which are a part of or which are adjacent to exterior walls because of the importance of the protection of such structural members against the possible penetration of moisture. It is desirable, of course, to prevent rusting of wall columns, spandrel beams and girders as far as practicable by constructing the walls solidly to minimize moisture penetration as described in Section H32.334 of Bell System Practices. Structural steel members which are not concrete covered or solidly pargeted in exterior walls, particularly where hollow tile is incorporated in the wall structure, have in certain instances corroded even to the extent of building up sufficient rust to crack the enclosing masonry. Continued rusting could, of course, weaken the steel. There is evidence that paint alone will not provide adequate protection. It is important that concrete for protection completely encases the steel, also that it be free from voids and thoroughly set before laying up the surrounding masonry. The effectiveness of pargeting is usually dependent upon careful workmanship and vigilant supervision. Also the thickness of this type of covering on the inner faces of steel members must be increased to at least 2 inches for protection against fire unless other covering is provided. Consideration of these factors indicates advantages for stone concrete casing.

2.02 Where reinforced cinder concrete has been used for floor and roof slabs, the steel reinforcement sometimes develops rust and corrosion, particularly if subject to moisture conditions such as may occur in roof slabs. This action evidently results from the porous nature of the concrete as well as from the corrosive action of some cinders, at least when wet. Corrosion is not prevalent, however, where stone concrete is used.

2.03 The placing and agitating of concrete so that it will be free from voids is covered in Section H32.378 of Bell System Practices.

2.04 The recommended thickness of stone concrete for protecting structural steel members is not less than 2 inches, and coarse aggregate for such concrete is preferably trap rock, limestone or calcareous gravel. Where it is necessary that granite or silicious gravel aggregate be used, the concrete thickness should be increased to at least 3 inches.

2.05 All concrete protection should be secured in position with heavy steel wire or rods firmly attached to the structural members.

2.06 It is important to avoid embedding pipes, etc., in the concrete protection of structural members. Pipes, conduits, sleeves or cable hole sheathing should not be placed where they encroach within the required thickness of protection. Requisite chases are sometimes provided in the concrete covering of "H" section columns on the sides opposite the web, to receive conduits. It is desirable that pipes, etc., which are located adjacent to protected structural members be so arranged that in warping or bending under excessive heat they can not displace the concrete protection.

3. TREATMENT OF RUSTED STEEL IN EXISTING STRUCTURES

3.01 Where, during routine inspections, rusting of structural steel members in exterior walls is indicated, for example, by a crack in the masonry parallel and adjacent to a structural member; it is important that the condition be investigated and corrected as soon as practicable, particularly if the crack continues to widen. This would include the removal of sufficient masonry to expose and clean the steel involved and to reinforce it if necessary. The steelwork affected is then painted and pargeted and the enclosing masonry solidly replaced. If these procedures are not followed the rust build-up can continue and may seriously impair the strength of the steel. Such investigations and repairs are, of course, executed during seasonal periods not subject to freezing temperatures.

PROTECTION AGAINST EXPOSURE FIRES

1. GENERAL

1.01 This section outlines recommended standards of construction for preventing fire from entering and spreading through fire-resistive telephone buildings. Protection against exposure fires involves principally the provision of fire-resistive wall and roof surfaces and protection of the necessary openings for windows, doors, ventilation air intakes, and stairway and elevator shaft roof structures. The measures suggested for protection against exposure fires are also considered for protection against missiles and other hazards of strife.

1.02 The amount of protection to be provided is determined for each particular building depending on the character of adjacent buildings and their contents, and the distance between them and the telephone building. Any change in exposure which may occur from time to time is a matter for immediate reporting and attention and should be included for checking on inspection routine.

1.03 This section is revised and reissued to modify the requirements for the use of labeled windows in fire-resistive telephone buildings. For operation and maintenance application the section is dually numbered with this issue and the same number is assigned for uniformity.

1.04 The suggested standards of construction are based, in general, on the National Fire Codes, Volume III — Building Construction and Equipment, of the National Fire Protection Association; and the National Building Code, recommended by the National Board of Fire Underwriters.

1.05 Plans and specifications for new buildings or building additions should be submitted to Marsh and McLennan for their review as to the adequacy of fire protection and it is suggested in addition, that they be consulted whenever there is a change in the exposure of the building.

1.06 For the provision of adequate protection it is recommended that all fire doors, shutters, fire windows, and other similar protective devices for openings in exterior walls bear the label of Underwriters' Laboratories, Incorporated appropriate for the class of protection involved. Materials and devices are tested by Underwriters' Laboratories, Incorporated, for compliance with Laboratory standards of proper construction and performance with regard to their suitability for installation in accordance with regulations of the National Board of Fire Underwriters. Products tested and found to comply with the requirements are listed in Underwriters' Laboratories publications, and many listed products, inspected in current output, are labeled.

1.07 Where the following suggested measures are exceeded by the requirements of local or state codes, the legislated requirements are applicable.

2. WALL OPENINGS

2.01 Wall openings present the principal problem in protection against exposure fires and it is advisable that the openings be limited in size and number to the requirements for rapid egress from the building and for the provision of sufficient light and ventilation as proportionately suited to the various occupancies.

2.02 The avoidance of hazardous surroundings, where practicable, and as outlined in Section H21.111, Selection of Building Sites for Central Offices, is an important factor in limiting the requirements for exposure protection.

2.03 Although the standard protectives generally offer less fire resistance than the walls of which they form a part, they are designed to remain in position as an effective barrier against fire for the desired period of protection. With consideration of the degree of exposure outside the building, wall openings are classified D, E, or F, respectively, for severe, moderate or light exposure.

2.04 Telephone buildings in heavily developed commercial areas may require the protection of Class A or B labeled devices at openings exposed to buildings considered of particularly hazardous occupancy or where the nature of adjacent street or alley traffic warrants their consideration.

2.05 ***Windows***

(a) Labeled windows are provided as single retardants for the protection of Classes E and F openings and are used in combination with fire shutters in Class D openings which require double retardants.

(b) Labeled windows when required are of steel frames and sash, glazed with approved 1/4" wired glass held in place by steel clips. Their use is restricted to the moderate or light exposures because of the inherent limitations of the glass which transmits radiant heat and flows at temperatures often reached in fires. The main variation between the types of labeled windows is the limitations as to the size of individual glass lights and the total exposed areas of glass, with the larger sizes and areas permitted in the Class F openings.

(c) The use of labeled windows is governed mainly by the degree of current fire exposure or the worst possible fire exposure of the building that could exist under the present building codes. If there is any knowledge of pending changes in the Building Codes or Zoning Requirements they also should be considered. The following recommendations should be considered when planning the type of window to be used.

(d) Building exposures requiring labeled windows.

(1) The side of the exposed building located less than 15 feet from any lot line except those fronting on a street.

(2) The exposed building located 15 or more feet from an exposing building or any lot line, but requiring a single retardant under the provisions of the National Building Code, 1955 Edition, Paragraph 803, along with Standard 80-A found in NFPA's National Fire Codes, Volume III—Building Construction and Equipment.

(e) The automatic operation of windows is not generally required and is not recommended because of the accident hazard involved in the failure of the automatic device.

(f) Street front windows in first floor nonequipment space such as public offices, clerical offices and quarters may be glazed with plain glass, provided the outside exposure is separated from any equipment space by a ceiling high partition having a fire resistance rating of not less than one hour. In order to maintain the fire-resistive efficiency of this partition it is important that any view openings be protected in an approved manner. The use of wired glass as a single retardant is recommended to conform to the requirements for the use of wired glass in Class C openings in interior partitions. In the event it is considered desirable to use ordinary plate glass in the view openings it is suggested that steel shutters be provided.

(g) Where labeled windows are not required, the sash and frame are of noncombustible material, such as aluminum, steel, etc, in fire-resistive buildings.

2.06 ***Fire Shutters***

(a) Rolling steel fire shutters are used in combination with windows to provide Class D labeled protection for openings in walls under severe exposure. Their use in telephone buildings, however, is determined by the requirements of local codes pertaining to fire-resistive construction or the recommendations of Marsh and McLennan in consideration of the severity of exposure, under the procedures outlined in Section H44.015, Fire and Safety Inspection and Advisory Services Rendered by Marsh and McLennan.

(b) Considerations of the high initial cost and subsequent maintenance and testing involved, indicate for new buildings definite fire protection advantages in omitting certain windows or spacing them farther apart. Where a serious exposure hazard develops at an existing building, similar advantages may be gained where practicable, by closing the exposed opening with masonry. The practicability of these alterations, however, would depend largely upon the occupancy, and ventilation requirements of the space exposed.

(c) Where the conditions of construction and character of occupancy permit, installation of fire shutters on the interior face of the wall opening offers the advantages of protection from weather, appearance, and ease of access for operation.

(d) The automatic operation of fire shutters generally does not appear to be warranted in telephone buildings, and where required is limited to use on openings not intended for emergency exits.

(e) Rolling shutters should be provided with approved attachments for conveniently testing their operation from the inside of the building, and with approved safety attachments to prevent their operation while windows are being washed. These attachments are designed to prevent the shutters being left in an inoperative condition.

2.07 ***Doors***

(a) Door openings in exposure walls normally do not serve to provide light or ventilation to the building and are therefore more easily protected by standard fire doors.

(b) Openings in exposure walls to provide exit to outside balconies associated with smokeproof towers and the opening into the tower from the balcony are generally protected by Class E labeled doors. Class D labeled doors are used in these locations, however, where the severity of the outside exposure warrants the use of Class D labeled protection for adjacent window openings in the building wall.

(c) Doors at openings used as exits are of the swinging type where practicable, opening in the direction of exit travel and are provided with self-closing devices.

(d) Self-closing doors are normally closed and latched in the closed position, and it is important that their closing is not prevented, by wedging or tying in the open position.

(e) Latching devices are provided on self-closing doors to prevent warping of the door under severe exposure in the closed position, and it is important that the devices be maintained in sound operative condition at all times.

2.08 ***Miscellaneous Openings***

(a) Louvered or hooded openings in exposure walls for ventilation air intakes, etc, are generally equipped with automatic fire dampers or automatic rolling steel shutters.

(b) Equipment entrances, when required to be open, offer a definite fire hazard if temporary protection is not provided. Loading platforms associated with equipment installations are generally installed in a manner which prevents the use of the doors or windows normally intended to protect the exposure. It is considered advisable that temporary closures of incombustible materials be provided for protection of the openings when in use, and that loading platforms be constructed of incombustible materials for protection at the opening when in use.

2.09 ***Glass Blocks***

(a) Glass block panels are suitable for use only in exterior walls of light exposure or where there is no exposure.

(b) Where used as window protectives under light exposure the panels are limited in area to 120 square feet.

(c) Where there is no exposure the panels are limited in area to 144 square feet.

(d) Glass blocks are not used in fire walls, party walls, enclosure walls of stairs or elevator shafts, or in any wall subject to moderate or severe exposure.

3. ROOF COVERING

3.01 Approved fire-resistive roof coverings are classified A, B or C, respectively, in consideration of their effectiveness against severe, moderate or light exposure from outside fires. The properties of roof coverings which are considered in determining their classification include: (1) their flammability, (2) degree of heat insulation they afford the roof deck, (3) their stability under fire exposure, (4) absence of flying brand hazard, and (5) the frequency of repairs necessary to maintain their fire-resistive properties.

3.02 Fire-resistive telephone buildings generally require roof coverings of standard quality approved and listed by Underwriters' Laboratories as Class A or B.

3.03 Built-up roof coverings surfaced with gravel, crushed stone or slag, are generally provided on flat roofs for protection from severe or moderate exposure. Where asbestos felt is used for the built-up layers, the surfacing is not required. Other types of coverings acceptable for Class A or B installation include tin, copper or other metal; slate, clay or Portland cement tile, and asbestos shingle.

4. ROOF OPENINGS

4.01 ***Skylights***

(a) Due to the considerations of high initial cost, attendant maintenance and hazard of leaks, it is desirable that the use of skylights be limited to locations where necessary equivalent light or ventilation can not be furnished by windows, or where skylights are required by local ordinances.

(b) The framework and sash of skylights are of galvanized iron, copper or monel metal, properly reinforced where span requires, securely fastened to angle irons on the roof.

(c) Skylights over stair, dumbwaiter, air or similar shafts are glazed in an approved manner with plain glass not over 3/16" thick, not over 18" wide, nor more than 720 square inches in area, protected with approved wire screens.

(d) Skylights for ventilation and other purposes which are inclined less than 80 degrees to the horizontal are glazed with 1/4" thick wired glass or 1/2" plate glass protected with approved wire screens. The panes are limited in width to 18" and in area to 1728 square inches.

(e) Where skylights inclined at an angle of 80 degrees or more to the horizontal are subject to exterior exposure, approved wired glass not less than 1/4" thick or 1/2" plate glass protected with approved wire screens are used. The unsupported surface of the glass is limited to 48" in either dimension and 720 square inches in area.

4.02 ***Scuttles***

(a) Where scuttle openings are provided for access to the roof, their fascias and covers are constructed preferably with steel plates and angles. Scuttle openings are at least 2 feet by 3 feet in size.

(b) Scuttle covers are hinged and counterbalanced to facilitate operation and minimize accident hazard.

(c) Stairs or permanent ladders with handrails are provided to give ready access to the scuttles.

INTERIOR CONSTRUCTION

TO RESTRICT SPREAD OF FIRE

1. GENERAL

1.01 This section outlines standards for interior construction recommended for restricting the spread of fire in fire-resistive telephone office buildings. In designing telephone buildings to house equipment and associated personnel with greatest flexibility and economy it is essential that the safety of the occupants be assured and that interruption to service and fire losses be avoided. Although primarily for new buildings or additions of fire-resistive construction, these recommendations are considered where alterations are made to existing buildings.

1.02 The construction of floors and interior walls and partitions based upon a predetermined degree of fire resistance will prevent the spread of fire through a building. Such construction divides a building into areas in which a fire can normally be confined without endangering the structural integrity of the building. It is important, however, that proper protection be provided where the fire-resistive efficiency is impaired by the required openings in the floors, walls, and partitions.

1.03 In these recommendations, materials and construction are defined on the basis of performance standards rather than in terms of minimum dimensions and materials. "Fire Resistance Rating" is the time in hours that the material or construction will resist the standard fire exposure as determined by a fire test made in conformity with the "Standard Method of Fire Test of Building Construction and Materials" established by the American Society of Testing Materials. It is suggested that nationally recognized testing laboratories be consulted for test data on materials or construction considered for use on which fire resistance rating information is not readily available.

1.04 The use of non-combustible materials and construction is essential in restricting the spread of fire and it is assumed that the structural members not included in these recommendations are of approved non-combustible construction.

1.05 Where local or state regulations require higher degrees of protection than suggested in this practice, the legislated measures should be followed.

2. REFERENCES

2.01 The recommendations in this practice are based in general on the National Fire Codes of the National Fire Protection Association, Volume III - Building Construction and Equipment; Volume V - National Electrical Code; and the National Building Code recommended by the National Board of Fire Underwriters. National Fire Codes is a compilation of National Fire Protection Association Standards on building construction and equipment and the following standards, which have been adopted by the National Board of Fire Underwriters and pertain to this practice are available in pamphlet form.

Protection of Openings in Walls and Partitions Against Fire (N.B.F.U. No. 80) 1939

Air Conditioning, Warm Air Heating, Air Cooling and Ventilating Systems (N.B.F.U. No. 90) 1950

Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying (N.B.F.U. No. 91) 1949

Copies of the National Building Code and the pamphlets may be had on application to the offices of the National Board of Fire Underwriters, 85 John Street, New York City.

3. DEFINITIONS AND TERMS

3.01 Where reference is made to labeling in this section it refers to the label of Underwriters Laboratories, Incorporated. Materials and devices are tested by Underwriters Laboratories, Incorporated, for compliance with Laboratory standards of proper construction and performance with regard to their suitability for installation in accordance with regulations of the National Board of Fire Underwriters.

3.02 The word "approved" means acceptable to the inspection department having jurisdiction, and installed in accordance with the regulations of the National Board of Fire Underwriters, and when referring to devices, means tested by Underwriters Laboratories, Incorporated. The inspection department having jurisdiction will determine correctness of installation and use.

3.03 Openings in interior walls and partitions are classified A, B, or C in accordance with the fire-resistive requirements of the wall in which they are located, and the "labeled" or "approved" protection recommended applies to all materials and devices, and their installation, in accordance with the class of protection required. Fire doors used for protection of openings in walls and partitions are of two types, as follows:

(a) Self-closing doors are normally closed doors which close and latch when released from the open position.

(b) Automatic doors which are normally open and arranged to close when released by the action of heat.

To provide the protection for which they were designed, fire doors are maintained in reliable operating condition at all times. It is recommended that automatic doors be checked periodically as to condition and also test operated for proper closing. Self-closing doors should not be wedged or tied in open position or in other manner obstructed in closing. The use of fusible link hold-open devices for this purpose does not prevent the spread of smoke, and also may provide a source of draft to the fire. Latching devices should not be removed or made inoperative to eliminate the need of turning the knob in opening the door.

4. FLOORS

4.01 Floor construction has a fire resistance rating of not less than three hours.

4.02 Openings in floors for pipes, conduit, etc., are properly fire-stopped or enclosed with approved non-combustible construction.

4.03 Cable slots in floors are protected in accordance with the recommendations in B.S.P. Section H36.148, Cable Openings.

5. FIRE WALLS

5.01 A fire wall separates buildings or a single building into fire sections extending continuously from the foundation to the roof, and requires construction with a fire resistance rating of not less than four hours.

5.02 The importance of fire walls in preventing the spread of fire makes it essential that openings in such walls are limited in size and number and protected most efficiently. Necessary openings are protected on each side of the wall by approved fire wall, Class A labeled doors. The doors are either self-closing or automatic and when the opening serves as a required horizontal exit, one door of each type is used to protect the opening.

6. SHAFT ENCLOSURES

6.01 Series of floor openings providing communication between two or more successive stories are continuously enclosed to prevent the spread of fire vertically through the building. It is considered desirable to limit openings in shaft enclosures to those necessary for the purpose of the shaft.

6.02 When a floor opening is used for communication between only two stories, as for example, a convenience stairway, the enclosure of the stairway in one story is considered adequate, provided, (1) the stairway is not a required exit, (2) does not connect large equipment areas on the two floors, or (3) does not connect an equipment area with an area of hazardous occupancy.

6.03 Interior stairways and elevator hoistways are enclosed by construction having a fire resistance rating of not less than two hours.

6.04 Openings in stairway and elevator hoistways are provided with approved shaft doors labeled Class B. All such doors except manually operated elevator doors, are self-closing.

6.05 Recommendations on the construction of interior stairways are outlined in B.S.P. Section H32.610, Stairway Planning and Construction.

6.06 Cable openings where necessary in shaft enclosures are protected in accordance with B.S.P. Section H36.148, Cable Openings.

6.07 Shafts used for light, ventilation, dumbwaiters, conduit, etc., are enclosed by construction having a fire resistance rating of not less than two hours and the necessary openings require Class B labeled protection.

6.08 Shafts which do not extend through the roof are enclosed at the top with construction having a fire resistance rating equal to that of the walls of the shaft, and where not extending to a floor are enclosed at the lowest point with floor construction of the same type as required for the lowest floor through which it passes.

7. PARTITIONS

7.01 Partitions used for the subdivision of fire sections of telephone buildings are important in safeguarding life and in restricting the spread of fire throughout the building. By separating areas of different occupancy with adequate fire-resistive construction, telephone equipment can be protected from the more hazardous occupancies of the building.

7.02 Telephone Equipment Areas are separated from other areas by partitions having a fire resistance rating of at least one hour. In equipment areas where future equipment space is used temporarily for non-equipment purposes, it is recommended that such temporary occupancy be separated from the equipment area by a partition having a fire resistance rating of one hour. Doorways in these partitions are protected by self-closing Class C labeled fire doors.

7.03 Mechanical Plant Equipment Areas, such as boiler rooms, elevator machine rooms, ventilating equipment rooms, etc., are enclosed by partitions having a fire resistance rating of one hour and doorways are protected by self-closing Class C labeled doors.

7.04 Permanent Corridor and Room Partitions have a fire resistance rating of one hour and doorways are protected by self-closing Class C labeled doors. Partitions for private offices, quarters, conference rooms, etc., within a general office area not exceeding 5000 square feet, are not required fire-resistive construction.

7.05 Storage Areas for materials used in normal telephone operations are enclosed by partitions having a fire resistance rating of one hour and doorways are protected by Class C labeled doors. It is suggested that the storage of combustible materials in telephone office buildings be limited to the requirements for normal operation and that the storage area be designed for those requirements.

7.06 The protection required for other storage of combustible materials and for all storage areas in locations considered hazardous, is determined for each specific location by the inspection department having jurisdiction. The services of Marsh and McLennan are recommended in connection with the storage of combustible materials, in accordance with B.S.P. Section H44.015, Fire and Safety Inspection and Advisory Services Rendered by Marsh and McLennan.

7.07 Ventilation Louvers, Grills and other necessary openings in the above partitions are protected by approved automatic closing devices. Heat activated closing devices, however, do not necessarily provide protection against smoke hazard and it is considered advisable to limit the number of openings, particularly in partitions forming exit corridors.

7.08 Cable Vaults are separated from the general basement area by a partition having a fire resistance rating of not less than two hours, and doorways are protected by self-closing Class B labeled fire doors. Where practicable, it is advisable to limit the openings in this partition to the required doors. The requirement for this partition is covered in B.S.P. Section H36.148, Cable Openings.

7.09 Transformers where necessarily installed within telephone buildings, are separated from other building areas by approved vault construction designed to protect building personnel and to prevent mechanical or structural damage to the building and contents in the event of fire, escape of harmful gases or possible transformer explosion. The design requirements are based in general upon the type and capacity of the transformers, and the adequacy of the ventilation provided for heat and gas dissipation and the release of pressures resulting from a possible explosion.

7.10 Suggested procedures for the design of transformer vaults with consideration of the ventilation requirements and explosion hazard are outlined in B.S.P. Section H34.284, Ventilation-Basement Spaces. The recommendations in this section pertain to the additional protection to be considered to prevent the spread of fire originating in transformer vaults. The specific provisions for safe installations of transformers of different types and capacities are recommended to conform to the requirements of the National Electrical Code of the National Fire Protection Association.

7.11 In general, the walls and roofs of transformer vaults are of reinforced concrete or masonry having a fire resistance rating of not less than three hours. Floors are of concrete not less than 4 inches thick. Building walls and floors which meet these requirements may serve for the floor, roof or one or more walls of the vault.

7.12 In the event it is necessary to provide entrance to the vault from the building, the opening is protected by a tight fitting Class A labeled self-closing fire door. However, where added strength is indicated to reduce the possibility of explosion pressures entering the basement, as for example where oil-insulated transformers are used, it is considered advisable to provide a steel plate and angle door in metal frame firmly anchored in the wall. Doors are maintained locked and access to the vault is limited to qualified personnel. For oil-insulated transformers, a door sill or curb is provided, 4 inches high or of sufficient height to confine within the vault the oil from the largest transformer.

7.13 It is desirable wherever possible to avoid extending into or through vaults any piping or duct systems not associated with the electrical installation. If unavoidable, however, it is suggested that those sections or accessories requiring maintenance be located outside the vault. Arrangements are made where necessary to avoid possible trouble from condensation, leaks and breaks.

8. AIR DISTRIBUTION DUCTS

8.01 These recommendations are for consideration in the installation of air duct systems employing mechanical means for the movement of air and used for ventilating, heating, or cooling telephone building areas.

8.02 The protection of vertical extensions of duct through floors and of horizontal extensions where fire-resistive construction is pierced, is very important in the restriction of fire to a limited area. Automatic fan cut-off devices or alarms for the detection of fire are generally installed in air duct systems but the additional protective construction recommended in this section is necessary to prevent the communication of fire between the building areas.

8.03 Experience indicates that galvanized sheet steel with its higher melting point and strength is superior to aluminum as material for ducts and plenum chambers. It is recommended that steel be given preference to aluminum for use in duct systems up to the fire dampers protecting the branch duct work.

8.04 Where ducts pass through walls, floors or partitions, the space around the duct is sealed with rope asbestos, mineral wool or other non-combustible material to prevent the passage of flame or smoke.

8.05 Supply and return ducts in vertical extension form flues which provide a natural outlet for a fire to spread to other floors and the draft, either natural or mechanical, would increase the intensity of a fire. It is important, therefore, that such vertical ducts be enclosed by construction having a fire resistive rating of one hour. The protective construction extends from the top of the floor slab to the underside of the slab above. Duct extensions within the ventilating equipment room, however, do not require the protective construction, provided there is no open flame equipment within the room. Approved fire dampers are provided at each direct outlet or inlet and in each branch duct at its junction with the main vertical duct where the duct system serves two or more stories. Dampers are not required at room openings of the branch duct.

8.06 The passing of duct through fire walls is avoided wherever possible. Where ducts or the outlets from or inlets to them pass through fire walls they are provided with approved automatic fire doors on both sides of the wall through which they pass.

8.07 Fire doors at openings through fire walls and fire dampers at enclosures or partitions where required, are so arranged that the disruption of the duct will not cause failure to protect the opening.

8.08 An approved fire damper is provided on each opening where a duct passes through a required fire-resistive partition. Fire-resistive partitions required in telephone buildings are outlined in Paragraphs 7.01 through 7.06 above.

8.09 The passing of duct through cable vault walls is avoided wherever possible. Where ducts or the outlets from or inlets to them pass through the wall, the duct within the cable vault is enclosed by construction having a fire resistance rating of not less than two hours and each duct opening through the wall is provided with an approved fire damper.

8.10 Duct extensions through storage area walls are not generally recommended as they require protective construction in accordance with the exposure. Ducts passing through walls of storage areas housing normal amounts of combustible materials as outlined in Paragraph 7.05, are provided with approved fire dampers at each wall opening. In other storage areas as outlined in Paragraph 7.06, the duct work within the storage is enclosed by protective construction having a fire resistance rating of not less than two hours and each duct opening through the wall is provided with an approved fire damper.

8.11 It is desirable that no portion of the basement space be connected to the recirculatory system of any ventilating plant serving stories above the basement. Suggested procedures for ventilation of power rooms, cable vaults and other basement areas, are outlined in B.S.P. Section H34.284, Ventilation-Basement Spaces.

9. KITCHEN EXHAUST SYSTEMS

9.01 For the ventilation of kitchen cooking equipment an independent system is required, in no manner connected to any other ventilating system. The system is designed to lead as directly as possible to outside.

9.02 Vertical risers where necessarily located inside the building are enclosed in a shaft preferably constructed of masonry at least equivalent to four-inch hollow tile, extending from the first floor pierced and through the roof. Residue traps with provision for clean out are provided at the base of each vertical riser.

9.03 Exhaust ducts are not extended through fire walls and dampers are not installed in any portion of the system.

9.04 Openings in horizontal runs of duct for inspection or cleaning purposes are equipped with tight-fitting sliding or swinging doors and latches.

9.05 Range or grease filters, if used, are of non-combustible construction designed for the specific purpose and so proportioned as not to decrease the air velocity in the duct below the 2000 feet per minute minimum operating velocity recommended for kitchen exhaust systems.

9.06 It is suggested that periodic inspection be made to determine the amount of residue in hood, ducts, fans and related portions of the system, and cleaning should be undertaken whenever an inspection indicates the need.

9.07 Recommendations pertaining to the design and construction of kitchen exhaust systems are outlined in B.S.P. Section H42.120, Ventilation of Kitchen Cooking Equipment.

CHIMNEYS, SMOKE-STACKS AND FLUES

1. CHIMNEYS

Construction

1.01 Chimneys should be constructed of approved masonry or reinforced concrete not less than 8 inches thick. This thickness may be reduced to not less than 3-3/4 inches for small buildings having ordinary stoves, ranges or furnaces. They should extend at least 3 feet above the highest point at which they come in contact with a roof of the building, and at least 2 feet higher than any ridge within 10 feet.

1.02 Chimneys should be properly capped with terra cotta, stone, or other approved incombustible, weatherproof material securely anchored. Chimneys should be wholly supported on approved masonry or self-supporting fireproof construction.

1.03 Clearances: Where chimneys pass through combustible floors or roofs or are enclosed by walls of combustible materials, there should be at least 2 inches clearance between the face of the chimney and any combustible material; except behind fireplaces, where this clearance should be increased to at least 4 inches. The space between the chimney and the floors or joists at each floor should be firestopped with incombustible material to prevent the passage of fire.

1.04 Chimneys should not be corbeled more than 6 inches from a wall, nor should they be corbeled from a wall less than 12 inches in thickness, unless the chimney projects equally on each side of the wall.

1.05 No change in the size or shape of a chimney, where the chimney passes through the roof should be made within a distance of 6 inches above or below the roof joists or rafters.

1.06 All chimneys should be lined with a flue lining conforming to the requirements of this practice.

Flues

1.07 All heating apparatus or heat-producing appliances, except electric heating appliances and certain gas appliances, as covered later, should be connected to a flue conforming to the requirements of this practice.

1.08 No flue should have smoke-pipe connections in more than one story of a building. Two or more smoke-pipes on one floor may be connected to the same flue and the venting of an automatic gas appliance into a flue serving other fuels is permissible providing the gas appliance connection into such flue is made at a point not less than 12 inches above the connection for such other appliance. An automatic gas appliance is considered as one that is equipped with a safety pilot light, the extinguishment of which will automatically shut off the supply of gas.

Flue Linings

1.09 Flue linings should be made of fire clay tile or other refractory clay tile to withstand, without softening or disintegrating, the temperatures to which they will be subjected.

1.10 Clay Tile Flue Linings: Clay tile flue linings should not be less than 5/8 inch thick.

1.11 Flue linings should be built in solidly as the chimney construction is carried up, carefully bedded one on the other in mortar with close-fitting joints left smooth on the inside.

1.12 Cement mortar or cement lime mortar should be used in setting flue linings.

1.13 Flue linings should start from a point not less than 8 inches below the intake. They should extend as nearly vertical as possible for the entire height of the chimney. Where possible, it is recommended that flue linings be extended 4 inches above the top or cap of the chimney.

1.14 Clean-Outs: Clean-outs should be provided for all flues. They should be constructed the same as such flues and should be equipped with cast iron doors arranged to remain tightly closed when not necessarily opened for cleaning.

1.15 Size of Flues: Cross-sectional areas of smoke flues should be designed to accommodate all smoke-pipes or vents connected to such flues and should be proportioned to meet the conditions of temperatures within and without the flue, thickness of masonry, exposure, shape and material of flue. They should not be less than 70 square inches for warm air, hot water and low pressure steam heat appliances; and not less than 40 square inches for ordinary stoves, ranges and room heaters.

2. METAL SMOKE STACKS

Construction

2.01 Metal smoke stacks, unless structurally self-supporting, should be guyed securely or firmly anchored to, or otherwise supported by, the building served thereby.

2.02 All metal work should be painted and clean-out openings should be provided at the base of every stack.

Exterior Stacks

2.03 Every such stack or part thereof erected on the exterior of a building should have a clearance from the wall of not less than 24 inches if the wall is of combustible construction, and not less than 4 inches if it is of any other type of construction.

2.04 No such stack should be nearer than 24 inches in any direction from a wall opening, exit or fire-escape.

2.05 When such stack is insulated on the exterior in some approved manner, the clearances prescribed may be reduced to two-thirds of those specified.

Interior Stacks

2.06 Every stack or part thereof erected within a building should be enclosed, above the story in which the appliance served thereby is located, in walls of approved masonry or fire partitions the equivalent of 8 inches of brick or 6 inches of two cell terra cotta. The masonry enclosure should extend up to and through the roof.

2.07 Height: Stacks should extend at least 3 feet above the level of that part of the roof nearest the stack and at least 2 feet higher than any ridge within 10 feet.

3. GAS APPLIANCES

3.01 Gas appliances (except domestic gas ranges) requiring a hood or using in excess of 50,000 B.T.U.'s per hour should be connected to a flue or stack constructed as required by this practice.

3.02 Automatically controlled gas appliances using more than 5,000 B.T.U.'s per hour and also automatically controlled appliances using less than 5,000 B.T.U.'s per hour which are not equipped with an effective device for shutting off the gas supply in the event that the constantly burning flame or pilot flame is extinguished should have flues. Appliances installed in the same room which have an aggregate demand at normal rating as great as 30 B.T.U. per hour per cubic foot of room content should have flues.

4. INCINERATORS

4.01 Chimneys or smoke stacks for incinerators require special treatment and reference should be made to the practice covering this equipment for the information.

CHIMNEYS, SMOKESTACKS, FLUES AND VENTS

1. GENERAL

1.01 This section outlines suggested standards of construction for protection from the hazards involved in the removal of the products of combustion from heating appliances used in telephone buildings.

1.02 This issue includes a general revision of the practice to conform to present recommendations, and suggests protective measures for additional types of heating appliances. Marginal arrows, indicating changes in the text, are omitted in this issue because of the general revision of the text.

1.03 The suggested standards are based in general on the following:

(a) National Fire Codes, Volume I - Flammable Liquids, Gases, Chemicals and Explosives.

(b) National Fire Codes, Volume III - Building Construction and Equipment.

(c) National Building Code, recommended by The National Board of Fire Underwriters.

(d) Standard of the National Board of Fire Underwriters for the Installation of Gas Piping and Gas Appliances in Buildings as recommended by the National Fire Protection Association - N.B.F.U. Pamphlet No. 54 (1950).

The National Fire Codes are obtainable from the National Fire Protection Association, 60 Battery March Street, Boston, Massachusetts. Copies of the National Building Code and N.B.F.U. Pamphlet No. 54 may be had on application to the offices of the National Board of Fire Underwriters, 85 John Street, New York City.

1.04 In addition to the provision of adequate flues or vents, it is important that the installation of each type of heater is in accordance with approved practices. Heating devices should be suitable for the particular installation and the installation should be made in accordance with the manufacturer's instructions and conditions of safe operation of which there is acceptable evidence, such as labeling or listing by Underwriters' Laboratories, Incorporated, or the American Gas Association Testing Laboratories.

1.05 The recommended construction outlined in this section, unless otherwise stated, is for the removal, by natural draft, of the products of combustion from heating apparatus and heat producing appliances normally used in telephone buildings, and which do not develop temperatures in excess of 600 degrees Fahrenheit.

1.06 Recommendations pertaining to clearances to combustible materials and construction in connection with the installation of heating equipment are outlined in B.S.P. Section H42.110, Heating Equipment - Fire Protection. Clearances in connection with the installation of gas appliances and accessories are recommended to conform to the standard of the National Board of Fire Underwriters for the Installation of Gas Piping and Gas Appliances in Buildings.

1.07 Where local or state regulations exceed the standards suggested in this practice, the legislated measures are applicable.

2. DEFINITIONS

2.01 The various devices and their functions in the removal of products of combustion are as follows:

(a) Flue or Vent: A conduit or passageway, vertical or nearly so, for removing products of combustion from solid, liquid or gas fuel.

(b) Chimney: A vertical masonry or reinforced concrete shaft containing one or more flues or vent.

(c) Smoke Pipe: A pipe of breeching connecting a heating appliance with the flue or vent.

(d) Gas Vent: A flue for removing products of combustion from gas appliances, but not suitable for other fuels.

2.02 With consideration of the requirements for venting the heating devices, flues or vents are identified by the protection afforded in their construction, as follows:

(a) Type A Flue: A chimney or metal smokestack.

(b) Type B Gas Vent: Approved vent piping for use with approved gas appliances not required to be vented to Type A flues.

(c) Type C Gas Vent: Vent piping of approved material and used for venting certain types of gas appliances directly to the outer air.

3. TYPE A FLUES

Chimneys

3.01 Chimneys are constructed of approved solid masonry units or reinforced concrete and are wholly supported on masonry or self-supporting fireproof construction. The chimney walls are not less than 8 inches thick except that walls of rubble stone masonry are not less than 12 inches thick. In community dial offices and buildings of similar heating requirements the chimney walls have a thickness of not less than 4 inches. Where 4-inch chimney walls are used, however, it is important that the installation is made in a manner to reduce the movement of air through the flue walls. The brick should be carefully bedded on full mortar joints, and the area between the flue lining and the walls of the chimney filled with mortar.

3.02 Chimneys are extended at least 3 feet above the highest point where they pass through the roof of the building, at least 2 feet higher than any ridge within 10 feet, and are properly capped with brick, terra cotta, stone, concrete or other approved non-combustible weatherproof material.

3.03 Changes in the size or shape of a chimney where it passes through the roof are not recommended to be made within a distance of 6 inches above or below the roof joists or rafters.

3.04 Corbeling, where necessary, is limited to walls not less than 12 inches thick unless it projects equally on each side of the wall. The projection from the face of the wall is limited to 6 inches and one course of brick for each inch of projection.

3.05 Chimneys are constructed with flue linings of fire clay or other refractory clay which will withstand the action of flue gases and resist without softening or cracking, the temperatures to which they will be subjected, but not less than 2000^{o} Fahrenheit. In taller buildings where considered desirable, cast iron piping of approved quality, form and construction is used for flue lining.

3.06 Flue linings are installed ahead of the construction of the chimney as it is carried up, carefully bedded one on the other in approved or fire clay mortar with close fitting joints left smooth on the inside. Filling the area between the flue lining and the chimney walls with mortar tends to reduce the movement of air through the walls of the flue.

3.07 Flue linings are installed from a point not less than 8 inches below the intake and extend, as nearly vertically as possible, for the entire height of and 4 inches above the top or cap of the chimney.

3.08 Required clay flue linings are not less than 5/8 of an inch thick for the smaller flues, increasing in thickness for the larger ones. The cross-sectional area is not less than the aggregate areas of the vents of the appliances connected to them.

3.09 Smoke pipe or breeching connections to flues are limited to one story of a building, unless provision is made for effectively closing the connection when their use is discontinued temporarily, and completely closing them with masonry when discontinued permanently. Smoke pipe runs are short, well fitted and supported, and where practicable, are sloped upward toward the flue connection.

3.10 Two or more smoke pipes are not joined for a single flue connection, unless the smoke pipes and flue are of sufficient size to serve all of the appliances so connected.

3.11 Cleanouts for flues are equipped with cast iron doors and frames arranged to remain tightly closed when not in use.

3.12 Whenever the construction of a new building or building addition involves the vertical extension of a wall along or within 3 feet of a lot line and above the top of a chimney or smoke flue or an adjacent building, all chimneys and smoke flues within 10 feet of the new construction are extended to conform to the requirements of their use.

Metal Smokestacks

3.13 The requirements for venting the heating apparatus and appliances in telephone buildings do not generally warrant the use of smokestacks. For reasons of maintenance and appearance exterior stacks are not considered desirable, and the cost and space requirements for wall enclosure limit the economical use of interior stacks to one-story buildings. The suggested standards for their construction and use are included in this section for consideration of existing installations, and for new construction where the flue requirements can not be met by standard chimneys.

3.14 Metal smokestacks are of adequate thickness, properly riveted or welded and, unless structurally self-supporting, are guyed securely, or firmly anchored to or otherwise supported by the building served.

3.15 All metal work is painted or galvanized and the stacks are extended to a height of not less than 10 feet above the highest point of any roof within 25 feet. Cleanout openings are provided at the base of each stack.

3.16 Metal smokestacks need no protection against lightning other than that afforded by their construction, except that they are properly grounded. If the foundation does not provide ample electrical connection with the earth, ground connections are made in the manner generally prescribed for buildings. Metal guy wires and cables are grounded at their lower ends.

3.17 Exterior Stacks should have a clearance of not less than: 4 inches from non-combustible walls; 24 inches from walls of a frame building; or 24 inches in any direction from any wall opening, fire escape or other exit facility, unless the stack is insulated in an approved manner, in which case the clearance herein prescribed may be reduced one third.

3.18 Interior Stacks, except in a one-story building, are enclosed above the story in which the heating apparatus or appliance is located, in walls of non-combustible construction having a fire resistance rating of not less than one hour. Space is provided between the stack and enclosing walls for accessibility for examination and repair, and wall openings are limited to the requirements for inspection purposes.

3.19 A stack is protected in passing through a roof constructed of combustible materials by a galvanized iron ventilating thimble extending not less than 9 inches below and 9 inches above the roof construction. The thimbles are of sufficient size to provide a clearance on all sides of the stack of not less than 6 inches.

4. TYPE B GAS VENTS

4.01 Type B gas vents are made up of approved vent piping of non-combustible, corrosion-resistant piping material of adequate strength and heat insulating value, with tight joints of approved type.

4.02 They are installed with a clearance of not less than one inch to combustible material or construction, provided that for vents of floor furnaces the clearance is not less than 3 inches for a distance of not less than 3 feet from the outlet of the draft hood. Provision is made to prevent mechanical injury to Type B gas vents where they are extended through walls, floors or roofs.

5. TYPE C GAS VENTS

5.01 Type C gas vents are made up of sheet copper piping of not less than 24 U. S. gauge or of galvanized iron of not less than 20 U. S. gauge or of other approved corrosion-resistant material.

5.02 The vent piping is used in runs directly from the space in which the appliance is located to the outer air and is not extended through any combustible walls or partitions unless it is guarded at the point of passage by ventilated metal thimbles of sizes approved for use with the appliance.

5.03 The requirements for Type C gas vents apply to all gas appliance vent piping other than approved Type B vents.

6. SOLID AND LIQUID FUEL BURNING APPLIANCES

6.01 Boilers and Furnaces associated with warm air, hot water and low pressure steam heating systems are generally vented into chimneys as outlined in Part 3.

6.02 Stoves and Cooking Ranges burning solid or liquid fuel also require Type A flues.

6.03 Incinerators of approved domestic or portable type, or having a horizontal grate area not exceeding 9 square feet, are vented to Type A flues when installed in accordance with accepted conditions of safe operation. Incinerators of the non-fuel fired stationary type used in some telephone buildings, require a flue lining of fire brick not less than 4-1/2 inches thick laid on the 4-1/2-inch bed in fireclay mortar and extended the full height of the flue. All flues for non-fuel fired incinerators are terminated in substantially constructed spark arresters. Spark arresters of heavy wire netting of not more than 3/4-inch mesh are generally satisfactory, particularly where wire of chrome nickel alloy or high chrome content nickel steel is used. Expansion chambers or hood type spark arresters may be considered where combustible surroundings warrant their use.

6.04 Internal Combustion Engine Exhausts are not recommended to be vented into the low heat appliance flues as covered in this section. Suggested methods of exhaust piping are outlined in B.S.P. H42.210, Internal Combustion Engines.

7. GAS BURNING APPLIANCES

7.01 It is considered advisable to provide flue connections for all gas appliances except industrial appliances of such size and character that the absence of a connection does not constitute a hazard to the occupants of the building.

7.02 Vent piping from a gas appliance is not recommended to be interconnected with another vent pipe, smoke pipe, or flue, unless the gas appliance is equipped with an automatic device to prevent the escape of unburned gas at the main burner or burners, and the individual vents joined by a Y fitting located as close as practicable to the chimney or flue.

7.03 Chimneys or flues installed for the use of gas appliances but which are not suitable for solid or liquid fuels, are recommended to be plainly labeled where the vent pipe enters the chimney or flue to prevent their use for appliances burning solid or liquid fuels.

7.04 Every flue connected appliance except an incinerator, unless its construction serves the same purpose, is equipped with a draft hood designed to (1) insure the ready escape of the products of combustion in the event of no draft, back draft, or stoppage beyond the draft hood; (2) prevent a back draft from entering the appliance; and (3) neutralize the effect of stack action of the chimney flue upon the operation of the appliance.

7.05 Small Gas Appliances and heaters which may be installed without vents include:

(a) Domestic appliances with input rating of less than 50,000 British thermal units per hour.

(b) Domestic gas ranges.

(c) Automatic instantaneous water heaters of the single faucet type.

(d) Automatically controlled appliances equipped with automatic device to prevent escape of unburned gas at the main burner and having an input rating less than 5,000 British thermal units per hour. Automatically controlled appliances are equipped to turn the gas supply on or off automatically in accordance with the demand for heat, but do not include appliances equipped with controls governing the supply of gas to the main burner or burners which can not automatically reduce the gas supply below 30 per cent of the input rating.

7.06 Type A Flues are used for venting gas burning appliances which (1) may readily be converted to the use of solid or liquid fuel; (2) gas fired incinerators; and (3) other appliances which produce flue gas temperatures in excess of 550 degrees Fahrenheit at the outlet of the draft hood when burning gas at the manufacturer's input rating. Gas fired boilers and furnaces and water heater units are generally vented to standard chimneys as outlined in Part 3.

7.07 Type B Gas Vents may be accepted in lieu of a connection to a standard chimney when:

(a) Local conditions with respect to gas supply are such that a change to solid or liquid fuel in the particular appliance is unlikely.

(b) Arrangements can be made so that the enforcing authority is notified of the change to gas or other fuel so that the requirements of a chimney can be enforced.

7.08 In general, Type B vents are used with gas appliances which burn gas at the manufacturer's input rating without producing flue gas temperatures in excess of 550 degrees Fahrenheit at the outlet of the draft hood of the appliance.

7.09 Domestic and other gas burning appliances are labeled by the American Gas Association Laboratory, indicating that they have been tested and found to be reliable and safe for operation with Type B gas vents.

7.10 Type C Gas Vents are used for the venting of gas appliances which do not require Type A flues or Type B gas vents.

CABLE VAULTS, DUCTS, SLOTS AND HOLES

1. GENERAL

1.01 This practice outlines the general procedure to be followed in order to protect against the hazards which would result from passage of fire, smoke or inflammable gases thru the walls, floors or partitions of telephone buildings and especially the cable entrance vaults therein.

2. CONSTRUCTION

2.01 Underground cable ducts entering the cable vault should be caulked and sealed as specified in Bell System Practices - Outside Plant Construction and Maintenance.

2.02 Cable openings thru floors, walls or partitions, other than underground cable ducts, shall be constructed and protected as specified in Section H36.148 of these practices entitled "Cable Openings."

3. INSPECTIONS

3.01 In the course of his daily routine observations of conditions at the building the Wire Chief or person in charge should observe and see to it that the covers and mineral wool packing provided for cable openings are properly in place excepting only during intervals while installers are working in such cable openings; covers should be restored at the end of the working day in all cases.

HEATING EQUIPMENT

FIRE PROTECTION

1. GENERAL

1.01 This section covers practices recommended for the safe installation of appliances used exclusively for the heating of buildings. The following recommendations are based on provisions of the Building Code Recommended by the National Board of Fire Underwriters, 1949 Edition. For further details, reference should be made to Article XI of the above Code. Where local or state regulations require higher degrees of protection than those covered in this practice, the local or state regulations should be followed.

1.02 This section is reissued to refer to the latest edition of the "National Building Code" as recommended by the National Board of Fire Underwriters and other Bell System Practices relating to the same general subject. For operation and maintenance application, the section is dually numbered with this issue and the same issue is assigned for uniformity. Arrows are used to indicate changes throughout the text.

1.03 Heating plants for buildings, except in small structures such as community dial offices, are usually located in fire resistive rooms as covered in double numbered section BSP H41.230, H54.345.

1.04 The construction of chimneys, smokestacks, and flues is covered by BSP Section H41.260. Periodic cleaning of flues helps to prevent fires.

1.05 Gas, oil, and coal fired plants should be installed and maintained in accordance with current standards of the National Board of Fire Underwriters. Periodic inspection of safety devices should be made to insure that they function properly to prevent the possibility of creating fires.

1.06 The danger of fires originating in coal bins will be slight if the precautions described in double numbered BSP Section H34.284, H51.353 are followed. Coal fires should be combated as described in P.O.L. 1055.

2. HEATING FURNACES AND BOILERS DEFINED

2.01 Heating furnaces and boilers are intended to include floor mounted direct fired warm air furnaces, hot water boilers and low pressure steam boilers used for the heating of buildings.

3. FURNACES AND BOILERS BURNING OIL

3.01 Mounting: Furnaces and boilers burning oil should, where possible, be mounted on floors of fireproof construction having incombustible flooring or surface finish. Where it is not possible to mount furnaces or boilers on other than wood joist floors or other combustible construction, the floor under the appliance should be protected by two courses of 4-inch hollow clay tile laid at right angles with cells matched so as to preserve free circulation of air through each tile course. The entire tile base should extend at least 12 inches beyond the appliance on all sides and be covered with 3/16-inch thick metal plate.

3.02 Clearances: The clear distance from the appliance to woodwork or other combustible material whether plastered or unplastered should be not less than 18 inches above, at sides and rear, and 48 inches at front. Where it is not possible to obtain the above minimum clearances all exposed combustible surfaces should be protected with 28-gauge sheet metal set one inch clear of the protected surface with incombustible spacers. In no case should the clearances be reduced to less than 9 inches above, 6 inches at sides and rear and 48 inches in front. All protection should extend beyond the appliance not less than 18 inches, both vertically and laterally.

3.03 Installation: The installation should be made in accordance with the provisions contained in "Regulations of the National Board of Fire Underwriters for the Installation of Oil Burning Equipments," current edition.

4. FURNACES AND BOILERS BURNING COAL

4.01 Furnaces and boilers burning coal should have the same mounting and clearances as described for appliances burning oil, except where mounting is on a combustible floor 1/4-inch asbestos mill board covered with 24-gauge sheet metal should be placed to cover the floor area not less than 18 inches beyond the front of the appliance or the side where ashes are removed.

5. FURNACES AND BOILERS BURNING GAS

5.01 Furnaces and boilers burning gas should have the same mounting and clearances as described for appliances burning oil.

6. STOVES

6.01 Mounting: Stoves for heating purposes, where placed on combustible floors, should be mounted on iron legs providing an open space of not less than 4 inches below the bottom of the stove. The floor should be protected with 24-gauge sheet metal extending at least 6 inches beyond the appliance on sides and rear, and 18 inches at the front.

6.02 Clearance: Stoves should be installed to provide a minimum clearance of 24 inches to combustible surfaces whether plastered or unplastered, unless protected with a 28-gauge sheet metal shield set one inch clear of the protected surface with incombustible spacers. With this protection the clearance may be reduced to not less than 12 inches. Metal shielding should extend from the floor to 18 inches above and 12 inches beyond sides of the stove.

7. GAS-STEAM RADIATORS AND PORTABLE HEATERS

7.01 General: Gas-steam radiators equipped with pilot lights should be so located as to avoid the possibility of the pilot flame being extinguished by air currents. They should be connected to the gas supply with rigid piping. Portable heaters such as oil stoves should be located where they will not be subject to accidental overturning, and they should not be filled while lighted.

8. SMOKE PIPES

8.01 Smoke pipes should be connected with smoke flues as described in Bell System Practice H41.260 - Chimneys, Smokestacks and Flues. Two or more smoke pipes may be joined for a single flue connection, including junctions of smoke pipes from oil burning appliances with those from appliances burning solid fuel, provided the several smoke pipes are constructed to comply with the severest requirements for any one of those connected. Connections of vents from appliances burning gas to chimney flues are covered in Section H41.260 of these practices.

8.02 Smoke pipes should not pass through a floor, roof or exterior wall unless such floor, roof or wall is of fireproof construction.

8.03 Passing Through Partitions: Smoke pipes from heating furnaces or boilers should not pass through combustible partitions. Where necessary, smoke pipes from ordinary stoves may do so if they are guarded by double metal ventilated thimbles not less than 12 inches larger in diameter than the pipe, or by steel or tile sleeves built into brickwork or other approved fireproof materials extending not less than 8 inches beyond all sides of the sleeve.

8.04 Clearances for Smoke Pipes: The clear distance between a smoke pipe or metal breeching and combustible material, including plaster on a combustible base should be not less than 18 inches. This clear distance may be reduced to not less than 9 inches if the combustible material or construction is protected by sheet metal no thinner than 28 gauge placed one inch from the combustible surface and extending full length of the smoke pipe and not less than 12 inches beyond it on both sides.

9. WARM AIR DUCTS

9.01 Installation: Warm air heating ducts should be installed in accordance with Standards of the National Board of Fire Underwriters Pamphlet No. 90.

9.02 Protection: Warm air ducts extending from the furnace to vertical wall ducts should, for their initial 6 feet of horizontal run, be placed not less than 18 inches from woodwork. This clearance may be reduced to 9 inches if the woodwork is protected with 28-gauge sheet metal placed one inch from its surface and extending 12 inches beyond the duct on both sides. Elsewhere the horizontal warm air ducts should be placed not less than one inch from woodwork unless such woodwork is covered with asbestos paper overlaid with sheet metal.

9.03 Ducts and duct fittings and connections installed in combustible partitions, walls or concealed ceiling spaces should be covered with at least one thickness of asbestos paper weighing not less than 12 pounds per 100 square feet. An air space of not less than 5/16 inch should be provided on all sides of such ducts.

9.04 No warm air duct should be placed in a partition, wall or other enclosure of combustible construction unless it is at least 6 feet distant in a horizontal direction from the nearest surface of the furnace.

10. WARM AIR SUPPLY REGISTERS

10.01 Setting: Where registers are placed in floors or walls of combustible construction the register boxes should be covered with 12-pound asbestos paper and a clear space of at least 5/16 inch maintained between the sides of the box and the combustible material.

10.02 Register Over Furnace: When a register is placed in a floor of combustible construction over the furnace, the register box should be constructed with double sides spaced 4 inches apart, except where the warm air passage is entirely surrounded by a cold air return passage.

10.03 Fixed Register: Each warm air furnace system should have at least one register installed without valves or louvers.

11. STEAM AND HOT WATER HEATING PIPES

11.01 Protection: Where steam or hot water heating pipes pass through combustible floors, partitions or other combustible construction, an open space of at least one inch should be provided at all sides of the pipe. This space should be closed at ends with metal collars or escutcheons. Steam and hot water heating pipes should be kept not less than one inch from any combustible construction except where they are covered with at least one inch of approved insulation.

11.02 Wood casings or enclosures for steam or hot water heating pipes, or wood covers for wall recesses in which such pipes are placed should be lined with sheet metal.

11.03 Pipe Coverings: Coverings used on all steam or hot water heating pipes should be of incombustible material.

12. ASH PITS

12.01 Pits or receptacles for the storage of ashes should be of brick, iron or other incombustible material. The walls of such pits should be of approved masonry not less than 8 inches thick. The floor, and the roof if covered, should be of fireproof construction. If the ash pit is not covered, the ceiling of the room in which it is located should be of fireproof construction.

HEATING EQUIPMENT

3. STOVES

3.03 Stoves on combustible floors shall have iron stove legs at least 4" high which shall rest on a sheet of heavy galvanized iron on the floor extending 1'-6" in front of the stove and at least 8" on each side of it. Where appearance is important, a standard "stove board" such as can be obtained from a hardware or stove dealer may be used instead of the galvanized iron.

4. HOT PLATES

4.01 Wooden table or bench tops supporting hot plates (gas, oil, or electric) shall be covered with 1/4" asbestos faced with sheet metal not thinner than #24 gauge.

4.02 Shelves for supporting hot plates shall be of asbestos "transite," slate, metal, or other approved incombustible material, on sturdy metal brackets securely attached to the wall.

4.03 Walls or partitions of combustible material such as wood or wood lath and plaster on studding shall be protected where a hot plate or oil stove or gas stove is within 1'-6" of them. Such protection consists of a sheet of asbestos transite 1/4" thick, or sheet metal not thinner than #24 gauge with 3/16" of asbestos next to the wall. Protection shall extend at least 1'6" each side of and above the burner.

6. PROTECTION - WALLS - WOODWORK

6.02 Steam or hot water pipes where passing through a combustible floor or partition shall be protected by a sheet metal sleeve with a close fitting collar at the floor line or on one side of the partition, so made as to insure clearance not less than 1" between pipe and combustible material.

6.04 Stove pipes or smoke pipes shall be at least 18" from any unprotected wood or other combustible material, and shall be at least three feet below any unprotected combustible ceiling or joist. These clearances may be reduced by one-half if protection is provided by 1/2" asbestos covered by #24 gauge sheet metal extending at least 18" each side of smoke pipe.

SOLDERING EQUIPMENT AND WAX POTS

1. GAS SOLDERING FURNACES

1.01 Gas soldering furnaces should be mounted on iron shelves or other non-combustible supports firmly secured to the building structure, providing a clear air space of at least 1 inch between the furnace and the nearest surface of the structure. All combustible material within 18 inches of such furnace should be suitably protected. Furnaces should be connected to the gas supply by rigid pipes. Temporary installations employing flexible tubing should not be used.

1.02 A shut-off valve should be located in the supply line to each furnace. This valve should be near the furnace and should be in addition to the regular shut-off provided with the furnace.

2. ELECTRIC SOLDERING COPPERS

2.01 Where electric soldering coppers are used suitable stationary or portable holders should be made available to provide a rest for the coppers in order to minimize the possibility of leaving them where they might become a fire hazard.

3. OPEN FLAME TORCHES

3.01 Gasoline, kerosene or alcohol torches for heating soldering coppers or for other uses in telephone buildings should not be employed. For small jobs where other heating methods are not available solidified alcohol in small cans may be used.

3.02 Where an open flame torch is required for sweating operations, such as connecting power lugs, it is recommended that small portable outfits having tanks filled with acetone-moistened porous materials under pressure be used. These outfits are of such a nature as to prevent any hazardous dissociation of the gas from shocks, heat, electric sparks or other causes.

3.03 Torches should not be operated in switchboard sections or near combustible material. Where used near telephone equipment an extinguisher should be made available for instant use. It is desirable also to cover adjacent wire and other equipment with a flexible asbestos sheet and to take any precautions as may be necessary to catch sparks or molten metal drippings.

3.04 In certain cases of battery repairs it may be necessary to employ larger open flame devices but these should be used as infrequently as practicable and the equipment should not be stored in the building.

4. HEATING IMPREGNATING COMPOUND AND SOLDER

4.01 Paraffin, impregnating compound and solder should preferably be heated in electric wax and solder pots. If such equipment is not available the material may be heated by means of a kerosene furnace located as follows:

(a) Where practicable the furnace should be operated outside of the building and the heated material carried inside for use.

(b) In the event that a satisfactory place outside the building is not available or where difficulty would be experienced in carrying the heated material to the job, the heating may be done in a boiler room or other designated place where there is a minimum possibility of the lighted furnace becoming a fire hazard.

4.02 When paraffin or other impregnating compounds are heated inside a building, the heating device should not be located in switch or apparatus rooms. Also, the heating device should be located so as to insure that any fumes generated during heating do not enter switch or apparatus rooms through doors, cable slots, sleeves, etc., as these fumes, if in sufficient quantity, may have a detrimental effect on the functioning of the central office apparatus.

SOLDERING EQUIPMENT AND WAX POTS

2. ELECTRIC SOLDERING COPPERS

2.02 Electric soldering coppers shall be disconnected when not in use.

2.03 Frayed cords or cords having broken insulation shall be repaired or replaced at once.

2.04 An electric soldering copper may break down internally in such a way that the metal parts of the tool become crossed with the heating circuit. This condition is indicated by arcing when the metal of the tool comes in contact with circuits or grounded frames. In such cases, the tool shall be taken out of service at once.

2.05 All cords for electric soldering coppers shall be equipped with two-part extension plugs in good order. It is intended that these plugs shall automatically break the circuit if the cord is subjected to any sudden or excessive strain.

3. OPEN FLAME TORCHES

3.05 The restrictions on the use of such torches apply to everyone including telephone cable splicers and installers and to contractors employed on plumbing, heating, electrical wiring, or any other work.

4. HEATING IMPREGNATING COMPOUND AND SOLDER

4.03 Note that the restrictions apply to everyone, including cable splicers, installers and outside contractors.

INTERNAL COMBUSTION ENGINES

1. GENERAL

1.01 This section outlines suggested fire preventive and protective measures and certain recommendations with regard to blast and service protection for consideration in connection with the installation and operation of internal combustion engines employing gasoline, kerosene, diesel oil or gas.

1.02 For the purpose of this section, a critical location as referred to herein is defined as an area designated as a critical target area by the Federal Civil Defense Administration, offices serving important military or Atomic Energy installations, and/or regions subject to earthquakes.

1.03 This practice is revised and reissued to:

(a) Recommend certain safety considerations in connection with the location of engines and associated equipment.

(b) Indicate changes in materials recommended for piping for diesel oil.

(c) Recommend limiting connecting diesel engine exhaust pipes to flues, chimneys or stacks to multistory buildings.

(d) Recommend special anchorage of tanks in engine rooms and basements in critical locations.

(e) Recommend consideration of special anchorage of engines in accordance with Section AA610.006 of Bell System Practices for installations in critical locations.

(f) Recommend for buildings in critical locations the location of the engines in such buildings, to the extent practicable, to minimize damage from blast effects and to provide reasonable safety to the attending personnel from blast and nuclear radiation hazards.

(g) Recommend the engine cooling system be independent of public water supply in designated target areas.

(h) Recommend consideration of the provision of fuel tanks of sufficient capacity to meet anticipated conditions in designated critical target areas in the event of an actual enemy air attack.

(i) Include details regarding the construction of enclosures for tanks in buildings.

(j) Include revisions to conform to current recommendations of the National Board of Fire Underwriters.

(k) Recommend certain safety considerations in connection with the location, operation and storage of portable engines.

(l) Include changes in certain wording and rearrangement of the text. Arrows are used to indicate changes throughout the text.

1.04 The following suggestions are based in general on recommendations contained in Pamphlets 37 and 30 of the National Board of Fire Underwriters covering, respectively, the Installation and Use of Internal Combustion Engines, and Storage, Handling and Use of Flammable Liquids. Further details may be found in the current issues of these pamphlets.

1.05 Where local or state regulations are more restrictive than the procedures covered in this section, the legislated regulations should, of course, apply.

1.06 Instructions in detail for the installation of internal combustion engines and associated fuel equipment, exhaust silencers, ventilating equipment, and piping are covered in Section AA618.401 and the AA367.900 series of Bell System Practices.

1.07 All internal combustion engines for installation in buildings, together with fuel tanks, piping, fittings and valves should be installed in accordance with the standards of the National Board of Fire Underwriters unless otherwise required by more severe local regulations.

1.08 Plans for proposed installations of engines, storage tanks and piping are submitted where required to the local authorities for their approval.

1.09 On the basis that elimination of conditions favorable to the starting of fires is a most effective guard against damage, it is important that engine sets, exposed piping, valves, tanks, etc., be kept clean at all times. Rubbish, dirt or debris are not permitted to accumulate in rooms or space occupied by engines and their associated equipment.

1.10 It is important that open flames or smoking be prohibited in engine rooms or in space occupied by engines or fuel storage tanks.

1.11 Any gasoline supply for priming purposes is kept in a safety can outside the building. A closed can of not more than one pint capacity is used for priming operations at the engine. This may be kept in the engine room.

1.12 The requirements for fire protective apparatus in emergency engine rooms are covered in Section H43.010 of Bell System Practices.

1.13 The requirements for earthquake bracing for equipment in critical locations are covered in Section AA610.006 of Bell System Practices. Where engines are installed in critical locations consideration is given to the provision of special anchorage in accordance with Section AA610.006 of Bell System Practices.

2. ENGINES

Location

2.01 In order to minimize the transmission of noise to other parts of the building and to simplify the fuel supply systems, it is desirable that engines be located in the basement or on the ground floor wherever practicable. In this connection, considerations of possible flood hazards and vulnerability to damage by possible enemy air attack should not, of course, be overlooked. It is suggested that engines be located to the extent feasible, consistent with good judgment and sound engineering, especially when within a building situated in a designated critical target area, so as to afford a reasonable degree of protection to the engine from blast and to attending personnel from a standpoint of both blast and nuclear radiation.

2.02 Gasoline engines are placed in rooms used for no other purposes, having partition and ceiling construction at least equivalent to similar construction having a 2-hour fire resistance rating and doors bearing a Class "B" label. Where automatic operation gasoline engine sets are used, the door to the engine room is entered from the outside with no openings into other parts of the building through which gasoline vapors might pass. The location of small portable gasoline engines is covered in Paragraphs 4.01 to 4.05, inclusive, of this practice.

2.03 From the standpoint of fire protection, separate rooms are not required for diesel engines. However, consideration is given to problems involved when engine is operating, such as noise, drafts and controls of ventilation as it might affect boiler combustion. Dependence on the boiler room door being closed results in less emphasis on need for partition around engine. This is on the basis of less interference with boiler draft. Diesel engines in unattended remotely located buildings, such as radio structures, are separated from equipment areas by a fire partition if the over-all investment is large and a service interruption would involve considerable loss. In such cases where diesel engines are used, a Class "B" fire door designed to close automatically, and remain closed when not in use, may be placed in the wall between the engine room and equipment room for the convenience of operating personnel.

2.04 It is desirable that engines be so located that any parts which might fly off during periods of ungoverned overspeed will not be liable to hit and damage vital equipment such as the house service panel, batteries, fuel tanks, etc.

2.05 It is recommended that where it is necessary to locate the radiators remote from the engine room, consideration be given to the possibility of providing an installation arrangement which will protect the radiator from pressure and flying or falling debris which might result from blasts or earthquakes. Roof top, areaway, or other exposed radiator installations are more vulnerable to this type of damage and are, therefore, considered generally undesirable. In this connection, locations utilizing the screening effect of structural features of the building or of adjacent structures and locations on the side of the building opposite from the probable direction of the blast are considered. Cooling systems for engines situated in critical locations should be independent of public water supply systems in that such systems might be severely damaged and service disrupted in the event of an enemy air attack or an earthquake.

2.06 The engine room accesses and the control point should be so arranged that it is not necessary to pass by the side of the engine in order to execute an emergency manual shutdown of the engine during periods of overspeed.

2.07 Suggestions for the ventilation of internal combustion engine rooms are covered in Section H34.284 of Bell System Practices, and requirements for the ventilating equipment in such rooms are outlined in Section AA360.015.

2.08 All Bell System standard type engine sets are designed to be installed in rooms with a ceiling height of 9 feet under the lowest structural ceiling projection except where the standard 300 kw or larger nonstandard diesel engine alternator set is used and in that case, a minimum height of 10 feet is necessary.

Fuel Piping

2.09 Fuel lines for gasoline, kerosene, or any fuel having a flash point lower than 100°F should be arranged to prevent gravity feed from the fuel storage tank to the engine, with all pipe connections made above the highest fuel level in the tank and all piping so graded as to drain back into the fuel tank. It is desirable that the above suggestions also be applied wherever practicable to fuel lines carrying diesel oil. In any case where it is necessary to enter the basement with exposed fuel piping, a hand operated shut-off valve is installed in the supply line inside the basement near the point of entry at the basement wall. All standard diesel sets now being manufactured for the Bell System are provided with suction pumps which will lift fuel from 12 feet below the pump. Therefore, supplementary pumps or tanks ordinarily would not be necessary. However, where a diesel oil storage tank is so located with respect to an engine that the engine fuel pump can not transmit the oil, a low capacity auxiliary "day tank" and auxiliary fuel pump are usually provided. Antisyphon valves are not required by the National Board of Fire Underwriters. The circle seal valve specified for standard diesel engine tank installations is an effective syphon check against approximately a 5-foot head of oil. The maximum permissible liquid capacity of supply tanks in buildings is given in Paragraph 3.09.

2.10 Piping material for diesel oil in order of preference is:

(a) Black wrought iron for sizes 3/4 inches and above.

(b) Brass tinned on the inside.

(c) Stainless steel.

(d) Red brass.

(e) Yellow brass.

No difficulties have been encountered with any of the foregoing materials where good stable diesel fuels as recommended in Bell System Practice A301.290 were used. Materials for piping carrying other fuels may be galvanized iron or brass tinned on the inside, and all piping should be standard iron pipe size. Tin lined cast brass fittings are used with tin lined brass pipe, cast stainless steel fittings with stainless steel pipe, cast brass fittings with brass pipe, galvanized cast iron fittings with galvanized pipe and black cast iron fittings with black iron pipe. It is important that fill pipes be buried sufficiently below grade to afford protection against accidental injury. All pipe connections are made up tight with glycerine and litharge compound or Permatex No. 1. Joints of piping laid in moist earth are thoroughly coated with moistureproof paint after the compound has set. If steel piping is to be buried in earth containing alkali, sometimes present in soils of arid regions, it is protected with a bituminous coating over a priming coat of red lead. These coatings may be protected if necessary by an asbestos fabric wrapping. Cinders are not placed in contact with metal pipe because they will accelerate corrosion. Pipe systems should be substantially supported and protected against physical damage and excessive stresses rising from settlements, vibration, expansion or contraction.

2.11 Flexible sections of braided metal pipe are run as straight as possible. They should not be bent to meet the connecting pipes.

Exhaust Piping

2.12 Exhaust pipes are of full weight genuine wrought iron or steel and it is desirable that they be made up with a minimum number of bends and fittings consistent with adequate facilities for accommodating expansion and for dismantling when cleaning or making repairs.

2.13 A separate exhaust line extended to the roof as directly as practicable is usually provided for each gasoline engine; however, in the case of diesel engines, a common exhaust may be used provided shut-off valves are installed at each entry from a two-cycle engine. Individual or common diesel exhausts may be exhausted into boiler flues or chimneys as outlined in Paragraph 2.16. Where appearance is not controlling and where adequate stack facilities do not exist, a savings in cost and an increased dissipation of heat may be effected by placing exhaust piping on the exterior of the building in accordance with ED-80924-01. The piping should be securely connected to the engine and silencer and be adequately supported for its entire length. It is important that provision be made for expansion of pipe as shown on Drawing ED-80926-01.

2.14 Exhaust pipes are arranged to discharge away from any window or building ventilation opening and it is desirable that the pipe termination be located at least 15 feet distant from such openings.

2.15 Exhaust pipes for Gasoline, Kerosene or Illuminating Gas Engines are run outside the building or extended to the roof through suitable masonry enclosed flues which are used for no other purposes. Exhaust pipes for diesel engines using standard fuels, which includes kerosenes with flash point ratings better than 115°F, are not included in the above limitations and may be exhausted into boiler flues as described in Paragraph 2.16. The limitations described in Paragraph 2.17 to prevent exhaust pulsation damage are applicable to these engines.

2.16 Exhaust pipes for diesel engines may be run on the outside of buildings, extended to the roof in a masonry enclosed flue or exhausted into an inside flue or chimney equivalent to 8 inches of brickwork with standard flue lining, or 6 inches of reinforced concrete, with no woodwork within 4 inches of the flue or chimney; or diesel exhaust pipes may, in the case of multistory buildings, be connected to any interior or exterior flue, chimney or stack in use or previously used for a medium or high heat appliance, including building boilers, provided the chimney or stack is in good condition, adequate in size, impervious to exhaust gases, preferably free from offsets, and without openings in chimney, smoke pipe or breeching where flue gases might be forced out, for example, into boiler room when engine is operating. In order to assure the absence of negative pressure conditions in boiler rooms or engine rooms it is essential that adequate supplies of air be provided to these spaces. This will insure that the engine combustion-air will not be drawn from the boiler room and cause reverse flow of exhaust gases out of the stack during periods when the boiler is not operating. Where diesel exhaust pipes discharge into such flues it is desirable that they be provided with a suitable full caliber long sweep tee as shown on Drawing ED-80926-01. The cross-sectional area of the flue should not be less than 150% of the total cross-sectional area of all pipes that would be used if one pipe were extended from each engine. While it is usually desirable that flues into which diesel exhaust pipes are discharged have a continual draft induced by boilers, incinerators or hot water heaters, experience has proved that this is not essential to satisfactory operation. Therefore, diesel exhausts may usually be discharged into standby boiler flues or abandoned boiler flues provided the other requirements of this paragraph are met. Diesel exhaust pipes are not connected to boiler breechings.

2.17 The conclusions in the preceding paragraph are based on 1200 rpm minimum, two-cycle diesel engines with frequency of exhaust explosions not being below 40 per second. The frequency of explosions that result in damage to masonry flues is usually 8 to 10 per second, or sometimes as high as 20 per second. These conditions may be found in some of the older nonstandard engines. Round straight flues receiving the discharge from exhaust pipes develop less vibration, noise and friction than rectangular flues and offset flues. However, the present standard engines with appropriate silencers usually may be exhausted into round, square or rectangular flues without danger of damage due to pressure waves being built up in the flue if the stack and lining are of substantial construction with all mortar joints completely filled.

2.18 In general, extending a diesel engine exhaust pipe to the outside point of discharge is considered preferable to exhausting into a flue or chimney, since the former arrangement is less liable to leakage and requires less attention to the condition of the enclosing flue and masonry. Flues lined with metal less than number 11 gauge (1/8-inch thick) have not been found satisfactory because of possible vibration of the metal.

2.19 Exhaust pipes should not be embedded in a wall or floor, and exhaust piping of gas or gasoline engines should not be covered with any heat-retaining covering.

2.20 Nonwater-cooled exhaust pipes are not placed within 9 inches of wood lath and plaster partition, ceiling or other combustible material. Where nonwater-cooled exhaust piping is exposed to contact by employees it is protected by suitably ventilated metal guards. Horizontal runs are kept as short as possible.

2.21 Where nonwater-cooled exhaust pipes pass through combustible partitions they are provided with galvanized iron ventilated thimbles at least 12 inches larger in diameter than the pipes, or with galvanized iron sleeves having a diameter not less than 1-1/2 inches larger than the outside diameter of the pipe and built into panels of brickwork or other incombustible material extending at least 8 inches beyond all sides of the sleeves. It is desirable, where pipes pass through finished walls enclosing air spaces, that protection be furnished to prevent flammable material from dropping on the hot pipe.

2.22 A nonwater-cooled exhaust pipe passing through a brick or concrete partition is provided with a galvanized iron sleeve having a diameter at least 1-1/2 inches larger than that of the pipe.

2.23 An exhaust pipe passing through a brick or concrete wall to the outside of a building is usually furnished with a metal sleeve having an inside diameter at least 3 inches larger than the outside diameter of the exhaust pipe to allow for expansion of the vertical run of pipe. This clearance space is closed at the outer wall surface by clamping a sheet copper facing flange to the pipe. A copper flashing guard is attached to the outside face of the wall above the sleeve to shed rain away from the pipe where it enters the building.

2.24 The bottom of the exhaust pipe run and the lowest point of each horizontally mounted silencer are provided with suitable means for drainage.

2.25 It is important that silencers be securely supported and so located that no metal portion of any silencer will be nearer than 12 inches to any woodwork or other combustible material.

3. FUEL SUPPLY SYSTEMS

Diesel Fuel Tanks

3.01 Subject to the limitations described in Paragraphs 3.06 to 3.09, inclusive, small diesel fuel storage tanks may be located in the engine room or basement provided local regulations permit. Unenclosed diesel tanks are not located within 5 feet horizontally of any fire or flame. However, buried tanks described in succeeding paragraphs are considered preferable unless unusual conditions are encountered. Diesel fuel tanks should be constructed of tank steel (not galvanized).

Gasoline Tanks

3.02 A buried gasoline tank is located preferably outside the building where property is available and where excessive or otherwise costly excavation would not be required. A location remote from adjoining property is preferable where a choice can be made, but consideration is given to places which will be out of the path of possible growth of the building.

3.03 Gasoline tanks having capacities up to 2000 gallons may be installed either outside the building or under the basement floor, provided that the top of the tank is lower than the lowest floor, basement, cellar or pit of any building within a radius of 10 feet from the tank. A basement location is generally resorted to where the building covers the entire property, where the ground line is considerably above the basement level with no courts or areaways available to reduce the required excavation, or where rock and water are encountered.

3.04 If the top of an underground tank is not lower than the lowest floor, basement, cellar or pit of any building within a 10-foot radius, its capacity is restricted to 550 gallons.

3.05 It is desirable that all pipe connections to buried storage tanks be provided with swivel joints or otherwise arranged so that a slight settlement of the tank will not place undue stress on the piping or fittings.

Setting Diesel Fuel Storage Tanks in Engine Rooms or Basement

3.06 The tank is located as near the engine as practicable to avoid long runs of piping and minimize the number of bends. Where possible, tanks should not be located adjacent to an engine where parts flying off as mentioned in Paragraph 2.04, may damage the tank.

3.07 Tanks are installed on a firm foundation such as a substantial concrete floor. Small auxiliary "day" tanks are preferably mounted on masonry or concrete walls or partitions. Special anchorage of tanks is recommended in critical locations in accordance with Section AA610.006 of Bell System Practices.

3.08 Main supply tanks larger than 60 gallons capacity should not be located above the lowest story, cellar or basement.

3.09 Supply tanks in buildings do not exceed 275 gallons individual capacity, or 550 gallons aggregate capacity in one building unless installed in an approved enclosure constructed as follows: The walls of the enclosure should be constructed of reinforced concrete at least 6 inches thick or of brick at least 8 inches thick. Such enclosures should be installed only on concrete or other fire resistive floors and should be bonded to the floors. Enclosures should have tops of reinforced concrete at least 5 inches thick or equivalent fire resistive construction, except that where floor or roof construction above the enclosure is concrete or other fire resistive construction, the walls may be extended to and bonded to the underside of the construction above in lieu of the provision of a separate top. Any openings to such enclosure should be provided with fire doors or other approved closures and 6-inch noncombustible liquid tight sills or ramps. Provision should be made for adequate ventilation of such enclosures prior to entering for inspection or repairs to tanks.

3.10 Diesel fuel storage tanks installed inside buildings are designed and constructed in accordance with the recommendations of Paragraph 2.12 of Pamphlet No. 30, standards of the National Board of Fire Underwriters for the storage, handling and use of flammable liquids, April, 1952.

Setting of Buried Tanks

3.11 The tank is located as near the engine as practicable to avoid long runs and excessive number of bends in the piping. Locating tanks where the suction lift exceeds 12 feet is avoided where possible since lifts over 12 feet require supplementary pumps.

3.12 It is important that the tank be set on a firm foundation and surrounded with soft earth or sand well tamped in place. Prior to installation, tanks are protected against corrosion on the outside, equivalent to two preliminary coatings of red lead followed by a heavy coating of hot asphalt.

3.13 Tanks outside the building are buried underground with the top below the level of any piping connected to the tank and not less than 2 feet below the surface of the ground, except that instead of the 2-foot cover, the tank may be buried under 1 foot of earth overlaid with a slab of reinforced concrete or equal construction at least 4 inches thick except for an access manhole to the piping. The concrete slab is set on a firm well-tamped earth foundation and extends at least 1 foot beyond the outline of the tank in all directions. Where necessary to prevent floating, tanks are securely anchored or weighted.

3.14 If the tank is under a driveway subject to traffic by heavy vehicles the total coverage above the top is not less than 3 feet, except that 2 feet is permissible if the driveway has a 6-inch thick reinforced concrete pavement.

3.15 Tanks buried under the floor are so installed and protected as to comply with the foregoing requirements for outside tanks.

3.16 Buried tanks installed inside buildings are designed and constructed in accordance with the recommendations of Paragraph 2.12 of Pamphlet No. 30, standards of the National Board of Fire Underwriters for the storage, handling and use of flammable liquids, April, 1952.

Access Opening

3.17 When tanks are buried, an access opening and cover are provided above the tank where pipe connections are located, other than fill and vent pipe, and the space between the top of the tank and the underside of the cover is kept filled with sand when not in use. Covers should be securely fastened by bolts or other means so as to make access difficult by unauthorized persons. Access opening is not used for filling purposes. Detail of access opening is shown on Standard Drawing No. ED-80925-011.

Venting of Tanks

3.18 Storage tanks are equipped with an open vent or an approved automatically operated vent, arranged to discharge to the open air. Vent pipes are so laid as to drain toward the tank without sags or traps in which liquid can collect. They are located so that they will not be subjected to physical damage above ground. The lower end of the vent pipe enters the tank through the top and extends into the tank for a distance of not more than 1 inch.

3.19 Each tank is vented through piping adequate in size to prevent blowback of vapor or liquid at the fill opening and to permit proper inflow of liquid while tank is being filled. Vent pipes should be the same size as the fill pipes, but in no instance should pipes smaller than 1-1/4-inch nominal inside diameter be used. When storage tanks are filled by the use of a pump through tight connections special consideration should be given to the size of the vent pipes to insure that it is adequate to prevent the development of abnormal pressure in the tank during filling. This may be accomplished by providing a vent pipe not less in size than the discharge of the pump.

3.20 Vent pipes from tanks storing gasoline are so located that the discharge point is outside of buildings, not less than 12 feet above the top of the fill pipe, and not less than 12 feet above the ground level adjacent to the vent pipe. Vent pipe outlets for gasoline tanks are so located that flammable vapors will not enter building openings, or be trapped under eaves or other obstructions. If the vent pipe for a gasoline tank is less than 10 feet in length or greater than 2 inches in nominal inside diameter, the outlet is provided with a vacuum and pressure relief device or an approved flame arrestor is located in the vent line at the outlet or within the approved distance from the outlet. In no instance, is a flame arrestor located more than 15 feet from the outlet end of a vent line. Permanently open vent pipes are provided with weatherproof fittings at the outlets.

3.21 Vent pipes from tanks storing diesel fuel are terminated outside of buildings and higher than the fill pipe opening. Vent pipes for diesel tanks are terminated sufficiently above ground to prevent obstruction by snow and ice and are fitted with return bends, coarse screens or other devices to minimize ingress of foreign material.

Facilities for Filling Tanks

3.22 Storage tanks are filled only through fill pipes terminating outside of buildings at a point at least 5 feet from any building opening at the same or lower level. Each fill terminal is within a heavy cast metal box so designed as to make access difficult by unauthorized persons. Each fill box bears an appropriate designation "Gasoline" or "Fuel Oil" cast in the metal frame.

3.23 Fill pipes are screened, or provided with a trap or seal, or are carried to within 4 inches of the bottom of the tank.

3.24 Where both gasoline and fuel oil tanks are provided at an installation the fill boxes are as widely separated as practicable. The inner cap of the gasoline fill box is painted red and stenciled "Gasoline" unless this designation is cast on the stationary part of the cap. The inner cap of the fuel oil fill box would in such cases be painted green and stenciled or otherwise designated "Fuel Oil." It is important that the locks provided on such fill boxes have different key control, and that the keys be in the personal custody of the Wire Chief.

3.25 Diesel oil tanks that are an integral part of the engine or engine base are filled from the main storage tank by means of a manually operated pump so located as to be within sight of the fuel pipe connection to the engine tank.

3.26 Fuel tanks mounted on or that are an integral part of small kerosene engines are filled from approved safety cans.

Care and Attendance

3.27 In no instance should a fuel storage tank which feeds directly to the engine be filled while the engine is running. It is desirable that fuel storage tanks be filled during daylight hours. When tanks are to be taken out of service for some time they are completely emptied and then filled with water which has been treated to minimize rusting.

3.28 When a tank gauge is installed its operation is checked at the time of the first tank filling. Thereafter it should be observed periodically when fuel is added to see that the gauge indication agrees approximately with the amount of fuel added.

Size of Fuel Tanks

3.29 In determining the size of a fuel tank consideration should be given to the provision of sufficient capacity to permit the maintenance of a certain minimum fuel supply for those installations located in designated critical target areas. An appraisal of each installation may be made to determine the requirements for emergency standby fuel based on factors such as: the possibility of access routes for fuel deliveries being blocked by debris, the vulnerability to conflagration of the area in which the supplier is situated, the availability of alternate sources of supply with consideration of their location, the vulnerability of the supplier to damage and his provisions for emergency pumping if required, the minimum delivery requirements of the supplier to maintain a desired reserve in the fuel tank under normal conditions, etc.

4. SMALL PORTABLE ENGINES - GASOLINE

4.01 Portable gasoline engines and their particular type of fuel system are considered more hazardous than stationary engines. These hazards should be recognized.

4.02 The term "small portable," as applied to engines in this practice includes those gasoline engines mounted on skids as well as those mounted on wheels or otherwise so arranged that they can be moved from place to place as the necessities of service demand.

4.03 Small portable engines are operated outside of buildings and may or may not be housed in a metal enclosure and may be placed on a concrete pad or concrete blocks or directly on the ground. Such locations outside of buildings are preferably adjacent to but no less than 5 feet from a masonry wall without openings. Where it is not possible to avoid wall openings a minimum clear distance of 10 feet from wired glass windows and doors should be maintained. Where exterior wall is of frame construction a minimum distance of 15 feet should be maintained. Operating locations should not be near areaways or low sections of ground where gas pocket conditions might develop. *The potential hazard of flammable* mixtures of gasoline vapors and air should be considered for each location.

4.04 Fuel may be supplied from buried tanks, from small standard portable gasoline safety cans that may or may not be directly connected *to the engine, or from tanks mounted* integrally with the engine itself. The setting of buried tanks is covered in Paragraphs 3.10 to 3.16, inclusive. Carburetion engines having *fuel supply tanks mounted on the engine are* considered as introducing a greater hazard than those using underground or separate fuel tanks.

4.05 Where portable engines when not in use are stored within the building, all gasoline should be removed from the tank, fuel line, carburetor and fuel cup before the engine is placed within the building. After draining, at least one complete filling with kerosene and a subsequent draining should be accomplished to flush out the remaining traces of gasoline and gasoline vapor before the unit is placed in storage.

STORAGE AND USE OF PAINTS, PAINT REMOVERS, THINNERS OIL, GASOLINE, FILMS, MATCHES AND EXPLOSIVES

1. GENERAL

1.01 This practice deals with the storage and use of paints, oils, gasoline, motion picture films, matches and explosives. In general, potentially explosive compounds shall not be kept in or around telephone buildings. When necessary that such materials be temporarily kept about the buildings, the recommendations herein shall be followed. #

2. GASOLINE AND OTHER HIGHLY VOLATILE AND INFLAMMABLE FLUIDS

2.01 Gasoline or other highly volatile and inflammable cleaning fluids shall not be used for any purpose in any telephone buildings except upon special authorization by the General Plant Manager.

2.02 If, for some unavoidable reason, it becomes necessary to keep such fluids temporarily about the building, they shall be stored in approved safety containers outside the building.

2.03 Torches or furnaces shall be filled and stored outside the building and not used within a telephone building except upon authorization of the District Plant Superintendent.

3. OIL SUPPLIES

3.01 Oil supplies, including kerosene, petroleum spirits and lubricating oils shall not be stored in leased or owned central office buildings except as follows:

a. In quantities not to exceed 1 quart when kept in tightly closed metal containers and stored in metal fire resistant cabinets or lockers.

b. In quantities not to exceed 5 gallons when kept in Underwriters approved safety cans and stored in standard paint cabinets outside the building.

c. In quantities not to exceed 1 barrel when kept in steel drums or tanks approved by Underwriters for their specific use and stored in fire resistant rooms isolated by fire walls and doors from the rest of the building.

d. In quantities and under conditions specifically approved by written authorization of the General Plant Manager or Chief Engineer.

4. PAINTING SUPPLIES

4.01 Paint, oil, varnish, shallac, turpentine and alcohol shall be stored in a standard paint cabinet or approved container outside of the building and shall not be kept in quantities larger than necessary. When a large job of painting or varnishing is being done and it is impracticable to store the material outside the building particular care shall be taken to keep the paints, oils, etc., in a safe place, preferably in steel cans with covers or lockers with doors.

4.02 (PAINT REMOVERS) Certain commercial paint removers are highly volatile, inflammable and explosive and must not be employed in telephone company buildings since the fumes from such compounds may be ignited by the operation of electric light switches, gas water heater pilot lights, broken light bulbs, etc. Only fireproof paint removers shall be used in telephone buildings.

5. CELLULOSE NITRATE PAINTS OR LACQUERS

5.01 Paints or lacquers having a cellulose nitrate base shall not be used or applied in telephone buildings, except within rooms or spray booths built for the purpose and constructed to meet Underwriters requirements.

6. PAINTING - GENERAL SAFETY PRECAUTIONS

6.01 Since paints, varnishes and shellacs all contain thinners such as turpentine, mineral spirits, alcohol, etc., which are quite volatile and when used in small unventilated quarters may increase the normal fire hazards to some degree, care shall always be exercised to provide adequate ventilation especially in small equipment, power and battery rooms, elevator cabs, etc.

7. MOTION PICTURE FILMS

7.01 Only safety type motion picture films shall be stored or shown in telephone buildings. The Nitro-Cellulose type films shall not be stored or shown in telephone buildings, the exception being that they may be shown in standard projection booths providing the necessary precautions are taken. These precautions are not listed here and in case such films are to be shown in booths, instructions shall be obtained through regular channels from the Chief Engineer.

NOTE: All 16 mm film is "Safety Type" and so indicated along the sprocket side of film where the words "Safety Type Film" are visible. Some of the older 25 mm films are of the "non-safety" Nitro-Cellulose type and are so indicated along the sprocket edge.

8. MATCHES

8.01 Due to the highly inflammable ## nature of matches the following restrictions shall be observed in connection with their storage in Telephone Company Buildings:

a. Ordinary household (non-safety) matches shall not be stored in any Telephone Company building. Only safety type matches shall be used in such quarters and the following references to "matches" are with respect to safety type matches.

b. Stocks of matches in all telephone buildings shall be as small as is consistent with the normal monthly need.

c. Matches stored in telephone buildings also housing telephone equipment shall be kept in a steel cabinet or metal container which is as nearly airtight as practicable. A steel drawer type filing cabinet will be satisfactory for the storage of a small supply (100 paper books or less) of matches in such buildings.

d. A stock of matches too large for practicable safe storage in a telephone building housing telephone equipment shall be placed in some other storage location such as in a metal cabinet or container in a telephone company building housing no telephone equipment.

9. DYNAMITE OR OTHER EXPLOSIVES

9.01 Dynamite or other explosive shall not be stored within a distance of 500' from a telephone building by or under the direction of an employee.

9.02 Instructions concerning the use of dynamite and other explosives by authorized persons as well as rules to be observed by all employees in connection therewith are to be found in the "S" series practices.

ELECTRIC WIRING AND EQUIPMENT

1. GENERAL

1.01 This practice covers the use and maintenance of electric wiring and equipment in telephone buildings with particular respect to avoiding fire hazards.

1.02 The electrical machinery and equipment, apparatus, fixtures, conduit and wiring must conform, as stipulated in other sections of Bell System Practices to the National Electrical Code, the Bell System Practices for lighting in operating rooms and on switch frames or apparatus racks, the specifications for the particular building, and the electrical code of the state and municipality.

2. TEMPORARY WIRING

Electrical wiring, conduit, fixtures and apparatus for temporary use must comply with the National Electrical Codes and the local codes for permanent wiring. (Note especially during building changes or additions).

3. CHANGES AND ADDITIONS

Extensions to or changes in the existing wiring, fixtures, etc., shall only be made as specified in approved job orders or estimates.

4. FUSES

4.01 Fuse wire is prohibited.

4.02 Use only standard fuses of the non-renewable type bearing the approval of the Underwriters Laboratories, Inc.

4.03 The capacity of each fuse and its type must conform with the requirements of the National Electrical Code for the fuse mounting involved and for the size and character of the wiring and apparatus protected by the fuse. The proper capacity of fuses shall be stencilled upon the mounting by the Installer or Contractor.

5. PORTABLE LAMPS AND EXTENSION CORDS

5.01 The use of extension cords and portable lamps should be minimized, confining them to situations where special lighting is not usually required. Whenever the nature of the work necessitates the repeated use of a light, arrangements should be made for the permanent installation of suitable lighting fixtures.

5.02 Portable cords used by repairmen in the rear of switchboard sections shall be removed and hung outside the section whenever the rear doors or curtains are closed. Such lamps should be removed and disconnected whenever the workman leaves the equipment even for a short interval. This is to eliminate the possibility of overheating and fire in his absence.

5.03 Lamp cords shall not be hung on nails, pipes, or telephone equipment. Portable lamps shall be hung by the lamp-guard hook.

5.04 Every portable lamp should be equipped with the molded combination guard and socket, the special cord and the attachment plug as specified in the standard catalog of supplies. Cords used in the rear of switchboard sections shall be equipped with the special porcelain plugs adapted to the receptacles mounted in the rear of the sections.

5.05 Every portable lamp must be fitted with an approved guard so as to prevent the lamp from resting against combustible materials as well as to safeguard the lamp from breakage.

6. LAMP SHADES

Combustible material, such as paper or fiber shall in no case be used as a lamp shade even temporarily; use metal, asbestos or other noncombustible material.

BELL SYSTEM PRACTICES
Buildings
Fire Protection

ADDENDUM H42.410
Issue A, 5-1-34
N.W.B. TEL.CO.
MINN. AREA

ELECTRIC WIRING AND EQUIPMENT

1. GENERAL

1.01 This addendum is issued to discuss the use of ornamental lamps.

2. ORNAMENTAL LAMPS

2.01 In Operators' Quarters or Lunch Rooms only, ornamental table lamps or floor lamps are permissible, provided they conform to the National Electrical Code and this Practice.

2.02 Shades on such lamps may be of fabric or parchment, provided they are securely mounted on wire or metal frames which hold them "clear" of the lamp bulb by at least three ~~inches~~. inches with top open for ventilation. Shades made of inflammable materials such as celluloid are prohibited, as are parchment shades finished with inflammable lacquers of the pyroxalin or nitro cellulose type.

2.03 Cords for such lamps must have not less than 1/32 inch rubber insulation; conductors must be #18 gauge, and must bear the approval label of the Underwriters Laboratories Inc. Cords with an outer jacket of rubber (Type POSJ or SJ) are preferred to cords with an outer braid of silk or cotton which usually frays and becomes easily ignitable.

GAS AND KEROSENE LIGHTING EQUIPMENT

1. GENERAL

1.01 This practice covers the general procedure, from a fire protective view point, to be followed in the installation and maintenance of gas and kerosene lighting equipment. These types of lighting equipment are used for emergency lighting as covered in the following paragraphs.

2. GASOLINE OR ACETYLENE LIGHTING

Plants

2.01 Gasoline or acetylene lighting plants shall not be used in telephone buildings.

3. EMERGENCY LIGHTING

3.01 If either electric service or gas, but not both, is available for regular use and the interruptions are infrequent, candle lanterns or battery flash lights may be used for emergencies.

3.02 If the regular lighting is unreliable and the interruptions are frequent standard kerosene lamps or battery flash lights shall be used for emergency lighting.

4. OPEN FLAME LIGHTS

4.01 Open flame lights of any kind shall not be used. i.e., - (without globes)

5. GAS LIGHTING

5.01 Movable gas brackets shall not be used in locations where the gas flame can be brought in contact with woodwork or other combustible material. A combustible ceiling or partition exposed to a gas light at a distance of less than 18 inches shall be provided with a metal heat deflector of suitable size so placed that there is at least 3" of air space between the deflector and the ceiling. Flexible tubing or lead piping shall not be used for connecting gas lights.

5.02 All globes on gas arc lamps shall be provided with wire globe nets as a safeguard against falling glass in event of breakage.

6. KEROSENE LIGHTING

6.01 Where gas or electricity is not available, or where kerosene lamps are used for emergency lighting the standard bracket reflector lamp shall be used, so mounted that curtains or other combustible materials cannot come in contact with the lamps.

6.02 Swinging bracket lamps are not approved.

6.03 A combustible ceiling exposed to a kerosene lamp at a distance of less than 18" shall be provided with a heat deflector of tin or porcelain enameled iron of suitable size so placed that there is at least 3" of air space between the deflector and the ceiling.

6.04 Oil lamps for inside use shall be of a type in which the fount is not detachable from the framework, or if detachable is set in from above.

6.05 Lamps shall be refilled in daylight and while not burning. They shall be carefully cleaned before using.

7. CANDLE LANTERNS

7.01 Candle lanterns, when used, shall be of a type having a metal framework and a lamp chimney. Such lanterns shall not be used as portable lights for examining wiring, etc. When a self contained portable light is needed for such purposes, flash lights shall be used.

8. BATTERY FLASH LIGHT

8.01 Battery flash lights, when used, shall be of the standard type.

GAS AND KEROSENE LIGHTING EQUIPMENT

1. GENERAL

1.01 This addendum is issued to define "battery flash lights".

3. EMERGENCY LIGHTING

3.03 "Battery Flash Lights" as used in this Section means the standard electric hand lantern operated by two #6 dry cells as described in P.E.L. #2069 and P.E.M. 99 and listed in the Catalog of Tools.

FIRE PROTECTIVE APPARATUS - GENERAL

1. GENERAL

1.01 Fire Protective Apparatus is provided in telephone buildings for extinguishing small fires and for retarding the spread of large fires until the arrival of the Fire Department. This section outlines the method of providing such equipment.

2. INSTALLATION OF PROTECTIVE APPARATUS

2.01 The Plant Department is responsible for installing, testing, and maintaining fire protection apparatus, and for instructing employees in the proper use of it in accordance with other practices.

2.02 The amount, type and location of # protective apparatus will be specified for each new office, garage, warehouse, etc., (or major addition) by the Chief Engineer, who also will prepare requisitions for the same to be delivered to the local plant representative. All plans and specifications for buildings will show the location of this equipment and the contractor will mount and install necessary brackets and backboards for the fire protective apparatus.

2.03 The Plant Department will receive and inspect all new fire extinguisher equipment, charge and tag it, and deliver it to the Contractor and supervise the installation by the Contractor. This is to be done prior to the starting of any work by the Western Electric, so that adequate protection will be available during the hazardous, unpacking and installation period.

2.04 For small offices or other locations where only one or two extinguishers are needed, ## the District Plant Superintendent shall order the required extinguishers and locate them in the room with the telephone equipment where they will be readily visible and accessible.

2.05 The type and number of fire pro- ## tective apparatus units listed in the table attached to Section H43.010 shall be considered as minimum requirements and additional units and types provided as appears consistent and appropriate for the quarters involved.

3. INSTRUCTION OF EMPLOYEES

3.01 The Plant Department is primarily responsible for instructing employees of all departments in the use of fire protective apparatus in accordance with other instructions, and for fighting fires should they occur. It must be remembered that safety and avoidance of personal injury and loss of life are the first considerations.

3.02 In most cases, other departments will be concerned chiefly in providing for the orderly exit of their employees when necessary. However, any employees, regardless of department, left in charge of or alone with telephone property should be thoroughly instructed in the use of fire protective apparatus. This applies particularly to Traffic Department employees in offices not attended continuously by Plant employees. Also, care should be taken to see that these employees know which Plant employees to call and where they may be reached in case of fire or other emergency.

3.03 A demonstration is the most practicable method of providing instructions in the proper use of fire protective apparatus. There appears to be no other adequate method by which employees may be taught how to estimate the scope of a fire and how to determine the best method of extinguishing it or of controlling it until the arrival of the Fire Department.

3.04 At least one demonstration should be made each year before as many employees in a building as possible, showing the method of using each kind of apparatus.

It is suggested that the demonstration take place at the time when the chemical extinguishers, such as soda acid and foam type, are due to be recharged. In offices where carbon dioxide and water type extinguishers are installed, it will be advisable to discharge one of each for demonstration purposes.

4. USE OF FIRE PROTECTIVE APPARATUS

4.01 Where available, carbon dioxide dry gas extinguishers should first be used on small fires followed by the use of asbestos gloves to remove or snuff out any remaining embers.

4.02 If carbon dioxide extinguishers and asbestos gloves are not available or prove to be inadequate, use water, limiting the amount to that necessary to bring the fire under control in order to minimize water damage. Soda acid extinguishers should be used if water is not available. In unheated locations the Pump Type - Anti-Freeze (See Note) should be used. Tarpaulins should be used to minimize water damage.

NOTE: Existing "Fyr-Fyter"(non-freeze) Extinguishers should be retained in service as long as adequate and serviceable.

4.03 Fires in oil or grease should first be attacked with a carbon dioxide extinguisher or with a foam type extinguisher. If the burning liquid flows over the floor its progress may be stopped and the fire controlled by the use of a sand barrier.

5. FIRE DEPARTMENT

5.01 Appropriate measures shall be taken by the local Plant representative to make the acquaintance of and establish good working relations with the Fire Chief and his assistants, including the supervisory personnel of Volunteer fire fighting organizations in the smaller exchanges. He shall arrange in so far as possible, for such personnel to annually visit Telephone Company buildings housing telephone * equipment. At the time of such visits he shall explain to them the bad effects of water or chemicals applied directly to the equipment which should be avoided unless the severity and advanced stage of the fire demands such action in which case there shall be no hesitancy in their use. Arrange for cooperation in the use of dry gas, asbestos or other Telephone Company protective equipment <u>when available</u> in lieu of water or chemicals when feasible to do so.

5.02 In case of fire the Fire Department should be called promptly unless it is certain that the fire can be controlled without their aid.

6. RECHARGING SCHEDULE

6.01 Soda acid and foam type extinguishers shall be recharged annually and the date of recharge entered on the tag which is attached to each unit. All extinguishers in each district shall be recharged as of the date shown in the following schedule which has been arranged to spread orders on the Western Electric Company for recharging material.

6.02 Schedules:

Date	Area	District
April 1	Minn.	St. Paul - Dwtn. #
April 1	Minn.	St. Paul - Suburban #
April 1	Minn.	St. Paul - Southern #
April 1	Minn.	Southern
June 1	Minn.	St. Cloud
Aug. 1	Minn.	Duluth
Sept. 1	Minn.	Minneapolis-North #
Sept. 1	Minn.	Minneapolis-Central #
Sept. 1	Minn.	Minneapolis-South #
April 1	Iowa	Des Moines
June 1	Iowa	Waterloo
July 1	Iowa	Sioux City
Aug. 1	Iowa	Davenport
Sept. 1	Iowa	Council Bluffs
April 1	Nebr.	Sioux Falls
May 1	Nebr.	Omaha
June 1	Nebr.	Grand Island
Aug. 1	Nebr.	Rapid City
May 1	N.Dak.	Jamestown
May 1	N.Dak.	Bismarck
July 1	N.Dak.	Kenmare
July 1	N.Dak.	Valley City
July 1	N.Dak.	Fargo
Aug. 1	N.Dak.	Williston
Aug. 1	N.Dak.	Rugby
Sept. 1	N.Dak.	Grand Forks
April 1	S.Dak.	Aberdeen ##
April 1	S.Dak.	Huron ##
Aug. 1	S.Dak.	Pierre ##

6.03 Orders for recharging material shall be forwarded approximately two weeks prior to the date shown in the schedule in order that the extinguishers can be recharged on the specified dates.

7. WEIGHING SCHEDULE

7.01 The Plant Department shall establish a definite schedule for weighing carbon dioxide extinguishers and the gas cartridges in water type extinguishers according to the stipulation in the Bell System Practice covering each type. These should be weighed at least annually and recorded on the tag on each extinguisher.

PROTECTIVE APPARATUS - GENERAL

1. GENERAL

1.01 This Addendum is issued to clarify procedures regarding location of fire protective equipment in small offices.

2. INSTALLATION OF PROTECTIVE APPARATUS

Note: The following paragraph replaces the one of like number in this Section H43.001.

2.02 The amount, type, and location of protective apparatus will be specified for each office by the Chief Engineer except for small offices requiring only one fire extinguisher and for unattended dial offices, in which case the District Plant Superintendent shall order the required extinguishers and locate them without instructions other than this Addendum. These shall be located so as to be easily seen and used, in the room with the telephone equipment.

DISTRIBUTION OF FIRE PROTECTIVE APPARATUS

1. GENERAL

1.01 This section outlines the general procedure to be followed in distributing fire protective apparatus throughout telephone buildings. The recommendations are intended to apply to all new buildings.

1.02 In the case of existing buildings which do not come up to the recommendations, the question of whether to replace existing protective apparatus will have to be considered for each specific case.

1.03 This section is reissued to remove soda-acid-type fire extinguishers from the recommended list of fire protective equipment and to suggest some variations in the distribution ratio of our fire protective equipment. It also recommends the installation of carbon dioxide fire extinguishers and water-type fire extinguishers in CAMA, AMA, billing machine and other accounting areas.

1.04 The attached table has been revised to show these changes and to add unattended carrier huts in the group of small buildings requiring fire protective apparatus. Arrows are not used to indicate changes in the text due to the major revisions.

1.05 Fire protective apparatus in accordance with the attached table should be provided in completed buildings so as to be available during the period of equipment installation. Sections A310.105 and A804.415 cover the Principles of Fire Fighting and Description and Use of Equipment and Apparatus.

1.06 Where the distribution of extinguishers requires that they be placed on columns, the units, of course, are not mounted in the working aisle in equipment rooms. Since they are not visible from all sides of the columns consideration should be given to identifying the extinguisher location by painting a red band about six inches wide around the column at a level near the extinguisher center. If it should occasionally be necessary to locate a wall-mounted extinguisher where it may be obscured or partly obscured by switchboards or other obstructions, consideration should be given to providing a red painted identification marker at a suitable height for visibility.

1.07 In garages a red arrow, located above the extinguisher and higher than the vehicles, could be used to identify the location of extinguishers.

1.08 Identification bands on columns or wall location markers are usually omitted in such spaces as main entrance halls, public business offices, lounges, etc, where appearance is a controlling factor.

1.09 Vaporizing Liquid Fire Extinguishers should not be used because of the toxicity of the liquid, and handling precautions required.

1.10 Extinguishers shall ***not*** be camouflaged or painted to match the walls.

2. CARBON DIOXIDE TYPE

2.01 When the table specifies that carbon dioxide extinguishers should be located "1 per 50′ of Travel" it is expected that they will be located so that a unit can be reached by a maximum travel of 50 feet. This spacing should normally provide the total number of extinguishers required for various occupancies as outlined in the table.

2.02 ***Terminal and Switch Rooms:*** Carbon dioxide extinguishers (KS-14137) are located on walls, partitions or columns, giving preference to the wall locations where practicable. Generally, they should be placed along the walls at the ends of main cross aisles and at intervals along the walls where equipment is perpendicular to the length of the room. Additional extinguishers necessary to meet the 50-foot requirement, generally, should be mounted on columns adjacent to cross aisles.

2.03 *Mezzanine Platforms:* Extinguishers generally are not located on mezzanine platforms associated with distributing frames unless the distance between stairways leading to the main floor is more than 60 feet. Where possible, extinguishers are located so as to be readily accessible at the foot of mezzanine stairways, and not under them.

2.04 *Accounting Centers:* Carbon dioxide extinguishers are located in accounting centers in the rooms or areas containing CAMA, AMA equipment, data processing and billing machines, because of the electrical equipment involved.

2.05 *Garages:* Carbon dioxide extinguishers as well as water-filled and foam extinguishers may be used for garages as indicated in the table. Carbon dioxide type could be used in the open or carport garages as indicated in the table.

3. ASBESTOS GLOVES

3.01 Asbestos gloves are used for snuffing out glowing embers after the flames have been put out with a CO_2 extinguisher and are located as indicated in the table.

4. WATER TYPE

4.01 Water-type extinguishers are placed in accounting and equipment rooms for use on nonequipment furnishings and materials only and are located in accordance with the table. Where it is mounted adjacent to a carbon dioxide type, the carbon dioxide extinguisher should be placed between the water type and the door opening. This makes the CO_2 the first available extinguisher when someone comes through the door.

4.02 In the case of a large equipment space with only two entrance doors or possibly a dividing wall, consideration should be given to placing an additional water-type extinguisher within the floor area to reduce the distance to a water extinguisher to 100 feet.

4.03 Water-type extinguishers should never be used on live electrical equipment of any type or flammable liquids. The water-type extinguisher is for use on nonequipment furnishings and material only.

5. SODA-ACID TYPE

5.01 Soda-acid extinguishers have been superseded by the carbon dioxide and cartridge water types and are no longer recommended for telephone buildings because of the corrosive character of the water and the additional work required for maintenance.

6. FOAM TYPE

6.01 Foam-type extinguishers are located as indicated in the table.

7. SAND PAILS

7.01 Sand pails are no longer recommended.

8. PORTABLE TARPAULINS

8.01 Portable tarpaulins are provided when consideration of local conditions, such as the type of construction of the building and arrangement of the plumbing, indicates possible need for them for the protection of telephone equipment from leaking water.

8.02 In general, one holder containing two tarpaulin sections will be sufficient for a single-unit dial or manual office. In large multiunit dial offices, it will probably be found satisfactory to provide not more than one holder with two tarpaulin sections for each equipment floor. Similarly, in multiunit manual offices and in large toll offices one holder for each terminal room floor should be sufficient.

8.03 In general, the holders are located in the terminal room rather than in operating rooms and at conspicuous locations such as doorways.

8.04 Where overhead plumbing can not be avoided in equipment spaces or operating rooms, tarpaulins are preferably located near the point of possible water damage.

Attached:
Table

DISTRIBUTION OF FIRE PROTECTIVE APPARATUS

SPACE		CARBON DIOXIDE	ASBESTOS GLOVES	WATER	FOAM	LOCATION
Switch Rooms Terminal Rooms Operating Rooms Test Rooms Large Manual Attended "L" Main Stations	Crossbar Panel S x S Repeater Toll	1 Per 50′ of Travel	1 Set Per Gas Ext.	Ratio of 1 to each 4 Gas Ext. Min. of 1		On walls, partitions or columns Locate at entrance doors except for large operating rooms where the travel should not exceed 100 ft.
Power Spaces Emergency Engine Rooms Equipment Rooms in Military Installations		1 Per 50′ of Travel Min. of 2				One near entrance door
Cable Vaults (See Note A)		1 (2 for very large vaults)	1 Set Per Gas Ext.			Outside door to vault
Transformer Vaults Power Service Rooms						None — depend on Power Company
Kitchens		1 or 1 Foam (2 for very large kitchens)			1 or 1 Gas	Near entrance door
Heater Rooms (See Note B)	Oil	1 or 1 Foam			1 or 1 Gas	Near entrance door
	Gas	1 or 1 Foam			1 or 1 Gas	
	Coal			1		
Office — Clerical Spaces Locker Rooms Lounges — Dining Rooms				1 per 5,000 sq. ft. (Fire Resistive) 1 per 2,500 sq. ft. (Other Type Const.)		(a) Where 1 ext. is provided locate near door (b) Where more than 1 ext. is provided, distribute evenly throughout room
Storage Areas (Heated) * General Bldg. Space and General Basement Space				1 Per 2,500 sq. ft. Min. of 1		
AMA Accounting, Billing Machine or Data Processing Areas		Machine Area 1 per 50′ Maximum Travel		Office Area 1 per 2,500 sq. ft. 75′ Maximum Travel		On walls, partitions or columns
AMA and CAMA Perforating Areas		1 Per 50′ of Travel	1 Set Per Gas Ext.	Ratio of 1 to each 4 Gas Ext.		On walls, partitions or columns
Elevator Machine Rooms		1 (2 for very large rooms)	1 Set Per Gas Ext.			Near entrance door
Paint Storage Room		1 or 1 Foam			1 or 1 Gas	Outside door
Battery Room		Large Separate Rooms 1 per 50′ of Travel				On walls, partitions or columns
Small Manual Office		1	1 Set Per Gas Ext.			On walls, partitions or columns
Community Dial Office (See Notes C-D)	Heated *	1 Per 50′ of Travel	1 Set Per Gas Ext.	Ratio of 1 to each 4 Gas Ext.		1 gas ext. at main entrance door; distribute others on walls or columns
	Unheated	1 Per 50′ of Travel	1 Set Per Gas Ext.			
Garages	More Than 5 Cars	Ratio of 1 to each 5 Foam — Min. of 2	1 Set		1 per 2,500 sq. ft. Do not Provide in Unheated Space	Where 1 ext. is provided locate near door. Where more than 1 ext is provided distribute evenly
	5 or Less Cars	1				
Open or Carport Garages		1 Per 2,500 sq. ft. Min. of 1	1 Set Per Gas Ext.			Travel distance should not exceed 100 ft.
TV and Radio Equipment Areas Teletype Rooms (5 or More)		1 Per 50′ of Travel	1 Set Per Gas Ext.			Near entrance door
Radio Relay Buildings	Radio & Power Room	1 Per 50′ of Travel	1 Set Per Gas Ext.			Near entrance door
	Engine Room	1	1			Near entrance door
Unattended Carrier Huts	Equipment Room	1	1			Near entrance door
	Engine Room	1	1			Near entrance door

* Indicates whether or not temperature is continuously maintained above 32°F; in unheated areas substitute antifreeze units.

Note A: Where cables enter the building in areas other than through a basement cable vault, the following is recommended:
1. For basementless building or building with basement, but no cable vault. Provide fire protective measures required for space through which the cables enter the building including a minimum of 1 CO_2 Extinguisher and one set of asbestos gloves.
2. For buildings with cable vault, but no basement using an external entrance to the vault. Provide 1 CO_2 Extinguisher and one set of asbestos gloves inside the vault.

Note B: Extinguisher provided in gas fired heater rooms is ***not*** for use on gas heater unit. The storing of material or equipment other than the heater unit in heater rooms is ***not*** recommended. In the event of fire in gas heater unit, turn off gas supply. The type of extinguisher to be selected would be determined by the hazards associated with the heater room.

Note C: Less than 800 lines 1 gas extinguisher provided and 1 set of asbestos gloves.

Note D: Less than 1500 lines only 1 water extinguisher need be provided, less than 800 lines — no water extinguisher provided.

WATER-TYPE FIRE EXTINGUISHERS

CONTENTS PAGE

1. GENERAL

1.01 The water-type fire extinguisher is used on fires in telephone equipment which have made some headway and which are beyond the scope of the carbon dioxide type due to insufficient range of discharge of this extinguisher or to the lack of cooling action of the gas on deep seated masses of burning material. The water-type extinguisher is not suitable for use on fires involving flammable liquids, oils, or greases or live electrical equipment such as power boards, power plant apparatus, billing and computing machines used in accounting centers, CAMA or AMA equipment, radio and carrier equipment, or elevator machinery.

1.02 The water-type extinguisher replaces the soda-acid extinguisher in equipment space and supplements the carbon dioxide extinguisher.

1.03 This section is reissued to include the latest design of water-type extinguisher with newly designed label, and to list additional areas where this type of extinguisher should not be used.

1.04 Arrows in the margin indicate changes in the text.

2. DESCRIPTION

2.01 The extinguisher consists of a lead lined copper or brass tank of about 2-1/2 gallons capacity and uses plain water, which is expelled by the expansion of carbon dioxide from a metal cartridge located within the tank. The cartridge is attached to the underside of the extinguisher cap and is removable with the cap. A grooved puncturing pin attached to a plunger extends through the extinguisher cap and is directly above and at right angles to a disc in the top of the cartridge. The details of the latest design of extinguisher are shown in Fig. 1, and similar details of former designs in Figs. 2 and 3.

2.02 To discharge the extinguisher, the safety guard is pushed aside and the tank turned bottom up and bumped on the floor. The safety guard is omitted from the latest design, thus eliminating the first step. This causes the plunger to be forced in and the grooved pin to puncture the disc in the cartridge and releases the carbon dioxide into the extinguisher tank. The water in the tank is expelled with sufficient force to throw an effective stream some 30 to 40 feet horizontally and continues for about 60 seconds, after which gas is emitted for a few seconds. The discharge of liquid ceases when the extinguisher is turned right side up, but the gas continues to escape and can not be stopped until it is exhausted. A new pressure cartridge must be inserted and the tank refilled before the extinguisher can be used again.

2.03 On previously designed models, but omitted from the latest design, a "U" shaped hinged guard is placed over the outside end of the plunger to prevent accidental puncturing of the cartridge disc. When the extinguisher is to be discharged, this guard is pushed back and becomes fixed in the open position.

2.04 In case the guard is not pushed back when the extinguisher is to be used, the plunger will not be obstructed since the guard is of metal light enough to collapse when crushed to the floor under the weight of the extinguisher.

2.05 ***Rubber Jacket:*** A rubber jacket is provided over the grenade-shaped cartridge for the purpose of preventing possible electrolytic corrosion. This rubber jacket has been

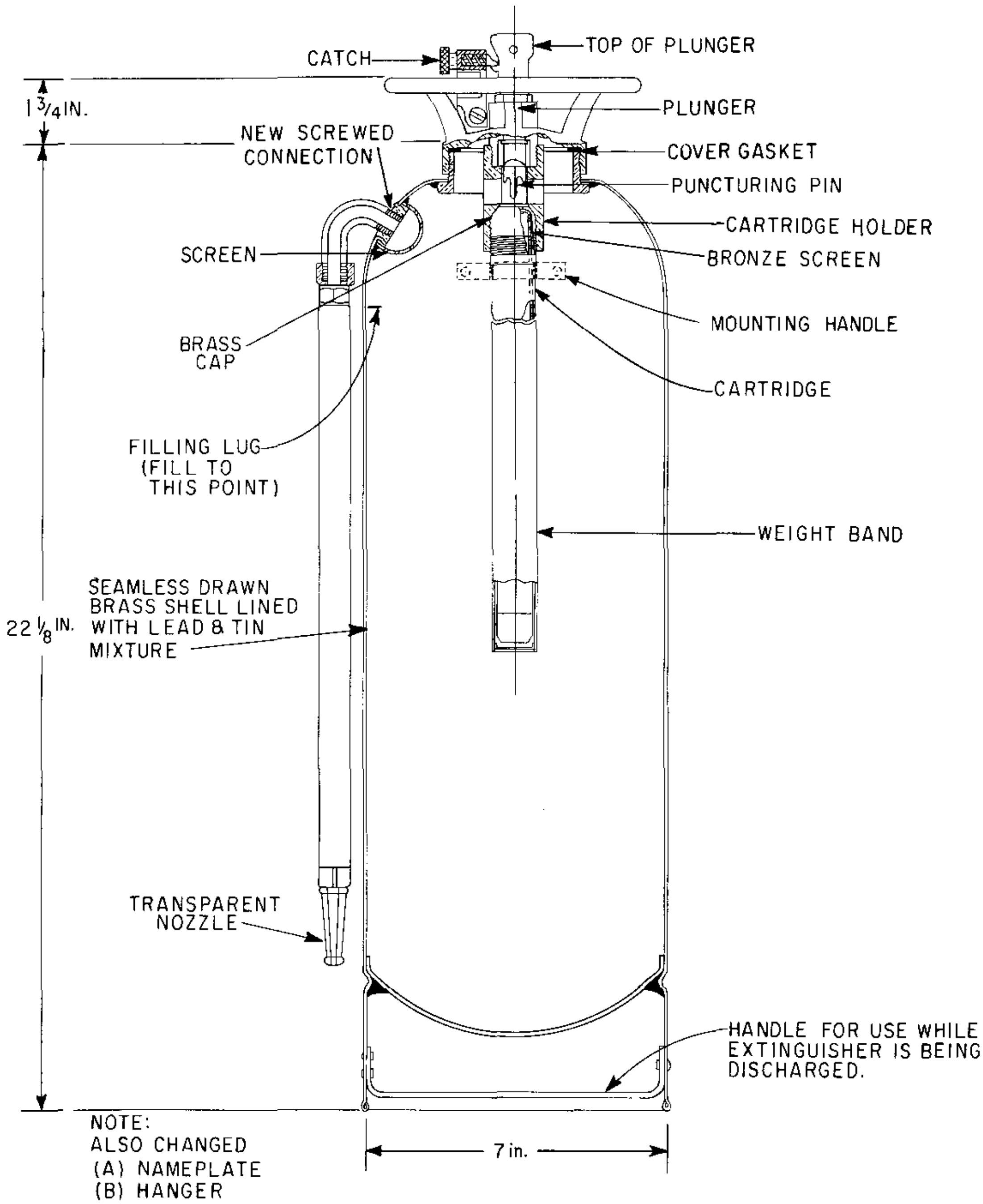


Fig. 1 — Latest Design with Cylindrical Cartridge

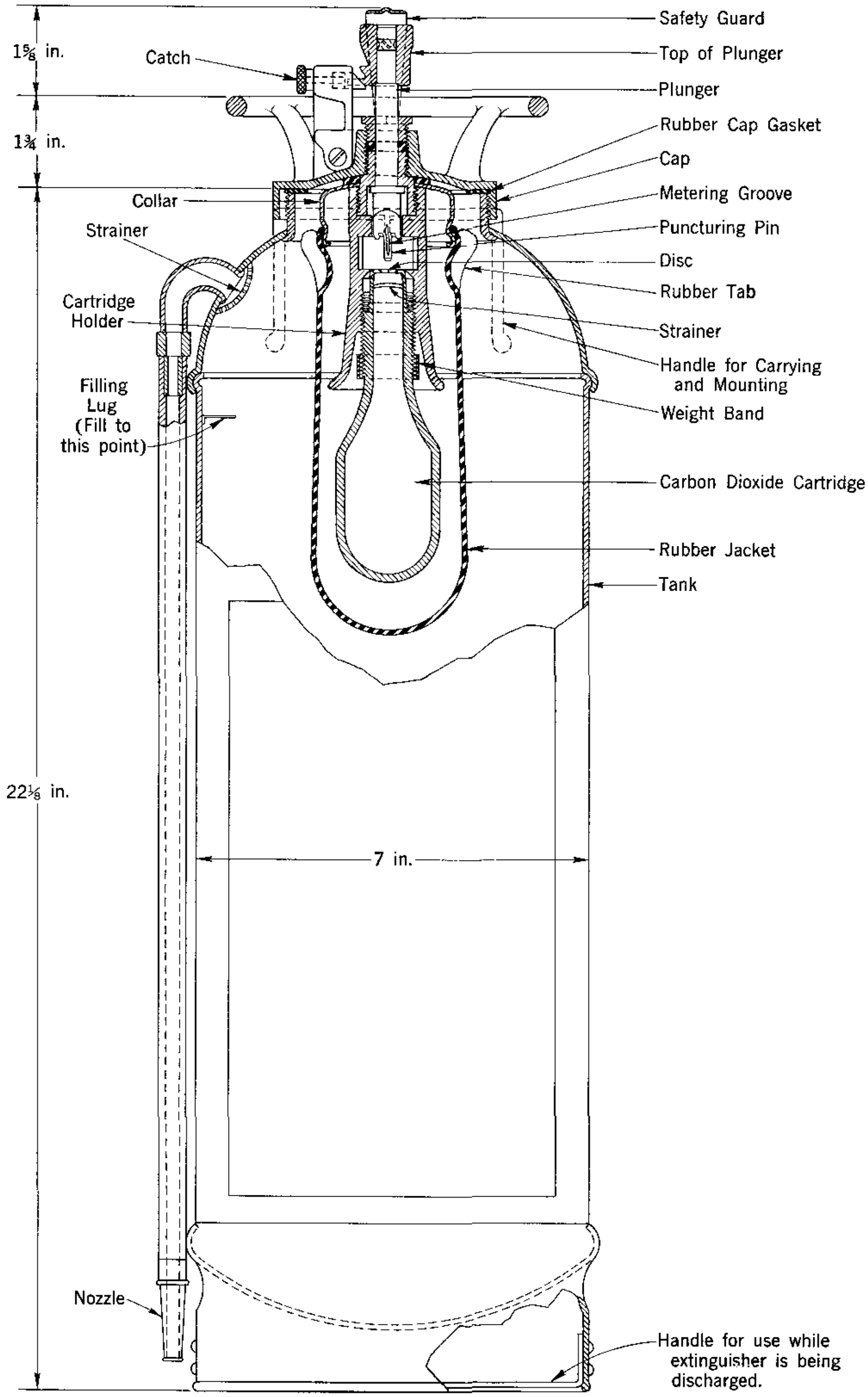


Fig. 2 – Design with Long Rubber Jacket

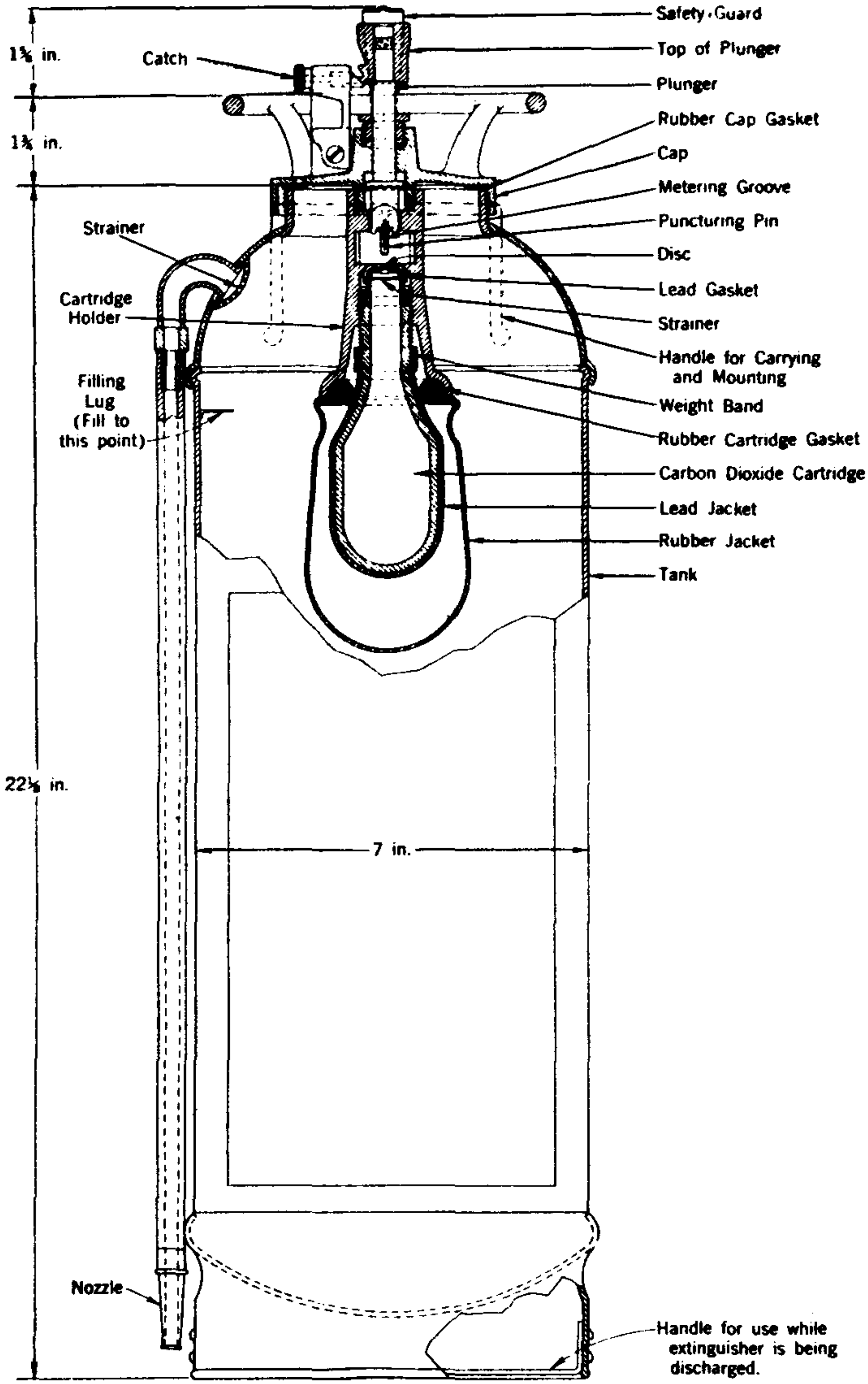


Fig. 3 – Design with Short Rubber Jacket

eliminated as unnecessary in the latest cylindrical design because the steel cartridge is enclosed in a brass jacket and then tin coated which prevents electrolytic corrosion.

2.06 *Cartridge:* A newly developed cylindrically shaped cartridge (WF75) approximately 12 inches long and 1-1/8 inches in diameter replaces the present zinc coated grenade-shaped cartridge (WF53). The new cartridge is designed without a screw-type safety cap and can be used in any Bell System standard water-type fire extinguisher.

3. LOCATION

3.01 Water-type extinguishers are subject to freezing and, therefore, should not be located in spaces where freezing temperatures may be encountered. If, however, it is considered necessary to place the water-type fire extinguisher in locations where freezing temperatures are encountered, antifreeze solutions should be added to the water. It is important in these cases to make sure that a properly labeled tank is selected and that the solutions used conform with the manufacturers' specifications. The Bell System standard extinguisher is not suitable for antifreeze solutions (not labeled properly). Water-type fire extinguishers suitable for antifreeze solutions are available only through local purchase.

3.02 The carbon dioxide which is held under pressure in the cartridge is subject to a rapid rise in pressure where temperatures above normal are experienced. It is desirable, therefore, to locate these extinguishers away from hot surfaces and out of the direct rays of the sun. In general, the clearance between extinguishers and radiators or uncovered heating pipes should be at least two feet. This distance may be reduced to six inches in the case of covered pipes.

3.03 Extinguishers should not be located where they are subject to mechanical injury from moving objects.

4. MOUNTING

4.01 Extinguishers should be mounted as shown in Fig. 4.

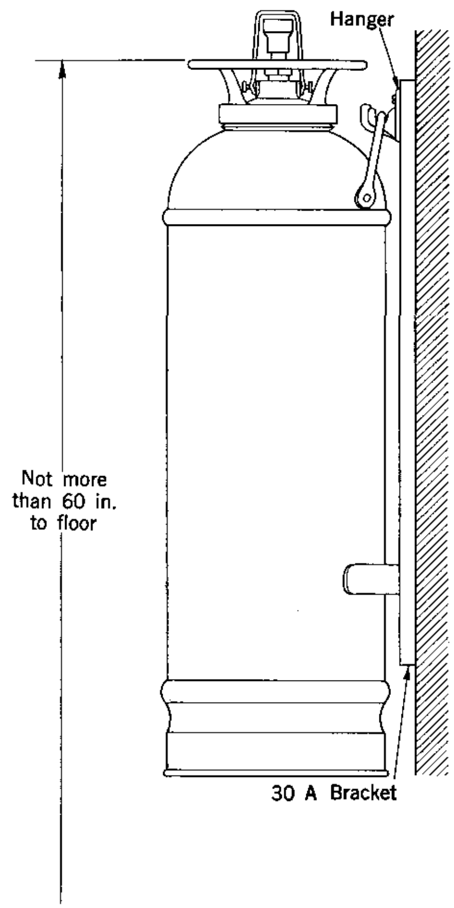


Fig. 4

4.02 Where extinguishers are placed on free standing columns, arrangements for mounting may include metal bands encircling the column or if it has been predetermined in what locations they will be required, consideration should be given to include mounting arrangements when the columns are constructed.

4.03 The extinguisher should be mounted so it will hang in a vertical position.

5. METHOD OF OPERATION

5.01 To operate the extinguisher, proceed as follows:

(1) Remove extinguisher from mounting bracket and carry to the fire in an upright position.

(2) Invert tank after pushing aside the safety guard on those extinguishers so equipped.

(3) Hold tank by handle in the bottom with hose in other hand.

(4) Bump plunger in tank cap on floor.

(5) Direct discharge at fire from a distance of about 5 feet if possible. If not possible, move away as the stream is effective up to about 30 or 40 feet horizontally.

(6) Play stream from top down with side-to-side motion. For other than equipment fires, play stream at base of flames and follow flames with stream.

(7) Stop liquid discharge by inverting tank to normal position when fire is completely extinguished.

(8) Do not use water-type extinguishers on fires involving flammable liquids, oils, or greases.

(9) Do not use water-type extinguishers on fires involving live electrical equipment such as power boards, power plant apparatus, billing and computing machines used in accounting centers, CAMA or AMA equipment, radio and carrier equipment, or elevator machinery.

(10) Do not return discharged or partially discharged extinguishers to their mounting brackets.

(11) Return plunger to normal position before unscrewing cartridge to avoid possibility of edges of metering groove picking up scrapings from cartridge disc.

6. MAINTENANCE

→**6.01** Maintenance of the water-type fire extinguisher is covered in Section H54.610 (H44.210).

SODA-ACID TYPE FIRE EXTINGUISHERS

1. GENERAL

1.01 The soda-acid type fire extinguisher is used on fires in telephone buildings which do not involve telephone equipment, flammable liquids, oils or greases, or live electrical equipment such as power boards, power plant apparatus or elevator machinery.

1.02 The soda-acid extinguisher is replaced by the water type extinguisher in equipment spaces and should be used as far as possible only in locations where the action of chemicals used on a fire will not contribute as seriously to the fire damage as is the case in equipment spaces.

1.03 This section is reissued to suggest that, if at the time of the annual refill any extinguisher caps are found without a pressure relief hole, such a hole should be provided as covered in Paragraph 6.07.

2. DESCRIPTION

2.01 The extinguisher consists of a lead lined copper tank of about 2-1/2 gallons capacity, containing water mixed with sodium bicarbonate and a bottle half full of sulphuric acid. The liquid is expelled by inverting the tank causing sulphuric acid to be mixed with the sodium bicarbonate solution resulting in a chemical action generating carbon dioxide gas, the pressure of which forces the liquid out of the hose with sufficient force to throw an effective stream some 30 feet. This discharge commences almost immediately after the tank is inverted and continues for about 50 seconds until all the liquid is gone. The discharge of liquid ceases when the extinguisher is turned right side up, but the gas continues to escape and can not be stopped until the chemical action has been completed. The extinguisher must be recharged before it can be used again. The details of a typical extinguisher are shown by Fig. 1.

3. LOCATION

3.01 Soda-acid extinguishers are subject to freezing and their action becomes sluggish at temperatures of 40°F. or lower and, therefore, are not located in spaces where the temperature may be lower than this figure.

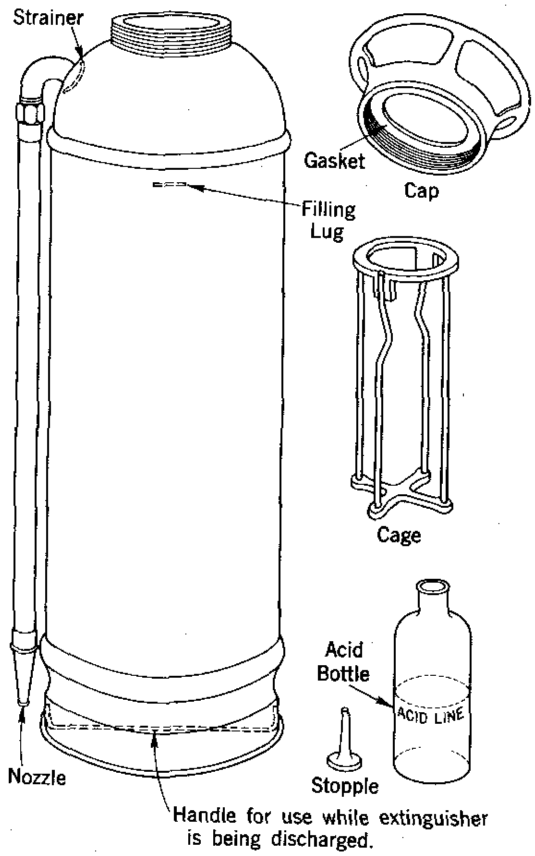


Fig. 1

3.02 Extinguishers are not located where they are subject to mechanical injury from moving objects.

4. MOUNTING

4.01 Extinguishers are mounted as shown by Fig. 2.

4.02 Where extinguishers are placed on free standing columns, arrangements for mounting may include metal bands encircling the

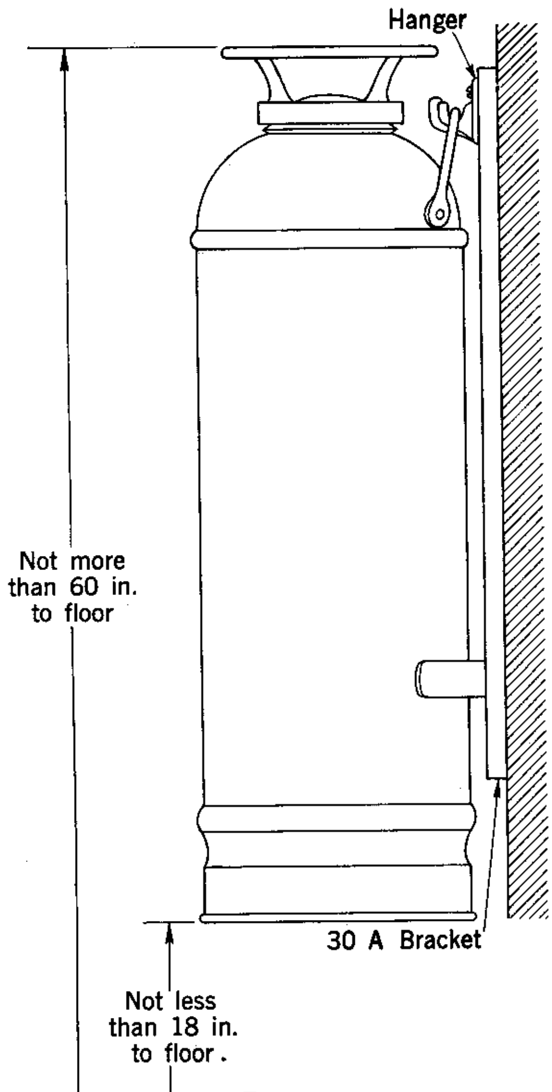


Fig. 2

column or if it has been predetermined in what locations they will be required, consideration should be given to including mounting arrangements when the columns are constructed.

4.03 The extinguisher is mounted and the lower guides are bent so that it will hang in a vertical position.

5. METHOD OF OPERATION

5.01 To operate the extinguisher, proceed as follows:

(1) Remove extinguisher from mounting bracket and carry to fire in upright position.

(2) Hold hose and extinguisher cap handle in one hand, directing the nozzle at the fire, and invert tank holding it by the handle in the bottom with other hand.

(3) Direct discharge at fire from a distance of 5 feet if possible.

(4) If impossible to stand so close, move away as the stream is effective up to about 30 feet.

(5) Play stream at base of flames and follow flames with stream.

(6) Stop liquid discharge by inverting tank to normal position when fire is completely extinguished.

(7) Do not use soda-acid type extinguishers on fires involving telephone equipment, flammable liquids, oils or greases.

(8) Do not use soda-acid type extinguishers on fires involving live electrical equipment such as power boards, power plant apparatus or elevator machinery.

(9) Do not return discharged or partially discharged extinguishers to their mounting brackets.

6. MAINTENANCE

(A) Inspection

6.01 Soda-acid type extinguishers should be inspected at intervals for the following items:

(1) Hose is in good condition.

(2) Nozzle opening is unobstructed.

(3) Hose coupling is tight at tank outlet.

(4) Dents are not evident on the extinguisher body at or near the upper or lower horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be discarded at once.

(5) Finish is in good condition.

(6) Mounting bracket is securely fastened to wall.

(7) Record tag is attached and extinguisher has been recharged within the required time.

(B) Recharging

6.02 Extinguishers are discharged and refilled at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 6.01 should also be made at this time.

Method

6.03 Remove the extinguisher from its mounting bracket and carry it to a suitable location where it can be discharged. This may be done either outside the building or inside into a service sink partly filled with water. Leaking gaskets, defective hose connections, or other irregularities are noted as the extinguisher is discharged and corrected during the recharging procedure. Only one extinguisher per floor should be taken out of service at one time.

6.04 Warning: In all the following operations where the extinguisher is to be taken apart, safety goggles and rubber gloves should be used.

6.05 Take extinguisher to a location where a new charge can be provided and where the tank can be refilled. Unscrew the cap and remove the cage and bottle from the tank.

6.06 The tank is examined on the inside for corrosion and for deposits of soda or other foreign material which should be scraped off with a suitable piece of wood. The tank should then be scrubbed with a stiff brush and rinsed thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The cap, cage and stopple should be scrubbed with a brush and carefully rinsed.

6.07 It has long been a requirement of the Underwriters Laboratories that manufacturers of this type extinguisher provide a means of pressure relief during removal of the cap. For many years it has accordingly been the practice of the manufacturers to provide a small hole through the cap threads which, as the cap is unscrewed, will release any pressure that might be present. Probably most extinguishers in the Bell System already are provided with this hole in the cap but if upon the annual refilling any are found without it, they are modified locally. The hole should be about 3/16-inch diameter with its center about 9/32 inch from the bottom edge of the cap.

6.08 The extinguisher is then carefully recharged in accordance with the following procedure irrespective of any recharging instructions that may be on the extinguisher name-plate or on the recharge package. 1-1/2 pounds of bicarbonate of soda is thoroughly mixed with about 2-1/2 gallons of lukewarm water. The temperature of the water should not exceed 100°F. The mixing is done outside the tank in order to insure that the soda is thoroughly dissolved. Undissolved soda may clog the hose or nozzle. The tank is filled to the filling lug, taking care not to pour any sediment into it. Filling the tank to levels above the filling lug reduces the air chamber volume and may result in excessive working pressure. Preservatives to prevent stagnation or solutions to lower the freezing point are not used.

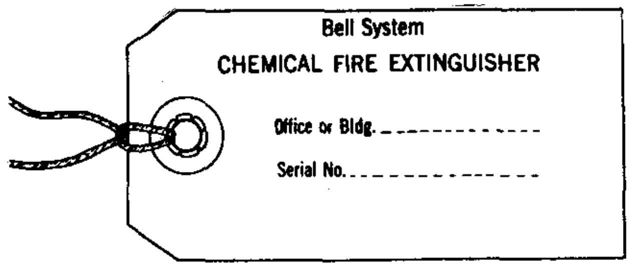
6.09 The cork or cap and label, if any, should be removed from a new bottle of acid and the bottle placed in the cage; a floating label may clog the outlet strainer. If the stopple is not a part of the cap assembly, it should next be put in place in the acid bottle. At this time, determine that the bottle is not so high, as to prevent the extinguisher cap from being screwed down properly on the tank. Also, check to see that the stopple is free to move out of the bottle for proper release of the acid and that the bottle is so held in the cage that it can not slide down on the stopple when the tank is inverted. These conditions can be checked best by placing the cage, bottle, stopple and extinguisher cap together as they are in regular assembly and determining with the fingers that the conditions mentioned are met.

6.10 Replace the rubber cap gasket with a new one. Coat the threads of cap and tank lightly with vaseline and screw the cap on the tank as tightly as possible by hand only, exercising care to insure that all threads are *properly engaged. A bar or rod should not be* used to tighten the cap. The same cap must always be replaced on the tank from which it was removed; in this connection it is suggested that all recharging operations be completed on one extinguisher before starting operations on the next.

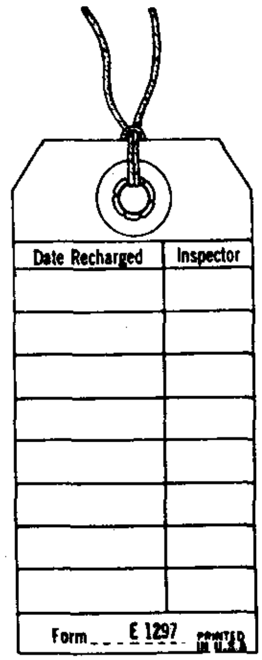
6.11 The date of recharging, etc., is recorded on the tag provided for this purpose. This tag is shown on Fig. 3.

6.12 The finish of the extinguisher is examined and polished or painted as required. The hose should not be painted. When the paint is sufficiently dry the extinguisher may be returned to its original location.

6.13 Extinguishers are emptied before shipping to other locations.



Front Side



Reverse Side

Fig. 3

FOAM TYPE FIRE EXTINGUISHERS

1. GENERAL

1.01 The foam type fire extinguisher is one of the approved types to be used on fires in locations which involve flammable liquids such as oil and gasoline (except alcohol). It is not suitable for use on fires involving live electrical equipment such as power boards, power plant apparatus or elevator machinery.

1.02 This section is reissued principally to include precautions against possible damage to extinguishers and disposition of those found in damaged condition.

2. DESCRIPTION

2.01 The extinguisher consists of a lead lined copper tank of about 2-1/2 gallons capacity, using water mixed with sodium bicarbonate and a foam producing agent and an inner container holding a solution of aluminum sulphate. The liquid is expelled by inverting the tank, causing the aluminum sulphate to be mixed with the sodium bicarbonate solution resulting in a chemical action producing foam and generating a pressure which forces the liquid out of the hose with sufficient force to throw an effective stream some 30 feet. This discharge commences almost immediately after the tank is inverted and continues for about 50 seconds until all the liquid is gone. The discharge of foam slows up when the extinguisher is turned right side up, but a certain amount continues to escape and cannot be stopped until the chemical action has been completed. The extinguisher must be recharged before it can be used again. The details of a typical extinguisher are shown by Fig. 1.

3. LOCATION

3.01 Foam extinguishers are subject to freezing and their action becomes sluggish at temperatures of 40°F. or lower and, therefore, should not be located in spaces where the temperature may be lower than this figure.

3.02 Extinguishers should not be located where they are subject to mechanical injury from moving objects.

4. MOUNTING

4.01 Extinguishers should be mounted as shown by Fig. 2.

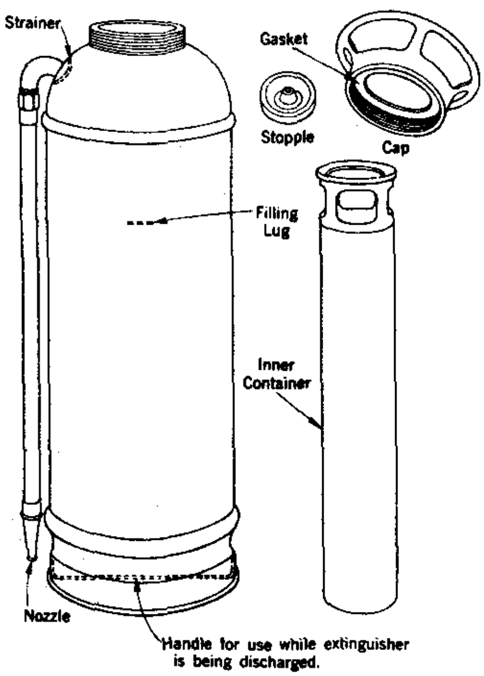


Fig. 1.

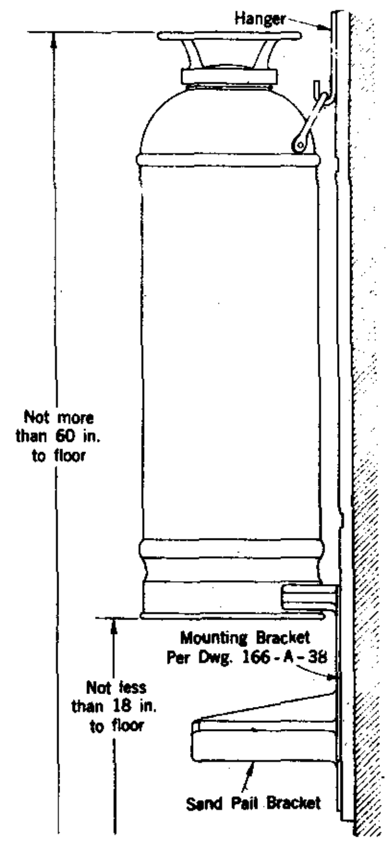


Fig. 2.

4.02 Where extinguishers are placed on free standing columns, arrangements for mounting may include metal bands encircling the column or if it has been predetermined in what locations they will be required, consideration should be given to including mounting arrangements when the columns are constructed.

4.03 If it is unnecessary to mount a sand pail with the extinguisher, it can be mounted as shown in the section covering water type extinguishers.

5. METHOD OF OPERATION

5.01 To operate the extinguisher, proceed as follows:

(1) Remove extinguisher from mounting bracket and carry to fire in upright position.

(2) Hold hose and extinguisher cap handle in one hand, directing the nozzle at the fire, and invert tank holding it by the handle in the bottom with other hand.

(3) Direct discharge at fire from a distance such that the foam will fall lightly on the burning surface. Fighting fire from too close a distance may cause burning liquid to splash and spread fire. If fire is in a container, the discharge should be played on the inside wall.

(4) If possible, walk around fire as foam is played on it.

(5) Reduce liquid discharge by inverting tank to normal position when fire is completely exti guished.

(6) Do not us foam type extinguishers on fires in lving live electrical equipment such a power boards, power plant apparatus or elevator machinery.

(7) Do not return discharged or partially discharged extinguishers to their mounting brackets.

6. MAINTENANCE

(A) Inspection

6.01 Foam type extinguishers should be inspected at intervals for the following items:

(1) Hose is in good condition.

(2) Nozzle opening is unobstructed.

(3) Hose coupling is tight at tank outlet.

(4) Dents are not evident on the extinguisher body at or near the upper or lower horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be discarded at once.

(5) Finish is in good condition.

(6) Mounting bracket is securely fastened to wall.

(7) Record tag is attached and extinguisher has been recharged within the required time.

(B) Recharging

6.02 Extinguishers should be discharged (or emptied) and refilled at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 6.01 should also be made at this time.

Method

6.03 Remove the extinguisher from its mounting bracket and if it is to be discharged, carry it to a suitable location, preferably outside the building, for this purpose. Leaking gaskets, defective hose connections, or other irregularities should be noted as the extinguisher is discharged. Only one extinguisher per floor should be taken out of service at one time.

6.04 Take extinguisher to a location where a new charge can be provided and where the tank can be refilled. Unscrew the cap and remove the inner container from the tank.

6.05 Where it is not desirable to discharge the extinguisher, it may be emptied instead. When this is done, both the tank and the inner container should be completely drained, care being exercised in doing this not to mix the aluminum sulphate and soda solution. If emptied into a slop sink, the soda solution should be poured into the sink first and thoroughly flushed down with water. The aluminum sulphate should then be emptied into the sink and flushed down with water.

6.06 The tank should be examined on the inside for corrosion and for deposits of soda or other foreign material which should be scraped off with a suitable piece of wood. The tank should then be scrubbed with a stiff brush and rinsed thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The cap, inner container and stopple should be scrubbed with a brush and carefully rinsed.

6.07 The extinguisher should then be recharged by carefully following the directions on the recharge packages usually furnished for this purpose. This generally involves thoroughly mixing the "B" solution containing bicarbonate of soda and a foam producing agent with lukewarm water. The temperature of the water should not exceed 100°F. The mixing should be done outside the tank in order to insure that the mixture is thoroughly dissolved. Undissolved soda may clog the hose or nozzle. The tank should be filled to the filling lug taking care not to pour any sediment into it. Filling the tank to levels above the filling lug reduces the air chamber volume and may result in excessive working pressures. Preservatives to prevent stagnation or solutions to lower the freezing point should not be used.

6.08 The recharge is completed by thoroughly mixing the "A" solution (aluminum sulphate) with water as directed and pouring it into the inner container which is then returned to the tank.

6.09 Replace the rubber cap gasket with a new one. Coat the threads of cap and tank lightly with vaseline and screw the cap on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged. A bar or rod should not be used to tighten the cap. The same cap, inner container and stopple must always be associated with the tank from which they were removed; in this connection it is suggested that all recharging operations be completed on one extinguisher before starting operations on the next.

6.10 The date of recharging, etc., should be recorded on the tag provided for this purpose. This tag is shown by Fig. 3.

6.11 The finish of the extinguisher should be examined and polished or painted as required. The hose should not be painted. When the paint is sufficiently dry the extinguisher may be returned to its original location.

6.12 Extinguishers should be emptied before being shipped to other locations.

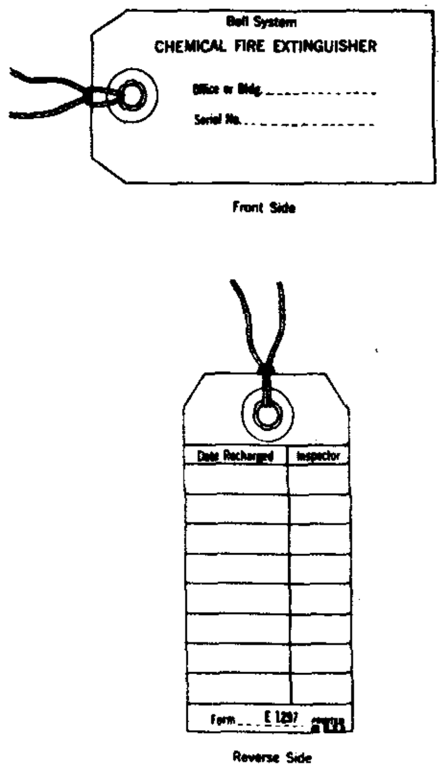


Fig. 3.

CARBON DIOXIDE TYPE FIRE EXTINGUISHERS

1. GENERAL

1.01 Carbon dioxide type fire extinguishers are used for fighting incipient fires in wires, cables, racks, switchboards, power machinery and in certain locations involving flammable liquids. Since the gas is harmless to the equipment, these extinguishers should be used wherever it is possible to get the nozzle within about 2 feet of the flames.

1.02 Extinguishers of two capacities are in use, one containing about 10 pounds of carbon dioxide and the other an older model, replacement of which is recommended in Paragraph 6.12 of this practice, containing about 7-1/2 pounds. The 10-pound extinguisher supersedes the 7-1/2-pound.

1.03 Two types of 10-pound extinguishers are used, their principal difference being in the method of operation. One type releases the gas by rotating a hand wheel and the other by pressure on a trigger. The 10-pound trigger operated extinguisher supersedes the older hand wheel type. Existing hand wheel operated extinguishers should, however, be continued in service as they are considered as providing the same fire protection as the newer type. Hand wheel type extinguishers of 10-pound capacity have been furnished in two over-all weights differing by about 5 pounds. To readily identify these two extinguishers, a yellow mark is furnished on the front of the cylinder of the ligher weight extinguisher. The trigger release extinguisher is about the same weight as the lighter of the two hand wheel types.

1.04 This section is reissued to:

(a) Recommend replacement of 7-1/2-pound carbon dioxide extinguishers.

(b) Recommend periodic replacement of hose assemblies.

(c) Recommend pressure testing of cylinders at time of recharge.

(d) Refer to double numbered Section H43.010, H54.601, "Distribution of Fire Protective Apparatus" of Bell System Practices.

(e) Include changes in certain wording and rearrangement of the text. Arrows are used to indicate changes throughout the text.

1.05 For operation and maintenance application, this section is double numbered with this issue and the same issue number is assigned for uniformity.

2. DESCRIPTION

2.01 Each extinguisher consists of a steel cylinder containing carbon dioxide under pressure which is discharged as a gas through a hose and a cone shaped nozzle when released. A general view of the 10-pound extinguisher having trigger release is shown by Fig. 1, and the 10-pound hand wheel release unit is shown by Fig. 2.

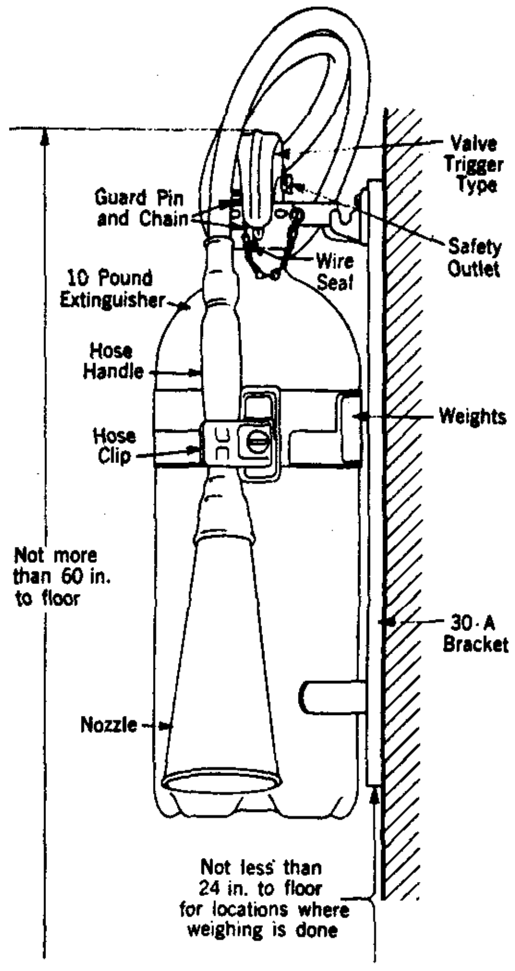


Fig. 1 - New Design with Trigger

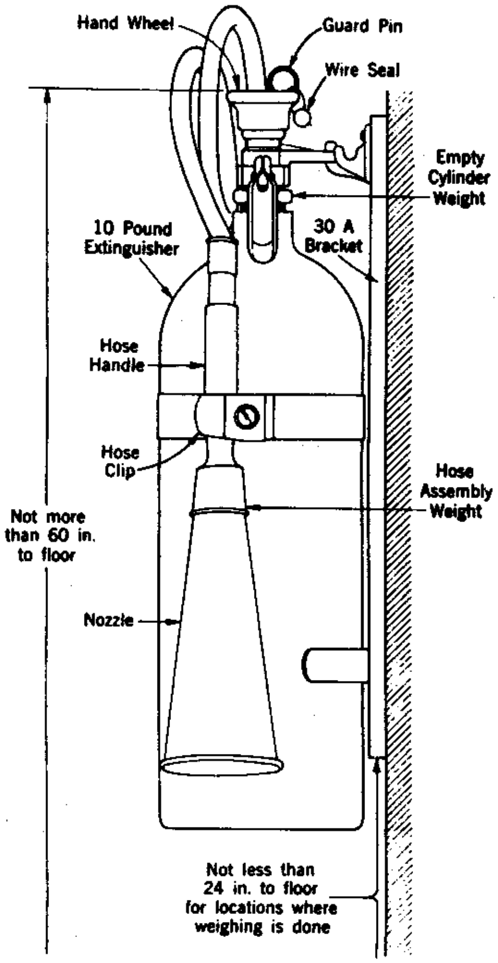


Fig. 2 - Former Design with Hand Wheel

2.02 The gas is most effective when used within about 2 feet from the fire and the discharge for both the 10-pound and the 7-1/2-pound extinguishers continues for 40 to 45 seconds. The gas has no appreciable cooling effect in fighting fires, but extinguishes the flames by its smothering action. In the case of burning fat such as in a cafeteria deep fat fryer care should be exercised that the force of the gas as it is discharged does not spatter the hot fat.

2.03 During the discharge of the extinguisher, solidified gas in the form of "snow" appears in the gas cloud and collects on the floor and other surfaces for a few moments until it evaporates. This "snow" is extremely cold and should not be handled, as frostbite may result.

2.04 Valve - 10-Pound - Trigger Release: Internally this valve has a main and an auxiliary valve seat. Operation of the trigger initially opens the auxiliary valve which admits full gas pressure to both sides of the main valve seat. Further pressure of the trigger opens the main valve with little effort. When not in use both valves are held closed not only by spring pressure but by full pressure of the gas within the cylinder. The trigger can be latched in the open position or can be released at will to stop the flow of gas, thereby permitting temporary conservation of the gas for use on any rekindling action which may occur after the fire has apparently been extinguished. To prevent inadvertent operation, the trigger is locked in the inoperative position by a pin having chain attachment to the body of the extinguisher. The pin must be withdrawn to permit operating the trigger. A wire seal is provided which is broken by operating the trigger, thus furnishing a visible means for determining whether the extinguisher has been operated.

2.05 Valve - 10-Pound Hand Wheel Release: This valve also can be closed after it has been opened, thereby permitting temporary conservation of the gas. The seal is, however, only temporary and is not sufficiently tight to retain the gas for more than a short time. The valve is provided with a guard pin which prevents accidental operation of the hand wheel by fixing it in position. A wire seal gives a visual indication of whether the guard pin and hand wheel have been tampered with. To use the extinguisher it is first necessary to withdraw the guard pin, which operation breaks the wire seal.

2.06 Valve 7-1/2-Pound: The valve on the 7-1/2-pound extinguisher cannot be closed once it has been opened. A hand wheel guard is available for this extinguisher to minimize the possibility of tampering with the hand wheel and discharging the extinguisher while on the mounting bracket. This guard is shown by Fig. 3 and should be provided only in cases where tampering might be expected.

2.07 Safety Cap - 7-1/2-Pound: A safety cap is provided on the 7-1/2-pound extinguisher for use during shipment when the hose is not in place on the extinguisher. It is important that during shipment and storage this cap be in place, since otherwise if the extinguisher is accidentally discharged there is considerable recoil; also the cap provides a

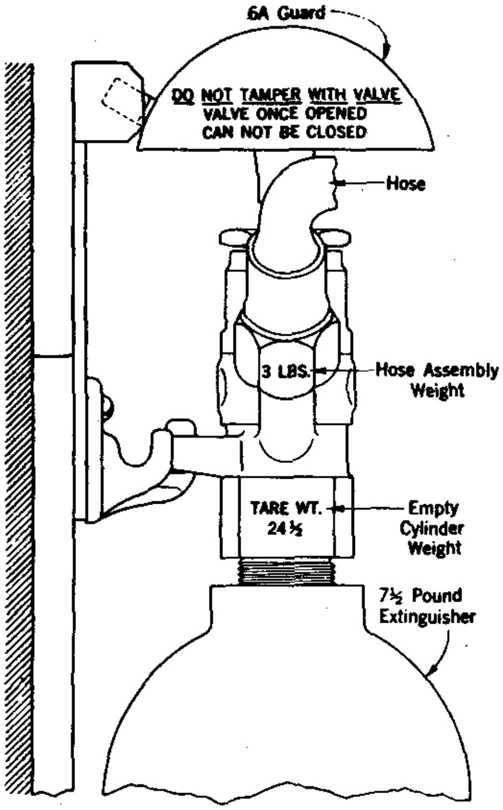


Fig. 3

desirable mechanical protection for the threads of the valve outlet. When not on the valve outlet, this cap is normally attached to a bushing on the extinguisher handle. The 10-pound extinguishers are so designed that separate safety caps are not required.

3. LOCATION

3.01 Carbon dioxide type fire extinguishers may be used in both heated and unheated spaces occupied by telephone equipment.

3.02 The carbon dioxide gas is subject to a rapid rise in pressure where temperatures above normal are experienced. It is desirable, therefore, to locate these extinguishers away from hot surfaces and out of the direct rays of the sun. In general, the clearance between extinguishers and radiators or uncovered heating pipes should be at least 2 feet. This distance may be reduced to 6 inches in the case of covered pipes.

3.03 The general procedure to be followed in distributing fire protective apparatus throughout telephone buildings is outlined in Section H43.010, H54.601 of Bell System Practices.

4. MOUNTING

4.01 10-Pound: The 10-pound extinguishers should be mounted as shown by Fig. 1 and Fig. 2 and if necessary the lower guides bent to hold the cylinder in a vertical position. If a mounting bracket for the 7-1/2-pound extinguisher only is available, it may be adapted to mount the 10-pound extinguishers by obtaining Guide P243864 and fastening it in the mounting holes for the gloves container.

4.02 7-1/2-Pound: The 7-1/2-pound extinguisher if retained in service is mounted as shown by Fig. 1 and Fig. 2 and the lower guides bent to hold the cylinder in a vertical position. Most of the 7-1/2-pound extinguishers have the long mounting brackets shown by Fig. 4 and where these are available they should be used for mounting.

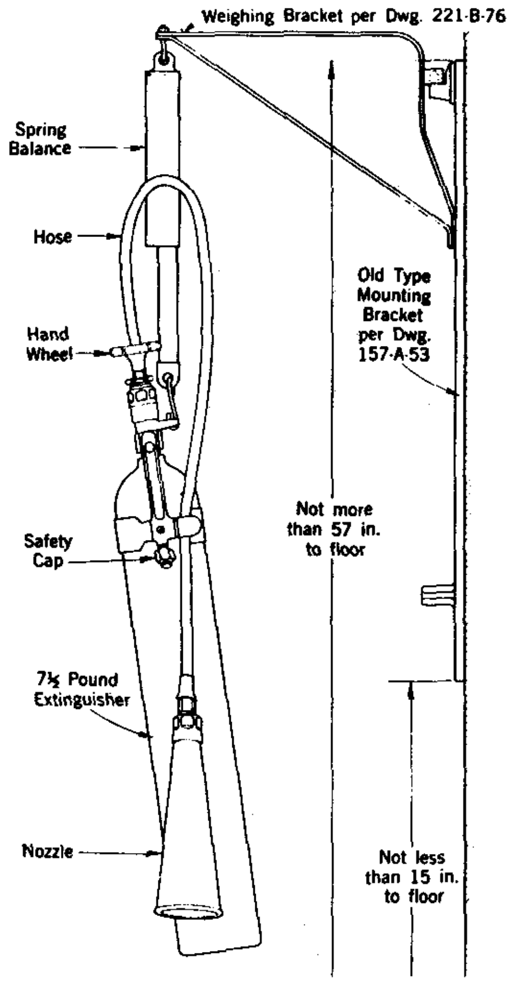


Fig. 4

4.03 Mounting Brackets: The 30A bracket shown for the 10-pound extinguishers is a universal type which is used for the 7-1/2-pound carbon dioxide type if retained in service, the water type, the soda-acid type, and the foam type extinguishers. This bracket replaces the bracket per Drawing 157-A-53 shown by Fig. 4. To insure that a hand wheel operated 10-pound extinguisher of lighter weight (yellow mark on cylinder) is returned to a given location, a yellow mark should be applied with multiple marking paint to the bracket at such location.

4.04 Where extinguishers are placed on free standing columns, arrangements for mounting may include metal bands encircling the column, or if their locations have been predetermined, consideration should be given to including mounting arrangements when the columns are constructed.

4.05 The extinguishers are shipped fully charged and completely assembled for use except that the hose is not attached to the valve. In mounting the extinguishers on the brackets the following directions should be carried out:

(a) Remove the cork or plug from the valve end of the hose which is provided during shipment to protect the inside of the hose from foreign particles.

(b) Inspect the orifice through the nozzle to see that the opening is free.

(c) 7-1/2-Pound Only: Remove the safety cap from the valve outlet and attach it to the lower end of the handle.

(d) Attach the hose securely to the valve with the aid of a wrench.

(e) The extinguisher should be weighed before placing it in service, as outlined in Paragraphs 6.02, 6.03 and 6.04.

(f) 7-1/2-Pound Only: After placing the extinguisher in position on the mounting bracket remove the safety clip around the valve stem which is provided to prevent accidental operation of the valve during shipment.

5. METHOD OF OPERATION

5.01 To operate the extinguisher, proceed as follows:

(1) Remove extinguisher from mounting bracket and carry it to the fire.

(2) 10-Pound Only: Remove the guard pin.

(3) Remove nozzle from the clip and direct at fire. Open hand wheel valve by turning hand wheel to the left. For extinguishers having trigger control, open the valve by upward pressure of the index finger on the trigger. This valve may be latched in the open position, if desired, by pulling the trigger up and forward (toward the valve body). Keep hand on top of 7-1/2-pound extinguisher to prevent its falling.

(4) Direct discharge at base of fire with nozzle about 1 foot from fire, if possible.

(5) Starting at the base of the flames, move nozzle slowly from side to side and work generally upward on the flame area but quickly return below momentarily to wipe out such rekindling as may occur so far as it may be consistent to do so with the fire conditions prevailing above.

(6) While carbon dioxide will continue to be discharged, the extinguisher is ineffective after the discharge of "snow" ceases and, if required, another extinguisher should be brought into play at this time.

(7) 10-Pound Only: If the fire is extinguished before the effective discharge is completed, the discharge may be stopped by turning the hand wheel to the right, or by releasing the trigger to its normal position, as the case may be.

(8) Any glowing embers remaining after the discharge of the gas should be snuffed out with asbestos gloves.

(9) Do not return discharged or partially discharged extinguishers to their mounting brackets. They should be forwarded for recharge in accordance with local instructions. Where recharging is accomplished by the Western Electric Company arrangements will be made for the pressure testing of the cylinders of the extinguishers in accordance with the requirement of the Interstate Commerce Commission (Bureau of Explosives). Where recharging is handled locally it is recommended that arrangements be made with the concerns doing the recharging to accomplish the retesting of cylinders as required by the Interstate Commerce Commission. The date of the last test of the cylinder is stamped on it.

6. MAINTENANCE

(A) Inspection

6.01 Carbon dioxide type extinguishers should be inspected at intervals for the following items:

(1) 7-1/2-Pound Only: That the safety clip has been removed from around the valve stem.

(2) 10-Pound Only: That the wire seal is not broken. If broken, extinguisher should be weighed.

(3) Hose is in good condition especially at couplings.

(4) Nozzle is not broken and orifice is unobstructed.

(5) Hose coupling is tight at cylinder outlet and at nozzle.

(6) Hose is looped back over valve handle and held in place by clip on side of extinguisher in such a way that lower edge of nozzle is slightly above bottom of extinguisher.

(7) Finish is in good condition.

(8) Mounting bracket is securely fastened to wall.

(9) Record tag is attached and extinguisher has been weighed within the required time.

(B) Weighing

6.02 Extinguishers should be weighed at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 6.01 should also be made at this time.

Method

6.03 Weighing of extinguishers should be done with the aid of a spring balance coded No. 120, manufactured by John Chatillon and Sons of New York. The spring balance should be supported by a weighing bracket arranged to be attached to the hook or the extinguisher mounting bracket. This arrangement is shown by Fig. 4.

6.04 Both the 10-pound hand wheel type and the 7-1/2-pound extinguishers have the weight of the empty cylinder stamped on the valve and the weight of the hose assembly stamped on the hose coupling. The 10-pound trigger type has the weight of both the empty cylinder and of the hose assembly stamped on the name plate at the rear of the hose clip. To determine if the extinguisher is in proper condition for immediate use, the following conditions should be met irrespective of any instructions that may be on the name plate:

The total weight (by spring balance) should not be less than:

STAMPED CYLINDER WEIGHT

plus

STAMPED HOSE ASSEMBLY WEIGHT

plus

5 POUNDS

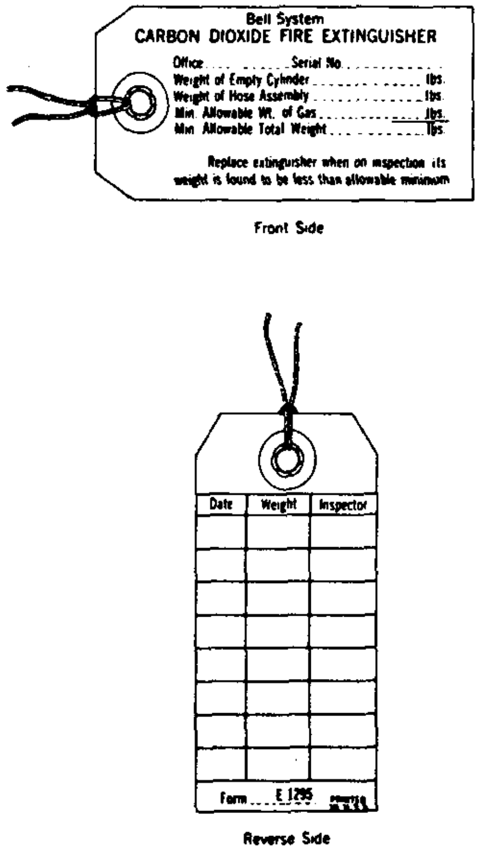


Fig. 5

Recording Weight

6.05 If the extinguisher is within the required weight limit and otherwise satisfactory, it should be returned to its mounting bracket and the weight recorded on the tag provided for this purpose. This tag is shown by Fig. 5.

6.06 Extinguishers which do not meet the requirements should be discharged, and then forwarded for recharge in accordance with local instructions.

6.07 Although the extinguishers are designed with an ample factor of safety and will withstand a reasonable amount of rough usage, care should be exercised while weighing or otherwise handling them to avoid dropping or subjecting the cylinder or valve to an excessive strain.

6.08 The finish of the extinguisher cylinder should be examined and painted as required. The hose should not be painted.

6.09 When returning discharged extinguishers the hose assembly should be disconnected from the extinguisher and in the case of the 7-1/2-pound type the safety cap should be placed over the valve opening.

6.10 The hose assemblies for the 10-pound and 7-1/2-pound extinguishers are not interchangeable. The hose assemblies for the two 10-pound hand wheel control extinguishers of different weights are interchangeable. The hose assembly for the 10-pound trigger control extinguisher is not interchangeable with those of any of the foregoing extinguishers.

(C) Replacement

6.11 The replacement of all remaining 7-1/2-pound extinguishers with the 10-pound unit per KS-14137 is recommended.

6.12 In view of the indicated approximate 10-year service life of the hose assembly and the difficulties involved in pressure testing them, it is suggested that the hose assemblies of 10-pound and larger size carbon dioxide extinguishers be replaced on a 14-year basis. To assist in this replacement the date of manufacture such as (53) is stamped into the metal couplings of hose assemblies of new extinguishers and on all replacement assemblies. For extinguishers obtained prior to the introduction of this procedure it is suggested that the earliest date appearing on the extinguisher body be considered as the date of manufacture of the hose assembly.

ASBESTOS GLOVES

1. GENERAL

1.01 The asbestos glove is used for extinguishing small fires in telephone equipment and for snuffing out small quantities of glowing embers after the flames have been smothered with a carbon dioxide extinguisher. Gloves should be employed only where it is reasonably certain that they will be adequate as compared to using gas or water.

1.02 Gloves are not intended to protect the hands in handling the carbon dioxide extinguisher and should not be used for this purpose.

2. DESCRIPTION

2.01 The glove consists of a 20-inch asbestos gauntlet having three fingers and two thumbs. It is large enough for any hand and arm, and having two thumbs it can be used on either hand without loss of time in arranging a proper fit. See Fig. 1.

2.02 Two gloves comprise a set and are kept in a metal container having a metal ring attached to a hinged cover on the bottom which is pulled down in order to grasp the gloves. The glove container is designed for attachment to the mounting bracket of the carbon dioxide extinguisher and is perforated at four points so that it may be seen whether the gloves are in place.

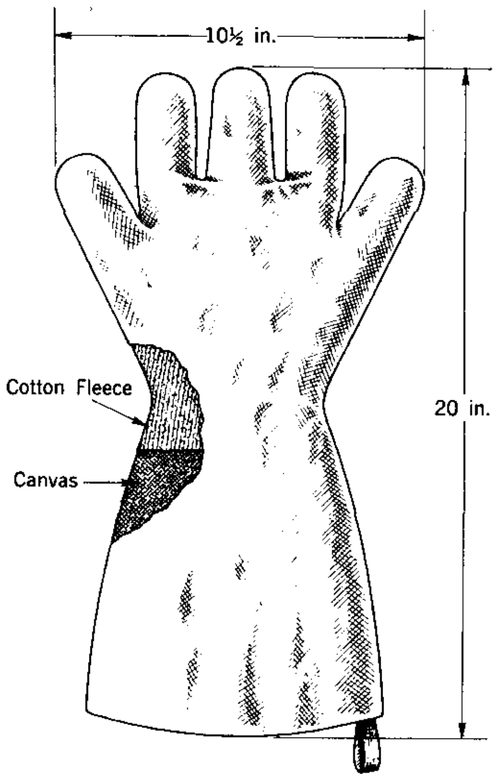


Fig. 1.

3. MOUNTING

3.01 Gloves should be mounted as shown by Fig. 2.

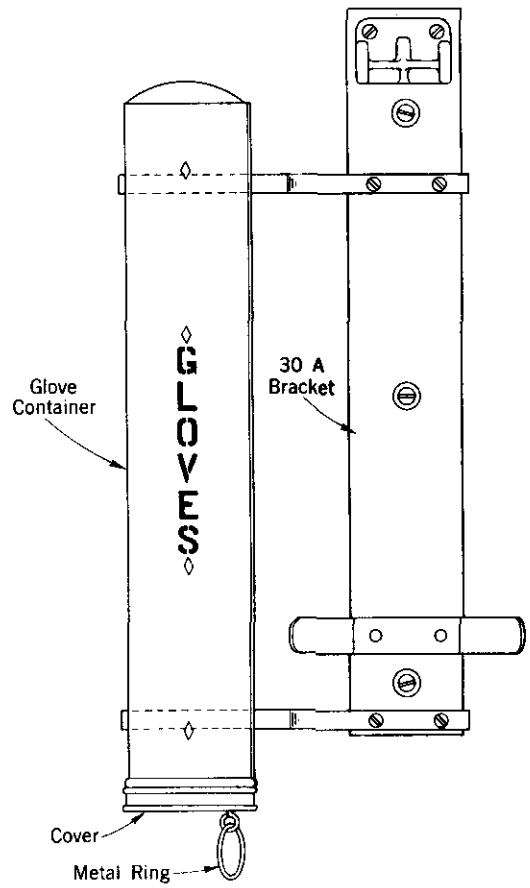


Fig. 2.

4. METHOD OF USING

4.01 To use the gloves, proceed as follows:

(1) Remove gloves from container and carry to fire.

(2) In most cases small fires should be extinguished with the carbon dioxide extinguisher. When gloves are to

be used, place one on each hand and snuff out fire. Gloves may also be used to prevent the spread of fire by putting them in the path of the flames.

(3) Do not use gloves on fires involving live electrical equipment such as power boards, power plant apparatus or elevator machinery.

(4) Return gloves to container after use if they are in suitable condition.

5. MAINTENANCE

(A) Inspection

5.01 Gloves and container should be inspected at intervals for the following items:

(1) Container cover opens freely.

(2) Gloves should be removed from container, inspected and returned with fingers up. They should be loose enough to be easily removed.

(3) Container finish is in good condition. Container should be painted if required.

(4) Mounting bracket is securely fastened.

TARPAULINS

1. GENERAL

1.01 Tarpaulins of the portable type are used to protect telephone equipment and in some cases other important apparatus or records from possible damage from water due to roof or plumbing leaks or other emergency conditions. They should not be used in an effort to smother incipient fires.

1.02 This section is reissued to specify the use of an improved type portable tarpaulin as recommended in P.E.L. 5939. The new tarpaulin can be stored in the present tarpaulin container. It is suggested that consideration be given to the replacement by the improved type tarpaulin of all tarpaulins of the KS-5143 type which have been in service ten years, or earlier where warranted.

1.03 For operation and maintenance application this section is dually numbered and the same issue number is assigned for uniformity.

1.04 Arrows are used to indicate changes in the text.

2. DESCRIPTION

2.01 The KS-15648 List 3 Portable Tarpaulin, described in P.E.L. 5939, is waterproof and flame-retardant. It is approximately 5 feet 10 inches wide by 12 feet long, and is designed for emergency use in telephone offices. The tarpaulin material consists of nylon cloth having a gray-colored coating of polymer or copolymer polyvinyl chloride resin with the hem and center seam electronically sealed. This material is reasonably pliable so that the tarpaulin may be draped over delicate apparatus without danger of damaging the apparatus. The tarpaulin is equipped with grommets in the hem so that it may be tied in position with tie cords when in use. Six tie cords 2 feet 9 inches long are furnished with each tarpaulin and they are stored between the folds when the tarpaulin is in the container.

2.02 Portable tarpaulins are not of sufficient size to protect entire pieces of large equipment (such as a switchboard) from a fire hose or major plumbing break. They are intended to temporarily cover portions of any equipment or apparatus which are threatened from leaking roofs, defective plumbing, etc.

3. MOUNTING

3.01 Portable tarpaulins should be stored two in each sheet metal container provided for the purpose, and this container should be mounted without brackets, as shown in Fig. 1.

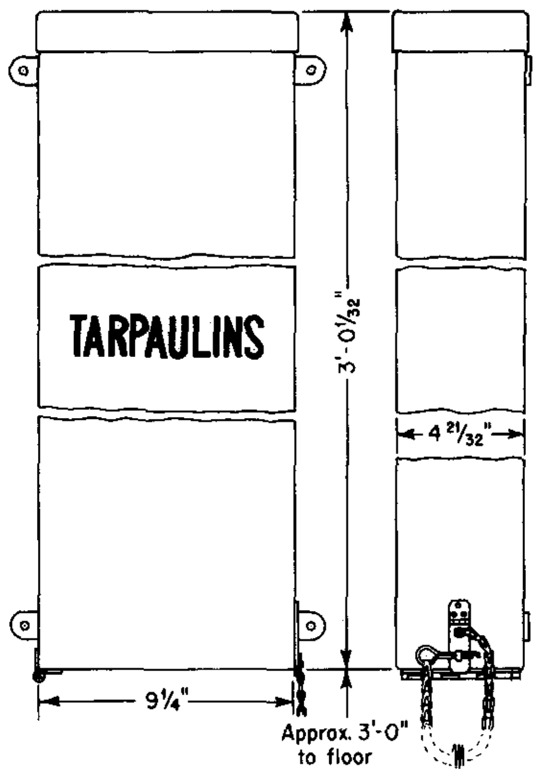


Fig. 1

4. METHOD OF USING

4.01 To use the portable tarpaulins, proceed as follows:

(1) Remove one or both tarpaulins from the container and carry to the required location.

(2) Place tarpaulin over equipment to be protected and, if necessary, secure it in place using eyelets provided in the hem and the tie cords folded with the tarpaulin.

(3) Provide arrangements for taking care of water leakage.

(4) After emergency has passed, dry tarpaulins thoroughly and return to container. Tarpaulins should not be dried over radiators or gas heaters.

5. MAINTENANCE

5.01 → Maintenance of and folding instructions for tarpaulins are covered in Section →H54.610 (H44.210).

STANDPIPE AND HOSE SYSTEMS

CONTENTS PAGE

1. GENERAL

1.01 This practice outlines arrangements for the installation of standpipe and hose systems in new telephone buildings.

1.02 This issue includes a general revision of the practice. Marginal arrows indicating changes in the text are omitted in this issue because of the general revision of the text.

1.03 The codes, ordinances and recommendations contained in this practice are based in general on the standards of the National Board of Fire Underwriters and of the National Fire Protection Association. Where local or State regulations require higher degrees of protection than those recommended in this practice, those regulations should be followed. Additional information pertinent to standpipe and hose systems is available in the following pamphlets:

Standards of the National Board of Fire Underwriters

No. 14 Standpipe and Hose Systems.

No. 20 Installation and Operation of Centrifugal Fire Pumps.

No. 22 Water Tanks for Private Fire Protection Service.

No. 23 Fire Department Hose Connections for Sprinkler and Standpipe.

No. 26 Supervision and Care of Valves Controlling Water Supplies for Fire Protection.

Recommendations of the National Fire Protection Association

No. 198 Care of Fire Hose.

1.04 *Approved:* The word "approved" as used in this section means conformance with Underwriters Laboratories Inc. specifications.

1.05 *Combined Standpipe:* The term "combined standpipe" for the purpose of reference and use in this practice shall mean: "A standpipe installed and sized to provide a water supply both to the 1-1/2-inch first aid hoses which are furnished as part of the system and to the 2-1/2-inch hose outlets to which Fire Department hoses may be attached.

1.06 *Application:* Standpipe and hose equipment is intended for use on interior fires should they reach such proportions they can not be extinguished with portable fire extinguishers. The 1-1/2-inch hose lines are first aid devices for use by the occupants of the building. The 2-1/2-inch hose lines are for Fire Department use, since its personnel are trained in the use of large fire streams. Hose at stations on the roof, where provided, are for use on cooling towers and for the protection of the telephone building against fires in nearby properties. Hose lines are not used on small incipient fires or on live electrical equipment such as power boards, radio, TV, power plant apparatus or elevator machinery.

1.07 *Installation:* The installation of standpipe and hose equipment is to be completed promptly as the building construction work progresses so the equipment will be available for use. See BSP H41.040, FIRE PROTECTION DURING CONSTRUCTION.

2. STANDPIPES

2.01 *General:* Some of the recommendations in the following paragraphs are less restrictive than those appearing in previous issues of this practice. The primary reasons for this are that the provision of an adequate number of portable fire extinguishers, training employees in their use, a continuous program of fire prevention education, and prompt action by employees in cases of fire have had the effect of minimizing the occasions where the use of the first aid fire hose is required.

2.02 The recommendations should be tempered by good judgment after consideration of the following factors:

(a) The external fire exposure to the building.

(b) The prompt availability of an adequate local Fire Department and, in rural areas, road accessibility and fire hydrant location.

(c) The relative importance of the building considered in terms of service essential and restoration time if interrupted by fire.

(d) Extent of combustible material in the building.

(e) Data and assistance in the evaluation of the above factors may be procured through the advisory services of Marsh and McLennan, Inc.

2.03 ***Types of Standpipes:*** For the purpose of this practice, standpipes are defined as follows:

(a) A first aid standpipe is one installed and sized to provide a water supply to 1-1/2-inch first aid hoses only.

(b) A Fire Department standpipe is one installed and sized to provide a water supply to 2-1/2-inch hoses for use by the Fire Department.

(c) A combined standpipe is one installed and sized to provide a water supply to 1-1/2-inch first aid hoses which are furnished as part of the system and to 2-1/2-inch hose outlets to which Fire Department hoses may be attached.

2.04 ***Where to Install Standpipes:*** First aid standpipes should be considered for telephone buildings of one story or higher when they house equipment or records which are of prime importance to the internal affairs of the company or to the rendering of essential telephone service. No exact yardstick is suggested to measure the phrase of "Prime Importance" but a few examples are as follows:

(a) A telephone equipment building housing an initial or ultimate installation of more than 5000 lines of local service.

(b) A telephone equipment building housing an important toll service.

(c) A telephone equipment building housing a local service associated with a Government activity or project.

(d) A nonequipment telephone building housing an accounting center whose records and machines are essential to the internal affairs of the company.

2.05 First aid standpipes may be required in telephone buildings one, two or three stories in height when the factors in 2.02 or 2.04 are considered.

2.06 Combined standpipes are recommended for telephone buildings over three stories in height.

2.07 Future additional stories are considered in determining the type of standpipe system and the size of the standpipes, unless it should appear to be economical in a specific case to replace the initial installation with a larger size or supplement it with other standpipes in connection with the building extension.

2.08 ***Number of Standpipes:*** The number of first aid standpipes for 1-1/2-inch hose or combined standpipe in each building or section of a building within fire walls is in general such that all portions of each story of the building except cable vaults, transformer vaults or power boards are within 20 feet of a nozzle attached to not more than 75 feet of 1-1/2-inch hose connected to the standpipe or to a standpipe lateral. To avoid extensive structural changes in an existing building when alterations are made, the recommended hose length may be increased to 100 feet.

2.09 ***Size of Standpipes:*** First aid standpipes should not be less than 2-1/2 inches in size.

2.10 Combined standpipes should be not less than 4 inches in size in four-story and five-story equipment buildings and not less than 6 inches in size in buildings six stories and higher. In nonequipment buildings combined standpipes should be not less than 4 inches in size in five-story and not exceeding six-story buildings and not less than 6 inches in buildings exceeding six stories.

2.11 ***Location of Standpipes:*** First aid standpipes may be located in the areas to be protected, if this appears desirable to reduce lateral piping runs.

2.12 The recommended location for a combined standpipe is one that affords the best possible protection against exterior and interior fire exposure and mechanical damage. The outlets should be within stairway enclosures, as near the stairway as possible or outside or immediately inside of the exterior walls within one foot of a fire tower or exterior stairway or fire escape.

2.13 ***Hose Connection on Roof:*** Hose connections on the roof are not provided on first aid standpipe systems. If combustibles are on the roof and a combined standpipe system is in use, the standpipes are extended through the roof and outlet valves are installed. The hose connection should preferably be located in a heated space such as a penthouse. If this is not feasible, then an arrangement such as shown in Fig. 1 may be used. The automatic drip valve is provided to prevent freezing. Municipal regulations may require a manifold with three hose connections fed from the same standpipe as shown in Fig. 2. The lateral piping to a hose connection on the roof is 2-1/2 inches in size. Hose should not be installed at these connections unless required by local or State ordinance or law. The thread on the valved outlet must be compatible with those used by the Fire Department that would normally respond to an alarm.

2.14 ***Siamese Connections:*** An outside building Siamese or manifold connection for use by the Fire Department should be provided for standpipes 4 inches and larger. It is to be located on the street wall at a height between 18 inches and 36 inches above grade. Municipal regulations in some cases require a Siamese connection for each street if the building involves more than one street frontage. Each Siamese connection is provided with an approved straightway check valve located in the building. No gate valve is provided. Piping between the check valve and the Siamese connection is arranged to drain automatically. The pipe from the standpipe to the Siamese connection should be at least 4 inches in diameter. See Fig. 3.

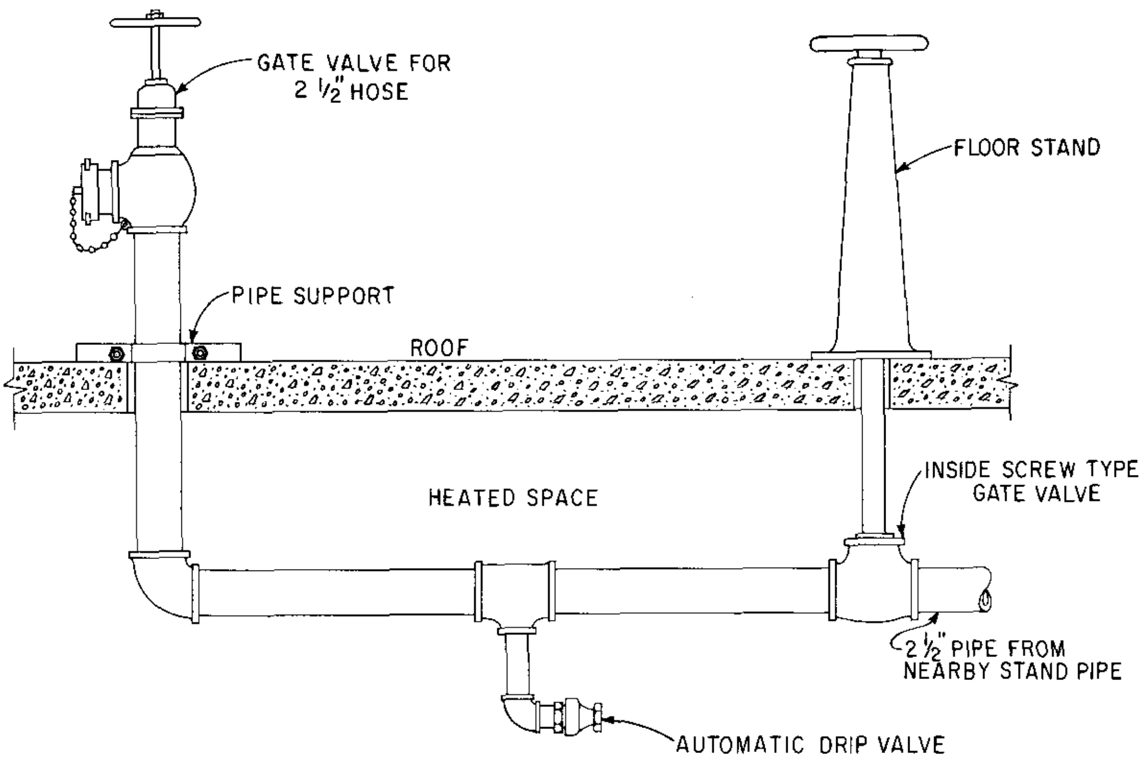


Fig. 1

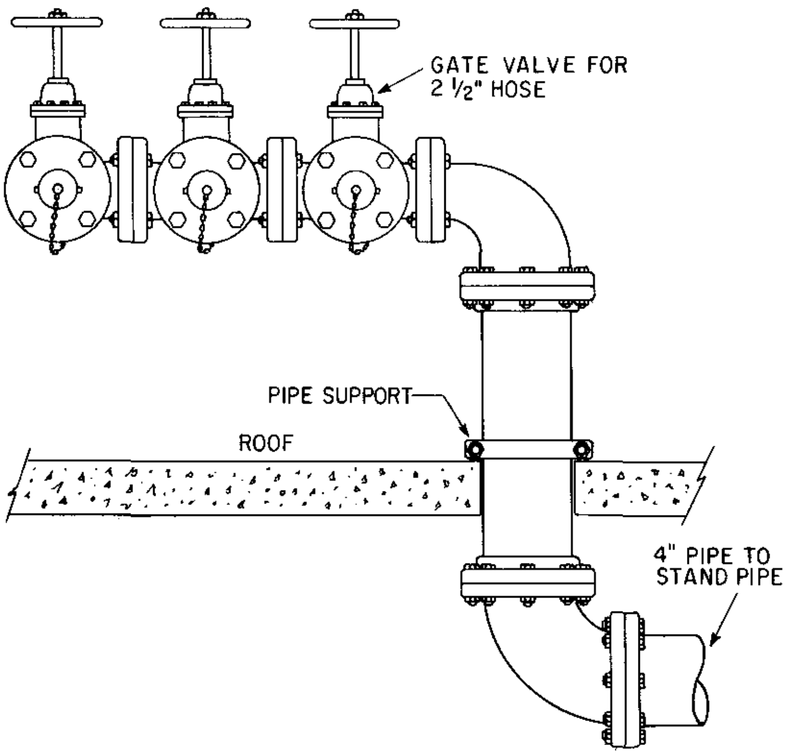

GATE VALVE FOR
2 1/2" HOSE
PIPE SUPPORT
ROOF
4" PIPE TO
STAND PIPE

Fig. 2

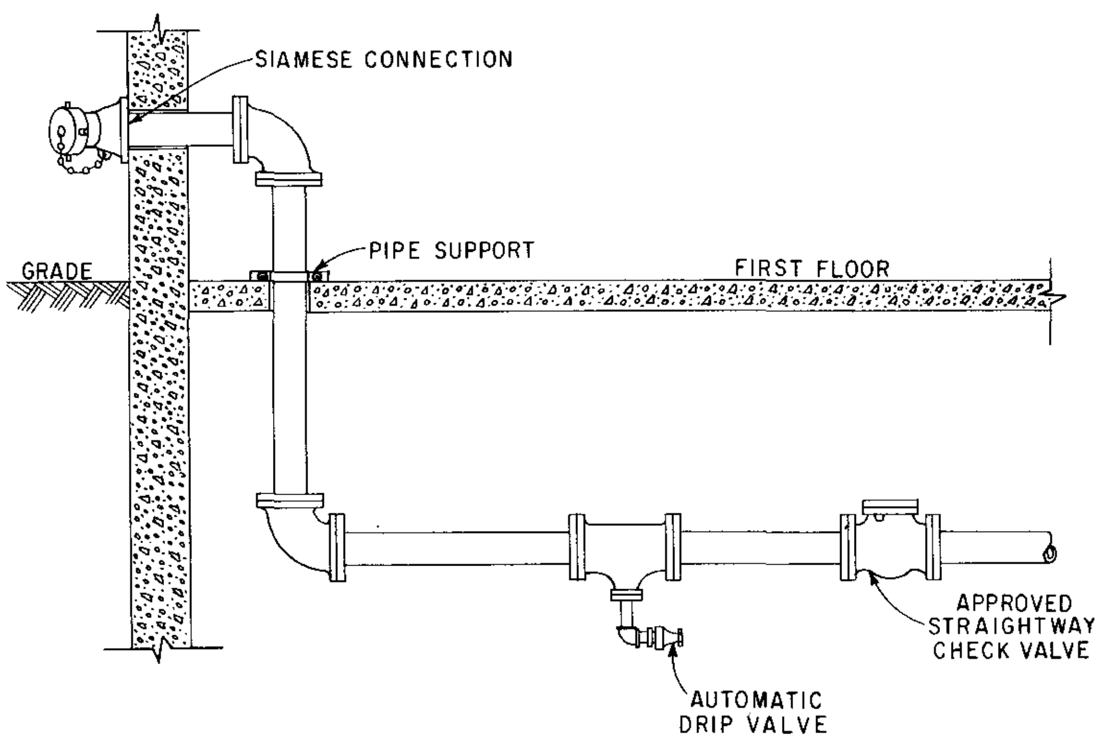

SIAMESE CONNECTION
PIPE SUPPORT
GRADE
FIRST FLOOR
APPROVED
STRAIGHTWAY
CHECK VALVE
AUTOMATIC
DRIP VALVE

Fig. 3

3. HOSE STATIONS

3.01 ***Locations of Hose Stations:*** The 1-1/2-inch hose stations are generally located near the standpipe usually in the space to be protected. In equipment rooms consideration should be given to locating the hose station outside the equipment area if corridors or other nonequipment areas are nearby. The stations should also be kept outside stairways or fire towers as this arrangement permits prompt use of the hose stream without interference with people leaving the building via the stairway. Each 1-1/2-inch hose station inside the building is connected by lateral piping not less than 1-1/2 inches in size to all sizes of standpipes.

3.02 Hose stations must be within reach of a person standing on the floor and as a maximum are not more than six feet from the floor. They are located conspicuously and where it is unlikely they will be obstructed.

3.03 ***Fire Department Standpipe Connection:*** Although a Fire Department 2-1/2-inch valved outlet is provided at each floor on standpipes 4 inches and larger, the 2-1/2-inch hose should not be installed, unless required by local or State ordinance or law. The thread on the outlet must be compatible with those used by the Fire Department that would respond to an alarm.

3.04 ***Hose:*** Each first aid hose station inside the building, regardless of the size of standpipe, is equipped with 1-1/2-inch approved unlined linen hose. Rubber-lined hose is not used as it must be stored away from heat and should have water passed through it at least four times a year to keep the rubber lining in good condition.

3.05 When it is required that 2-1/2-inch hose be installed approved unlined linen hose should be provided.

3.06 When regulations require that hose be installed at the roof connection a sufficient length should be provided to reach all edges of the roof. To facilitate handling, the hose may be made up in sections with no section being more than 100 feet in length. The hose should be coupled to the hose valve if located in the penthouse or other heated space. If necessary to use the arrangement shown in Fig. 2, the hose should be located in an easily accessible hose cabinet in the heated space.

3.07 ***Hose Racks:*** Each 1-1/2-inch hose station is provided with an approved rack securely fastened in position. Racks and valves may be recessed in the wall, provided the walls of a fire cutoff are not reduced in effective thickness. If a door is used to protect the rack from dust, it should be nonlocking and the words "FIRE HOSE" placed on the door.

3.08 When regulations require that 2-1/2-inch hose be installed, an approved rack is provided as for 1-1/2-inch hose unless the installation is in a closet, when it may be stored on a shelf. At each location of 2-1/2-inch hose, a sign should be placed reading "FOR FIRE DEPARTMENT USE ONLY — DANGEROUS."

3.09 ***Hose Valves:*** The hose at each station is coupled to an approved hose valve. Where the normal static pressure at any hose outlet for 1-1/2-inch hose exceeds 50 pounds psi an approved device is provided at each hose outlet valve for reducing the pressure to such a valve that the nozzle flowing pressure will not exceed 50 psi. The pressure regulating device should preferably be of the adjustable type. Each hose valve for 1-1/2-inch hose on a wet pipe system should be provided with a suitable open drip or automatic connection so installed that any slight leakage past the valve seat will be carried off and prevented from entering the fire hose. Care is taken to avoid contact with polish, oils, or wetting the stored linen hose inasmuch as this type of hose is subject to rot or mildew. The danger of the hose becoming wet while on the rack also can be avoided by having the hose placed entirely above the outlet (coiled upward instead of downward) with a pin hole on the lower side of the nipple for drainage.

3.10 ***Nozzles:*** Solid stream nozzles for the 1-1/2-inch first aid hose are not to be used in telephone equipment areas, AMA centers, Electronic Data Processing centers, radio or TV or power rooms. Where nozzles of this type are in use within reach of these areas, consideration should be given to relocating them to nonequipment spaces and replacing with a nonadjustable spray-type nozzle as soon as practical. The spray nozzle used should have a nonadjustable spray pattern of 30° or 35° and designed to go from the shut off position to the 30° or 35° pattern without passing through a solid stream. The water pattern should be accomplished by the use of milled teeth at the nozzle tip as this design prevents clogging and not by the use of a strainer or perforations at the nozzle head. Spray nozzles should be installed on all 1-1/2-inch first aid hoses for new installations.

3.11 A fire hose is not used under any circumstances for purposes other than fire fighting. Violation of this rule may result in hose being missing, defective or useless at time of fire.

4. WATER SUPPLY AND PIPING

4.01 ***Sources:*** Standpipes are connected to approved water supply systems capable of providing water continuously at adequate volume and pressure as outlined in the following paragraphs.

4.02 ***Street Mains:*** Generally a standpipe water supply is from a municipal street main but if the street main is not capable of providing water at the minimum quantities outlined in subsequent paragraphs one or more methods of augmenting the street main supply is required.

4.03 ***Character of Water Supply:*** The recommended design of a water supply system for standpipe and hose is one that provides the following:

(a) An available water supply for 1-1/2-inch hose line streams for use of the building occupants in the initial effort to control a fire. The supply will furnish 70 gallons per minute so as to afford two good first aid streams simultaneously for at least 30 minutes. The pressure is sufficient to provide at least 32-1/2 psi (which allows for a 7-1/2 psi friction loss for 75 feet of hose) at the highest 1-1/2-inch nozzle for use by occupants of a building as first aid fire protection.

(b) A means of obtaining water in sufficient volume and pressure to furnish the number of streams required for the full protection of the building for at least 30 minutes. The supply will furnish 250 gpm for a combined standpipe and 500 gpm for two or more standpipes with pressure at the highest hose outlet of 50 psi.

4.04 ***Other Water Systems:*** To provide the character of water supplies previously outlined or augment the available water supply to achieve the required minimum quantities, the following acceptable water supplying systems may be used:

(a) Gravity tank. (Where the height of the tank necessary to achieve the minimum requirement would not be prohibitive.)

(b) Pressure tank.

(c) Fire pumps where the volume of water at the street main is sufficient.

(d) Ground level suction tank with booster fire pump.

(e) Deep well with vertical shaft pump.

See Standards for the Construction and Installation of Water Tanks for Private Fire Protection (NBFU Pamphlet #22) and Standards for the Installation of Centrifugal Fire Pumps (NBFU Pamphlet #20).

4.05 The connection at the street water main is 4 inches for the 4-inch standpipe and 6 inches for the 6-inch standpipe. If permitted by the local water company, connect the standpipe water supply so that it bypasses the water meter. See Fig. 4.

4.06 ***Gate Valves:*** All gate valves supplying the standpipe system should be sealed in an open position.

4.07 ***Metering:*** If metering is required, the standpipe system may be metered either separately or as shown in Fig. 5.

4.08 ***Size of Water Meters:*** The water meter adds to the total friction loss of water flowing in the standpipe system. In order to maintain the necessary pressure and flow, the meter should be large enough to afford the minimum pressure drop. In locations where a meter system is required by local code or thought desirable, it should be selected only after considering the approximate pressure losses in Table 1 and the water supply's ability to maintain the required pressure.

TABLE 1

Approximate Pressure Drop Through Water Meters (Lb per Sq In.)

METER SIZE	WATER FLOW IN GAL PER MIN 140	250	500
3 inch	5	15	60
4 inch	—	6-1/2	25
6 inch	—	1-1/2	6

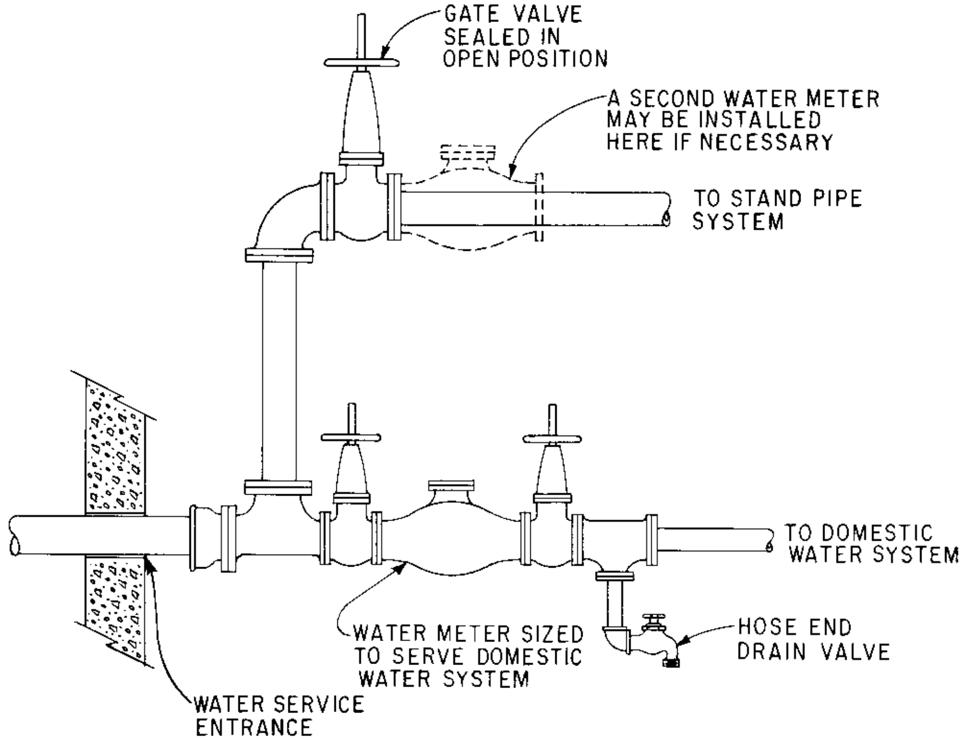


Fig. 4 – Standpipe Bypassing Domestic Water Meter

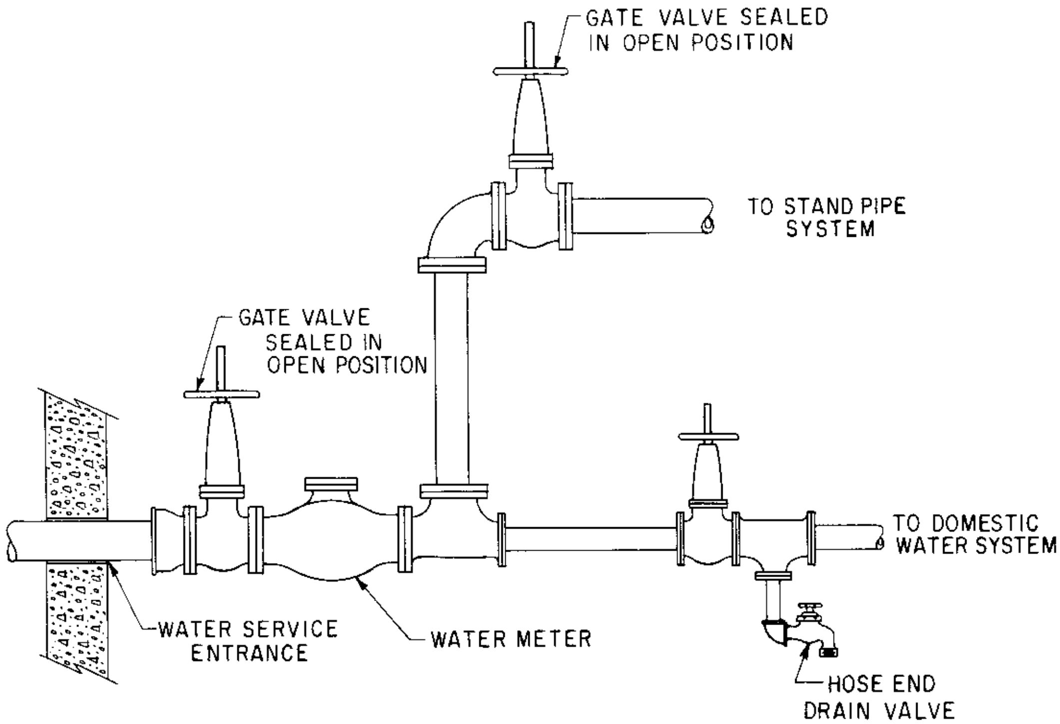


Fig. 5 – Standpipe Connected Through Water Meter

4.09 ***Rural Restrictions:*** Special considerations should be given to large buildings located in areas not served by city water or a municipal Fire Department. A standpipe installation equipped with 1-1/2-inch hoses could be installed with a pumping system capable of furnishing water as outlined in Paragraph 4.04 of this section, for minimum supplies for small hoses. This might be accomplished by utilizing the water storage pressure tank of the sanitary system for the building or a roof tank.

4.10 During times when additions are constructed to large buildings in rural areas a standpipe and hose system as described in 4.09 would afford considerable protection at a time when fire hazards are greater. When additions are made to buildings without a standpipe and hose system consideration might be given to the use of a temporary tank truck with an auxiliary pump capable of supplying water to the highest part of the building at a minimum flowing pressure of 25 psi at the nozzle. This would increase the fire protection facilities during the period of construction.

5. MAINTENANCE

5.01 Maintenance and care of Fire Hose and standpipe systems is covered in BSP H44.210 (H54.610).

INSPECTION OF TELEPHONE COMPANY PROPERTIES

1. GENERAL

1.01 This section outlines the procedures to be followed in the inspection by the Plant Department of those Telephone Company quarters that are not inspected by Marsh and McLennan.

1.02 All quarters occupied by this Company's personnel or equipment should be inspected annually as outlined in this practice. In those quarters leased from another telephone company, the extent of the inspections should depend upon the relations with that company; however, fire or safety hazards in any leased or rented quarters that may endanger telephone personnel or equipment should not be permitted to exist.

2. INSPECTIONS BY THE PLANT DEPARTMENT

2.01 The Plant Department is charged with the responsibility of inspecting annually between April 1 and October 1 those quarters not inspected by Marsh and McLennan. The appendix to this practice lists those buildings or quarters to be inspected. Each Area will maintain and reissue this Appendix when changes are warranted. The inspections shall be made by the District Plant Superintendent or by other personnel he may designate.

2.02 The inspection shall be directed in particular toward the elimination of fire or safety hazards although it may be appropriate to include such other items as building maintenance and house service operations. Special emphasis should be placed upon the requirements of Bell System Practices, Section H54.601, Distribution of Fire Protection Apparatus, Section H54.610, Fire Protection Apparatus and Section H54.405, Means of Egress.

2.03 Form 3050, Annual Fire Protection and Fire Hazard Inspection Report may be used as a guide in making the inspection. The form need not be filled out for each location inspected unless some undesirable conditions are observed that will require remedial action on the part of the General Plant Manager or the Chief Engineer. This procedure may be modified locally if the District Plant Superintendent wishes to maintain a report of the inspections. In those cases where remedial action is required, the original copy of the report shall be forwarded to the General Plant Manager. In all cases when any fire or safety hazard is observed, immediate steps to eliminate them should be initiated.

2.04 The District Plant Superintendent shall report by letter to the General Plant Manager (Minn. to Div. Supt.) all inspections not reported on Form 3050. Details of letter should list the buildings inspected, dates and name of the inspector.

2.05 A knowledge of the requirements of the following practices would be a requisite for completing a thorough inspection:

Fire Prevention Measures	- Section H40.101
Fire Protection Apparatus - General	- Section H43.001
Garages	- Section H40.050
Storage and Use of Paints, Paint Removers, Thinners, Oil, Gasoline, Films, Matches and Explosives	- Section H42.250
Internal Combustion, Engines	- Section H42.210
Chimney Smokestacks, Flues and Vents	- Section H41.260
Interior Construction to Restrict Spread of Fire	- Section H41.230
	" H54.345
Standpipe and Hose Systems	- Section H43.210
Heating Equipment - Fire Protection	- Section H42.110
Protection Against Exposure Fires	- Section H41.215
	" H54.341
Fire Shutters Inspection and Testing	- Section H54.330

Properties Inspected by Insurance Underwriters' Engineer

1.	Albert Lea	143 East Main Street
2.	Anoka and Garage	5th Avenue and Monroe Street
3.	Austin	311 St. Paul Street
4.	Bemidji	515 Beltrami Avenue
5.	Brainerd	402 South 7th Street
6.	Cloquet	11th and Avenue F
7.	Crookston	123 East 2nd Street
8.	Duluth - East End Garage	1021 East 1st Street **
9.	Duluth - West End Garage	2916 West 1st Street
10.	Duluth-Calumet	702 North 54th Avenue West
11.	Duluth-Douglas	1202 West 101st Avenue
12.	Duluth-Hemlock	1806 East 1st Street
13.	Duluth-Melrose	322 West 1st Street *
14.	Duluth-Number 5	4431 Regent Street
15.	Elk River	NOTE 1 #
16.	Excelsior and Garage	560 - 2nd Street
17.	Faribault and Garage	122 N.W. 4th Street
18.	Fergus Falls	310 West Lincoln
19.	Grand Rapids	501 - 2nd Avenue West
20.	Hibbing	318 East 21st Street
21.	Litchfield	4th Street and Ramsey Avenue
22.	Little Falls	202 - 1st Avenue S.E. #
23.	Luverne	Luverne and McKenzie Streets
24.	Marshall and Garage	305 West Lyon Street
25.	Mankato	215 Hickory Street *
26.	Minneapolis-38th Street	3748 Pillsbury Avenue

27.	Minneapolis-Downtown	224 South 5th Street *
28.	Minneapolis-24th Avenue	3308 - 24th Avenue South
29.	Minneapolis-Bryant Avenue	816 - 21st Avenue North
30.	Minneapolis-Gladstone	700 - 6th Street S.E.
31.	Minneapolis-Granville	2643 Central Avenue N.E.
32.	Minneapolis-Kenwood	1111 West 22nd Street
33.	Minneapolis-Beard Avenue	4703 Beard Avenue South
34.	Minneapolis-Hopkins	1101 Excelsior Avenue, Hopkins
35.	Minneapolis-Hopkins (New)	10 - 11th Avenue North, Hopkins
36.	Minneapolis-Orchard	710 Mendelsohn Road
37.	Minneapolis-South	400 West 98th Street
38.	Minneapolis-66th Street	300 West 66th Street
39.	Minneapolis-66th Street Garage	300 West 66th Street
40.	Minneapolis-Vera Cruz	5421 Lakeside Avenue
41.	Minneapolis-Penn Avenue	248 Penn Avenue South
42.	Minneapolis-Garage	900 Laurel Avenue **
43.	Minneapolis-Stores	216 South 5th Street **
44.	Montevideo	120 South 3rd Street
45.	Owatonna	216 South Cedar Street *
46.	Redwood Falls	321 South Washington Street
47.	Red Wing	418 West 4th Street
48.	Rochester	320 - 2nd Avenue S.W.
49.	St. Cloud - Toll	22 - 6th Avenue North
50.	St. Cloud-Exchange	26 - 6th Avenue North
51.	St. Cloud-Garage	Osseo Avenue and 2nd Street North
52.	Sauk Centre	530 - 4th Street North

53.	St. Paul-Emerson	397 South Fairview
54.	St. Paul-Humboldt	350 Front Street
55.	St. Paul-La Salle	134 - 4th Avenue North, South St. Paul
56.	St. Paul-Market Street	70 West 4th Street
57.	St. Paul-Midway	426 North Fairview
58.	St. Paul-Beech Street	881 Beech Street
59.	St. Paul-Rice Street	3323 Rice Street
60.	St.Paul-Cleveland Avenue	33rd and Cleveland Avenue North
61.	North St. Paul	25 - 7th Avenue N.E., North St. Paul
62.	Stillwater	East Olive and 2nd Street
63.	Spring Lake Park	County Road "J" and Central Avenue
64.	Thief River Falls	110-1/2 East 3rd Street # NOTE 2
65.	Virginia	328 - 2nd Avenue South
66.	Virginia Garage	15th Avenue West and West Chestnut #
67.	Wadena	Dayton Avenue and Jefferson Street
68.	Wayzata and Garage	Highway #101 and #12
69.	White Bear	1016 West 4th Street #
70.	Willmar and Garage	411 - 4th Street West
71.	Windom	1044 - 3rd Avenue
72.	Winona	128 West 3rd Street

* Buildings having Long Lines terminal equipment and occupancy

** Leased Property

\# Added this issue

NOTE 1 After 10-15-57

NOTE 2 After 1-1-57

HBR:

List of locations in the Northern Division to be inspected by the Plant Department.

Building	Occupancy	Address
Commerce Building	Division Office	8 E. 4th St.
	Downtown District	
Selby*	Garage	524 Selby Ave.
Bayport*	C.D.O.	
St. Croix Beach	C.D.O.	
St. Paul Park*	C.D.O.	
Hastings*	Repeater Station	
Stillwater Jct.	Repeater Station	
R1E-Newport*	Repeater Station	
	Suburban District	
Ballard*	District Office	308 Wabasha
Forest Lake*	C.D.O.	
Mahtomedi	C.D.O.	
North St. Paul	Dial Office	
Marshall	Garage	1431 Marshall Ave.
	Detroit Lakes District	
District Office	Office	125 E. Frazee St.
Battle Lake	C.D.O.	
Baudette	Manual Office	
Cass Lake	C.D.O.	
Henning	C.D.O.	
Mahnomen*	C.D.O.	
Nisswa	C.D.O.	
Park Rapids*	Manual Office	113 W. 3rd St.
Roseau	Manual Office	
Staples*	Manual Office	411 - 2nd Ave. N.E.
Warroad	Manual Office	411 - W. 4th
R1E-Rollag*	Repeater Station	
R2E-Luce*	Repeater Station	
R3E-Sebeka*	Repeater Station	
J1E-Rothsay	Repeater Station	
J2E-Evansville	Repeater Station	
	Duluth District	
Elks*	District Office	311 W. 1st St.
Barnum	C.D.O.	
Biwabik*	C.D.O.	
Buhl*	C.D.O.	
Carlton	C.D.O.	
Chisholm*	C.D.O.	8 - 2nd Ave. N.W.
Coleraine*	Manual Office	
Cook	C.D.O.	

Building	Occupancy	Address
	Duluth District (cont.)	
Cohasset	C.D.O.	
Duluth		
Downtown*	Garage	505½ W. Superior
Pike Lake	C.D.O.	
Gilbert*	C.D.O.	
Grand Marais	Manual Office	
Grand Marais	Toll Terminal	
Grand Rapids*	Garage	
Hinckley*	C.D.O.	
Hovland	C.D.O.	
Keewatin*	C.D.O.	
Marble	C.D.O.	
Moose Lake	Manual Office	
Moose Lake	Repeater Station	
Mountain Iron	C.D.O.	
Nashwauk	Manual Office	201 - 2nd St.
North Branch	Manual Office	
Orr*	C.D.O.	
Pengilly	C.D.O.	
Pine City	Garage	
Pine City	Repeater Station	
Pine City*	Manual Office	
Rush City	C.D.O.	
Silver Bay	C.D.O.	
Sandstone	Manual Office	
Sandstone	Repeater Station	
Tofte	C.D.O.	
N2S-Atkinson	Repeater Station	
N3W-Soderville	Repeater Station	
Wales	Micro Wave Station	
Duluth	Micro Wave Station	329 W. 10th
Duluth	Mobile Radio	807 W. 10th
Beaver Bay	Repeater Station	
Beaver Bay	Toll Terminal	
	St. Cloud District	
Volkmuth	District Office	
Appleton	Manual Office	42 W. Snelling
Avon*	C.D.O.	
Beardsley	C.D.O.	
Braham	C.D.O.	
Buffalo*	Manual Office	
Cambridge*	Manual Office	127 No. Main
Cambridge	Repeater Station	
Clinton	C.D.O.	
Cold Springs	C.D.O.	
Elk River*	Manual Office	
Fergus Falls	Garage	

St. Cloud District (cont.)

Building	Occupancy	Address
Foley*	Manual Office	
Glenwood*	Manual Office	15½ E. Main
Graceville*	Manual Office	
Holdingford	C.D.O.	
Isanti	C.D.O.	
Montevideo*	Garage	418 South 1st
Monticello	C.D.O.	
Milaca*	Manual Office	
Mora*	Manual Office	128 N.E. Railroad
Morris	Manual Office	8 E. 6th St.
Ogilvie	C.D.O.	
Ortonville*	Manual Office	6 N.W. Second
Paynesville	Dial Office	300 Washburne Ave.
Pierz	C.D.O.	
Princeton*	Manual Office	501 - 1st St.
Royalton	C.D.O.	
Swanville	C.D.O.	
St. Joseph*	C.D.O.	
Watson*	C.D.O.	
K2W-Buffalo	Repeater Station	
K3W-Maple Lake	Repeater Station	
K1E-Spring Hill	Repeater Station	
K2E-Eden Valley	Repeater Station	
K3E-Kimball	Repeater Station	
R1W-Zimmerman*	Repeater Station	
R2W-Gilman*	Repeater Station	
R3W-Little Falls*	Repeater Station	
R4W-Motley*	Repeater Station	
K1N-Atwater	Repeater Station	
Sauk Centre	Filter Hut	

*Indicates leased

FIRE AND SAFETY INSPECTION AND ADVISORY SERVICES RENDERED BY MARSH AND McLENNAN

1. GENERAL

1.01 This section furnishes a general outline of the fire and safety inspection and advisory services provided by Marsh and McLennan, Inc., for the Associated Companies and covers the services described in P.E.C. 647 and P.E.L. 3429 as amended by a Chief Engineer's Letter and Comptroller's Letter dated November 20, 1957.

1.02 These inspection and advisory services will be rendered for self-insured risks as well as for risks on which commercial insurance is carried.

1.03 This section is reissued for the following reasons:

(a) To change the basis for the advisory and inspection services of Marsh and McLennan from a dollar value basis to one based on occupancy, size and exposure.

The welfare and safety of the people is of prime concern and this is considered first for any location. Occupancy refers to the number of people and size to the amount of equipment involved. Space occupied by equipment, vehicles or supplies, while important, is considered more as to size of the installation and the effect a loss would have on continuity of telephone service.

Fire exposure must be considered for all locations and is of primary concern when the initial building is placed on the new site.

(b) To recommend various inspection intervals for different groups of buildings.

(c) To include a suggested form for preparation of inspection lists.

1.04 Arrows are not used to indicate changes in this issue because of the major revision of the text.

2. ADVISORY SERVICES

2.01 Marsh and McLennan will furnish advice with respect to fire protection and safety for new buildings, for extensions to existing buildings and for important alterations. It is desirable that this service be utilized as early as practicable in the schedule of a given project so that there will be ample time for reviewing and considering any recommendation before the drawings and specifications for a building are completed.

2.02 Marsh and McLennan will also provide the following advisory services:

(a) Furnish advice, upon request, with respect to plans and specifications in other cases where some specific fire protection or safety question has arisen.

(b) Furnish information and advice on specific questions on all subjects having to do with insurance and fire protection practices.

(c) Furnish information with respect to Underwriters' rules and recommendations, also as to rates and penalties in specific cases.

(d) Furnish advice with respect to fire protection questions involved in the selection of buildings and supplies equipment and for the handling and storage of oils, gasoline, fuels and other combustible materials.

(e) Assist in the development of fire extinguishing equipment, in its application and in plans for the education of field forces in the proper use of fire fighting apparatus.

(f) Receive and review reports of all fires in telephone properties, and assist in investigating and analyzing specific fires upon request.

(g) Furnish information regarding important fires in other than telephone properties, where these are of general interest, also in connection with fire protective and preventive matters.

3. INSPECTION INTERVALS AND SERVICES

3.01 Marsh and McLennan will provide detailed inspections of all buildings and central office installations appearing on the prepared list for inspections submitted by the Associated Companies. The inspections, so far as practicable, are to be made with Telephone Company representatives, thus affording opportunity for joint consideration of the problems involved.

3.02 ***Inspection Intervals:*** It is preferable that the number of locations to be inspected not fluctuate from year to year, but it is not necessary to omit or add a location merely to maintain an average. For this reason the locations inspected at the three to five-year interval are to be divided so that approximately the same number of locations are listed for inspection each year. The following inspection intervals are recommended:

(a) One-Year Inspection Interval

(1) Large buildings normally occupied by Personnel (Administration, Accounting, Clerical or Operating Personnel) where the occupancy is more than 100 people.

(2) Large central offices.

(3) Important long distance switching centers.

(4) Repeater stations located on important long distance routes. These buildings would be considered as a group or district and a representative building would be selected each year for inspection. The typical building would indicate any corrections required at other similar buildings.

(5) Large work centers used for repair and for material storage or garages used for parking more than 50 vehicles.

(b) Three to Five-Year Inspection Interval

(1) Dial office buildings combined with small operating room and/or business office.

(c) Other Intervals

Some properties may be listed for an inspection, either annually or at some other interval when in the opinion of the Telephone Company they require special consideration. This could be the case with an old manual office, small unattended dial office, or a location where the adjacent areas are undergoing considerable change.

(d) Inspection of New York

All new buildings (large) and major alterations or additions to large buildings would be listed for an inspection by Marsh and McLennan. An inspection during construction of a multistory building may be desirable. The listing of such buildings for inspection would be planned to coincide with the next regular inspection trip by the Marsh and McLennan inspectors providing that the next regular inspection would occur during a period of construction when an inspection would be worth while; however, an inspection may be scheduled outside the regular intervals when deemed necessary by the Telephone Company.

(e) Leased Buildings

It is desirable to list leased quarters for inspections particularly where a sizeable number of people are involved. There is an advantage in having this inspection before a lease is signed to discover if costly alterations might be necessary to insure fire and safety features and exits.

3.03 ***Fire Protection:*** This service covers an inspection of the property from the standpoint of possible fire hazards existent within and without the building, the number of and conditions surrounding fire exit facilities, the adequacy and condition of fire protection equipment and the conditions of the building as regards protection against fire and other hazards.

3.04 ***Accident Hazards:*** This service covers an inspection of the property to disclose possible accident hazards existent within or without the building. General safety features will be included in the inspection with the view of maintaining proper standards to avoid possible accident hazards. This service, however, excludes detailed elevator inspections and does not contemplate detailed check of the structural strength of buildings such as determining whether the structural design of the floor is adequate for the loads being carried.

3.05 ***Boilers and Boiler Rooms:*** This service includes a general inspection of all heating boilers (except those inspected by others), water heaters and related equipment as well as boiler rooms in general.

3.06 ***Special Inspections:*** Marsh and McLennan will, upon request, make special inspections of properties where some specific fire protection or safety question has arisen.

4. PREPARATION OF INSPECTION LISTS

4.01 The following is recommended in the preparation of inspection lists.

(1) List locations alphabetically by city and state.

(2) Indicate all locations appearing on the list for the first time. If construction will not be completed by the beginning of the year, indicate the approximate "in-service date." (If completion date is not met during the year, advise Marsh and McLennan so that inspection may be deferred.)

(3) List locations which are due for retirement in the current year with the approximate date thereof.

(4) Use specific street numbers or clear location description if street number is not given.

4.02 Inspection forms are available through Marsh and McLennan, Inc.

FORM 19.18

Page No. ____________

____
TELEPHONE COMPANY

LIST OF BUILDINGS TO BE INSPECTED

Year ________ State ______________________

LOCATION OF PROPERTY		FOR MARSH & McLENNAN USE ONLY	
CITY	STREET	Date of Inspection	Date Report Received

LIST OF LOCATIONS TO BE INSPECTED
BY MARSH & McLENNAN - 1961

STATE OF MINNESOTA

Northern Division

Bemidji & Garage	515 Beltrami Avenue
Brainerd	402 So. 7th St.
Crookston	123 East 2nd St.
Detroit Lakes	Front St. & Summit Avenue
Duluth East End Garage	1021 E. 1st St.
* Duluth West End Garage	2916 West 1st St.
Duluth-Calumet	702-54th Avenue West
Duluth Hemlock	1806 East 1st St.
**Duluth Melrose	322 West 1st St.
Duluth #5	4431 Regent St.
Fergus Falls	310 West Lincoln
Fergus Falls Garage	Sheridan and Hampton Avenue
Glenwood	Franklin Avenue & Oak St.
Hibbing	318 East 21st St.
* Hibbing Garage	2515-1st Avenue
Little Falls	202-1st Avenue S.E.
Park Rapids	107 So. Park Avenue
Pine City	7th St. & 4th Avenue
St. Cloud Toll	22-6th Avenue No.
St. Cloud Exchange	25-6th Avenue No.
St. Cloud Garage	144 Osseo Avenue No.
St. Paul Emerson	397 South Fairview
St. Paul Humboldt	350 Front Street
St. Paul LaSalle	134-4th Avenue N. So. St. Paul
St. Paul Market St.	70 West 4th St.
St. Paul Midway	426 North Fairview
St. Paul Beech St.	881 Beech Street
St. Paul Rice St.	3323 Rice Street
St. Paul Cleveland Av.	33rd and Cleveland Avenue No.
St. Paul Lexington Av.	2990 South Lexington
St. Paul Maplewood	2565 E. Conway Avenue
* St. Paul Ramsey Garage	349 North-Smith
* St. Paul Moreland A. Ga.	So. Robert & Moreland Avenue W.
St. Paul Sylvan Ave. Ga.	Hawthorne & Sylvan St.
Sauk Centre	530 - 4th St. So.
Stillwater & Garage	302 So. 2nd St.
Thief River Falls	110½ East 3rd St.
Virginia	328-2nd Avenue South
Virginia Garage	15th Avenue West & Chestnut
Wadena	406 Jefferson
White Bear Lake	1016 West 4th St.

* Leased Property
** Building having Long Lines Terminal Equipment and/or occupancy.

Southern Division

Albert Lea	143 East Main Street
Anoka & Garage	5th Avenue and Monroe Street
Austin & Garage	311 St. Paul Street
*Austin Garage	106 S. Railway St.
Excelsior & Garage	560-2nd Street
Faribault & Garage	122 N.W. 4th Street
Marshall & Garage	305 West Lyon St.
**Mankato	215 Hickory St.
Mpls. 38th Street	3748 Pillsbury
**Mpls.-Downtown & Gar.	224 So. 5th Street
Mpls. 24th Avenue	3308-24th Avenue South
Mpls. Bryant Avenue	816-21st Avenue North
Mpls. Granville	2643 Central Avenue N.E.
Mpls. Beard Avenue	4703 Beard Avenue South
Mpls. Hopkins	1101 Excelsior Avenue, Hopkins
Mpls. Hopkins (New)	10-11th Avenue No., Hopkins
Mpls. South	400 West 98th Street
Mpls. 66th Street	300 West 66th Street
Mpls. 66th Street Gar.	300 West 66th Street
Mpls. Vera Cruz	5421 Lakeside Avenue
*Mpls. Laurel Garage	900 Laurel Avenue
*Mpls. 42nd Ave. Gar.	6105-42nd Avenue No.
*Mpls. 40th Ave. Gar.	836-40th Avenue N.E.
*Mpls. Nicollet Ave. Gar.	3920 Nicollet Avenue
*Mpls. 3rd St. Garage	1507-3rd Street S.
*Mpls. Gorham Garage	3230 Gorham Avenue
Mpls. 212-216 So. 5th St.	212-216 So. 5th St.
Mpls. 42nd St. Garage	2900 East 42nd St.
Mpls. 4th St. Bldg.	223-227 So. 4th St.
*Mpls. Camden Garage	3829 No. Mississippi Drive
Mpls. Cahill Garage	70th & Cahill
*Mpls. Plymouth Bldg.	6th & Hennepin
**Owatonna	216 So. Cedar St.
Pipestone	401 S.W. 4th St.
Preston	210-14 Fillmore
Red Wing	418 W. 4th St.
Redwood Falls	321 So. Washington
Rochester	320-2nd Avenue S.W.
*Rochester Garage	520-6th Avenue N.W.
Shakopee	2nd & Sommerville St.
Spring Lk Pk & Garage	County Rd "J" and Central Avenue N.E.
Wayzata & Garage	Highways 101 and 12
Windom	1044-3rd Avenue

Following Building to be added after April 1961:

Mpls. Brooklyn Center	1101-65th Avenue No.

* Leased Property
** Buildings having Long Lines Terminal Equipment and/or occupancy.

FIRE AND SAFETY INSPECTION AND ADVISORY SERVICES RENDERED BY MARSH AND McLENNAN

1. GENERAL

1.001 This addendum is issued to correct Paragraph 3.02 (d) in Part 3 of Section H44.015.

1.002 Correct Paragraph 3.02 (d) to read:

(d) Inspection of New Work.

FIRE AND SAFETY INSPECTION AND ADVISORY SERVICES RENDERED BY MARSH AND MCLENNAN

1. GENERAL

1.01 This addendum specifies certain administrative procedures in connection with the inspection of Telephone Company buildings by the Marsh and McLennan Company.

2. ADVISORY SERVICES

Added text

2.03 All requests for services of the Marsh and McLennan Company shall be referred along lines of organization to the Chief Engineer.

3. INSPECTION SERVICES

3.01 Add: Annually the Assistant Vice President (Engineering) will, in conjunction with the Areas, prepare a list of all the properties to be inspected by Marsh and McLennan. (See Appendices A,B, C,D, and E)

Added text

3.06 Should any reports or communications be received from Marsh and McLennan, they should be directed to the Chief Engineer.

3.07 The Chief Engineer will receive from the Marsh and McLennan Company the Inspection Reports covering those buildings inspected. He will review the reports and for those cases requiring corrective measures, prepare two copies and forward them to the General Plant Manager together with any Job Orders, Estimates or recommendations necessary to effect the corrective measures as recommended.

3.08 The General Plant Manager will arrange to have the recommendation carried out and will report completion to the Chief Engineer who will in turn inform the Marsh and McLennan Company.

INSPECTION OF TELEPHONE BUILDINGS FOR GAS HAZARDS

1. GENERAL

1.01 This section outlines the procedure to be followed in the daily inspection of cable vaults and other portions of basements in telephone exchange buildings in communities served with gas, primarily as a safeguard against hazards from the entrance of migrating gas.

1.02 In communities served with gas, this applies also to unattended dial offices.

1.03 Employees assigned the duty of carrying out the provisions of this Practice must be cautioned and supervised to insure against the relaxation of vigilance otherwise likely to occur in following a routine examination to detect the presence of a danger which will be very rarely encountered.

2. UNATTENDED DIAL OFFICES

2.01 Before entering such an office which has been closed for a time, note carefully whether there is any smell of gas or any other foreign odor which might be dangerous. If gas or suspicious odors are noted, avoid switching on lights or approaching with flames or lanterns which might ignite combustible gases. Open the door and thereby clear the room of the gas before entering and be careful to avoid all possible causes for ignition until the dangerous conditions have been corrected.

2.02 Be sure to leave the ventilators at unattended dial offices open and free so that natural ventilation will tend to avoid any accumulation of dangerous gases at times when no one is present in the building.

3. TELEPHONE OFFICES WITH UNDERGROUND CABLE ENTRANCES

3.01 This applies only to telephone offices with cables entering through underground ducts which terminate below the level of the first floor.

3.02 A daily inspection shall be made of cable vaults and other portions of the basement of telephone buildings to determine whether dangerous gases or undesirable odors are present.

3.03 In special cases where it is known that the gas supply system is leaking, particularly in the winter months, this inspection should be made more often as circumstances may warrant.

3.04 Use the sense of smell to indicate the presence of free gas.

3.05 Some individuals are relatively insensitive to the smell of gas and such individuals should not be assigned the duty of making this inspection.

3.06 Immediately before proceeding with the inspection of cable vaults and basements, the inspector should go outside the building for a few moments sufficient to sharpen his sense of smell, relieving it temporarily of any lack of sensitivity due to an atmosphere laden with tobacco smoke or other adverse factors.

3.07 Examine a round all floor drains and plumbing fixtures for gas which may be entering from the sewer because traps are not properly filled.

3.08 Examine all normally closed rooms in which foreign gases or odors might enter and accumulate owing to lack of natural ventilation, etc.

4. WHEN GAS IS PRESENT

4.01 Carefully avoid doing anything which might ignite the gas such as bringing open flames near, or operation of pull chains or key sockets for electric lights.

4.02 Ventilate the cable vault by opening the windows.

4.03 The inspector's supervisor should be notified immediately and special instructions obtained as to further procedure.

4.04 The presence of gas shows that at some point there is an opening in the basement wall on floor which should be located and sealed to prevent further entrance of gas.

4.05 The responsible individual in the organization of the municipality or the gas company serving it should be immediately notified and requested to locate and repair the leak in the gas service system without delay.

5. ANNUAL INSPECTION

5.01 Annually the cable vault and the entire basement should be closely examined to detect any openings which may have occurred either in the the masonry walls or around conduits, pipes, etc. Appropriate steps should be taken to immediately replace any seals which appear to have become defective and to provide seals for masonry cracks or other openings not previously present.

MEANS OF EGRESS

INSPECTION AND TESTING

1. GENERAL

1.01 This section outlines suggestions for routine inspections and, where appropriate, tests of the various means of egress generally common to telephone buildings, and is offered as a reference in supplementing the inspection services of Marsh & McLennan in preserving safe and effective exit facilities.

1.02 The means of egress covered include halls, corridors, passageways, interior and exterior stairs, fire towers, fire escapes, horizontal exits, doorways and windows required to furnish safe access to the street or other point of refuge in the event of fire.

1.03 This section is reissued to:

(a) Indicate the codes upon which the recommendations herein are based and which contain certain detail regarding the subject for reference use which is not covered herein.

(b) Refer to Section H32.610, "Stairway Planning and Construction" of Bell System Practices.

(c) Recommend the frequency of inspection of fire escapes and outside stairways.

(d) Include changes in certain wording and rearrangement of the text. Arrows are used to indicate changes throughout the text.

1.04 For operation and maintenance application, this section is double numbered with this issue and the same issue number is assigned for uniformity.

1.05 Codes and Ordinances: The recommendations contained in this section are based in general on the Building Exit Code of the National Fire Protection Association and the Building Code recommended by the National Board of Fire Underwriters. Where the following procedures conflict with or are exceeded by corresponding requirements of local or state legislation, the legislated requirements should, of course, apply.

1.06 It is desirable that routine inspections of all means of egress and tests of certain exit facilities be made at sufficiently frequent intervals to ensure maintaining a maximum degree of safety. The inspections and tests are preferably made by assigned employees who are specially instructed in these procedures. Any faulty conditions disclosed by the routine investigations or that become evident at any time should be corrected at once.

2. HALLS AND PASSAGEWAYS

2.01 Halls, corridors and passageways, including exitways from rooms which lead through other rooms, should be kept free from obstructions. Furniture, items of building or telephone equipment, etc., should not be placed or stored within exitway space, nor should vehicles be parked or materials located where they might interfere with free egress from the building. The amount of scaffolding placed for maintenance operations in exitways should be kept to a minimum, located so as to cause least obstruction and be removed as soon as possible.

3. STAIRWAYS AND FIRE ESCAPES

3.01 Stairs, landings and platforms of interior and exterior stairways, fire towers and fire escapes should be maintained free from all obstructions. Balustrades, hand rails, brackets and newels should be examined for loose connections and anchorages. Electric light or power wires should not be placed above or within 3 feet of outside stairs or fire escapes unless the wires are enclosed in rigid conduit.

3.02 Outside stairs and fire escapes should be inspected at least annually, and should be scraped and painted as often as necessary to maintain them in proper condition at all times. All anchorages, metal supports, brackets and other fastenings for outside stairs or fire escapes should be examined for looseness or excessive corrosion.

3.03 Where the lower flight of fire escape stairs is counterbalanced, its bearings should be kept lubricated and the entire device including its latching arrangement tested by actual operation. When lowering or raising the counterbalanced section it is desirable that care be taken to avoid excessively jarring or stressing the structure. No obstruction should be permitted at any time in the space under a counterbalanced section.

3.04 The landings, platforms, and the treads of all outside stairs and fire escapes are designed so that the accumulation of snow and ice thereon will be reduced to a minimum. The landings, platforms and the treads of outside stairs and fire escapes should be promptly cleaned of snow and ice.

3.05 Section H32.610 of Bell System Practices outlines desirable arrangements for the number and layout of stairways and stairway enclosures in telephone buildings and general features of construction.

4. DOORS AND WINDOWS

4.01 Doors and sash in openings serving as required exits should be tested for proper operation and inspected for sound physical condition. Doors should swing easily and sash move freely without undue effort on the part of the operator. Where necessary, locks, latches, hinges and closing devices should be adjusted to operate smoothly and effectively.

4.02 Revolving doors in required exits should be tested by pressure for release of the wings from each other so that each will swing independently. Where used, revolving doors should not constitute more than 50% of the required door width.

4.03 Automatic fire doors are usually tested for operation by temporarily removing the fusible link.

4.04 It is important that practices of blocking open self-closing doors with wedges, or of tying them open, be discouraged. These doors while closed prevent the passage of smoke through the opening which might otherwise render the adjoining area of refuge untenable. It is recognized that there may be certain cases in which the volume of personnel movement and the urgency of need for additional ventilation may possibly outweigh the matter of smoke protection involved to the extent that management may wish to grant specific approval permitting the doors in such cases to be held open. In this event it is recommended that such doors be equipped with and held open by an automatic door closer having a hold open device the automatic release of which is controlled by a fusible link.

5. EXIT LIGHTS AND SIGNS

5.01 Exit signs and regular and emergency lighting for the several means of egress should be kept clean and the control switches checked for proper operation. Burned out lamp bulbs should be replaced promptly with new lamps of proper wattage.

FIRE PROTECTION APPARATUS

ROUTINE INSPECTION AND MAINTENANCE

CONTENTS PAGE

1. GENERAL

1.01 The purpose of this section is to provide the necessary information for the house service or other forces charged with the responsibility for routine inspection and maintenance of fire protection apparatus.

1.02 It is reissued because of extensive changes and to include information regarding the following:

(a) Hydrostatic testing of water-type, foam-type and any of the soda-acid fire extinguishers remaining in use.

(b) A change in the loss of weight tolerance for carbon dioxide (CO_2) fire extinguishers to ten per cent for all sizes.

(c) To describe the procedure for inspecting and weighing the new disposable cylindrically shaped cartridge for the water-type fire extinguisher.

1.03 The newly developed disposable cartridge designated as WF-75 for the water filled cartridge-type extinguishers has been adopted as standard to replace the zinc coated grenade shaped cartridge (WF-53) which has been provided for some years. The new cartridge is approximately twelve inches long by one and one-eighth inch in diameter. To protect it from corrosion, it is brass clad and tin coated. Consequently, it does not require the use of a rubber jacket as with the grenade shaped cartridge. The new cartridge is threaded at the upper end and is screwed into the present cartridge holder the same as with the grenade shaped cartridge. When the cartridge is discharged or fails to meet weight requirements it is disposed of.

1.04 Complete descriptions of the fire protective apparatus covered in this section are given in the following sections:

H43.110 / H54.602	Water-Type Fire Extinguishers
H43.120 / H54.603	Soda-Acid Type Fire Extinguishers
H43.130 / H54.604	Foam-Type Fire Extinguishers
H43.140 / H54.605	Carbon Dioxide-Type Fire Extinguishers
H43.150 / H54.606	Asbestos Gloves
H43.160 / H54.333	Tarpaulins
H43.210 / H54.607	Standpipe and Hose Systems

2. HYDROSTATIC TESTING

2.01 The National Board of Fire Underwriters Bulletin No. 10 dated July 1955 recommends that water extinguishers of the soda-acid and carbon dioxide (CO_2) cartridge propelled types and also foam extinguishers must be given a hydrostatic pressure test at least once every five years.

2.02 Hydrostatic tests may be made by a qualified contractor, either on the premises, in a suitably equipped truck at the building site or at the contractor's service station. All tests shall be carried on in accordance with the procedures given in Section 71 of the above-mentioned Bulletin No. 10.

2.03 If any such extinguisher upon subsequent annual inspection shows evidence of mechanical damage, corrosion, or distortion of the shell as from freezing temperatures or from any other causes it may be unsafe for use. Therefore, regardless of the date of the last hydrostatic test the extinguisher is again given a hydrostatic pressure test before being returned to service.

2.04 Each extinguisher which favorably passes the hydrostatic test shall have an orange record tag Form E-4400 attached to it on which the following will be noted:

(a) date of test

(b) test pressure

(c) name of person and concern making the test

2.05 All fire extinguishers less than five years old that are subject to periodic hydrostatic testing should have an orange record tag Form E-4400 attached. The year of installation should be posted on the tag on the first line in the "date" column and the word "installed" in the second column.

3. MAINTENANCE OF CARBON DIOXIDE FIRE EXTINGUISHERS

(A) Inspection

3.01 Carbon dioxide type extinguishers should be inspected for the following items at least once each year or when placed in service:

(1) ***10 and 15 Pound:*** That the wire seal is not broken. If broken, extinguisher should be weighed.

(2) Hose is in good condition especially at couplings, and that couplings are dated for determination of 14-year safe hose life.

(3) Nozzle is not broken and orifice is unobstructed.

(4) Hose coupling is wrench tight at cylinder outlet and at nozzle.

(5) Hose is looped back over valve handle and held in place by clip on side of extinguisher in such a way that lower edge of nozzle pointing downward is slightly above bottom of extinguisher.

(6) Finish is in good condition.

(7) Mounting bracket is securely fastened to wall.

(8) Record tag is attached and extinguisher has been weighed within the required time.

(B) Weighing

3.02 Extinguishers should be weighed at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 3.01 should also be made at this time.

Method

3.03 Weighing of extinguisher should be done with the aid of a spring balance coded No. 120 manufactured by John Chatillon and Sons of New York. The 5-pound extinguisher requires a more sensitive scale and the Chatillon No. 010 is suggested. The spring balance should be supported by a weighing bracket arranged to be attached to the extinguisher mounting bracket.

3.04 All extinguishers are marked with the cylinder weight and the horn and hose assembly weight so that the weight of gas can be checked without dismantling the parts. To determine that the extinguisher is in proper condition for immediate use, the following conditions should be met:

The total weight (by spring scale) should be not *less* than:

STAMPED CYLINDER WEIGHT
PLUS

STAMPED HOSE ASSEMBLY WEIGHT
PLUS
4½ POUNDS FOR 5-POUND EXTINGUISHER
9 POUNDS FOR 10-POUND EXTINGUISHER
13½ POUNDS FOR 15-POUND EXTINGUISHER

The above method of determining if extinguishers meet the weight requirement shall be used irrespective of any conflicting instructions that may be on the extinguisher nameplate.

Recording Weight

3.05 If the extinguisher is within the required weight limit and otherwise satisfactory, it should be returned to its mounting bracket and the weight recorded on the tag Form E-1295 provided for this purpose.

3.06 Extinguishers which do not meet weight requirements should be carried to a suitable location in building service quarters where the noise of discharge would not be distracting or outside the building, and discharged. Where feasible the discharging may be done for training. The extinguishers should then be forwarded for recharge in accordance with local instructions.

3.07 Extinguishers which develop a leak such as may be evidenced by a hissing sound or the presence of frost about the valve assembly should be immediately replaced. The leaking extinguisher should be discharged and recharged as outlined in Paragraph 3.06.

3.08 Although the extinguishers are designed with an ample factor of safety and will withstand a reasonable amount of rough usage, care should be exercised while weighing or otherwise handling them to avoid dropping or subjecting the cylinder or valve to an excessive strain.

3.09 The hose assemblies for the two 10-pound hand wheel control extinguishers of different weights are interchangeable. The hose assemblies for the 10-pound trigger control and the 15-pound extinguishers are not interchangeable with those of any of the foregoing extinguishers. When ordering hose specify model number and manufacturer.

4. MAINTENANCE OF WATER-TYPE FIRE EXTINGUISHERS

(A) Inspection

4.01 Water filled cartridge type extinguishers should be inspected for the following items at least once each year or when put into service:

(1) Safety guard is upright and plunger is not depressed.

(2) Plunger catch operates freely.

(3) Hose is in good condition.

(4) Nozzle opening is unobstructed.

(5) Hose coupling is wrench tight at tank outlet.

(6) Dents are not evident on the extinguisher body at or near the horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be emptied, removed from service and immediately replaced. Discarded extinguishers should be classified as "junk" and returned through the usual lines of organization to the Western Electric Company branch house for disposition.

(7) Finish is in good condition.

(8) Mounting bracket is securely fastened to wall.

(9) Record tag is attached and cartridge has been weighed within the required time.

(10) Bears orange hydrostatic test record tag Form E-4400 to show that extinguisher has been given the prescribed hydrostatic test within five years. If Form E-4400 shows only the date of installation, check whether hydrostatic test will be due during the current year and, if so, report to supervisor.

(B) Weighing Cartridge

4.02 Extinguisher cartridges should be weighed at least once a year, the tanks cleaned out and refilled to make sure the extinguishers are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 4.01 should also be made at this time.

Method for Grenade Shaped Cartridge

4.03 Remove the extinguisher from its mounting and carry it to a location where the cartridge can be weighed and the tank emptied, cleaned, and refilled. Only one extinguisher per floor should be taken out of service at one time, unless replacements are installed.

4.04 Care should be exercised in handling the cartridges to prevent possible damage to the disc since the rapid release of the gas will propel the cartridges with considerable force. Spare cartridges should be kept in the original container with the safety caps on them until required for use and should be stored in places where the temperatures are normal.

4.05 Unscrew the top cap and dry all parts thoroughly with a clean cloth. Remove the rubber jacket and unscrew the cartridge from the cartridge holder. In the case of extinguishers having a short rubber jacket, discard the lead gasket and replace with a new lead gasket (see Paragraph 4.14). Inspect the rubber jacket for possible defects and discard if unsuitable for reuse.

4.06 In the case of extinguishers having a short rubber jacket, remove the rubber cartridge gasket, inspect it for possible defects and discard if unsuitable for reuse. Only rubber gaskets having an extended lip can be re-used.

4.07 Dry the cartridge with a clean cloth and examine for any evidence of corrosion. Carefully remove any salts from the corrosion areas with a knife blade or suitable sharp tool. If any pitting is evident or if there is any corrosion at the cap the cartridge should be replaced. Good cartridges should now be weighed.

4.08 Scales per KS-6990 are used for weighing the cartridge. Before using the scales, the rubber tubes, provided during shipment over the four knife edges, should be removed and the balance of the scales checked. For cartridges having a stamped weight of about twenty-two ounces, a one pound and a 1/4-pound weight should be placed on the beam platform and the graduations on the beam used to obtain the actual weight down to 1/16 of an ounce. For cartridges having a stamped weight of about thirty ounces, a one pound, a 1/2-pound, and a 1/4-pound weight should be used in a similar manner.

4.09 ***Weighing:*** The weight of the completely charged cartridge is stamped on the weight band and if the actual weight is not within 1/2 ounce of this value, the cartridge is unsatisfactory for use.

4.10 ***Recording Weight:*** If the cartridge is within the required weight limit and otherwise satisfactory, it should be re-used and the weight recorded on the white tag Form E-1296 provided for this purpose.

4.11 Discharged cartridges should be discarded rather than returned for credit. When discharged or underweight, the grenade shaped cartridges are replaced with the disposable cartridge (WF-75). See Paragraph 1.03.

4.12 ***Refilling Tank:*** The tank should be emptied and refilled each time the cartridge is weighed. After emptying the tank, it should be examined on the inside for corrosion and any foreign matter scraped from the tank walls with a suitable piece of wood such as the wood handle of a blade-type radiator brush. The tank interior should then be scrubbed with a stiff brush such as a wood-handled toilet bowl brush, using only clean water. Rinse thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The tank should be filled to the filling lug with clean cold water. Preservatives to prevent water stagnation or solutions to lower the freezing point should not be used.

4.13 ***Assembling:*** Clean the extinguisher cap with a dry cloth. In the case of extinguishers having a short rubber jacket, thoroughly dry the seating surfaces for the lead and rubber cartridge gaskets and the threaded area between these surfaces. See that the metering groove in the puncturing pin is unobstructed and note that the plunger catch operates freely. Make sure that the plunger is in the fully unoperated position, i.e., plunger pulled all the way out before inserting the cartridge or the gas will be discharged when the cartridge is screwed in. Replace the rubber cap gasket with a new one.

4.14 In the case of extinguishers having a short rubber jacket, place a rubber cartridge gasket over the neck of the lead covered cartridge with the lip down. Any tendency of the rubber to seize the cartridge will be minimized by applying powdered talc to the gasket. Also for these extinguishers, place a new lead gasket over the cartridge top and paint the area of the top within the gasket opening with one heavy coat of black asphaltum paint. Make sure that the lead gasket stays centered on the cartridge top.

4.15 In the case of extinguishers having a long rubber jacket neither the lead nor the rubber cartridge gasket nor the painting of the cartridge top with black asphaltum paint is required.

4.16 Keeping the cartridge dry, screw it into the cap as tightly as possible by hand, as it is important that the cartridge top assemble firmly in the holder. Proper assembly can be determined by observation through the ports opposite the puncturing pin. The top of the cartridge should be visible and there be about an 1/8" gap between the cartridge top and the puncturing pin.

4.17 In the case of extinguishers having a short rubber jacket, fit the rubber jacket over the lead covered cartridge in such a way that the bead on the jacket opening fits into the groove between the lip on the gasket and the bottom edge of the cartridge holder. Satisfactory seating is aided by pulling the rubber jacket out with the fingers at points below the gasket lip and allowing it to snap back in place. At the same time a part of the air can be exhausted by squeezing the jacket, in order that the water level in the tank will not be brought up to a higher point than originally intended.

4.18 In the case of extinguishers having a long rubber jacket, fit the rubber jacket over the cartridge in such a way that the bead on the jacket opening fits into the groove in the metal collar which projects downward from the bottom of the extinguisher cap. The rubber jacket is provided with four tabs around the neck to facilitate fitting it to the collar. Squeeze the jacket to emit entrapped air.

4.19 The threads of the cap and tank should be coated ***lightly*** with vaseline and the cap screwed on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged and that four full turns of the cap are given, engaging at least four full screw threads. Caps or tanks for water-filled type extinguishers should not be interchanged with those for soda-acid or foam extinguishers.

4.20 The finish of the extinguisher should be examined and cleaned (not painted) to restore good appearance, as required.

4.21 Extinguishers should be emptied and cartridge removed and packed separately before shipping to other locations.

Method for Disposable Cartridge

4.22 Remove the extinguisher from its mounting and carry it to the location where the cartridge can be weighed and the tank emptied and refilled. Only one extinguisher per floor should be taken out of service at one time unless replacements are installed. Inspect for the details given in Paragraph 4.01.

4.23 Unscrew the extinguisher top cap and dry all parts with a clean cloth. Unscrew the disposable cartridge from the cartridge holder. Dry the cartridge with a clean cloth and examine for possible corrosion especially at the top end.

4.24 ***Weighing:*** The weighing is done with the scales per KS-6990 as described in Paragraph 4.08. The weight of the charged cartridge is stamped on the jacket. If the actual weight is not within one half ounce of the stamped weight replace with a new cartridge.

4.25 ***Recording Weight:*** If the cartridge is within the required weight limit and otherwise satisfactory, the weight is recorded on the white tag Form E-1296 and the cartridge re-used.

4.26 After inspecting the tank both interior and exterior as described in Paragraph 4.01 and refilling the tank with water as described in Paragraph 4.12 the cylindrical cartridge is screwed hand tight into the cap.

4.27 See that the metering groove in the puncturing pin is clean and note that the puncturing pin and the plunger catch operate freely. Make sure that the plunger is in the fully unoperating position before replacing the cartridge or the gas will be discharged when the cartridge is screwed into position. The threads of the top cap and tank should be lightly coated with vaseline. The top cap is screwed on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged, and that four full turns of the cap are given, engaging at least four full screw threads. The cap should be replaced on the same tank from which it was removed.

4.28 The finish of the extinguisher should be examined and cleaned (not painted) to restore good appearance, if required.

4.29 Extinguishers should be emptied and the cartridge removed and packed separately before shipping to other locations.

5. MAINTENANCE OF SODA-ACID TYPE FIRE EXTINGUISHERS

(A) Inspection

5.01 Soda-acid type extinguishers should be inspected for the following items:

(1) Hose is in good condition.

(2) Nozzle opening is unobstructed.

(3) Hose coupling is wrench tight at tank outlet.

(4) Dents are not evident on the extinguisher body at or near the upper or lower horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be discarded at once. Discarded extinguishers should be classified as "junk" and returned through the usual lines of organization to the Western Electric Company branch house for disposition.

(5) Finish is in good condition.

(6) Mounting bracket is securely fastened to wall.

(7) Record tag is attached and extinguisher has been recharged within the required time.

(8) Bears orange hydrostatic test record tag Form E-4400 to show that extinguisher has been given the prescribed hydrostatic test within five years. If Form E-4400 shows only the date of installation, check whether hydrostatic test will be due during the current year and, if so, report to supervisor.

(B) Recharging

5.02 Extinguishers are discharged and refilled at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 5.01 should also be made at this time.

Method

5.03 Remove the extinguisher from its mounting bracket and carry it upright to a suitable location where it can be discharged. This may be done either outside the building or inside into a service sink partly filled with water. Leaking gaskets, defective hose connections, or other irregularities are noted as the extinguisher is discharged and corrected during the recharging procedure. Only one extinguisher per floor should be taken out of service at one time unless replacements are installed.

5.04 ***Warning:*** In all the following operations where the extinguisher is to be taken apart, safety goggles and rubber gloves should be used.

5.05 Take extinguisher to a location where a new charge can be provided and where the tank can be refilled. Unscrew the cap and remove the cage and bottle from the tank.

5.06 The tank is examined on the inside for corrosion and for deposits of soda or other foreign material which should be scraped off with a suitable piece of wood such as the wood handle of a blade-type radiator brush. The tank interior should then be scrubbed with a stiff brush such as a wood-handled toilet bowl brush using only clean water. Rinse thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The cap, cage, and stopple should be scrubbed with a brush and carefully rinsed.

5.07 It has long been a requirement of the Underwriters Laboratories that manufacturers of this type extinguisher provide a means of pressure relief during removal of the cap. For many years it has accordingly been the practice of the manufacturers to provide a small hole through the cap threads which, as the cap is unscrewed, will release any pressure that might be present. Probably most extinguishers in the Bell System already are provided with this hole in the cap but if upon the annual refilling any are found without it, they are modified locally. The hole should be about 3/16-inch diameter with its center about 9/32-inch from the bottom edge of the cap.

5.08 The extinguisher is then carefully recharged in accordance with the following procedure irrespective of any recharging instructions that may be on the extinguisher name plate or on the recharge package. The bicarbonate of soda in the package is thoroughly mixed with about 2½ gallons of lukewarm water. The temperature of the water should not exceed 100°F. The mixing is done outside the tank in order to insure that the soda is thoroughly dissolved as undissolved soda may clog the hose or nozzle. The tank is filled to the filling lug, taking care not to pour any sediment into it. Filling the tank to levels above the filling lug reduces the air chamber volume and may result in excessive working pressure. Preservatives to prevent stagnation or solutions to lower the freezing point are not used.

5.09 The cork or cap and label, if any, should be removed from a new bottle of acid and the bottle placed in the cage; a floating label may clog the outlet strainer. If the stopple is not a part of the cap assembly, it should next be put in place in the acid bottle. At this time determine that the bottle is not so high, as to prevent the extinguisher cap from being screwed down properly on the tank. Also, check to see that the stopple is free to move out of the bottle for proper release of the acid and that the bottle is so held in the cage that it can not slide down on the stopple when the tank is inverted. These conditions can be checked best by placing the cage, bottle, stopple, and extinguisher cap together as they are in regular assembly and determining with the fingers that the conditions mentioned are met.

5.10 Replace the rubber cap gasket with a new one. Coat the threads of cap and tank lightly with vaseline and screw the cap on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged and that four full turns of the cap are given, engaging at least four full screw threads. The same cap must always be replaced on the tank from which it was removed; in this connection it is suggested that all recharging operations be completed on one extinguisher before starting operations on the next.

5.11 The date of recharging, etc, is recorded on the white tag Form E-1297 provided for this purpose.

5.12 The finish of the extinguisher is examined and cleaned (not painted) to restore good appearance, if required.

5.13 Extinguishers are emptied before shipping to other locations.

6. MAINTENANCE OF FOAM-TYPE FIRE EXTINGUISHERS

(A) Inspection

6.01 Foam-type extinguishers should be inspected for the following items:

(1) Hose is in good condition.

(2) Nozzle opening is unobstructed.

(3) Hose coupling is wrench tight at tank outlet.

(4) Dents are not evident on the extinguisher body at or near the upper or lower horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be discarded at once. Discarded extinguishers should be classified as "junk" and returned through the usual lines of organization to the Western Electric Company branch house for disposition.

(5) Finish is in good condition.

(6) Mounting bracket is securely fastened to wall.

(7) Record tag Form E-1297 is attached and extinguisher has been recharged within the required time.

(8) Bears orange hydrostatic test record tag Form E-4400 to show that extinguisher has been given the prescribed hydrostatic test

within 5 years. If Form E-4400 shows only the date of installation, check whether hydrostatic test will be due during the current year and, if so, report to supervisor.

(B) Recharging

6.02 Extinguishers should be discharged (or emptied) and refilled at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 6.01 should also be made at this time.

Method

6.03 Remove the extinguisher from its mounting bracket and carry it upright to a suitable location, preferably outside the building, for this purpose. Leaking gaskets, defective hose connections, or other irregularities should be noted as the extinguisher is discharged. Only one extinguisher per floor should be taken out of service at one time unless replacements are installed.

6.04 Take extinguisher to a location where a new charge can be provided and where the tank can be refilled. Unscrew the cap and remove the inner container from the tank.

6.05 Where it is not desirable to discharge the extinguisher, it may be emptied instead. When this is done, both the tank and the inner container should be completely drained, care being exercised in doing this not to mix the aluminum sulphate and soda solution. If emptied into a service sink, the soda solution should be poured into the sink first and thoroughly flushed down with water. The aluminum sulphate should then be emptied into the sink and flushed down with water.

6.06 The tank should be examined on the inside for corrosion and for deposits of soda or other foreign material which should be scraped off with a suitable piece of wood such as the wood handle of a blade-type radiator brush. The tank interior should then be scrubbed with a stiff brush such as a wood-handled toilet bowl brush using only clean water and rinsed thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The cap, inner container and stopple should be scrubbed with a brush and carefully rinsed.

6.07 The extinguisher should then be recharged by carefully following the directions on the recharge packages furnished for this purpose. This generally involves thoroughly mixing the "B" solution containing bicarbonate of soda and a foam producing agent with lukewarm water. The temperature of the water should not exceed 100°F. The mixing should be done outside the tank in order to insure that the mixture is thoroughly dissolved. Undissolved soda may clog the hose or nozzle. The tank should be filled to the filling lug taking care not to pour any sediment into it. Filling the tank to levels above the filling lug reduces the air chamber volume and may result in excessive working pressures. Preservatives to prevent stagnation or solutions to lower the freezing point should not be used.

6.08 The recharge is completed by thoroughly mixing the "A" solution (aluminum sulphate) with water as directed and pouring it into the inner container which is then returned to the tank.

6.09 Replace the rubber cap gasket with a new one. Coat the threads of cap and tank lightly with vaseline and screw the cap on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged and that four full turns of the cap are given, engaging at least four full screw threads. The same cap, inner container and stopple must always be associated with the tank from which they were removed; in this connection it is suggested that all recharging operations be completed on one extinguisher before starting operations on the next.

6.10 The date of recharging, etc, should be recorded on the white tag Form E-1297 provided for this purpose.

6.11 The finish of the extinguisher should be examined and cleaned (not painted) to restore good appearance, if required.

6.12 Extinguishers should be emptied before being shipped to other locations.

7. MAINTENANCE OF ASBESTOS GLOVES

(A) Inspection

7.01 Gloves and container should be inspected at intervals for the following items:

(1) Container cover opens freely.

(2) Gloves should be removed from container, inspected and returned folded together, with fingers up. They should be loose enough to be easily removed.

(3) Container finish is in good condition. Container should be painted if required.

(4) Mounting bracket is securely fastened.

8. MAINTENANCE OF TARPAULINS

(A) Inspection

8.01 Portable tarpaulins and container should be inspected annually for the following items: See Fig. 1.

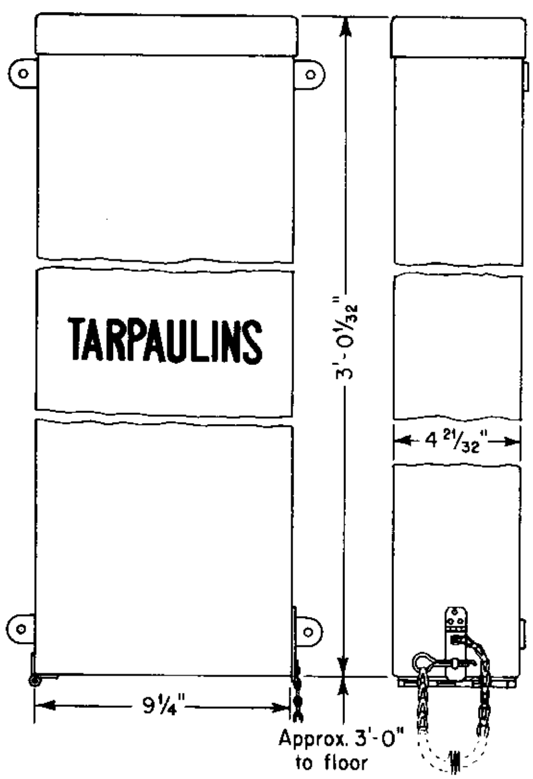


Fig. 1

(1) Bottom door of container opens freely.

(2) Tarpaulins should be removed from container and inspected for possible defects. They should then be properly folded and rolled and replaced in the container. A check should be made to insure that they are loose enough to be easily removed.

(3) Container finish is in good condition. Container should be painted if required. It should not be painted same color as background.

(4) Container is securely mounted.

(B) Folding and Rolling Portable Tarpaulins

8.02 When tarpaulins are placed in the storage container, they must be folded and rolled in the proper manner to permit them to be placed and removed easily. The proper method for folding and rolling is shown in Fig. 2.

9. MAINTENANCE OF FIRE HOSE AND STANDPIPE SYSTEMS

9.01 Tests and Inspection:

(a) While the data given herein represents current views as to procedures and recommendations it is understood that they may be altered to meet differing local fire code regulations and conditions but only when the latter are more stringent.

(b) Each standpipe station and associated equipment, whether capped or equipped with hose, valves, etc, is inspected annually. Should any defects be found in the course of the inspection or during the performance of regular duties they should be remedied. If the defects or faults can be taken care of at the time they are found, this should be done. Otherwise, the defects are reported for prompt attention.

(c) A fire hose is not to be used, under any circumstances, for other than fire fighting purposes. Violation of this rule may result in hose being missing, defective or useless in case of fire.

(d) Fire hose stations should be free of any obstacle and nothing is permitted to obscure hose racks or to block the door of a hose

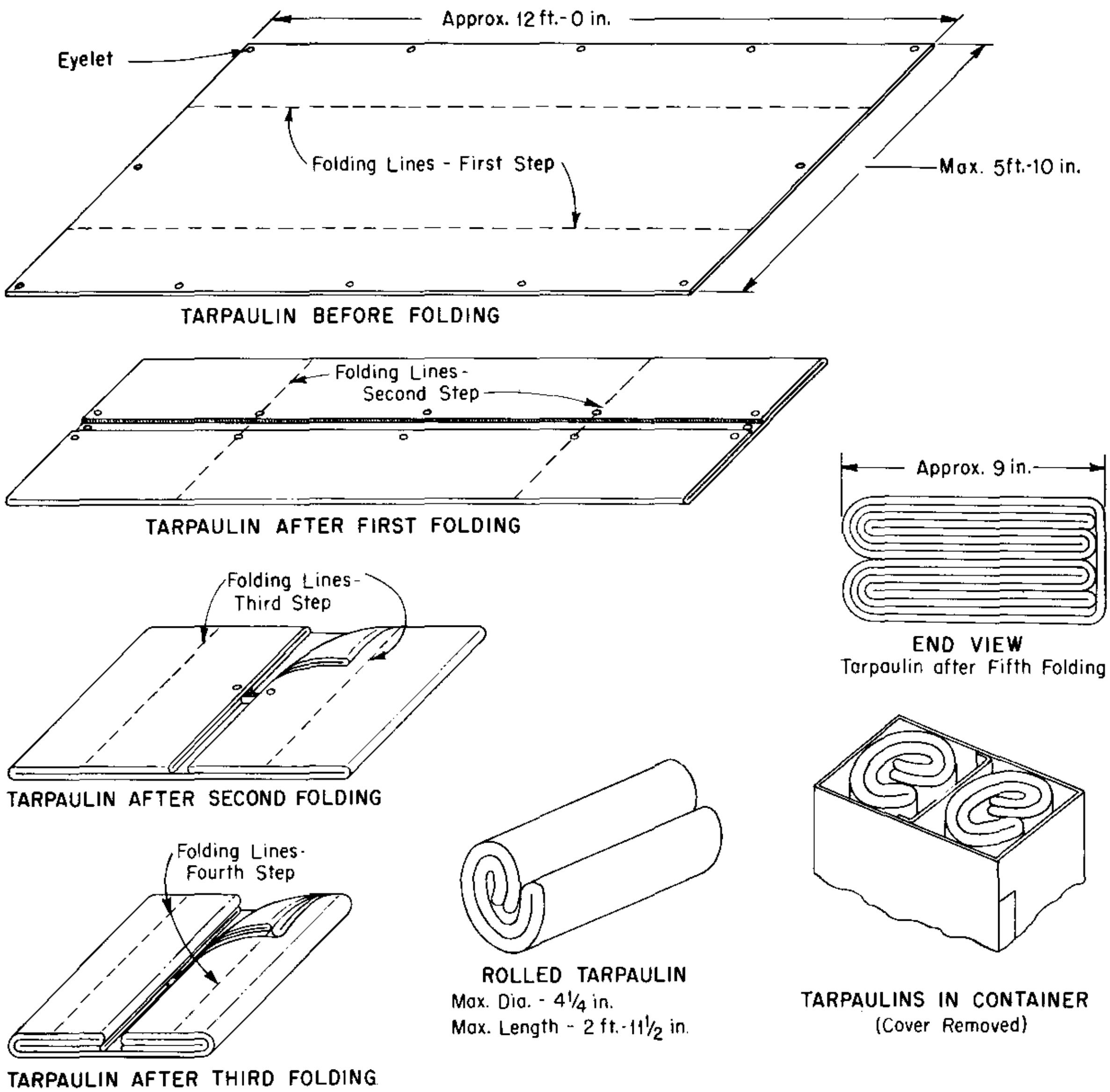

Approx. 12 ft.-0 in.
Eyelet
Folding Lines - First Step
Max. 5ft.-10 in.
TARPAULIN BEFORE FOLDING
Folding Lines - Second Step
TARPAULIN AFTER FIRST FOLDING
Approx. 9 in.
END VIEW
Tarpaulin after Fifth Folding
Folding Lines - Third Step
TARPAULIN AFTER SECOND FOLDING
Folding Lines - Fourth Step
TARPAULIN AFTER THIRD FOLDING
ROLLED TARPAULIN
Max. Dia. - 4 1/4 in.
Max. Length - 2 ft.-11 1/2 in.
TARPAULINS IN CONTAINER
(Cover Removed)

Fig. 2

cabinet or closet. Inspection is made to see that doors open readily.

9.02 Fire Hose Inspection:

(a) Inspection of fire hose is made annually. However, while unracking of the hose on exposed racks is done annually, it is required only every three years for hose on enclosed racks.

(b) When unlined linen hose becomes wet for any reason it deteriorates rapidly. For this reason, hydrostatic testing of the hose is not recommended.

(c) Should a hose become wet, it should be replaced with Underwriters Laboratories approved unlined linen hose unless the procedure for drying is followed as outlined in the directions given in the latest issue of pamphlet No. 198, "Care of Fire Hose," issued by the National Fire Protective Association.

(d) The exterior of the hose is cleaned by vacuuming. The hose rack, pipe fittings and hose cabinets are wiped clean with a damp or treated dust cloth.

(e) Indications of moisture are looked for, giving special attention to the loop close to the point where the hose is connected to the valve. If there is discoloration of the hose at the valve, such as would occur from water leakage, twisting of the hose by hand at the point of connection may cause it to tear indicating need for removal of the defective section and resetting of the coupling.

(f) The threads of the couplings are inspected and any injured or defective couplings are replaced. They are so adjusted that they can be easily tightened by hand. Oil or grease is not used, as they are likely to cause deterioration of hose and rubber washers. Threaded fittings are cleaned of any corrosion or foreign matter. Where couplings are polished, care is taken to keep the polish from coming in contact with the hose as the chemicals in metal polishes can damage it.

(g) The rubber washers, both at the hose valves and at the nozzles are examined and any that are lacking in strength or elasticity are replaced.

(h) After unracking and examining the hose for cracks, breaks or other evidence of deterioration, it is reconnected and replaced on the rack, making the folds in new locations to avoid creating a permanent set or breaks at the folds.

(i) The date of the inspection and inspector's name or initials should be entered in the gray linen tag (Form E-4307, "Fire Hose Inspection") attached to the rack. Inspection should include assurance of the Underwriters Laboratories approval label which should be affixed to the hose, the date of the manufacture of the hose, and manufacturer's identification.

(j) Consideration should be given to the replacing of unlined linen hose on exposed racks after fifteen to twenty years and on enclosed racks after twenty-five to thirty years, depending upon local conditions.

9.03 Standpipe Systems Inspection:

(a) The National Board of Fire Underwriters pamphlet No. 14 entitled "Standpipe and Hose Systems" specifies that hydrostatic testing of dry standpipe systems be done at intervals of not less than five years. This applies also to the dry portion of piping in a wet standpipe system between the check valve in the fire department inlet pipe and the outside multiple connection.

(b) Dry standpipes over ten years old should be tested with air at a pressure not exceeding twenty-five pounds per square inch to determine their tightness before water is turned into them for hydrostatic test.

(c) Hydrostatic testing of wet standpipes, except for dry sections, is not considered essential, when the system is supplied directly and only from a street water main. Hydrostatic testing of standpipes served by both a roof gravity or pressure tank and from the street mains is done, at least every three years. Such a test will determine the tightness of tank check valves. In such cases, tank supply control valves are turned off during the test so that in the event of a bad break, contents of tanks will not be lost.

(d) Fire pumps are usually turned over at weekly intervals with capacity tests made every three years. It is desirable that fire pump capacity tests be tied in with hydrostatic standpipe tests when required by local authorities.

(e) Where fire pumps are installed, pump capacity tests are made only after a hydrostatic test of the standpipe system has been made. The roof hose outlet should be opened to permit a limited flow through this highest outlet to assure an unobstructed standpipe before the system is returned to service.

(f) Hydrostatic testing of standpipe systems is done with a manually operated hydraulic pump. Standpipes are hydrostatically tested at a pressure of fifty pounds in excess of normal static pressure or, where fire pumps are installed, fifty pounds above maximum pump discharge pressure.

(g) The main gate valve in the water supply (sealed open) is checked to ascertain that it is in the proper open position.

(h) At the Fire Department connections, the check valves are inspected to determine that they are in working condition.

(i) The valves at hose connections are checked to assure that they are closed tightly to prevent leakage of water. The drip connections (where installed) at hose valves are checked to determine that they are open. This is done to avoid the possibility of any water that may leak past the valve from getting into the hose.

(j) All check valves throughout the standpipe system should be examined to make sure they are in proper working order.

Note: Check valves should be located on all supply lines from each separate water supply serving the standpipe system including the Fire Department (multiple) connections.

(k) The end valve of each standpipe system, located, for example, on the roof in the case of buildings over three stories in height, is opened to establish that there is a free flow of water. Adequate provision is made for carrying off the water to avoid water damage.

(l) Test procedures may differ with each installation and it is recommended that local fire departments be asked to cooperate with Telephone Company personnel in carrying on tests of standpipe systems.

(m) Where frequency of routine is suggested appropriate records should be maintained to make sure that such routines are being performed.

Form E-4400

Bell System

HYDROSTATIC TEST RECORD

FOR WATER FILLED, SODA ACID
AND FOAM FIRE EXTINGUISHERS

OFFICE OR BLDG. ____________________

SERIAL NO. ____________________

OBVERSE

HYDROSTATIC TEST RECORD

DATE	PRESSURE	INSPECTOR	
		COMPANY	PERSON

REVERSE

FIRE PROTECTION APPARATUS

ROUTINE INSPECTION AND MAINTENANCE

PURPOSE

This addendum supplements Section H44.210 - (H54.610) Issue 2 and is revised to provide additional information on Fire Hose Inspection, Standpipe Systems Inspection and Tests and Automatic Sprinkler Systems Inspection and Tests.

To delete reference to hydrostatic tests of fire hose and standpipe systems.

To cancel Addendum H44.210 - (H54.610), Issue C.

9. MAINTENANCE OF FIRE AND STANDPIPE SYSTEMS

9.01 Test and Inspection

Add the following to Paragraph 9.01 (b):

Inspect all hose stations to see that proper size spanner wrench is in place at station. Inspect roof hose stations to see that cabinet is in good condition, that door of cabinet opens easily, that cabinet is designated with word "Fire Hose" painted in a conspicuous location on the cabinet in 8" letters in contrasting color to that of the cabinet, that bleeder line valve of this station operates freely and that pipe line is properly drained.

9.02 Fire Hose Inspection

Delete:

First sentence of paragraph 9.02 (i).
Paragraph 9.02 (j) exposed racks (to twenty), enclosed racks (to thirty).

9.03 Standpipe Systems Inspection

Delete:

Paragraphs 9.03 (a), (b), (c) (only the last sentence of paragraph (d)) and paragraphs (e), (f), (l), (m).

Add the following to paragraph 9.03 (h):

Inspect Siamese connection monthly to see that it is not obstructed, the caps are properly placed, that connection is free of all foreign material that pipe line is properly drained between check valve and connection.

Add the following Paragraphs:

(n) If water supply is from gravity tank, inspect (monthly) to see that tank is properly filled, that all feed valves operate easily and are sealed open, that fire pumps function automatically and properly, that all pump valves operate properly, that adequate reserve of water is maintained for fire purposes where tank is used for house service as well as standpipe water supply.

(o) Interruption of Water Supply: When changes or repairs are made to standpipe or sprinkler systems which require the shutting off of the water supply, the office of the Plant Extension Engineer (Real Estate Agent) shall be notified of the approximate period of the shutdown. Department heads in the building, who may be involved, should also be notified before shutting the water supply system. The responsible Plant Supervisor shall notify the local fire department.

(p) Check to determine that the standpipe and hose system periodic test reports indicate that the entire system is in good order. The results of the tests and inspections shall be recorded on Form P-3173(0) and forwarded not later than January 15, of each year, through organization channels, to the Plant Extension Engineer (Real Estate Agent).

10. AUTOMATIC SPRINKLER SYSTEMS (Inspect Monthly by Plant Department)

10.01 Inspect main sprinkler water supply control valve to see that is is sealed open. This valve must be open at all times. If the seal is broken, it shall be replaced.

10.02 When repairs are required, they shall be made immediately. When these repairs involve shutting off the water supply, the Real Estate Agent and the local Fire Department shall be notified. Any force directly involved shall also be notified.

10.03 Inspect to see that the Siamese connection is not obstructed, that caps are properly placed, that threads are in good condition, that connection is free of all foreign material and that pipe line is properly drained between the check valve and the connection.

10.04 Test water and electric alarms by use of the 1" Inspectors Test Valve located at the farthest point of the system from the supply. Prior to test, notify occupants of buildings that a test is to be made, and inspect area outside of the discharge opening to prevent any water damage. The alarm test is made by opening the Inspectors Test Valve until the alarms sound.

10.05 Ascertain that extra sprinkler heads of the different temperature ratings required for replacements, and the special sprinkler head wrench are in place in the cabinet provided for that purpose.

10.06 Check visible sprinkler piping to see that is is properly secured and that all sprinkler heads are clear of obstructions which would interfere with the proper spread of water if the sprinkling head were operated.

10.07 Check to determine that the sprinkler system periodic test reports indicate that the entire system is in good order. The results of the tests and inspections shall be recorded on Form P-2888(0) and forwarded not later than January 15 of each year, through organization channels, to the Plant Extension Engineer (Real Estate Agent).

10.08 Where sprinkler lines and heads are located in a space subject to freezing temperatures, the lines shall be filled with an anti-freeze such as a fifty percent (50%) glycerine solution. The anti-freeze is prevented from mixing or backing-up into the main sprinkler system by means of a check valve. If a sprinkler head in the anti-freeze section is operated for any reason, arrangements shall be made at once for the replacement of the anti-freeze in that section before filling the main sprinkler system with water.

10.09 Identification signs for the control, drain, 1" test and alarm valves of the sprinkler system are normally supplied by the contractor at the time of installation. A check shall be made to determine that the signs are in place.

10.10 Replacement signs and seals may be obtained from the local sprinkler contractor.

ORDERING AND STOCKING OF BUILDING SERVICE SUPPLIES

CONTENTS

1. GENERAL

1.01 This practice outlines a plan for controlling the ordering and stocking of cleaning and sanitary supplies in all buildings except possibly the smaller ones where the consumption is not sufficient to warrant the operation of the plan.

1.02 The plan consists of (1) establishing a central supply location in each building with suitable cabinets or shelving for storing the supplies, (2) designating each shelf or bin with the name of the item, the authorized quantity, and the package size to be stocked and (3) ordering the difference between the items on hand and the designated quantity on a scheduled requisition basis.

1.03 The practice outlines a method for determining the requirements of the supply items used currently by the house service force in each building and contains recommendations with regard to coordinating supply deliveries. It also includes a simplified ordering procedure through the use of imprinted requisitions.

1.04 A means for current supervisory control of the stock on hand is afforded under the plan without recourse to extensive records.

2. DETERMINATION OF SUPPLY REQUIREMENTS

2.01 The plan as outlined herein is intended to apply primarily to the frequently ordered building service supply items. It requires a detailed analysis of the past consumption of each item in each building plus the application of experience and other factors in order to determine the correct requirements. In the overall for a large area this will entail considerable clerical effort, however after the plan is established it will not be necessary to post or maintain any records whatsoever. It is further suggested that the plan be introduced on a gradual basis i.e. completing the requirements study and establishing the stock in each building before proceeding with the next.

2.02 To determine requirements past consumption over a representative period is used as a guide. Recourse to past supply requisitions or to the Western Electric Company's records, where these may be available, will provide the necessary basic data.

2.03 It may be desirable however in order to check upon the reasonableness of the supply requirements, to make comparisons between a number of similar buildings on the consumption of like items, equated on a unit basis in terms of population, square feet or other applicable units.

2.04 It is not ordinarily necessary to set up requirements for items such as brushes, brooms, pails, mop and broom handles, chamois, artificial sponges, paper towel baskets,etc., as such supplies are ordered as required on a replacement basis.

2.05 Exhibit 1 represents the average consumption rate of several principal items as determined from the purchases made for a number of telephone buildings. These data are included only for illustrative purposes and may not be representative of the requirements in all areas.

3. STORAGE OF BUILDING SERVICE SUPPLIES

3.01 The storage space for building service supplies is usually in the basement and adjacent to an entrance or an elevator used for deliveries to the building.

3.02 The supplies should be kept on shelves in an available closet or in a suitable cabinet or locker.

3.03 The supplies should be arranged in an orderly manner with the name of each item, the maximum quantity to be stocked and the package unit size clearly marked on designation strips on each shelf or bin. The wording used in designating the items should conform to that on the requisition to facilitate reordering.

3.04 The lighter weight and smaller articles should be placed on the upper shelves and the heavier items on the lower shelves. Exhibit 2 illustrates a supply storage cabinet fabricated from commercially available parts.

3.05 A complete list of the supplies for the building should be prepared and posted, for example, on one of the doors of the supply cabinet. This list should specify the proper ordering names, the authorized quantities of all items to be stocked, together with the recommended minimum ordering units and scheduled ordering period for the particular building. A typical example of such a list is illustrated on Exhibit 3.

3.06 In buildings where the usage of paper towels or toilet paper exceeds one carton per month, the packages may be dispensed directly from the carton, stored adjacent to the supply cabinet.

3.07 Certain of the building supply items, such as those listed below, have a tendency to deteriorate or to become shelf worn when kept on hand over extended periods and it is recommended that new deliveries of such items be arranged on the shelves or stored so that the remaining items on hand will be consumed first.

Liquid Soap	Powdered Soap
Liquid Wax	Hand Scouring Powder
Paper Towels	Soda Cleaner
Toilet Paper	Sanitary Napkins
Cake and Bar Soap	Paper Drinking Cups

3.08 Upon receipt of a shipment it should be checked with the shipping receipt and all items placed in their designated locations. All packing materials and empty cartons should be removed from the building as soon as possible.

3.09 In the larger buildings having building service closets or sink rooms located throughout the building, it may be desirable to maintain a limited quantity of toilet paper and paper towels on floors where the usage is heavy. However, consideration should first be given to providing additional dispensing capacity in washrooms which have been requiring paper replenishment more frequently than once a day.

3.10 Where the group cleaning plan is followed (B.S.P. H50.001), the daily supplies for each zone should be carried on the house service truck. The trucks are replenished from the central supply before the next cleaning period.

3.11 The building service supply quarters should be maintained in a neat and clean condition.

4. SCHEDULES FOR ORDERING AND DELIVERY

4.01 The frequency of ordering supplies should be based upon an economical balance between the rate of consumption, standard package quantities, established supply delivery schedules and the value of the stock to be carried.

4.02 In general the ordering schedule will be governed by the frequency with which certain items should be replenished as for example, paper towels, the cartons of which are bulky to deliver and to store in large quantities. It should not be necessary, however, to replenish every stock item every ordering period, as certain supplies involving a relatively small cost and amount of storage space may be conveniently handled in sufficient quantities to overlap one or two scheduled ordering periods.

4.03 Except in possibly the larger metropolitan buildings it should not be necessary to requisition building supplies more frequently than once a month.

4.04 The proposed ordering schedule, the supply items and the quantities involved for each building should be reviewed by the Superintendent of Supplies so that the building service requirements may be coordinated with the supply delivery facilities to the best advantage and at the same time effect a reasonably uniform flow of supplies from the Distributing House.

4.05 The schedule should be set up to allow adequate time between the date of ordering and the date required so that normal schedules on the part of the Distributing House and the supply delivery organization may be adhered to.

4.06 It is suggested that the ordering schedule for each building be established on a definite day-of-the-week basis, such as the first Monday in every month, the first and third Wednesdays, etc., as necessary.

4.07 Deviations from the scheduled ordering dates should be avoided, except in the event of emergencies, by making sure that sufficient quantities are available to last until the next delivery date and that supplies for special work be ordered sufficiently in advance to meet the job requirements.

5. SUPPLY REQUISITION

5.01 The use of a single page multi-copy requisition form with the names and package size of frequently used items imprinted thereon is recommended for ordering building service supplies. The number of copies of the requisition will depend upon local requirements. This method facilitates handling and filling the order by ensuring legibility as well as the use of the proper ordering nomenclature and ordering units.

5.02 The determination of the items to be printed on the building supplies requisition should be based upon an analysis of the supplies ordered over a representative period. To be most beneficial, the form should be simple and clear in arrangement and wording and indicate the available standard packaging units. Ample blank spaces for writing in the occasionally ordered tools and supply items should be provided. In this connection, the Western Electric Company, through recourse to their records, may be of assistance in selecting the items to be printed and the unit quantities.

5.03 Padded sets of requisitions bound in a so-called snap-out arrangement as illustrated in Exhibit 4, is quite suitable. With this arrangement the requisitions are bound to a manila cover at the bottom with a perforated tear-off edge. The cover surrounds the requisitions and when slipped under the top set serves as a writing surface to prevent carbon transfers to following requisitions. The complete ordering information for items that are infrequently required may be printed on the cover for reference when orders for such items are written. Each set of copies of a requisition are bound with wire stapled tear-off binding at the top to hold the group together.

5.04 The text of the requisition form should be reviewed with the local Distributing House people, the accounting department and the supplies group, before being printed.

5.05 Printed requisitions should be reviewed periodically and revised, if necessary, to keep them up to date.

5.06 A review of the items written in on supply requisitions as well as of the orders for imprinted items will serve as a guide in the revision of the form.

6. ORDERING SUPPLIES

6.01 It is suggested that the responsibility for the preparation and approval of the building supply requisition be kept in the building as far as practicable and that the requisition be then forwarded direct to the Distributing House.

6.02 In Areas where there are one or more small buildings in a district and individual building supply requisitions for such buildings would not be practicable, it is suggested that the buildings be supplied from a central point.

6.03 The items and quantities to be ordered at each scheduled ordering period should be determined by counting the remaining stock on hand and inserting in the "Order" column of the requisition, the difference between this amount and the designated authorized quantity modified as necessary by package units and minimum ordering quantities.

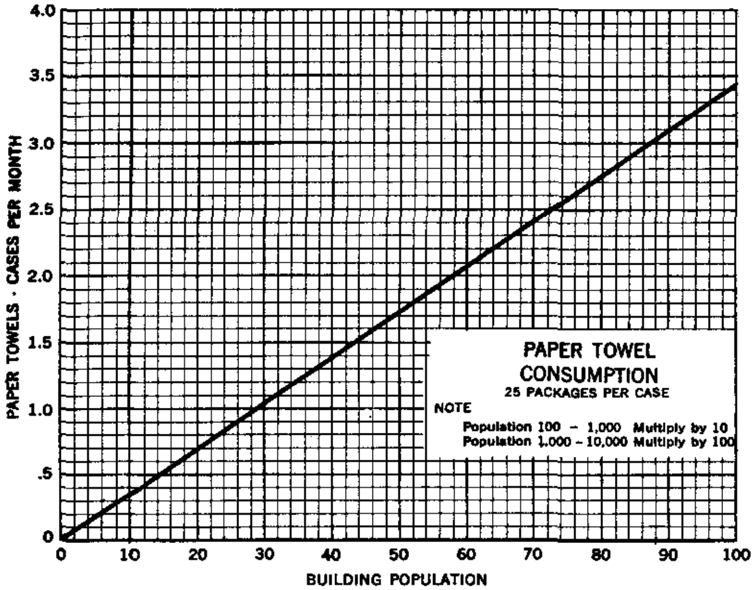
6.04 Orders for items not printed on the requisition form should be written clearly and firmly with a pencil in the space provided, to obtain legible carbon copies, using the ordering information printed on the cover of the requisition pad.

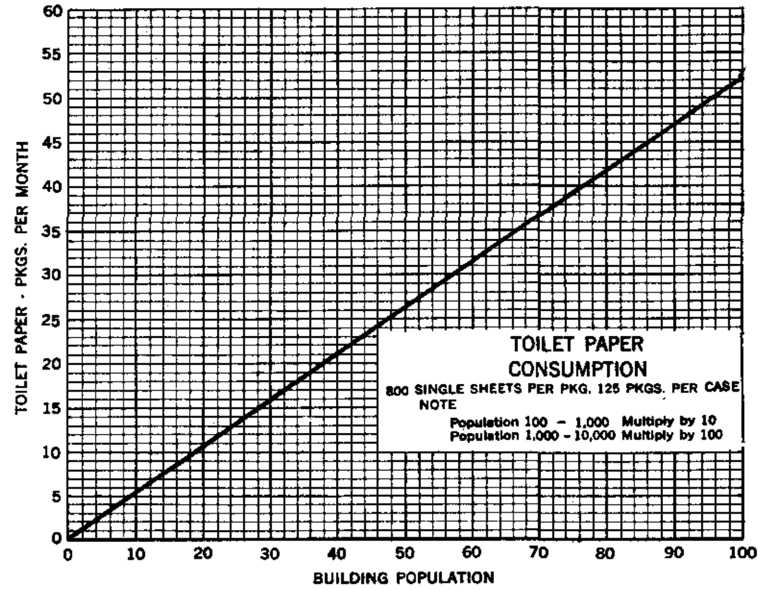
6.05 It is essential to the successful operation of the plan described herein that no substitutions or increases in quantities, of the building supply items authorized under the plan for a building, be made without supervisory approval.

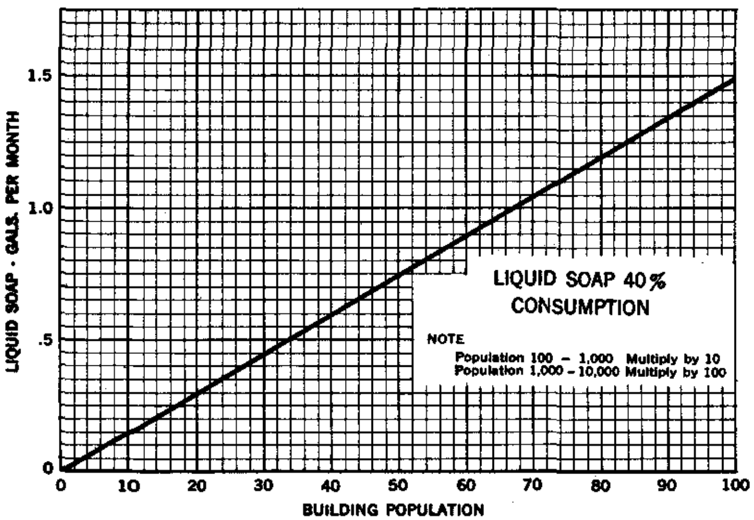
6.06 A duplicate list of the authorized items and quantities stocked in each building should be kept on file in the division or area office for supervisory purposes.

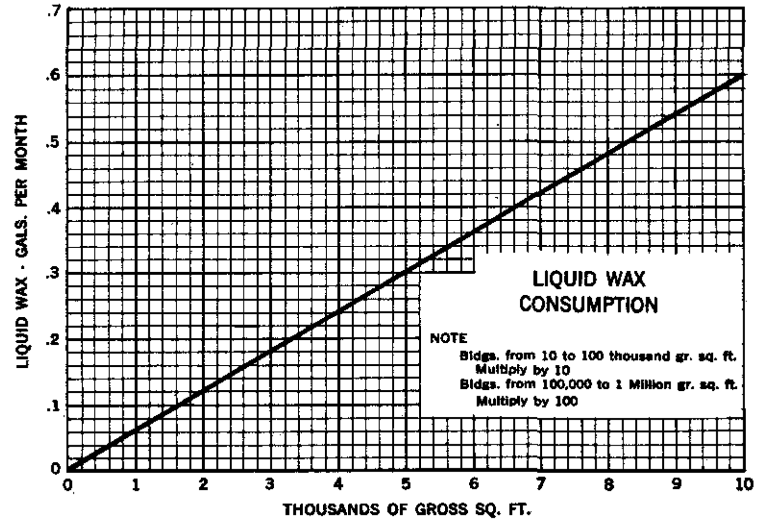
BUILDING SERVICE SUPPLIES

AVERAGE RATES OF CONSUMPTION





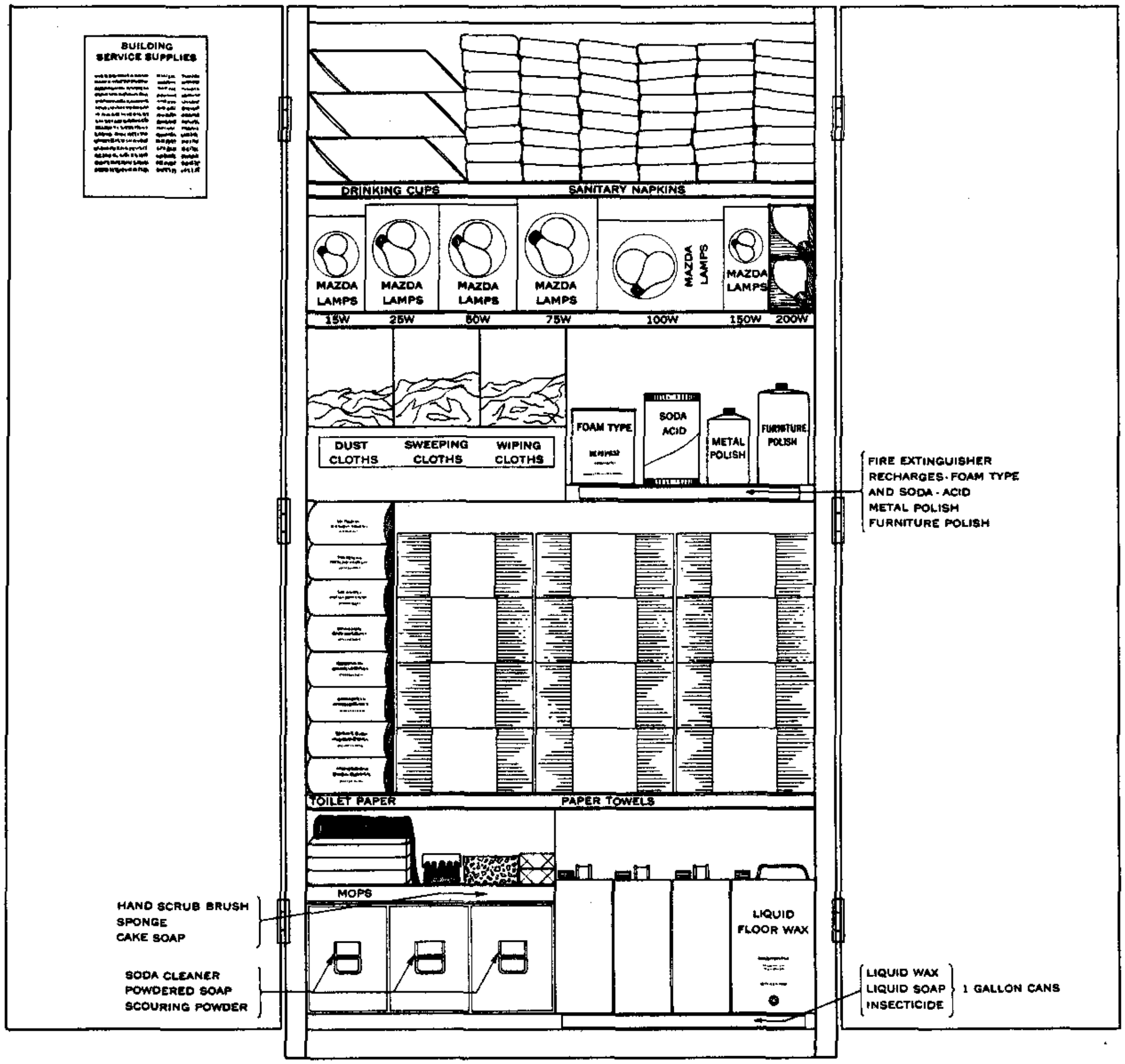




H50.007
Exhibit 1.

H50.007
Exhibit 2
38-Y-3541

BUILDING SERVICE SUPPLIES CABINET



Approx. Dimensions 72 in. height, 36 in. wide, 18 in. deep

Note --- Size of sketch precludes showing detail labelling on shelves, bins and drawers concerning items, quantities and ordering unit sizes.

SPECIMEN

BUILDING SERVICE SUPPLIES

Building No. Address

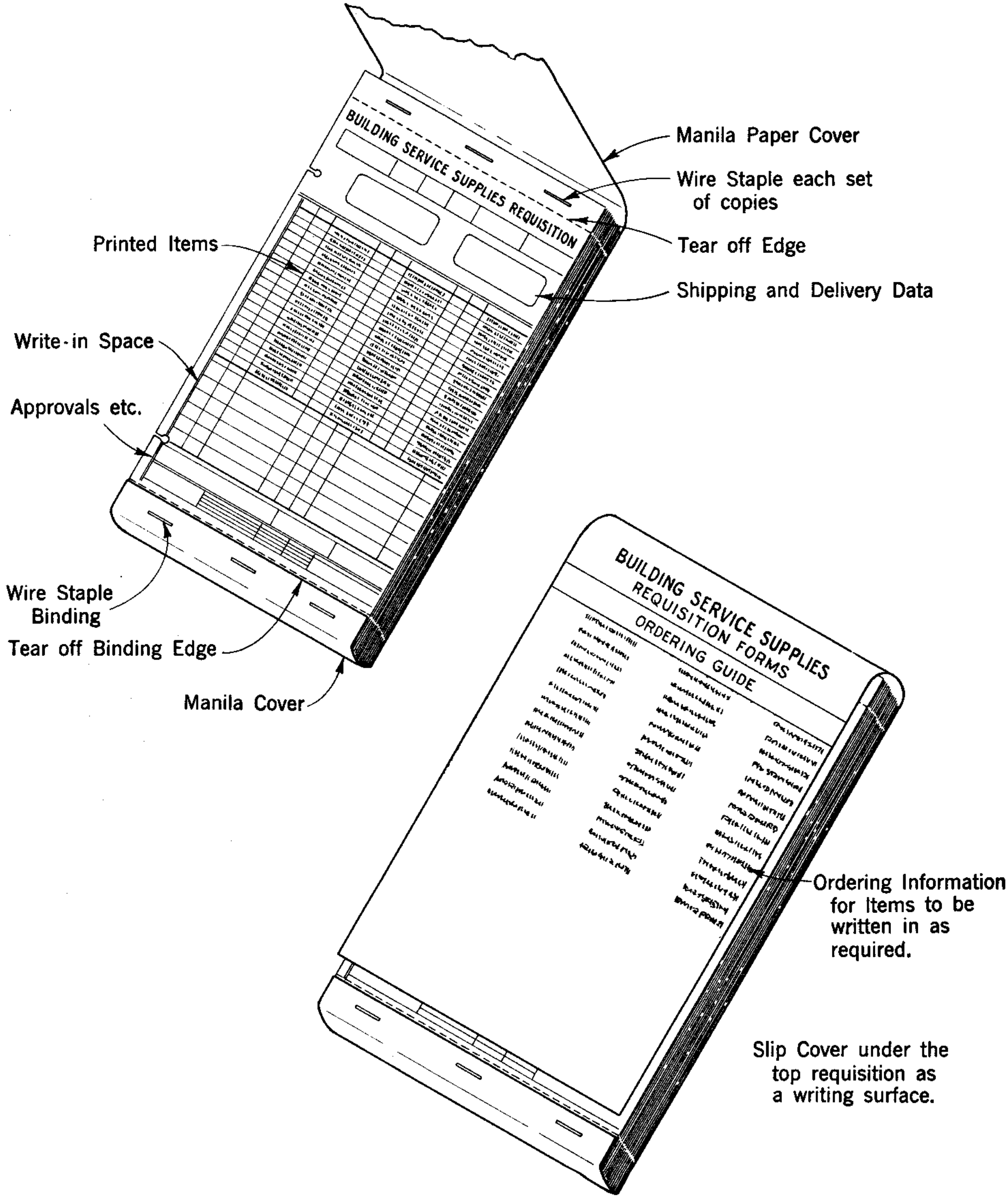
Note 1. Supply requisitions for this building should be placed on the FIRST MONDAY of every month.

2. Orders should specify one or more units as necessary, to replenish to the authorized quantity. Do not place orders for less than minimum units listed below.

Item	Authorized Quantity	Minimum Ordering Unit
Cloths, dust, large	10 pc.	1 pc.
Cloths, sweeping	10 pc.	1 pc.
Cloths, wiping	*5 lbs (1 bundle)	5 lbs (1 bundle)
Cups, paper drinking	9 cartons	1 carton (250 cups)
Insecticide, liquid	*1 gal.	1 gal.
Insecticide, pyrethrum	*2 oz.	2 oz.
Lamps	5% of each size in use but not less than 2 of any size	6 (in sizes up to 100 watts) 1 (in sizes over 100 watts)
Mops (24 oz.)	3	1
Napkins, Sanitary	*100 (1 ctn.)	100 (1 ctn.)
Oil, paraffin (Aerial Cable Lubricant)	*1 gal.	1 gal.
Paper, toilet	25 pkgs.	10 pkgs.
Polish, furniture	2 qts.	1 qt.
Polish, metal	2 pts.	1 pt.
Recharge-Soda-Acid Exting.	2	1
" -Foam Type	1	1
Powdered Soap	10 lbs (2-5 lb bags)	5 lbs (1-5 lb bag)
Scouring Powder	5 lbs (1-5 lb bag)	5 lbs (1-5 lb bag)
Soda Cleaner	10 lbs (2-5 lb bags)	5 lbs (1-5 lb bag)
Soap, liquid 40%	*1 gal.	1 gal.
Soap, white floating	3 cakes	1 cake
Towels, paper	36 pkgs.	1 ctn. (25 pkgs.)
Wax, liquid	2 gal.	1 gal.

* Replenish when quantity on hand reaches 1/4 of authorized amount.

BUILDING SERVICE SUPPLIES REQUISITION
PADDED MULTIPLE - COPY ONE TIME CARBON



DESIGN LOADS FOR TELEPHONE BUILDINGS

CONTENTS PAGE

1. GENERAL

1.01 This section covers recommendation for assumption of floor carrying capacities including dead, live, and other loads to be used in the design of buildings which house various types of telephone equipment. It also covers design loads for buildings which are used in whole or in part for accounting, business, clerical and executive offices, and for garages and stockrooms.

1.02 Minimum design loads for buildings and other structures are given in local and state building codes, and also in other publications such as American Standard Building Requirements, File A58.1, by the American Standard Association and the National Building Code recommended by the National Board of Fire Underwriters. Telephone buildings, however, require special considerations which normally are not specifically covered by such codes. This section outlines these special loading requirements together with general building design loads.

1.03 *Definitions*

(a) ***Dead load*** means the weight of all permanent construction, including walls, framing, roofs, permanent partitions, and stairways of a building.

(b) ***Live load*** means the load imposed by the occupancy including telephone equipment. It does not include such factors as wind or earthquake loads.

1.04 Buildings, and all parts thereof, are designed and constructed to support safely all loads, including dead loads, without exceeding allowable stresses prescribed for the materials of construction in the structural members.

1.05 When an existing building is enlarged, or otherwise altered, all portions thereof affected by such enlargement or alteration are strengthened, if necessary, so that all loads are supported safely without exceeding the proper allowable stresses.

1.06 Where local and/or State codes, rules, and regulations call for higher requirements than those indicated or implied in this section, such authority takes precedence and its requirements are followed; where the requirements are lower, compliance with the provisions of this section is recommended.

1.07 This section is revised to bring the live load recommendations up to date because of changes in telephone equipment and experience with actual loading conditions of buildings. The most important changes are:

(1) Lighter design loads for operating rooms.

(2) The addition of design loads for electronic data processing machines.

(3) Somewhat amplified notes on battery room loads.

(4) More conservative recommendations regarding advisable reductions in live loading for column design.

1.08 Marginal arrows are used to indicate a change in the text.

2. DEAD LOADS

2.01 When estimating dead loads for the purposes of design, the actual weights of materials and construction are used. In the absence of definite information, values are assumed which are satisfactory to the authority charged with the administration and enforcement of the local building code.

2.02 Quite commonly, especially in multistory buildings, there are important weight concentrations from vertical runs of building service items such as plumbing stacks and risers, ventilating and air conditioning ducts, and electrical service feeders. These loads, permanently located and carried by structural members, are considered as part of the dead load of the building.

3. LIVE LOADS

3.01 The live loads assumed for the purpose of design are the greatest that probably will be produced by the uses contemplated. They are considered to be uniformly distributed except for known heavy concentrations where the locations are fixed. The following table lists the uniform live loads that are adequate for various types of occupancy or use. Quite frequently, because of varying occupancy, the live loading actually required will be different on the various bays of a floor. The design engineer will then exercise his best judgment, whether to recognize these differences or to design the entire floor uniformly for the heaviest of the expected loads considering uniformity of construction methods, over-all economy, and the uncertainties of future occupancy.

OCCUPANCY OR USE	LIVE LOADS LBS. PER SQ. FT.
Corridors	
Permanent	Same as floor occupancy or use.
Temporary	Usually not less than 100.
Electronic Data Processing Equipment	100 (4)
If Raised Floor is Used	70 (4)
Card File Storage (when not over framing member)	200 (4)
Card File Storage (when over framing member)	150 (4)
Employee Quarters	
Cafeterias	100 (1)
Kitchens	150 (2)
Locker Rooms	60 (1)
Lounges	60 (1)
Toilet Rooms	Same as floor occupancy or use.
Fire Escapes	100
Garages	
Cars, less than 6000 pounds gross vehicle weight	100
Trucks 6000 to 20,000 pounds gross vehicle weight	150
Trucks over 20,000 pounds gross vehicle weight	250
Mechanical Plant Areas	
Air Conditioning (machine space)	200 (2)
Boiler Rooms	300 (2)
Elevator Machine Rooms	150 (2)
Fan Rooms	150 (2)
Fuel Rooms	400
Incinerator Charging Floors	100
Switchboards, Electric	150 (2)

OCCUPANCY OR USE	LIVE LOADS LBS. PER SQ. FT.
Office Areas	
Accounting, General Space	100 (1)
AMA and Business Machine Equipment	100 (2)
Business	100 (1)
Clerical	80 (1)
Executive	80 (1)
File Rooms	
Letters	80 (3)
Cards	125 (3)
Addressograph	150 (3)
Public Spaces	100
Stairways	100
Storage	
Light	125 (3)
Heavy	250 (3)
Extra Heavy	300 (3)
Telephone Equipment Areas	
Batteries	175-300 (2) (6)
Local Test Centers	100 (1)
Main Distributing Frames	175 (2)
Operating Rooms	100 (1) (5)
Power Equipment	175 (2)
Switching and Terminal Equipment (Excluding Main Distributing Frames)	150 (2)
Vaults	250 (3)

Notes: (1) Use this load for permanent locations; where in future telephone equipment space, use appropriate equipment loading.

(2) Use actual equipment loads if greater.

(3) Increase when present or future use exceeds this amount.

(4) In machine rooms housing any of the types of data processing machines, a design load of 100 pounds per square foot is usually adequate.

Where an electronic data processing machine room is provided with a raised false floor to accommodate cabling and ducts, a design live load of 70 pounds per square foot is adequate because the raised floor distributes loading to the structural slab much more uniformly than when the various computer cabinets or machines are placed directly on the slab.

Areas for card storage files would be afforded complete flexibility by a design load of 200 pounds per square foot. If the files can be located close to some of the framing members, the live load on the slab may be reduced to 150 pounds per square foot.

(5) The construction of the modern switchboard of less weight and elimination of the platform, affords the opportunity to lighten the live load design in operating rooms. The reduction from the former 150 pounds to 100 pounds per square foot is thus made possible.

Notes: **(Cont'd)** (6) The battery space in telephone equipment areas presents the problem of heavy concentration and is amplified by the number of central offices being served. Batteries currently in use range in weight from 415 pounds to 1715 pounds and as previously mentioned presents the problem of concentrated loads. The placing of the lighter weight batteries on racks in tiers more than two high is not desirable because of the associated higher temperature range, the maintenance problem and the fact that their combined weights soon approximates the weight of the heavier batteries. The bays assigned for battery location are, as a rule, fully utilized and consequently should not be designed below the most severely anticipated live load usage.

3.02 Experience has shown that an assumed uniformly distributed live load of 175 pounds per square foot for main distributing frames is normally required to safely support this type of loading, occupancy and use of the area.

3.03 It will be noted that in the table in Paragraph 3.01 the live loads indicated for cafeterias, locker rooms, local test centers, lounges and office space which are in permanent locations are less than those required for such areas located in future equipment space. Therefore, economies in construction might be affected by taking advantage of these lower load requirements in the design of central office buildings if such areas are located wherever possible in a side building appendage not in line with future equipment growth.

3.04 ***Future or Temporary Loads:*** The uniform live loads of 150 and 175 pounds per square foot are somewhat in excess of the loads actually imposed by many items of equipment, but are believed to provide reasonable margins of safety with a minimum amount of special strengthening. Likewise, it appears inadvisable to provide further strength to accommodate any possible future increase in weights of equipment, temporary loads of other unforeseen developments, in view of the fact that the total actual live loads will usually be less than these minimum uniformly distributed live loads. It is contemplated that in the future, the design of equipment and the floor plan layouts will not exceed these minimum loadings.

3.05 ***Provisions for Movable Partitions:*** In buildings where movable partitions might be installed or rearranged, the specified live loads in the table in Paragraph 3.01 are usually sufficient to care for such movable partition construction.

3.06 ***Concentrated Loads:*** In the design of floors, consideration is given to the effects of known or probable concentration of load to which they may be subjected. Floors are designed to carry the noted distributed loads under Paragraph 3.01 or the following minimum concentrations, whichever may produce the greater stresses, and these concentrations are assumed to occupy areas 2-1/2 feet square and to be placed so as to produce maximum stresses in the affected members. Whenever it is necessary to store temporarily or permanently heavy equipment and supplies such as loaded cable reels etc, it should be spread out to avoid excessive concentration.

FLOOR SPACE	LOAD
Equipment and Nonequipment, Including Corridors	2000 lbs.
Garages	Maximum Wheel Load*
Trucking Space within a Building	Maximum Wheel Load*

* Increase 50% for impact if the exact wheel load for the piece of the equipment is the basis of design.

As indicated in Paragraphs 3.01 and 3.18, known concentrated loads such as equipment frames, motor-generator sets, storage batteries, AMA and business machine equipment, and similar loads are considered in each specific case.

3.07 *Partial Loading:* When the construction is such that the structural elements thereof act together in the nature of an elastic frame due to their continuity and the rigidity of the connections, and the live load exceeds 150 pounds per square foot or twice the dead load, the effect of partial live load such as will produce maximum stress in any member is provided for in the design.

3.08 *Impact Loads:* The live loads listed in Paragraph 3.01 may be assumed to include a sufficient allowance to cover the effects of ordinary impact. For special loads involving unusual impacts such as those resulting from elevators, vehicles, etc, provision is made by a suitable increase in the assumed live load.

3.09 *Weights of Telephone Equipment:* The preceding paragraphs refer in general to all live loads encountered in telephone buildings. The average weight of installed telephone equipment, exclusive of occupants, temporary loads, etc, is based upon actual weights of the different items of equipment used. Detailed data with regard to weights, together with information concerning spacing of batteries, power equipment, switchboards, testing equipment, switching and terminal equipment, and other apparatus are given in the Standard Floor Plan Data Sheets issued by the Bell Telephone Laboratories, Inc.

Reduction of Live Loads

3.10 *Columns and Foundations:* The generally accepted practice of using reduced live loadings for the design of columns, piers, foundations or bearing walls in multistory buildings is recognized and permitted by most building codes. It is based on the logical assumption that most types of occupancy will never load all bays of all floors to their maximum designed load at the same time. Various codes use different formulas for applying the reduction to different types of construction so it is not feasible to state a method of arriving at the reduced loads that will meet the requirements of all cities.

Studies made on fully occupied telephone equipment buildings, however, show a much closer approximation of actual loads to the design load in the various bays than is the case in, say, an office building. This indicates that load reduction for column and foundation designs should be rather carefully handled in equipment buildings and the following procedures are recommended:

(1) No live load reduction in buildings of three stories or less.

(2) In taller buildings the formulas of the local building codes may be followed ***except*** that no reduction should be below a minimum of 115 pounds per square foot.

In office buildings, as contrasted with equipment buildings, the likelihood of underloading in many bays should permit taking full advantage of the reductions permitted by local codes for column and foundation design.

3.11 *Beams and Girders:* It is suggested that no reduction of live loads for use in design of girder members, even when allowed by local building codes, be applied in the design of telephone buildings as it appears that no appreciable economy is effected.

Roof Loads

3.12 Design loads for roofs either flat or pitched include the dead load of the roof; wind or earthquake loads whichever is the longer; and snow loads. All of these loadings vary greatly in different areas and climates but they are all considered and loadings adopted that are in accord with local practice and building codes.

3.13 Roofs to be used for special purposes such as locations for lens and various types of antennas are designed for the appropriate loads.

Other Live Loads

3.14 *Stairways:* Inside and outside stair treads and landings are designed to support a uniformly distributed live load of 100 pounds per square foot or concentrated loads of 300 pounds spaced 3 feet center to center, each occupying an area of 1 foot wide by the depth of the tread, whichever will produce the greater stress. A safety factor of 4 is used for inside stairways, and a safety factor of 6 is used for outside stairways on the basis that outside steel stairways being exposed to the elements are subjected to possible weakening through corrosion.

3.15 *Accessible ceilings, scuttles, and ribs of skylights* are designed to support a concentrated load of 200 pounds occupying an area 2-1/2 feet square and so placed as to produce maximum stresses in the affected members.

3.16 *Stairway and balcony railings,* both inside and outside, are designed to resist a horizontal thrust of 50 pounds per linear foot applied at the top of the railing.

Floor Load Data

3.17 Floor plans showing the weights and general plan dimensions of initial and future telephone equipment are given the architect in the design stage of a new building, or of an addition to an existing building, in order to determine that the basic live loads of 150 and 175 pounds per square foot, probably used in the initial planning, are adequate for the conditions of actual loading.

4. SOIL AND HYDROSTATIC PRESSURES

4.01 *Pressure on Basement Walls:* In the design of basement walls and similar approximately vertical structures below grade, provision is made for the lateral pressure of adjacent soil. Due allowance is made for possible surcharge from fixed or moving loads. When a portion, or the whole, of the adjacent soil is below a free-water surface, computations are based on the weight of the soil diminished by buoyancy, plus full hydrostatic pressure.

4.02 *Uplift on Floors:* In the design of basement floors and similar approximately horizontal construction below grade, the upward pressure of water, if any, is taken as the full hydrostatic pressure applied over the entire area. The hydrostatic head is measured from the underside of the construction.

5. WIND PRESSURES

5.01 Buildings are designed and constructed to withstand horizontal pressures caused by wind from any direction including pressure by cyclones, hurricanes, or tornadoes where applicable.

5.02 Every exterior wall is designed and constructed to withstand such wind pressures acting either inward or outward.

5.03 *Roofs*

(a) The roofs of all buildings are designed and constructed to withstand wind pressures acting outward normal to the surface.

(b) Roofs or sections of roofs with slopes greater than 30 degrees are designed and constructed to withstand wind pressures acting inward normal to the surface and applied to the windward slope only.

(c) Overhanging eaves and cornices are designed and constructed to withstand outward wind pressures.

(d) Adequate anchorage of the roof to walls and columns, and of walls and columns to the foundation to resist overturning, uplift, and sliding, is provided in all cases.

5.04 *Chimneys:* Chimneys, tanks, and towers are designed and constructed to withstand wind pressures.

5.05 *Shielding and Unusual Exposures:* No allowance is made for the shielding effect of other buildings.

5.06 *Stresses During Construction:* Provisions are made for wind stress during the construction of a building.

6. EARTHQUAKE LOADS

6.01 In general, every building is designed and constructed to withstand some lateral load from any horizontal direction.

6.02 Every building in localities where earthquakes of major or near major intensities are experienced, is designed and constructed to withstand a minimum lateral load from any horizontal direction as prescribed by local building codes.

6.03 In every building having a skeleton frame, such frame is designed and constructed to withstand a certain percentage of the force specified for the building itself in accordance with local building codes, without assistance from any walls or floors. By skeleton frame is meant a framework consisting of columns, girders, beams, and similar members supporting and transmitting all loads to foundations.

6.04 Reinforced concrete or masonry walls and all other permanent structural elements capable of providing resistance are assumed to act integrally with the structural frames in resisting the shears and movements due to the specified horizontal force, unless specifically designed and constructed to act independently.

CHECKING ROUTINE

GARAGES AND GARAGE WORK-CENTERS

PROJECT PLANNING AND DESIGN

1. GENERAL

1.01 This section furnishes a general outline of suggested principles to be considered in the planning and design of garages and garage work-centers. A checking routine is recommended for the analysis of specific building projects to determine the design requirements with consideration of the factors which affect the utility, cost and appearance of the building.

1.02 It is important to the control of building projects that consideration be given to the principles of initial planning in regard to location, site selection, and scope of the project. The review of building projects by application of a checking routine before plans and specifications are submitted for bids, provides an additional control to the project.

1.03 Many of the items listed in BSP Section H20.220, Checking Routine - Building Project Planning and Design, are applicable to the design and planning of garages and garage work-centers as well as to telephone buildings and are included in this section. It is thought that a tabulation of the items or questions to be considered will be helpful in the application of a checking routine.

1.04 The varying factors involved in developing well-balanced elements of utility, economy and appearance when selecting sites and preparing plans for garages and garage work-centers require the individual consideration of each project.

2. SELECTION OF GARAGE LOCATION

2.01 As a guide in determining garage locations, study plans are made of the work operations of Plant Installation, Maintenance, Construction and Repair Forces to be used as a basis for determination of the proper size and desirable location of garages prior to the acquisition of sites. A cost comparison of contemplated sites and a review of the items outlined in the succeeding paragraph are included in this analysis.

2.02 Factors to be considered in determining location:

(a) Location with minimum travel time to reduce labor cost and vehicle expense, unless available sites are excessive in cost and it is advisable to acquire land in a less accessible area.

(b) Influence of surroundings upon the architectural design of the building. Garages are frequently located in industrial or commercial areas where architectural treatment may be further simplified resulting in more economical construction.

(c) Reactions of adjacent property owners.

(d) The situation with respect to comfort and safety of employees. Accessibility to transportation facilities.

(e) Requirements and economy of combining associated plant offices, storeroom and garage at one location. The establishment of garage work-centers by locating offices for foreman, supervisors and even district offices in conjunction with garage facilities has localized plant operations and improved efficiency. In this way the supervision is nearer to the actual plant operations.

(f) Method and cost of handling supplies and need for plant storeroom.

(g) Community growth trend and direction as affecting motor vehicle operations and permanency of garages at location selected.

(h) Present and future boundaries of divisions, districts, etc.

(i) Size and number of garages for a given community and their relation to existing or contemplated central offices, other offices, storerooms, garages and work centers, rail lines for adjacent pole yards, street car and bus routes, arterial highways, etc.

(j) Usefulness for disaster operations in the event of natural disaster or an enemy attack.

(k) Cost of land and building at each site. Include cost of garage operating personnel and equipment in studies used to determine number of garages. Several plans are studied of larger and smaller installations at various locations before the most efficient types and sizes are selected.

(l) Deed, zoning and building code regulations.

(m) Fire or other hazards due to surrounding buildings and class of occupants.

(n) Wide street for safe exit and entrance.

(o) Avoidance of fronting on main arteries.

(p) Avoidance of congested districts.

(q) Efficiency of operations and house service costs.

(r) Availability of suitable commercial repair shops.

(s) Proposed or possible future city planning or road construction which might affect the lot by changes in width or grades of the sidewalk or street.

(t) Possible future changes in the character or development of the neighborhood.

3. SELECTION OF SITE

3.01 Factors to be considered in this section are outlined in more detail in BSP Section H21.111, Selection of Building Sites for Central Offices and Section H21.215, Survey Information.

3.02 Requirements with respect to type and use of proposed building.

(a) Adequate size for present and future needs for offices, employee facilities and parking, number of vehicles, storage of materials, supplies, poles, cable, hardware, trailers, etc., and unforeseen contingencies. Size of an average lot in suburban areas for a 30-car garage may be approximately 120-foot frontage with a depth of at least 200 feet. This will provide space for a driveway alongside the office portion of the building and space for employees' cars. The additional depth is required to provide for future growth, for storage of trailers and for storage of outside plant material. In outlying areas a ground plot of three to four times the size of the building, according to ground usage, is usually satisfactory. Conditions at each site, of course, will govern appropriate size of lot.

(b) Sufficient land area where feasible so that building may be set back about 15 feet from curb at entrance to permit view of street for safety in entering traffic and to allow a suitable turning radius.

(c) Where an associated pole yard is required, consideration is given to obtaining land where a railroad siding can be made available.

(d) Availability and capacities of water and gas mains, electric distribution systems and storm and sanitary sewers.

(e) Corner lot advantageous: more flexibility in arranging entrances to yard and garage. Increased natural light and air. Decreased fire exposure.

(f) Interior lot satisfactory if it extends through to parallel street, or driveway access or easement is obtainable.

(g) Interior lot with exit to one street should provide for minimum of 12-foot driveway along outside wall of building if practicable.

(h) Employee parking is provided where economically practicable or where ground is held for future telephone use and preparation costs are not excessive.

(i) Zoning and building code restrictions.

(j) Favorable neighborhood reaction to the project.

3.03 Avoidance of hazardous locations.

(a) Flood hazard of sites near streams.

(b) Good drainage. Adequacy of storm sewer facilities where available.

(c) Consideration of the type and occupancy of adjacent buildings and surrounding area from fire exposure and fire spread standpoint.

(d) Location as far away from most likely targets for enemy action as practicable.

(e) Hazards of locations near air craft landing areas.

3.04 Site conditions affecting building costs.

(a) Bearing capacity of the soil and type of foundations required.

(b) Slope and contour of lot with consideration of drainage problems, retaining walls, driveways, excessive cut or fill excavation, etc.

(c) Natural and established grades in relation to proposed floor elevations.

4. PLANNING

4.01 Scope of work.

(a) Early consideration of scope of work and design with architect.

(b) Decisions as to type of construction, materials and mechanical and electrical equipment.

(c) Planning the project development with the architect.

4.02 Working drawings.

(a) Advantage of complete plans and specifications. Possible reuse on other projects.

(b) Use of typical design for smaller garages.

(c) Reuse of mechanical, electrical, and plumbing detail sheets, gasoline tank and pump layouts, etc.

4.03 Requirements and considerations.

(a) General

(1) Importance of making prompt use of new plant and fullest practicable use of existing plant, salvaging existing buildings for reuse when applicable.

(2) Comparative costs of construction based on the use of the various applicable structural materials.

(3) Advantages in use of standard manufactured products.

(4) Selection of materials and design to reduce number of crafts involved and simplify coordination problems.

(5) Consideration of possible future growth of the garage in locating auxiliary spaces, heating and fueling equipment, etc.

(b) General garage plan.

(1) A rectangular building plan for parking area more efficient as regards cost per vehicle, with offices, etc., in separate lean-to with lower ceiling height. T and L-shaped arrangements or other irregular plans usually more costly per vehicle to be parked.

(2) Two rows of vehicles served by one vehicle aisle or four rows of vehicles served by two vehicle aisles are economical of space.

(3) Parking at right angle: 1-1/2 feet minimum between vehicles. An average parking area of 8 feet width is ordinarily used in calculating space for small vehicles.

(4) Width of garage generally 60 feet for one vehicle aisle with two rows of vehicles.

(5) Double aisle garages generally 110 feet minimum to 120 feet maximum width with separate entrance doors for each aisle, both front and rear. Parking area free of obstructions by placing interior roof columns only at line where two rows of vehicles meet (55 to 60-foot truss spans).

(6) Aisle width should be equal to length of larger vehicles to be parked, excluding consideration of one or two exceptionally long trucks.

(7) It is desirable for trucks to be headed into wall to permit night loading of supplies from aisle.

(8) Vehicle parking areas are limited preferably to one floor level because of cost factors and ramp construction.

(c) Garage capacity

(1) Although the layout for a specific location is governed by the needs, conditions and fleet make-up of the particular locality, generally the following types of buildings will be most suitable.

(a) Single aisle garage with lean-to (10 to 50-car capacity).

(b) Double aisle garage with lean-to (40 to 100-car capacity).

(2) Garages built initially with capacities of 10 to 40 cars are usually of the single aisle type, whereas capacities of over 40 cars are generally built with double aisles having two entrances at front and two at the rear. However, lot size and shape available or other conditions may indicate a modification of these basic types.

(3) Initial layout plans are prepared so that they may be expanded, if required, by providing additional bays at the rear and by changing the size of office and related facilities in the lean-to accordingly.

(d) Auxiliary space

(1) Offices, training room, employee facilities, locker rooms, storerooms, toolrooms, etc., most economically provided by building one-story lean-to along the side wall of garage with lower ceiling height (usually 8 feet). However, two-story additions for office space also have been used in some cases with satisfactory results. In other cases a two-story District Office Building has been erected, for example, on the front of the lot with a one-story garage at the rear.

(2) Additional detail regarding the layout and arrangement of attended storerooms is contained in Section 61.001 of Supply Operating Practices.

(e) Construction tool storage

(1) Space is provided for storage of construction equipment not in daily use such as pumps, generators, blowers, long ladders, ropes, blocks, etc. This may be located in lean-to, in garage proper enclosed with wire mesh partition, or in shed in yard, based on local conditions.

(f) Loading platform

(1) Platform attached to building at transport truck bed height with outside ramp and door leading to storeroom has been found practicable for ease of handling supplies where such facilities are required. Platforms built recently have been equipped with a cast-iron bumper. This bumper protects the platform but is severe on a truck which is forced against it too rapidly. It is possible to bolt a substantial wood bumper to the metal bumper if protection of the trucks is desired.

(g) Yard paving and driveways

(1) Heavily traveled areas such as entrance drives are usually hard surfaced. Generally, yard paving is of crushed rock or gravel except for those portions where travel is heavy necessitating use of black top or concrete.

(2) Concrete paving strips are provided in some yards as pads for the open storage of certain items such as cable reels, conduit, etc.

(3) Paving is considered at rear of garage which could be removed easily if garage is extended.

(4) Yard is adequately drained away from the garage building.

(5) Driveway curves at curb line are of sufficient radius to permit easy entrance of vehicles into traffic lanes.

(h) Smaller garages

(1) High cost per vehicle offset by simple treatment.

(2) Use of local contractors, labor and materials, where available, for lower costs.

(3) Consider use of prefabricated metal structures for economy.

5. DESIGN

5.01 General.

(a) Construction and maintenance economies of simplified general design of garages.

(b) Avoidance of eccentricities of architectural design.

(c) Consideration of surrounding structures.

5.02 Excavation and grading.

(a) Appropriate design of garage and appurtenant facilities to avoid excessive excavation, fill and grading costs.

(b) Consideration given to deferring improvement of part of lot where lot is larger than current requirements and area and surroundings permit.

5.03 Footings.

(a) Bottom below frost line and have proper bearing area. Appropriate design of building to avoid excessive foundation cost.

5.04 Floors.

(a) Garage floor reinforced concrete usually 5 inches or more thick, 1/8- to 1/4-inch slope per foot to drain to center of vehicle aisle. Provision of natural drainage of entire floor to permit hose cleaning and avoid need for squeegeeing of the floor is recommended. Every effort should be made to obtain a uniform surface without depressions where water will collect. Desirable to steel trowel floor finish to produce a hard dense surface which is as impervious as possible to penetration of oil and grease drippings thereby facilitating sweeping and cleaning. Marking of the floor in sections with edging tools is not recommended. A concrete floor is preferred which is entirely smooth except for expansion joints required for large areas. Consideration is given to surface hardening treatment for floors as outlined in BSP Section H53.105.

(b) If multistory garage can not be avoided, grade of ramp for light vehicles should not exceed 13 per cent and preferably 10 per cent. Surface finish ramps with an abrasive such as carborundum, and ribbed at a 45° angle, V-shaped to center of ramp to aid traction and drainage.

(c) Offices, etc., 4-inch concrete, except storerooms with heavy floor loads.

(d) Consideration given to the provision of a walkway about 3 feet wide in garage adjacent to office space about 4 inches to 5 inches higher than garage floor; office floor to be at the raised level. Walkway should terminate short of the materials door to storeroom to facilitate movement of hand supply trucks from storeroom to garage. Storeroom floor should be at same level as garage floor.

(e) Concrete finished floors in all areas without floor coverings to save first cost and maintenance, except offices where asphalt tile is considered. Asphalt tile (greaseproof) used in important storerooms.

(f) Curved, circular wheel guards at steel H columns with a minimum horizontal extension of 4 inches offer added protection to vehicles and eliminate dirt accumulations.

5.05 Walls.

(a) Avoidance of face brick, terra cotta and other costly finishes is recommended.

(b) Common brick exterior is recommended if appearance controlling. Face brick front considered only if necessary to conform to adjacent buildings.

(c) Reinforced concrete with minimum finishing usually satisfactory and economical.

(d) Neat, well-pointed concrete block masonry will usually give a good appearance.

(e) Quality of block important to avoid later dusting, shrinkage, spalling and rust spots.

(f) Waterproofing cement paints above grade on exterior of concrete block walls recommended to decrease porosity and improve appearance.

(g) Exterior walls of uniform height on all sides of garage proper, as outlined in Paragraph 5.07 (a) (4) are recommended.

5.06 Ceiling height.

(a) Twelve feet to trusses, or equal to door height if greater, recommended.

(b) Minimum ceiling height reduces construction cost and heating requirements.

5.07 Roof structure.

(a) Framing

(1) Wood bow-string truss - low original cost but higher in maintenance and heating.

(2) Metal bow-string truss - economical steel type but parallel chord steel truss may result in less heating volume.

(3) Beam and girder or flat slab construction - provide low roof with minimum volume to be heated, but are usually higher in first cost for a 60-foot span.

(4) Where bow-string trusses are used, the cost of construction may be reduced and appearance improved if the roof surface on each end bay is sloped downward from the top of the last bow-string truss to a horizontal roof line at the end walls. This arrangement permits exterior walls of uniform height and avoids high masonry walls at gable ends.

(b) Joists and sheathing

(1) Wood joists and wood sheathing - not fire resistive.

(2) Steel joists with precast gypsum slabs or precast concrete slabs more costly but not combustible.

(c) Roofing material

(1) Built-up roofing on solid sheathing or steel deck is recommended.

(2) Insulation is considered where advisable. Two-inch thickness rigid insulation provides savings in heating cost.

5.08 Doors.

(a) Vehicle door width usually 12 to 14 feet as required. Height 12 feet for telephone trucks or higher based on State regulations for maximum height of vehicles if commercial freight trucks are to enter.

(b) Overhead type doors generally used, electrically operated in larger garages with opening controls at strategic points and closing controls only at locations where clear view through doorway is possible. A red flashing safety light on electrically operated doors is helpful in preventing accidents.

(c) Both sides of door-jambs are protected with wheel guards to a height of 3 feet.

(d) Front and rear vehicle doors in garage are provided where possible.

(e) Pedestrian sidewalk and door are provided separate from vehicle entrance.

5.09 Windows.

(a) Commercially projected steel sash adequate and economical.

(b) Wired glass for fire protection, recommended particularly in walls which are adjacent to combustible structures or other exterior exposure.

(c) Bottom of window frames in garage section are located above projecting ladders on vehicles.

(d) Glass block lighting usually not economical and does not permit ventilation.

(e) Minimum windows in garage area are provided as required for adequate ventilation. Natural lighting advantage secondary - vehicle servicing generally a night operation.

(f) Heat loss in northern climates, and fire exposure are considered when determining number of windows.

5.10 Partitions in auxiliary space.

(a) Cinder or stone concrete block.

(b) Non-combustible wallboard over studding.

(c) Lath and plaster over studding or plaster on masonry in finished areas.

5.11 Ceiling finish of auxiliary space.

(a) Mineral board or lath and plaster.

5.12 Toilet wall surface.

(a) Painted masonry. Smooth salt glazed tile wainscot at wash basins is considered in important large garages.

5.13 Toilet stalls.

(a) Metal recommended because of moderate first cost and low maintenance.

5.14 Skylights.

(a) Skylights are avoided where possible because of cost, heat loss and continuous maintenance.

(b) Consideration given corrugated wire glass or Plexiglas flush with roof surface when effect of skylights is considered necessary.

5.15 Heating.

(a) Heating plants for garages should be cut off from the building by an unpierced fire wall (except for heating pipes) and fire resistive ceiling, with door entrance only from outside.

(b) Types of Heating Systems:

(1) Steam-heating preferred for larger garages. Coal-fired boiler equipped with stoker of bin feed type. Oil or gas fuel preferable to coal if economically practicable. Unit steam heaters in garage area and direct steam radiation in lean-to. Vacuum return pump. Hot water provided by coil in boiler and adequate storage tank. Boiler equipped with aquastat and necessary controls for providing hot water in nonheating season.

(2) Direct fired overhead unit heaters, gas, electric or oil installed at least 8 feet above floor, usually placed at truss height. Safe distance from adjacent combustible materials.

(3) Hot air or warm air systems designed in accordance with the requirements of the National Board of Fire Underwriters, Pamphlet No. 88, are sometimes employed because of economic considerations. Recirculation of vapors or odors from garage into office spaces is avoided.

(4) Gravity warm air systems not used because of fire hazard.

(c) Heating systems should be installed in accordance with the requirements of the National Board of Fire Underwriters.

(d) Automatic heat shutoff when garage doors are open is considered.

(e) The provision of means of controlling office and garage spaces at differing required temperatures is recommended. Lower temperature usually maintained in garage area.

(f) The provision of partitioned vehicle servicing area, if economical in heating layout, is recommended.

(g) Walls, floor and ceiling of heater room (including domestic hot water heater space) are of noncombustible materials as outlined in the National Building Code.

5.16 Ventilation.

(a) Local ordinances may require facilities for ventilating garages - some cities have regulations requiring special exhaust systems.

(b) If engines are to be run during repairs in service space, underfloor suction ducts with flexible hose for vehicle exhaust pipes are recommended.

(c) The requirements for occasional ventilation, either by natural or mechanical means, made necessary by operating conditions is contained in National Board of Fire Underwriters Pamphlet No. 88.

5.17 Electrical work.

(a) Five-foot candle light intensity usually provided for general illumination in garage.

(b) Incandescent or fluorescent - original cost versus cost of electricity.

(c) Fluorescent lighting fixtures not generally extended to areas where the quality and amount of light is not important or where the lighting is only occasionally used.

(d) Lighting circuits are arranged to minimize cost of electricity.

(e) Vehicle servicing areas require supplementary lighting.

(f) Storeroom areas require supplementary lighting for material selection and repair work. Lighting should be arranged to meet storeroom requirements.

(g) Use of paints with high reflectance on walls and underside of roof improves lighting.

(h) Three-prong polarity grounded electric outlets for power tools and drop lights located at least four feet above the floor are provided around the garage.

(i) Electrical installation should conform with National Electrical Code.

5.18 Plumbing.

(a) Number of fixtures determined by maximum number of persons as covered in BSP Section H24.520.

(b) Consideration given to facilities for women at work-centers.

(c) Toilet fixtures are arranged to make most efficient use of building space and piping for water and waste. Urinals with water seal above all drain openings to facilitate cleaning are recommended.

(d) Showers provided where justified by need.

(e) Water piping installed in garage area for car washing purposes.

(f) Trough drains, or individual floor drains along center line of vehicle aisle and equipped with slotted cover (not perforated cover) are recommended.

(g) Wash fountain is considered where economical rather than individual wash basins.

(h) Janitor's service sink and storage provided in separate small room opening to garage area.

5.19 Gasoline tank and pumps.

(a) Underground storage tank is provided.

(b) Size of tank governed by number of vehicles served.

(c) Storage requirements for a minimum of two weeks is provided.

(d) Cost factor is considered - price of gasoline dependent upon quantity delivered at one time.

(e) Gas pumps located preferably on an elevated concrete island in the open yard, and gassing of trucks done outside.

(f) Island is of sufficient height and size to protect pumps.

(g) If pumps must be within garage, a long filler hose for outside servicing is provided.

(h) Portable gasoline tanks are avoided where possible.

(i) Lubricant storage in separate room or underground.

(j) Handling of gasolines, oils and flammable liquids, and location of storage tanks in accordance with the standards of the National Board of Fire Underwriters, Pamphlet No. 30.

5.20 Compressed air.

(a) Outlets along walls and on center columns for inflating tires are provided.

(b) Air compressor motor of explosion-proof type unless located at height of 4-feet or more above the floor.

(c) Local regulations concerning location of compressor are observed; however, it should not be placed where high room temperatures exist.

5.21 Vehicle lift.

(a) Where vehicle servicing operations are to be performed, consideration is given to the provision of a two-column vehicle lift installed so as to be at floor level when in the lowered position.

(b) A lift is preferably installed in a corner of the garage or in lean-to space if available.

(c) Installation at about 45° angle to aisle to expedite placing of vehicle on the lift is recommended.

5.22 Fencing.

(a) Fence usually essential to protection of supplies and equipment. Fences seven feet in height with three strands of barbed wire at the top to provide additional protection against vandalism and theft have been used.

(b) Woven wire fabric and wood or steel posts generally used. Chain link fence more costly.

(c) Consideration is given to fencing only minimum area required, leaving portion of land for future development when needed.

5.23 Fire protection.

(a) Wired glass in windows will furnish considerable resistance to a fire in an adjacent building, and may afford some protection in the case of interior fires by assisting in excluding oxygen.

(b) Wired glass should be placed in metal window frames.

(c) Automatic sprinkler system would provide additional fire protection for building and contents especially where wood roof construction is used or where there is a large concentration of vehicles.

(d) Heat actuated fire signaling devices, less costly than sprinklers, sometimes are used on combustible ceilings to quickly detect fire and automatically close an electrical circuit to sound an alarm.

(e) Portable fire extinguishing equipment as recommended in BSP Section H43.010, for putting out incipient fires when personnel are on duty.

(f) Extinguishers should be located where they will not be damaged by trucks.

(g) Extinguisher locations clearly marked on columns or walls at height visible above parked vehicles.

(h) Repair work involving open flames or other hazardous work done only in a room separated from storage section by a fire wall. Outside entrance to repair room where possible, otherwise entrance should be equipped with an approved self-closing fire door in tight fitting frame.

(i) Bell System Practice, Section H40.055, covers the requirements for painting vehicles in Company garages.

(j) Good practice requirements for construction and protection of garages is discussed in the National Building Code and in Pamphlets Nos. 30 and 88 issued by the National Board of Fire Underwriters.

(k) Fire and safety inspection and advisory services rendered by Marsh and McLennan are covered in BSP Section H44.015.

6. PREFABRICATED METAL GARAGES

6.01 Various types of prefabricated metal buildings are being manufactured which may be suitable for garages in some locations. This type of construction provides low cost garaging. Some are sufficiently well constructed that the structure would not suffer the expense of shortened useful life. Where such an economical design can be used, it should save money in capital investment; and yet it does not appear to be so cheap as to be too costly in future operation and maintenance. Greatest economy can be obtained in prefabricated metal garages when heating is unnecessary and simplest construction can be used.

6.02 The stock design which seems to be most efficient for garages is 60 feet wide, varying in length, with columns along the walls every 16 feet. It will accommodate two lines of vehicles parked at right angles to the side walls with an aisle down the center. A separate lean-to may be included for office and toilet space. The standard ceiling height to underside of garage trusses would be 12 feet. An overhead door could be placed in each end of the garage and any suitable window arrangement could be provided.

7. OPEN-SHED TYPE GARAGES

7.01 A low cost open-shed type of garage has been used to some extent in warm climates. Those built generally have been of galvanized sheet metal on wood or steel frame, using gravel or sea shells for floors. The roof supports are located so as to provide proper spacing of vehicles for maximum use of space. The columns are placed back from the front roof line with cantilever roof construction to facilitate parking.

7.02 In several instances these sheds have been erected at the rear of the lot behind a central office building. However, they are often built as part of a group of buildings to serve as a complete work-center. Other facilities included in the work-center, such as plant offices, storerooms, training rooms, wash rack, vehicle servicing structure, etc., are of the same general type of construction except that office spaces are finished with wallboard on interior of walls and ceiling and asphalt tile on floors.

DISPLAY OF FLAGS

1. GENERAL

1.01 These instructions cover the display of the United States flag or Bell System flag on Telephone Company # owned buildings or leased property where flags are flown by the Telephone Company.

1.02 Size of Flags

United States Flag

Width	Length
4 Ft.	6 Ft.
5 "	8 "
6 "	9 "
8 "	12 "
9 "	15 "
12 "	18 "
15 "	25 "
20 "	30 "

Bell System Flag

Width	Length
4 Ft.	6 Ft.
5 "	7-1/2 "
6 "	9 "
7-1/2 "	11-1/4 "
9 "	13-1/2 "
12 "	18 "
16 "	24 "
20 "	30 "

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1.03 All flags shall be maintained in a clean and good condition. Badly worn or torn flags shall not be flown.

1.04 Selecting size of flag required.

(a) For flag poles set in the ground and for vertical flag staffs on buildings generally the width of the flag should be about 1/5 of the height of the pole.

(b) For roof and window inclined staffs, the width of the flag should be about 1/2 of the length of the staff. Inclined staffs should be at an angle of approximately 45 degrees.

2. DISPLAYING OR HANGING THE UNITED STATES FLAG

2.01 There is no Federal law in force pertaining to the manner of displaying or handling the flag of the United States. There are, however, regulations and national usages on the subject and in order that there may be no adverse reaction created through improper display of flags, all flags displayed on Company-owned or leased buildings shall be in accordance with this instruction. The rules herein contained relative to the displaying of the flag of the United States have been taken from the flag circular issued by the Adjutant General's Office of the War Department and are in agreement with the code of flag etiquette prepared by the National Americanism Commission of the American Legion. The observance of these rules would serve as an indication of the respect the Bell System has for its country.

2.02 The flag of the United States shall not be flown before sunrise or after sunset and shall be displayed at full staff on national, state, or generally observed holidays or as hereinunder specified.

2.03 On days of mourning designated by the President of the United States the United States flag shall fly at half staff until the conclusion of the period of mourning when it shall be hoisted to full staff and there remain until the usual time for lowering.

2.04 On Memorial Day, May 30, the flag of the United States shall fly at half staff until noon and at full staff from noon until the usual time of lowering.

2.05 In placing the flag of the United States at half staff, it shall first be hoisted to the top of the staff and lowered to half staff. Preliminary to lowering from half staff, it shall be hoisted to full staff.

2.06 Use of the United States flag shall be confined insofar as possible to its display on the staff. When it is required to be displayed in any other manner than by being flown from a staff, the following rules apply:

(a) When the United States flag is displayed either horizontally or vertically against a wall the Union shall be uppermost and to the flag's own right, that is, to the observer's left when the observer is facing the flag.

(b) When the flag of the United States is displayed with other flags, as on a wall, it shall be given the place of honor on the flag's own right. (Observer's left). The flag of the United States shall be above or at the same height as the other flag being displayed. The United States flag so displayed shall be larger than the associated flag.

2.07 When a flag is no longer fit for display, it shall be destroyed privately, preferably by burning.

2.08 The following are specifically designated days for displaying the United States flag. Over and above these specified days, the displaying of the United States flag should be governed by dictates of public opinion and the flag flown as frequently as seems proper and appropriate --- even upon a daily basis.

Lincoln's Birthday	Feb.	12
Washington's Birthday	"	22
Memorial Day	May	30
Flag Day	June	14
Independence Day	July	4
Labor Day	1st Monday in Sept.	
Armistice Day	Nov.	11
Columbus Day	Oct.	12
National Election Day		

Special Occasions as designated by the Vice President and General Manager.
Presidential Inauguration Day

3. DISPLAYING THE BELL SYSTEM FLAG

3.01 The Bell System flag shall be flown at full staff on our principal buildings at Davenport, Des Moines, Duluth, Fargo, Minneapolis, Omaha, St. Paul, Sioux Falls, and other designated exchanges, except when the United States flag is being flown.

3.02 There may be occasions when it would be appropriate to fly the Bell System flag at half staff but this shall be done only after approval by the Vice President and General Manager.

WINDOW SHADES

ORDERING AND INSTALLING

1. GENERAL

1.01 This section covers the ordering and installation of new and replacement window shades.

1.02 It is reissued to include single and double hung types and to specify the flame resistant vinyl type of shade cloth. These items are available from the Western Electric Company.

1.03 The single shade is installed at the top of the window casement and it may be adjusted to cover part or all of the window opening. The double hung shade is installed near the meeting rail of the window in such a manner that one shade may be adjusted to cover the upper half of the window and the other shade the lower half of the window. Generally, the single shade installation satisfactorily provides light control but the double hung shade may be advantageous where more effective light control, together with better ventilation, is required. Where decorative effect is not paramount, the double hung shades as shown in Fig. 2 are preferred to Venetian blinds.

1.04 When new shades (not for replacement) are required and the mounting of the brackets appears beyond the skill of the building service people the initial installation may be done by local shade dealers. However, it is important that assurance be had that the specified type and grade of shade cloth will be furnished. The recommended shade cloth is DuPont Tontine vinyl flame resistant or an approved equivalent.

1.05 The recommended shades are available in solid color, in duplex, having a different color on each side and in triplex, having the same color on each side but the shade is opaque. The latter is used where moving pictures are to be shown and in any other place where daylight is to be excluded. For usual requirements DuPont Tontine flameproof No. 506 Ecru, or approved equivalent, is recommended.

1.06 When using stepladders to install window shades the safety precautions described in Bell System Practice Section H51.201 - Stepladders - Use and Care should be observed.

1.07 Any soil such as finger marks, smudges, etc, incidental to installing the shade is removed with a moistened cloth or sponge. A mild soap rubbed against the cloth or sponge may be used if the moist cloth or sponge is inadequate.

1.08 It is helpful for use in checking service life to date the shades on installation. The date should appear on the right-hand side of the shade, close to the roller.

1.09 When quarters are redecorated, window shades should be inspected for cleaning or replacement.

2. EQUIPMENT AND MATERIALS

2.01 For securing ordering data:

- Measuring rule
- Stepladder

2.02 For installation:

- Measuring rule
- Stepladder
- Hammer
- Screwdriver
- Hand drill and drill points
- Center punch
- Necessary tacks and screws

3. SECURING ORDERING DATA

3.01 When ordering single hung window shades for either new installations or replacement purposes the length and width dimensions as indicated in Fig. 1 are given. In addition, orders should specify the desired color and whether inside or outside mounting brackets are applicable.

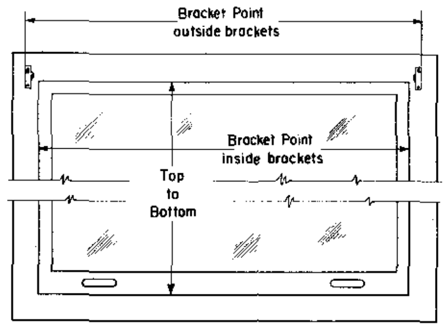

Fig. 1

3.02 For double hung shades, the top to bottom window dimension and the distance between bracket points are obtained the same as for the single hung shades. Color is specified. The manufacturer or dealer provides the proper dimension of both the top and bottom shades as indicated by the plan shown in Fig. 2.

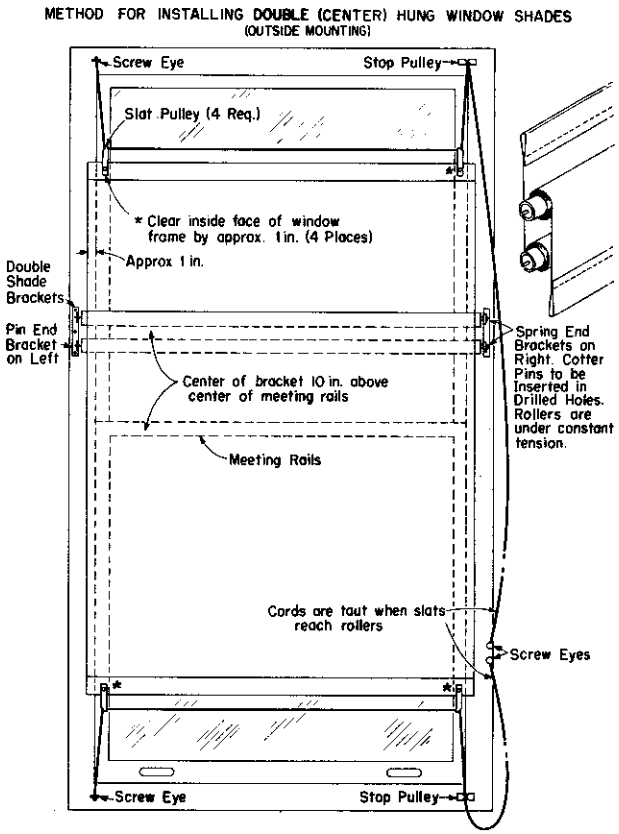

Fig. 2

3.03 Double hung shades are feasible only for outside bracket mounting. The necessary harness, i.e., cords, pulleys, brackets, screw eyes, etc, as shown in Fig. 2 are furnished with the shades when they are ordered without need for separately specifying them.

3.04 Measurements are taken to the nearest 1/16" for width and 1/4" for length. The width measurement should be carefully taken as a variation of as little as 1/16" may make the shade unsuitable. The manufacturer makes allowances for width and overlap length for the shade itself and such allowances should not be included in the dimensions specified. Also the width of shade on the roller is adjusted to assure proper functioning.

4. ORDERING

4.01 Orders should be worded as follows:

(Quantity) Shade, Window (single hung or double hung) (color, as DuPont No. 506) (Size, as width 45-3/16", length 83-3/4") (I.B. or O.B.)

4.02 The terms I.B. or O.B. are the customary trade designations for inside or outside brackets respectively and consequently it is unnecessary to spell out the words on orders.

4.03 When ordered as above from the Western Electric Company the shade is mounted on the roller by means of a top hem which prevents the shade from being pulled off the roller when over extended. Another hem at the bottom takes a 1-1/4" slat, eyelet inserted. The applicable mounting brackets and No. 4 cord of proper length for the type of installation are included. For double hung shades, the harness fittings as shown in Fig. 2 are furnished. For the larger building having a competent window shade installer the shades may be obtained without the rollers.

5. REPLACING SHADES - PROCEDURE

5.01 The shade should be placed in brackets fully rolled, and then extended the full length of its travel to check tension. Tension should be just sufficient to return the shade to the roller. To increase tension, pull the shade down a few feet, remove from the brackets, roll the shade back on the roller by hand and replace it in the brackets. To decrease tension, remove the shade from the brackets, unwind the shade a few feet by hand and replace it on the brackets. Avoid a strong tension because it tends to slam and damage the shade.

5.02 The shade cord is attached as follows:

(a) For single shades. One end of the cord is inserted in the eyelet of the shade and knotted with the knot on the window side of the eyelet. The other end is attached at the right-hand side of the window casing usually in an eye screw. Place the cord attachment about five feet from the floor. The cord should be of exact length so that it becomes taut when the shade is raised to within an inch or two from the top and thus prevents the slat from revolving about the roller.

(b) For double hung shades. The cord should be installed in a continuous length as shown in Fig. 2.

6. *INSTALLING NEW SHADES - PROCEDURE*

6.01 The brackets for single hung shades are located as follows:

(a) Inside brackets. The center of each bracket where the roller tip fits, is located approximately 1-1/2" (to centers) down from the top of the casement.

(b) Outside brackets. The brackets are located on the face of the casement near the top or near the lower edge of the top cross member. An overlap of not less than 2" should be allowed on each side where possible to avoid light leaks on the sides.

6.02 When installing brackets for new shades, it is important that they be level with respect to each other, otherwise the shade will not hang straight when pulled down and will roll up unevenly, toward the high side. The screw utilizing the slotted hole in the bracket base is installed first and in the middle of the slot. The second screw is not installed until the shade rolls correctly. If the shade does not roll up straight when grasped at the center it is an indication that the roller is not level, in which case the bracket is raised slightly at the end of the roller opposite to that which rolls off. A slight change, 1/16" or less, will correct the tendency for the shade to roll off at one side.

6.03 For wood casements, round head screws about 3/4" long should be used. For metal casements, self-threading metal screws should be used. Slightly smaller holes should be drilled in the casement for starting the screws. The round hole bracket is always on the right-hand side and the slotted bracket on the left for single hung shades and the reverse for the double hung.

6.04 For double hung shades the brackets are installed with the centers about 10" above the horizontal center line of the window meeting rail, on the outside face of the casing (window trim). The brackets are so mounted that the shade cloth will overlap the casing not less than 2". The mounting above the center rail is to permit the use of a window pole in raising and lowering the windows and permit ready access by window washers. The mounting bracket is positioned horizontally. Drill the window casings for bracket mounting screws as described in Paragraph 6.03. Attach the roller brackets.

6.05 After installing the brackets as shown in Fig. 2, the shades are then placed in the brackets, the cords attached as shown in Fig. 2, and the tension checked as outlined in Paragraph 5.01.

TABLE OF BUILDING CLEANING PROCEDURES AND MATERIALS

1. GENERAL

1.01 This section transmits the attached table which is intended for ready reference in determining the appropriate cleaning materials for the various building cleaning assignments.

1.02 The table is reissued and generally revised to include the changes in cleaning procedures and materials that are recommended in recently issued sections.

1.03 The first column of the chart represents the most commonly applied and mildest periodic treatments followed by the less frequently used and increasingly more effective procedures in the second and third columns.

1.04 While the customary sweeping and dusting operations are omitted from the table, such operations are, of course, required preliminary to many of the procedures included in the table.

1.05 If in doubt as to details regarding the operations, the specific quantities of cleaners to use, or any special conditions, reference should be made to the various B.S.P. sections covering the particular procedures, equipment or quarters involved.

1.06 Special care should be exercised at all times to perform each operation in a safe manner. All tools should be examined before using them to assure that they are in a safe and good workable condition. All materials and tools should be kept thoroughly clean and restored, following use, to their proper places. All material containers should be clearly marked as to their contents.

1.07 Most people can use the cleaning materials recommended in the attached table without adverse effect on the hands but those whose hands may be affected should wear suitable rubber gloves.

1.08 It is important that special consideration be given to all cleaning activities in terminal and switch rooms to avoid the possibility of creating or spreading dust or lint.

2. TABLE

2.01 The table of Building Cleaning Procedures and Materials is attached.

2.02 An enlargement of the attached table of Building Cleaning Procedures, measuring approximately 20 x 19, suitable for posting in building service quarters for ready reference by the cleaning forces is available and may be ordered through the Western Electric Company as (Quantity) Form No. E-4077.

Attached:
Table of Building Cleaning Procedures and Materials

TABLE OF BUILDING CLEANING PROCEDURES AND MATERIALS

PERFORM EACH OPERATION IN A SAFE MANNER AT ALL TIMES

Form E-4077 (6-55)

THIS TABLE APPLIES TO PERIODIC AND NOT TO DAY TO DAY ROUTINE PROCEDURES.
THE MILDEST PROCEDURES ARE EMPLOYED WHENEVER THEY ARE ADEQUATE AND THE MORE EFFECTIVE ONES USED ONLY WHERE THE MILDER ONES ARE NOT ADEQUATE.
REFER TO BELL SYSTEM PRACTICES FOR DETAILED WORK INSTRUCTIONS.

ITEM		1 MILDEST		2 MORE EFFECTIVE		3 MOST EFFECTIVE	
		PROCEDURE	MATERIAL	PROCEDURE	MATERIAL	PROCEDURE	MATERIAL
FLOORS							
CARPET & RUGS		VACUUM					
HARD CONCRETE	PAINTED PLAIN	DAMP MOP	WATER	WET MOP	POWDERED SOAP PYROPHOSPHATE CLEANER	SCRUB	POWDERED SOAP PYROPHOSPHATE CLEANER
	GARAGES, ENGINE ROOMS, ETC.		OIL ABSORBENT POWDER		GARAGE FLOOR CLEANER		GARAGE FLOOR CLEANER
STONE	MARBLE, TRAVERTINE TERRAZZO, TILE	DAMP MOP	WATER		PYROPHOSPHATE CLEANER		PYROPHOSPHATE CLEANER – SCOURING POWDER
RESILIENT ASPHALT LINOLEUM VINYL RUBBER		DAMP MOP	WATER	SPOT CLEAN AND APPLY WAX OR ANTI-SLIP FLOOR FINISH	½ POWDERED SOAP & ½ PYROPHOSPHATE CLEANER OR LIQUID FLOOR CLEANER	RECONDITION & APPLY WAX OR ANTI – SLIP FLOOR FINISH	½ POWDERED SOAP & ½ PYROPHOSPHATE CLEANER OR LIQUID FLOOR CLEANER
STAIRS AND LANDINGS	ALL KINDS	DAMP WIPE		WASH	PYROPHOSPHATE CLEANER	SCRUB	SCOURING POWDER
FURNITURE							
METAL OR WOOD	DESKS, TABLES, (INCL. RESILIENT TOPS) BOOKCASES, FILING CABINETS, LOCKERS, OFFICE CHAIRS, ETC.	SPOT CLEAN	POWDERED SOAP	WASH AND POLISH	POWDERED SOAP FURNITURE POLISH		
LOUNGE	CLOTH	VACUUM					
	LEATHER PLASTIC, IMITATION LEATHER	WIPE	DAMP CLOTH	SPOT CLEAN	POWDERED SOAP	WASH AND TREAT	POWDERED SOAP – LEATHER DRESSING POWDERED SOAP – FURNITURE POLISH
TRIM, HARDWARE AND DOORS							
BRIGHT	ALUMINUM, BRASS, BRONZE, COPPER NICKEL ALLOYS CHROMIUM, STAINLESS STEEL	WIPE	DAMP OR TREATED CLOTH	WIPE	PARAFINE OIL ON DAMP CLOTH	WASH AND/OR POLISH	PYROPHOSPHATE CLEANER – LIQUID METAL POLISH
LACQUERED	ALUMINUM, NICKEL ALLOYS BRASS, BRONZE, COPPER					STRIP – POLISH – RELACQUER	LIQUID METAL POLISH – PIGMENTED LACQUER
WEATHERED	BRONZE, COPPER, SWEDISH IRON BUILDING SIGNS ALUMINUM, NICKEL ALLOYS					POLISH LETTERS	ABRASIVE RUBBER ERASER
WOOD	PAINTED VARNISHED			SPOT CLEAN	POWDERED SOAP	WASH	PYROPHOSPHATE CLEANER
ENAMELED						WASH AND OR POLISH	POWDERED SOAP – FURNITURE POLISH
WALLS, PARTITIONS							
BRICK CONCRETE	UNFINISHED	BRUSH OR VACUUM					
	PAINTED	SPOT CLEAN	PYROPHOSPHATE CLEANER	WASH	PYROPHOSPHATE CLEANER		
METAL	ENAMELED, PAINTED						
PLASTER	UNFINISHED	BRUSH OR VACUUM					
	PAINTED	DUST		SPOT CLEAN	POWDERED SOAP	WASH	PYROPHOSPHATE CLEANER POWDERED SOAP
PAPERED	WASHABLE						
STONE	MARBLE, TRAVERTINE TILE, COMPOSITION	SPOT CLEAN	PYROPHOSPHATE CLEANER	WASH	PYROPHOSPHATE CLEANER		
WOOD	PAINTED VARNISHED	DUST		SPOT CLEAN	POWDERED SOAP	WASH WASH AND/OR POLISH	PYROPHOSPHATE CLEANER POWDERED SOAP – FURNITURE POLISH
CEILINGS	UNFINISHED	BRUSH OR VACUUM					
	PAINTED, ENAMELED ACOUSTICAL WITH COATED SURFACE	SPOT CLEAN AT VENTILATORS	PYROPHOSPHATE CLEANER	WASH	PYROPHOSPHATE CLEANER		
WASH ROOMS							
STALL PARTITIONS	MARBLE, SLATE, VITREOUS METAL, ENAMELED, PAINTED WOOD, PAINTED	WIPE	DAMP OR TREATED CLOTH	WASH	PYROPHOSPHATE CLEANER		
	WOOD, VARNISHED				POWDERED SOAP		
TOILETS	SEATS BOWLS URINALS	WASH	PYROPHOSPHATE CLEANER	SCRUB	SCOURING POWDER	CONTRACT SERVICE	INHIBITED MURIATIC ACID
WASH BASINS							
MISCELLANEOUS							
FIXTURES, LIGHTING	SHADES, GLASS METAL, ALL TYPES	WIPE	DAMP OR TREATED CLOTH	WASH	PYROPHOSPHATE CLEANER		
GLASS	WINDOWS, PARTITIONS BOOKCASES, MESSAGE REGISTERS PICTURES, BULLETINS, MIRRORS		DAMP CLOTH		WATER		
VENETIAN BLINDS WINDOW SHADES			DAMP CLOTH *		PYROPHOSPHATE CLEANER		

* CLOTH DAMPENED IN PYROPHOSPHATE SOLUTION MORE EFFECTIVELY REMOVES DUST AND DIRT FILM.

THE FOLLOWING QUANTITIES OF CLEANING MATERIALS ARE AMPLE FOR AVERAGE REQUIREMENTS

PYROPHOSPHATE CLEANER	1 TO 2 TABLESPOONFULS	TO APPROX. 10 QTS. (2 ½ GALS.) WATER, PREFERABLY WARM.
POWDERED SOAP	1 TO 2 TABLESPOONFULS	
GARAGE FLOOR CLEANER	2 TO 3 TABLESPOONFULS	
LIQUID FLOOR CLEANER	½ PT. PER GAL. WATER, PREFERABLY WARM.	

SCOURING POWDER IS APPLIED SPARINGLY AND DIRECTLY TO THE SOILED PORTIONS OF THE FLOOR.
GARAGE FLOOR CLEANER ALSO MAY BE APPLIED DIRECTLY TO HEAVY GREASE OR OIL DEPOSITS.
WHEN PYROPHOSPHATE CLEANER AND SOAP ARE USED IN THE SAME SOLUTION, FIRST DISSOLVE THE PYROPHOSPHATE CLEANER

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APPLICATION OF ANTI-SLIP FLOOR FINISH

NON-WAX TYPE

CONTENTS PAGE

1. GENERAL

1.01 This section describes the procedures to be followed in applying and maintaining the recommended non-wax Anti-Slip Floor Finish on asphalt tile, linoleum, rubber and vinyl floor coverings.

1.02 It is reissued to recommend a new improved cleaner, Liquid Floor Cleaner, as a companion item, and to make general revisions as a result of field experience.

1.03 Anti-Slip Floor Finish is a water emulsion of plasticized resinous materials which provides a readily renewable protective coating of greater slip resistance than floor waxes.

1.04 Anti-Slip Floor Finish requires special care in its initial application to ensure an anti-slip surface. It is essential that all previously applied wax be removed from the floor by thorough cleaning. It is also important that any residues from the cleaning solution be thoroughly rinsed from the floor with clean warm water. Failure to remove old wax will result in a slippery floor. Residues of wax or alkaline cleaners are apt to produce a poor bond between the floor and the finish with subsequent excessive scratching and powdering.

1.05 Anti-Slip Floor Finish and floor waxes should not be used on different parts of the same floor, or in adjacent rooms, in so far as practicable, because of the contrasting slip resistance and the liability of tracking wax over on to the anti-slip finish.

1.06 Procedures for evaluatng slip resistance are described in:

SECTION H51.119 - MEASUREMENT OF SLIP RESISTANCE OF RESILIENT FLOORS

2. TOOLS AND MATERIALS

2.01 To obtain satisfactory results with Anti-Slip Floor Finish it is essential that Liquid Floor Cleaner be used to prepare the floor regardless of the type of flooring.

2.02 Preparation of floor:

Container for cleaning solution
Container for rinse water
Container with wringer for dirty solution mopped up from the floor.

Mops, as follows:

Mop for applying and picking up cleaning solution
Mop for rinse water
Floor polishing machine (small, medium or large size two brush type) equipped with scrubbing brushes, or deck scrub brushes for small areas
Liquid Floor Cleaner
Putty knife
Cellulose sponge for wiping spatterings from surbases, furniture bases, etc.
Water, preferably warm
Caution signs

2.03 Application of Anti-Slip Floor Finish:

Pail and wringer or mop tank
Mop reserved for Anti-Slip Floor Finish
Anti-Slip Floor Finish
Caution signs

3. PREPARATION OF FLOOR

3.01 Caution signs reading, "CAUTION - FLOOR BEING CLEANED," are placed where they will prevent persons from inadvertently walking upon the wet floor.

3.02 Procedures to be followed in mopping and scrubbing are given in Bell System Practices, Section H51.107, Floor Mopping and Scrubbing. However, certain details and precautions should be observed to obtain best results with Anti-Slip Floor Finish. These are outlined in the following paragraphs.

3.03 Stripping Previously Waxed Floor: Machine scrubbing of old floors that have been previously waxed, or new floors with factory finish, is necessary before initial application of Anti-Slip Floor Finish to ensure removal of all previously applied wax or factory finish. Liquid Floor Cleaner is diluted in the ratio of one part cleaner to 10 parts of moderately hot water, about 130°F. Spread the cleaning solution over an area of approximately 200 square feet of floor space per man. Avoid the application of excessive amounts of cleaning solution to prevent possible action on the seams of the floor covering. Allow cleaner to remain in contact with floor for about 3 minutes to permit softening and emulsification of the old wax film. Scrub thoroughly with floor polishing machine. Pick up and rinse as described in Paragraph 3.05.

3.04 Stripping Floor Previously Maintained with Anti-Slip Floor Finish: Periodically it becomes advisable to completely remove old Anti-Slip Floor Finish to get a fresh start. Liquid Floor Cleaner is diluted in the ratio of one part cleaner to 16 parts of moderately hot water, about 130°F. Spread the cleaning solution over an area of approximately 200 square feet of floor surface per man. Allow cleaner to remain in contact with floor for about 3 minutes to permit chemical action to loosen the finish. Mop scrub or scrub with floor polishing machine. Pick up and rinse as described in Paragraph 3.05.

3.05 Pick up and Rinsing: Pick up the dirty cleaning solution with the mop used for applying the cleaning solution and wring into the separate waste container. The dirty solution should be picked up so that the floor appears clean and nearly dry. Using the rinsing mop thoroughly rinse with clean warm water, at least two times to remove all traces of old wax and cleaning material. Wring dirty rinse water into the waste container. Dry floor as much as possible with the wrung rinsing mop.

3.06 When the floor has dried, examine the surface to be sure that no wax is present as evidenced by high lights, i.e., streaky or spotty sheen areas when viewed toward light. However, when the floor is being reconditioned after resin has previously been used, there is no need to remove all traces of the old resin film.

3.07 In cutting over an old floor from wax to anti-slip, there may be wax in the pores of the floor even though there is no visible surface evidence. Under these conditions initial applications of Anti-Slip Floor Finish may not have maximum bond and anti-slip properties. It will be found that these properties in most cases improve with subsequent routine strippings and anti-slip reapplications. This may also be true of new floors where special attention may be necessary to ensure complete removal of factory finish.

4. APPLICATION OF ANTI-SLIP FLOOR FINISH

4.01 Caution signs should remain in place while the anti-slip floor treatment is being applied to warn occupants against the possibilities of slipping on the wet floor.

4.02 Where practicable, begin applying the finish at the point farthest from the exit and work toward the exit. It is important that the anti-slip finish be applied thinly and evenly.

4.03 Apply the finish in full strength, i.e., as received. Apply with a thoroughly clean mop which has been immersed in clean water and wrung as dry as possible with a mop wringer. Mops which have been previously used for applying wax must not be used for applying anti-slip finish. A separate mop is specially reserved for this purpose.

4.04 Pour the finish from the container into a clean pail, equipped with a wringer. Fill the pail about one-third full unless a smaller quantity is sufficient for the job at hand. Dip the dampened and wrung mop into the finish and then wring it sufficiently so that it will not drip. Apply the finish to the floor using side to side or forward and back strokes as required, carefully spreading the finish thinly and evenly. Do not attempt to respread the finish while it is drying.

4.05 Allow at least 20 minutes for drying between coats. For initial applications apply two coats. If the floor is porous a third coat may be necessary. While coverage will vary somewhat with the person applying the finish and the porosity of the floor, normal coverage is about 1500 square feet per gallon of finish for a two coat application.

4.06 On the second and third coats do not apply the finish closer than six inches to surbases of walls and columns, or to filing cabinets resting directly on the floor, or to similar permanently placed equipment or furnishings.

The additional coats should not be applied under desk pedestals, sanitary bases of filing cabinets or other furniture, or on any areas which are not walked upon.

4.07 Allow at least one hour following the final application before opening the area to traffic. The finished job should have a luster, should not show streaks or mop strand marks, skipped areas, dull areas or other evidence of uneven application.

4.08 Any Anti-Slip Floor Finish remaining in the pail after the application has been completed should not be poured back into the original container. If any substantial amount remains it should be placed in a separate container for reuse at the next application. Anti-Slip Floor Finish containers should be kept well capped to properly preserve the contents. Anti-Slip Floor Finish may deteriorate on aging. Cans are dated to facilitate rotation of stocks. Aging results in jelling or the formation of excessive sediment but this should not occur within one year.

5. ROUTINE CARE

5.01 For the routine care of floors on which Anti-Slip Floor Finish has been applied, proceed as follows:

(a) Day-to-day cleaning consists of dustless sweeping as covered by:

SECTION H51.104.1 – SWEEPING, DUSTLESS, DAMP CLOTH METHOD, OR

SECTION H51.104.2 – SWEEPING, DUSTLESS, TREATED CLOTH METHOD

5.02 Over-all Refreshing of Anti-Slip Floor Finish to Defer Reconditioning Intervals Is Accomplished as Follows: Wet mop with a warm solution of Liquid Floor Cleaner, one part to 40 parts of water, to remove surface soil, abrasions, and top film of Anti-Slip Floor Finish. Rinse once with clean warm water. Allow to dry and apply one coat of full strength Anti-Slip Floor Finish. This operation may be done on a spot cleaning or over-all basis, and may be repeated several times before a complete reconditioning becomes necessary as described in Part 3.

5.03 Buffing Anti-Slip Floor Finish is not recommended as the surface is so hard that buffing has little beneficial effect.

6. CARE OF TOOLS

6.01 Clean the pails and mop wringers and put them away in their storage places.

6.02 Clean the mops within a few minutes after their use, i.e., before the finish has set. This is done by immersing the mop in clean water, preferably warm, for a few minutes followed by two or three rinsings. Hang the mops (strands down) in a clean, well ventilated place where they can readily dry.

6.03 Wipe off the electric floor polishing machine following use, with a damp cellulose sponge.

6.04 Restore the caution signs to their storage places.

SWEEPING - GENERAL

1. GENERAL

1.01 This section describes the procedure for sweeping with floor brushes to remove loose dirt and litter accumulated on floors, stairways, sidewalks, areaways, etc. Smooth floors in buildings are swept by the dustless sweeping method described in Bell System Practices Section H51.104, Sweeping, Damp.

1.02 This section is reissued and generally revised to include stairway sweeping, to specify the Palmyra floor brush to replace the corn floor broom and to limit the use of dry sweeping methods to certain specific areas.

1.03 Sweeping as covered in this section is divided into four classifications:

(a) Light sweeping - for removal of the usual loose dirt and litter from sidewalks, boiler rooms and cable vaults.

(b) Heavy sweeping - for removal of dirt and debris of a heavier nature that accumulate in garages, outside areas such as driveways and areaways and some storage areas.

(c) Stairway sweeping - for removal of loose dust and dirt from stairways.

(d) "Pickup" sweeping - for removal of light random litter from public or other places. It is not intended that pickup sweeping be substituted for regular over-all sweeping but it may be used as a preliminary to or in the course of dustless sweeping.

The (a), (b) and (c) classifications are usually performed on scheduled routines.

1.04 The proper brush should be selected for the sweeping job to be done. A hair floor brush having numerous fine fibres effectively removes fine dirt. For heavy sweeping, the Palmyra floor brush is used. This brush has inner rows of Palmyra, which is sufficiently stiff to move heavy debris, surrounded by outer rows of Tampico, a finer fibre which removes the finer dust and dirt. The Palmyra brush replaces the corn broom. Gum, tar or other adhesive substances that may be encountered are removed with a putty knife.

1.05 When sweeping, it is important to avoid raising dust which is unsanitary and results in an unsatisfactory job. Dust settles back to the floor and on any flat surface in the area. Use of the proper tool and care in its manipulation rather than the use of sweeping compounds will best achieve the desired results; however, damp sawdust may be used if necessary on coarse concrete floors. Concrete floors which shed dust should be treated with concrete floor hardener as described in Bell System Practices Section H53.105, Hardening and Dust-Proofing Concrete Floors.

2. TOOLS

Hair floor brush - 16" or 30".

Palmyra floor brush - 18", 24" or 30".

Lobby brush and lobby dustpan.

Dustpan.

Counter dust brush.

Putty knife.

14 qt. pail.

3. LIGHT SWEEPING - PROCEDURE

3.01 Light sweeping is performed in boiler rooms, cable vaults, on sidewalks, stairways or areas having concrete or asphalt surfaces not adaptable to dustless sweeping.

3.02 The hair floor brush is used for light sweeping. Choice of the 16" or the 30" brush will depend upon the area to be cleaned and the obstructions encountered. The 16" brush is best suited for the more congested areas whereas the 30" brush is more effective for large, unobstructed spaces.

3.03 The handle of the brush is adjusted to the proper angle. The proper angle is such that the bristles set nearly flat on the floor with the forward bristles slightly off the floor, when the handle is adjusted to a convenient height for the person doing the sweeping. The floor is swept by using moderately long rhythmic sweeping strokes (2-1/2' to 3'). Push strokes are used for the most part but pull strokes will be found necessary to remove dirt from corners and some other spaces. At the end of each stroke, the brush should remain in contact with the floor. It is then lifted a few inches as it is pulled back for the next stroke. Lifting the brush from the floor before completing the stroke will scatter the dirt and raise dust. Some downward pressure should be exerted to augment the weight of the brush for effective removal of more tenacious dirt.

3.04 To obtain maximum effectiveness from each stroke, limit the overlap to not more than two or three inches both at the edges and in the stroke directions.

3.05 Sweeping should ordinarily begin at the point most distant from the exits to the room or area to be cleaned and continued in paths or aisles toward the exits. To save steps in open areas, forward progress is limited usually to one stroke length while moving sideways across the area in each direction. In directing the path of sweeping avoid having the same dirt pass twice over the same area. A counter dust brush is used for sweeping in corners and in other spaces inaccessible with the floor brush.

3.06 When an amount of dirt sufficient to fill a dustpan about one half full is accumulated it is picked up. This avoids the extra strokes required to move the accumulations along. The counter dust brush may be used for sweeping the dirt accumulations into the dustpan.

3.07 Pieces of paper, string, thread, hair and other objects which the brush passes over without moving should be picked up and placed in a convenient wastebasket or dustpan to avoid the extra sweep strokes needed to move this kind of dirt.

4. HEAVY SWEEPING - PROCEDURE

4.01 Heavy sweeping is intended for the removal of coarse debris and heavy dirt accumulations found in warehouses, garages and exterior areas such as driveways and ramps.

4.02 The Palmyra floor brush is used for heavy sweeping. While choice of the 18", 24" or 30" brush depends upon the size of the area to be done and the obstructions that will be encountered, the larger sizes are preferred where adaptable.

4.03 The same procedures are used as for light sweeping except where the surface is rather rough the strokes (2-1/2' to 3' forward movement) are composed of two or three short forward strokes each overlapping the other two or three inches to avoid leaving fine dirt behind. Pressure is required to press the brush fibres sufficiently hard against the surface being cleaned to remove heavy or tenacious dirt.

4.04 Stroke length should be adjusted to avoid raising dust and throwing dirt. Flat pieces of metal or other objects which can not be pushed forward with the brush should be picked up and placed in a convenient receptacle.

5. STAIRWAY SWEEPING - PROCEDURE

5.01 Stairs and landings are swept with the 16" hair floor brush and dirt accumulations are collected in a dustpan and deposited in a 14 qt. pail or other suitable receptacle. Sweeping is started on the top landing and continued down the stairway with the dirt being swept into the dustpan at landings and intermediate landings. Transfer to the dustpan should be more often if accumulation is heavy or if dust is being raised. Care should be taken to prevent sweepings from going off the ends of treads in stairs having open balustrades. Stairways should be swept at sufficient frequency to eliminate accumulations of discarded cigarette and cigar stubs, paper, clips, etc., which may cause accidents. Tools should be placed in the corner of the landings in a safe position and not on the stairs. Special care is taken to avoid being struck by an opening door.

6. PICKUP SWEEPING - PROCEDURE

6.01 Tidying up of lobbies, business offices or other public spaces between routine overall sweepings is done with a lobby brush and lobby dustpan. The dirt is swept into the lobby dustpan with one or two strokes and is not swept along the floor as in regular sweeping. This procedure is performed to catch the casual litter such as pieces of paper, match and cigarette stubs, etc. It is done as required to maintain a consistently clean appearance.

7. CARE OF SWEEPING EQUIPMENT

7.01 It is important that proper care be taken of brushes if full work effectiveness and service life are to be realized. Clean, well-maintained brushes sweep more effectively and with less effort than worn or dirty brushes. The position of the handle on the brush should be reversed weekly to prevent setting of the hair or fibres in one direction which very materially depreciates the quality and ease of sweeping. Brushes should never be permitted to rest on their sweeping elements when not in use. They should be tapped against the floor in the normal sweeping position for removal of accumulations of dirt rather than to strike the brushes against their sides or ends.

7.02 Brushes soiled with oily or sticky substances should be removed from the head-handle assembly and washed in a solution of two ounces of powdered soap per pail of water, preferably warm. Rinse well with clean water and remove surplus water by shaking with the bristles downward. Reassemble in head-handle assembly and allow to remain hanging for a few hours with the brush element facing downward. Comb out any matting or tangling with a piece of pointed wood about the size of a pencil.

7.03 Palmyra brushes should be wet with water once or twice a month to maintain pliability and to prevent the fibres from becoming brittle and breaking off.

7.04 For economy, order refill sweeping elements only for the floor brushes unless the head and handle assembly is damaged beyond further use.

SWEEPING, DUSTLESS
DAMP CLOTH METHOD

1. GENERAL

1.01 Dustless sweeping consists of wiping the floor with a damp cloth draped over the sweeping element of a sweeping tool. It is recommended for smooth surfaced floorings such as linoleum, rubber, asphalt, vitrified tile, terrazzo, marble, painted and unpainted concrete. Dustless sweeping maintains a high standard of cleanliness and minimizes mopping and scrubbing frequencies.

1.02 This section is reissued to eliminate damp sweeping as the prescribed method for sweeping floors in switchrooms and terminal rooms. The prescribed method for sweeping in these areas is covered by Section H51.104.3, Sweeping, Dustless, Treated Cloth Method, Disposable Type.

1.03 Dustless sweeping by the treated cloth method, laundered type, is covered by Section H51.104.2, Sweeping, Dustless, Treated Cloth Method, Laundered Type. Ordinary sweeping is covered by Section H51.103, Sweeping, General.

1.04 The sweeping tool consists of a skeleton brush head with two rows of bristle 1-1/2 inches long set at an angle around its outer edge and a 5-foot handle attached to the head assembly by means of a universal joint. This design permits raising or lowering of the handle without affecting the position of the brush head and also permits rotation of the head while in flat contact with the floor by twisting the handle. These features give great flexibility of movement to the tool and facilitate cleaning around and under furniture and other objects. The head of the tool is lower than the head of a hair floor brush so that it readily goes under low objects such as radiators.

1.05 The damp sweeping cloth is about one yard square, is hemmed at the two cut edges and has a reinforced center hole. When soiled, cloths should be laundered as described in Part 4.

2. EQUIPMENT AND SUPPLIES

2.01 Tool, sweeping.

Pail, two-compartment type for carrying both the clean dampened cloths and soiled cloths.

Lobby dust pan and brush.

Cloths, sweeping.

Soap, powdered for washing the cloths.

3. PROCEDURE — SWEEPING

3.01 Procure a sufficient quantity of the sweeping cloths to last for the scheduled sweeping without need for rewashing. One cloth usually suffices for 500 to 1,000 sq. ft. of floor space, under average conditions, before rewashing. The cloths if in a damp condition from the previous washing (see Paragraph 4.03), are folded flat and packed individually in one side of a two-compartment pail. If dried out they are dampened by immersing in clean water or are held under a faucet until wet, then wrung as dry as possible by hand; or they may be opened flat and sprinkled, then refolded and packed as outlined above. For sweeping all floors, the cloths are of the proper degree of dampness when they leave the floors slightly damp and the dampness dries within a few seconds.

3.02 Slip the center hole of a sweeping cloth over the handle of the sweeping tool permitting the cloth to drape loosely over the head. Place the tool in contact with the floor with the cloth completely covering the head so that the hair does not come in contact with the floor. This is done by moving the head forward as it is lowered to the floor. After a cloth has accumulated dirt on the forward portion, the head is raised about one foot and then lowered in the backward direction in order to present a clean surface to the floor. The handle of the tool is reversed so that the back edge of the tool then becomes the forward edge. When this portion of the cloth becomes dirty or dried out, it is replaced by a clean one.

3.03 In removing the soiled cloth, the brush handle should not be raised more than one foot from the floor and the soiled cloth handled very carefully to avoid releasing any dirt or dust. Fold the edges of the cloth inward toward the soiled portion. Any dirt that drops from the cloth should be wiped up, by hand, using the discarded cloth. Used cloths should be placed in the half of the two-compartment pail reserved for them.

3.04 When using the tool, downward pressure is applied to more effectively remove the imbedded dust and dirt from floor surfaces.

3.05 Three different types of strokes are used in manipulating the tool to meet various conditions of sweeping, as follows:

(1) The forward stroke, in which the tool head is simply pushed along in an approximately straight path as along a baseboard or filing cabinets.

(2) The side-to-side stroke, in which the tool is moved from side to side, as in mopping, across a path 6 to 10 feet wide. The head of the tool is rotated at the end of each stroke to keep the forward edge continuously in the direction of travel. When doing this stroke hold the handle at a comfortable angle. Care should be taken not to swing the head too violently at the end of each side stroke in order to prevent dirt or dust from being thrown off. This type of stroke is used in unobstructed areas.

(3) The random stroke, in which the tool is manipulated around and under desks, tables, lockers, etc, by twisting the handle so that the tool head reaches all of the obstructed floor area. The tool head is manipulated to maintain a leading edge so that any loose dirt will be carried out into open space. As the sweeping progresses from one piece of furniture to another, the front edge is held in the direction of travel.

3.06 Debris such as paper scraps, rubber bands, etc, encountered in the course of sweeping is pushed ahead with the sweeping tool into aisles or other open space. As each section of a room is completed the accumulations of debris are pushed to a convenient location to be picked up later with the lobby dust pan and brush.

3.07 The flexibility of the tool reduces the need to move furniture and other objects in order to clean under them. When chairs, wastebaskets, and other objects have been moved from the sweeping path be sure to return them to their proper places and in orderly arrangement. In moving the objects to temporary positions, avoid placing them where they can be tripped over or struck by a door. Do not place wastebaskets or other objects on chairs, desks, or other furniture.

3.08 During the course of the sweeping, clean surfaces of the cloth are presented to the floor, as described in Paragraph 3.02, after about 300 to 600 sq. ft. have been swept. Cloths should be replaced with clean ones when they become dirty or dry.

3.09 Floors which have been properly dustless swept will not show any dust on the tips of the fingers when they are passed over the floor in a side-to-side sweep of some 5 to 6 feet.

4. WASHING SWEEPING CLOTHS

4.01 Soiled cloths may be commercially laundered or washed on the premises. When laundered on the premises, the soiled cloths are placed as soon as practicable in a cleaning solution to soak. Prior to soaking, the cloths are gently shaken out and individually inspected for pins or other hazardous items.

4.02 For soaking, the cleaning solution consists of one tablespoon of pyrophosphate cleaner and one tablespoon of powdered soap per pail (ten quarts) of water, preferably hot. The pyrophosphate cleaner is first dissolved in the water before the soap is added. The cloths are soaked until they are to be washed, which should be deferred until near the time of their next use. It is not intended that the cloths shall be dried after washing. The final wringing following rinsing is intended to leave the proper dampness for damp sweeping.

4.03 The washing may be done either by hand or in a washing machine. The washing solution is the same as for soaking as given in Paragraph 4.02. All of the dirt is to be removed but it is neither necessary nor desirable to restore original whiteness and the use of bleach is unnecessary. Rinse until the rinse water remains relatively clear. Usually two or three rinses are adequate.

4.04 Following the washing, rinsing and wringing operations, the cloths are individually folded flat and packed firmly into one side of the two-compartment pails while they are still damp. They are then ready for damp sweeping but, cloths so packed, will only retain their dampness for a few hours.

4.05 Under some conditions, it may be desirable to pack a number of dampened sweeping cloths in one section of the two-compartment pail for use on the day's assignments and when these are soiled to shake, inspect for pins or hazardous items, rinse and wring them out in a service sink for reuse during the course of the tour.

5. CARE OF EQUIPMENT

5.01 The pail, sweeping tool and lobby dust pan and brush should be cleaned and put away in their proper places. The sweeping tool should be hung up so that the weight does not rest on the bristles.

SWEEPING, DUSTLESS
TREATED CLOTH METHOD
LAUNDERED TYPE

1. GENERAL

1.01 Dustless sweeping consists of wiping the floor with a specially treated cloth draped over the sweeping element of a sweeping tool. It is recommended for sweeping any smooth surfaced floorings, such as linoleum, rubber, asphalt tile, ceramic tile, terrazzo, marble, painted and unpainted smooth concrete. Dustless sweeping maintains a high standard of cleanliness and minimizes mopping and scrubbing frequencies.

1.02 This section is reissued to change the title and to eliminate this method as the prescribed procedure for sweeping floors in switchrooms and terminal rooms. The prescribed method for sweeping in these areas is covered by Section H51.104.3, Sweeping, Dustless, Treated Cloth Method, Disposable Type.

1.03 Dustless sweeping by the damp cloth method is covered by Section H51.104.1, Sweeping, Dustless, Damp Cloth Method. Ordinary sweeping is covered by Section H51.103 — Sweeping, General.

1.04 This section describes an alternate dustless sweeping procedure employing a cloth which has been treated with an oil-water emulsion and dried. The treatment leaves the dry cloth lightly impregnated with sufficient mineral oil to absorb dust and soil yet insufficient to leave any oil on the surfaces cleaned.

1.05 The sweeping tool used with the laundered type treated cloth may be either the damp sweeping tool described in Section H51.104.1, Sweeping, Dustless, Damp Cloth Method, or the sweeping tool recommended in Section H51.104.3, Sweeping, Dustless, Treated Cloth Method, Disposable Type. When using the latter tool, the cloth may be threaded over the handle in the same manner as when damp sweeping, or it may be attached by tucking opposite sides of the cloth under the sides of the boot in the manner described in Section H51.104.3. The latter method is preferred for when the cloth is reversed the soil picked up on the side first used for sweeping is enclosed within the loop that is formed by this method of attachment. Both tools have a universal joint which permits raising or lowering the handle without affecting the position of the brush head and also permits rotation of the head while in flat contact with the floor by twisting the handle. These features give great flexibility of movement to the tool and facilitate cleaning around and under furniture and other objects.

1.06 The sweeping cloth is approximately one yard square, is hemmed at the two cut edges and has a reinforced centered hole.

1.07 Dustless sweeping by the treated cloth method affords the following advantages:

(1) The dust absorbent treatment is nondrying and is not depleted by evaporation before or during the sweeping operation.

(2) Because of the nondrying feature, both sides of the sweeping cloth may be used rather than only one side as under the damp method. Thus the number of cloths required in a given space is substantially reduced.

(3) The sweeping operation is made easier because the cloth is dry and moves more readily over the floor.

1.08 The compound used for treating the sweeping cloths is an oil-water emulsion having an oil content such that when a cloth is treated and dried, the amount of oil retained by the cloth will equal 16 to 22 per cent of its dry weight. By this method of processing, the oil is so finely dispersed in the cloth and the amount so well controlled that the oil has affinity only for dust and soil and for the cloth itself rather than for the surfaces cleaned. Impregnations of less than 16 per cent of the dry weight of the cloth are ineffective and impregnations in excess of 22 per cent are unnecessary. When the amount of oil exceeds 30 per cent of the dry weight, the impregnation becomes so excessive that oil residues may be left on the cleaned surfaces.

1.09 The laundering and close control required in processing the cloths can be carried out to best advantage by commercial laundries. The treating compound incorporates a soluble yellow dye (or other color) which gives the sweeping cloths a depth of color that indicates whether or not they are impregnated to the proper degree. Too light color indicates insufficient treatment and too deep color, more than is required. Sample cloths may be set up locally to check for proper treatment.

1.10 The treated cloths are used dry. They should not be used wet or damp as any moisture left behind will contain oil and oil residues will result. Dampening is unnecessary as the cloths are sufficiently treated to pick up and retain dust and soil fully as well as by the damp cloth method. The sweeping cloth furnished by commercial laundries is a heavy fabric. The heavy weight provides the durability necessary for processing in the laundries.

1.11 The impregnating treatment is nonoxidizing and there is no hazard of spontaneous combustion. However, the cloths should be stored in a metal cabinet. The treated cloths will not leave an oil deposit when left on nonabsorbent surfaces such as metal, wood, linoleum, etc, but when left for a period of time on an oil absorbent material such as fabric or paper, they will stain. The treatment is nonirritating to normal skin.

2. EQUIPMENT AND SUPPLIES

2.01 The following are required:

Tool, Sweeping, Damp, or

Tool, Sweeping, Masslinn, No. 2121

Cloths, Sweeping, Treated, Laundered Type

Pail, two-compartment type for carrying both the clean and soiled cloths

Lobby Dust Pan and Brush

3. PROCEDURES — SWEEPING

3.01 Procure a sufficient quantity of treated cloths for the scheduled sweeping. Each cloth will clean about 2,000 to 4,000 square feet depending upon soil conditions in the particular area. The clean cloths are carried in one side of a two-compartment pail. To place the cloth on the damp sweeping tool, slip the center hole of the cloth over the handle. Raise the tool to permit the cloth to drape loosely over the head. With the cloth completely covering the head, lower the tool to the floor so that one half of the cloth trails under the brush head. This is done by moving the head forward as it is lowered. As the cloth becomes soiled, the head is raised and then lowered in the backward direction in order to present a clean area to the floor. When the forward half is soiled, the same procedure is followed with the other half. The handle of the tool is reversed so that the back edge of the tool head then becomes the forward edge. When both halves are soiled, the cloth is removed, turned over, replaced on the tool and used on the reverse side. THE CLOTH IS USED IN EACH POSITION UNTIL IT IS SOILED TO THE EXTENT THAT THE YELLOW (OR OTHER) COLOR OF THE CLOTH IS COMPLETELY OBSCURED.

3.02 To remove or reverse a soiled cloth, lower the handle to within about a foot of the floor, grasp the soiled cloth near the center hole and push the handle through the hole. There is less liability of scattering dust by this procedure. If the cloth is to be reversed, turn it over and rethread the handle through the center hole. If the cloth is to be discarded, place it in the half of the two compartment pail reserved for soiled cloths. Wipe up any soil that may drop from the cloth while it is being changed. Do not discard a cloth before using both sides.

3.03 With the Masslinn sweeping tool, the procedure outlined above may be followed or the cloth may be attached to the tool and used in the manner described in Section H51.104.3, Sweeping, Dustless, Treated Cloth Method, Disposable Type. The loop of cloth formed by this method of attachment is of sufficient width to provide four cleaning areas on each side.

3.04 WHEN USING THE SWEEPING TOOLS, DOWNWARD PRESSURE IS APPLIED TO REMOVE IMBEDDED DUST AND DIRT MORE EFFECTIVELY FROM THE FLOOR SURFACE.

3.05 Three different types of strokes are used in manipulating the tool to meet the various conditions of sweeping, as follows:

(a) The forward stroke, in which the tool head is simply pushed in a straight path as along baseboards, filing cabinets or telephone equipment frames.

(b) The side-to-side stroke, in which the tool is moved from side to side as in mopping, across a path 6 to 10 feet wide. The head of the tool is rotated at the end of each stroke to keep the forward edge of the tool continuously in the direction of travel. Care should be taken to prevent swinging the head violently at the end of each side stroke causing dirt or dust to be thrown off the cloth. This type of stroke is used in unobstructed areas.

(c) The random stroke, in which the tool is manipulated around and under desks, tables, lockers, etc, by twisting the handle so that the tool head reaches all of the obstructed floor area. The tool head is manipulated to maintain a leading edge so that any debris will be carried out into open space ahead of the sweeping tool. As the sweeping progresses from one piece of furniture to another, the front edge is held in the direction of travel.

3.06 Debris such as paper scraps, clips, rubber bands, etc, encountered in the course of sweeping is pushed ahead with the sweeping tool into aisles or other open space. As each section of a room is completed, the accumulations of debris are pushed to a convenient location to be picked up later with the lobby dust pan and brush.

3.07 The flexibility of the tool reduces the need to move furniture and other objects in order to clean under them. When chairs, wastebaskets, etc, have been moved, be sure to return them to their proper places. In moving the objects to temporary positions, avoid placing them where they can be tripped over or struck by a door. Do not place wastebaskets on chairs, desks or other furniture.

3.08 Floors which have been properly swept will not show any dust on the tips of the fingers when they are passed over the floor in a side-to-side sweep of some 5 to 6 feet.

3.09 Treated sweeping cloths should not be used for cleaning telephone equipment.

4. CARE OF EQUIPMENT

4.01 The accumulation of soiled sweeping cloths is placed in a bag and stored in a metal container or cabinet in a suitable location until picked up by the commercial laundry. The pail, sweeping tool, lobby dust pan and brush should be cleaned and put away in their proper places after each use. The sweeping tool is hung up so that the weight does not rest on the bristles.

SWEEPING, DUSTLESS
TREATED CLOTH METHOD
DISPOSABLE TYPE

1. GENERAL

1.01 Dustless sweeping consists of wiping the floor with a chemically treated cloth attached to a sweeping tool. It is the prescribed method for sweeping floors in telephone equipment space. It is recommended for sweeping any smooth surfaced floorings, such as linoleum, rubber, asphalt tile, ceramic tile, terrazzo, marble, painted and unpainted smooth concrete in all quarters. Dustless sweeping maintains a high standard of cleanliness and minimizes mopping and scrubbing frequencies.

1.02 This section is reissued to describe a modification of the usual method of arranging the cloth on the sweeping tool when sweeping in telephone equipment space, and when sweeping up tracked-in sand. Also to change the procedure to be followed for reversing the cloth on the tool to expose the clean side. The text has been extensively revised.

1.03 Dustless sweeping with cloths that are sent to the laundry for washing and retreating are covered by Section H51.104.2 Sweeping, Dustless, Treated Cloth Method, Laundered Type. Ordinary sweeping is covered by Section H51.103, Sweeping, General.

1.04 This section describes a dustless sweeping procedure employing a dry disposable cloth which has been chemically treated. The treatment leaves the cloth lightly impregnated with sufficient mineral oil to absorb dust and soil yet insufficient to leave any oil on the surfaces cleaned. The cloth is not reused but is disposed of in accordance with Paragraph 6.01.

1.05 The sweeping tool for disposable cloths is shown in Exhibit A. The head of the tool to which the cloth is attached consists of an aluminum pan with a 3/8 in. reinforcing rod around the periphery over which is placed a boot made of foam plastic material. The handle attaches to the head member through a universal joint. This design permits raising or lowering the handle without affecting the position of the brush head and also permits rotation of the head while in flat contact with the floor by twisting the handle. These features give great flexibility of movement to the tool and facilitate cleaning around and under furniture and other objects. The head of the tool is low and narrow. It goes readily under low objects such as radiators and the guard rails in switch and terminal rooms.

1.06 The disposable cloth is a nonwoven fabric made of a mixture of long staple rayon and cotton fibres. The cloth is not as strong as woven material but has adequate strength for one time use. The size approximates 24-in. by 24-in. The fabric is white but the impregnation dyes it a bright yellow (or other color) to show that the cloth is treated and to the proper degree. The cloth should not be dampened. Dampening is unnecessary as the cloths have sufficient chemical treatment to pick up and retain dust. A single cloth is capable of cleaning from 2000 to 4000 sq. ft. of floor area depending upon soil conditions. Because the fabric is made of long staple rayon and cotton fibres and the cloth is used but once, it does not lint as much as woven cotton cloth which sheds fine particles of lint due to repeated wear and laundering. For this reason the disposable type treated cloth is prescribed for sweeping in telephone equipment space.

1.07 Dustless sweeping with a treated cloth affords the following advantages in comparison with using a damp cloth:

(1) The dust absorbent treatment is nondrying and is not depleted by evaporation before or during the sweeping operation.

(2) Because of the nondrying feature, both sides of the sweeping cloth may be used rather than only one side as under the damp cloth method. Thus the number of cloths required in a given space is substantially reduced.

(3) The sweeping operation is made easier because the cloth is dry and moves more readily over the floor.

1.08 The chemical treatment is nonoxidizing and there is no hazard of spontaneous combustion. However, the cloths should be stored in a metal cabinet. The treated cloths will not leave an oil deposit when left on nonabsorbent surfaces such as metal, wood, linoleum, etc, but when left for a period of time on an oil absorbent material such as fabric or paper, they will stain. The treatment is not irritating to normal skin.

2. EQUIPMENT AND SUPPLIES

2.01 The following are required:

Tool, Sweeping, Masslinn No. 2121

Cloth, Cleaning, Masslinn No. 1050

Pail, two-compartment type for carrying both clean and soiled cloths.

Lobby Dust Pan and Brush

The disposable sweeping cloth can not be used successfully with the damp sweeping tool with swivel brush head.

3. SWEEPING IN NON-TELEPHONE EQUIPMENT SPACE

3.01 Non-telephone equipment space includes office areas, operating rooms, lounges, cafeterias, corridors, lobbies, basements, stairways and other space where there is no exposed telephone apparatus.

3.02 Procure a sufficient quantity of treated cloths for the scheduled sweeping. Each cloth will clean about 2000 to 4000 sq. ft. depending upon soil conditions in the particular area. The clean cloths are carried in one side of a two-compartment pail. The cloth is attached to the tool as shown in Exhibit A. To do this, spread out a cloth on the floor or on any suitable flat surface. The cloth is placed square, not diagonally, a little to the right. Grasp the tool by the handle and place it in the middle of the cloth with the long dimension extending from left to right. Rest the handle on the right shoulder. With both hands free, tuck the near edge of the cloth under the lip of the boot on the near side. The outer side of the cloth will pass through the slot in each corner of the boot to overlap the tool on each side. Without changing position, grasp the handle and turn the tool 180 degrees. This will bring the opposite side of the tool and cloth into position for attaching this edge of the cloth in the same manner. The cloth forms a loop which serves to enclose the dirt on the soiled side when the cloth is reversed. ***Be sure to tuck the cloth well into the slot in each corner of the boot.***

3.03 The loop of cloth is three times as long as the width of the tool head. It thus provides three cleaning surfaces, one on each end and a third in the center. To expose each of these surfaces, the tool is simply raised a short distance above the floor and placed down on one of the three positions on the cloth. The loop trails the tool head while sweeping except when the tool is in the center position. It is preferable to use the center position first. THE CLOTH IS USED IN EACH POSITION UNTIL IT IS HEAVILY SOILED AND ITS YELLOW (OR OTHER) COLOR COMPLETELY OBSCURED.

3.04 The method of reversing the cloths is shown in Exhibit B, Figs. 1, 2, and 3. Pull the near edge of the cleaning cloth from under the lip of the plastic boot. Then pull from opposite side. Remove tool from cloth, resting handle on shoulder. Grasp cloth in center and turn over. Spread out top half exposing soiled side. Place tool in center of soiled side and reattach the cloth. The cloth is now ready for sweeping with the dirt on the soiled side enclosed within the loop. When the reversed side is soiled, remove it from the tool as described above. It will be noted that the edges of the cloth that were tucked under the lip of the boot are clean. As shown in Exhibit B, Figs. 4, 5, and 6, fold the cloth so that these edges are adjacent. Then by holding the cloth at the sides of these clean areas, the soiled portion can be folded under the clean portion. This eliminates handling soiled cloth and scattering soil in disposing of the cloth. Any soil that may have dropped on the floor is wiped up with the folded cloth. Place soiled cloths in one side of two-compartment pail for disposal.

3.05 WHEN USING THE SWEEPING TOOL, DOWNWARD PRESSURE IS APPLIED TO REMOVE IMBEDDED DUST AND DIRT MORE EFFECTIVELY FROM THE FLOOR SURFACE.

3.06 Three different types of strokes are used in manipulating the tool to meet the various conditions of sweeping, as follows:

(a) The forward stroke, in which the tool head is simply pushed in a straight path as along baseboards and filing cabinets.

(b) The side-to-side stroke, in which the tool is moved from side to side as in mopping, across a path 6 to 10 feet wide. The head of the tool is rotated at the end of each stroke to keep the forward edge of the tool continuously in the direction of travel. This type of stroke is used in unobstructed areas. When using this stroke, the user may walk either forward or backward. However, it is generally preferable to walk forward.

(c) The random stroke, in which the tool is manipulated around and under desks, tables, lockers, etc, by twisting the handle so that the tool head reaches all of the obstructed floor area. The tool head is manipulated to maintain a leading edge so that any debris will be carried out into open space ahead of the sweeping tool. As the sweeping progresses from one piece of furniture to another, the front edge is held in the direction of travel.

3.07 Debris such as paper scraps, clips, rubber bands, etc, encountered in the course of sweeping is pushed ahead with the sweeping tool into aisles or other open space. As each section of a room is completed, the accumulations of debris are pushed to a convenient location to be picked up later with the lobby dust pan and brush.

3.08 The flexibility of the tool reduces the need to move furniture and other objects in order to clean under them. When chairs, wastebaskets, etc, have been moved, be sure to return them to their proper places. In moving the objects to temporary positions, avoid placing them where they can be tripped over or struck by a door. Do not place wastebaskets on chairs, desks or other furniture.

3.09 Floors which have been properly swept will not show any dust on the tips of the fingers when they are passed over the floor in a side-to-side sweep of some 3 to 4 feet.

4. SWEEPING IN TELEPHONE EQUIPMENT SPACE

4.01 To minimize the possibility of scattering dust in switchrooms, power rooms and in other areas where there is exposed telephone apparatus, the cloth is folded in half before being attached to the sweeping tool. The folded cloth is attached in the usual manner. The arrangement is illustrated in Exhibit C. The cloth can be turned over and reversed to present four cleaning surfaces.

4.02 Except for the different manner of attaching the cloth on the tool, the sweeping procedures followed in telephone equipment space are the same as in other areas as described in Part 3, Sweeping in Non-Telephone Equipment Space.

4.03 The forward stroke is used in equipment aisles. When an aisle is obstructed by a ladder, sweep along the equipment frames on one side to the ladder; sweep under the ladder; then reverse direction and sweep along the frames on the opposite side back to the cross aisle. When an unobstructed aisle is reached sweep through on one side to the next cross aisle; then do the unfinished portion of the obstructed aisle (or aisles) as described above; return to complete the unobstructed aisle. If a ladder is in use warn the person on it of your presence.

4.04 Do not change or replace the cloth in equipment aisles. The cloth should not be too heavily soiled before changing its position on the tool or replacing it.

4.05 WHEN DUSTLESS SWEEPING IN PANEL SWITCHROOMS, EVERY PRECAUTION MUST BE TAKEN TO PREVENT THE TOOL FROM GOING UNDERNEATH THE GUARD RAILS AND STRIKING THE SELECTOR RACKS.

4.06 Masslinn Cleaning Cloth No. 1050 should not be used for cleaning telephone equipment.

5. SWEEPING UP SAND

5.01 In areas where tracking in of sand is a problem, such as entrance lobbies, halls and corridors, a different procedure is necessary than that previously described. Sand can not be picked up and retained on a cloth but must be swept up in a conventional manner. To do this, fold the sweeping cloth at the center and attach it to the tool as described in Paragraph 4.01 when sweeping in telephone equipment space. Then use the tool in the same way as a hair floor brush. Sweep the sand into convenient piles and pick up the piles with the lobby dust pan and brush. As noted in Paragraph 4.01, when the cloth is folded and attached in this manner, it can be turned over and reversed to present four cleaning surfaces. Suitable mats placed at all entrances will relieve the sand problem.

6. CARE OF EQUIPMENT

6.01 The accumulations of soiled treated cloths are placed in a metal waste container with a suitable cover until they are removed from the building as trash or burned in an incinerator. Do not place a large number of cloths in the incinerator at one time.

6.02 The pail, sweeping tool, lobby dust pan and brush are cleaned and put away in their proper storage places after each use. To clean plastic boot, wipe with a cloth wrung out in a .3% solution of pyrophosphate cleaner. Remove from tool and allow it to dry before reusing.

Attached:

Exhibits A, B and C

ASSEMBLY OF CLEANING CLOTH ON SWEEPING TOOL

Fig. 1 – Spread cloth out on floor or other suitable flat surface, a little to one side. Grasp tool by handle and place it in center of cloth.

Fig. 2 – Rest handle on shoulder. With both hands free, tuck near edge of cloth under lip of the boot. Outer sides of cloth pass through slot in each corner of boot to overlap tool on each side. Tuck cloth well into slots in corners of boot.

Fig. 3 – Without changing position, grasp handle and turn tool 180 degrees. Attach this edge of cloth in same manner. A loop of cloth is thus formed under tool.

ASSEMBLY OF CLEANING CLOTH ON SWEEPING TOOL

Fig. 4 – Loop of cloth under tool is three times width of tool head. It thus provides three cleaning surfaces, one on each side and one in center. This picture shows tool head in center position.

Fig. 5 – Tool head in one side position.

Fig. 6 – Tool head in second side position.

ASSEMBLY OF CLEANING CLOTH ON SWEEPING TOOL

Fig. 1 – To reverse cloth on tool, pull cloth from near lip of boot and then from opposite side.

Fig. 2 – Place tool to one side with handle resting on shoulder. Grasp cloth in center, lift and turn over. Cloth will be folded in center.

Fig. 3 – Spread out cloth to full size, soiled side up. Place tool in center of soiled side and re-attach cloth. Wipe up any soil dropped on floor.

Fig. 4 – When reversed side of cloth is soiled, remove it as described under Fig. 1. It will be noted that edges of cloth which were tucked under lip of boot are fairly clean. Fold cloth so that these edges are adjacent.

Fig. 5 – By holding cloth at sides of these clean areas and raising cloth several inches, soiled portion can be folded under clean portion.

Fig. 6 – Grasp clean side of cloth in center and fold as illustrated. Wipe up any soil that may have dropped on floor. Place soiled cloth in two-compartment pail for disposal.

ASSEMBLY OF CLEANING CLOTH ON SWEEPING TOOL FOR SWEEPING IN TELEPHONE EQUIPMENT SPACE AND WHEN SWEEPING UP SAND

Fig. 1 – Fold cloth at center. Spread on floor or other suitable flat surface. Place tool in center of folded cloth.

Fig. 2 – Rest handle on shoulder. Tuck near edge of cloth under lip of boot. Turn tool around and attach opposite side. Tuck cloth well into slot in each corner of boot.

Fig. 3 – Cloth attached. Cloth can be turned over and then inside out to present four cleaning surfaces.

Fig. 4 – To remove cloth, pull from under lip at center and with side motion disengage cloth from boot. Turn tool around and remove from opposite side. Turn cloth over and reattach. To turn inside out, detach, spread cloth with soiled side down, grasp at center, lift to fold with clean side out. Reattach. Wipe up any soil dropped on floor.

DUSTING

1. GENERAL

1.01 This section outlines the procedure to be followed for the day-to-day general dusting of furniture, office equipment, radiators, window sills, meeting rails and deflectors, sill type ventilators, wainscoting, etc. It covers only such dusting as can be done without the use of a step-ladder.

1.02 The method described is designed to provide effective cleaning results with a minimum of reaching and stooping.

1.03 Dusting should be done prior to sweeping, where feasible, so that loose dust, clips or discarded papers, etc., which fall to the floor will be removed by the sweeping operation.

1.04 It is desirable, where agreeable to the departments involved, to have the tops of desks and the seats of office chairs in general office space dusted by the occupants rather than by the building cleaning force. When this is done, each occupant is supplied with a half-size dust cloth for this purpose. In such cases the remaining surfaces of desks and the chair legs shall be dusted by the building forces as required. Private office furniture shall be completely dusted each day. Temporarily, unoccupied private offices need only be dusted periodically as required.

1.05 All ash trays, whether on furniture to be dusted by the building cleaning forces or not, shall be emptied and cleaned daily.

1.06 No oil, wax or chemical treatment should be applied to the cloths used for routine dusting. However, the cloths may be very lightly dampened with water for dusting oak and metal furniture and file cabinets in general office space.

2. TOOLS

2.01 For General Space.

Radiator Brush (blade type)

Dust Cloths (full size)

2.02 For Equipment Space.

Radiator Brush (blade type)

Sweeping Cloths

3. ASSEMBLY OF DUSTING TOOL

3.01 Refer to Fig. 1 and Fig. 1A attached for guidance in assembling the dusting tool.

3.02 Proceed as follows:

(1) Fold a large dust or sweeping cloth in half so that it is approximately 18 inches by 36 inches.

(2) Lay the folded cloth on a flat surface.

(3) Place the brush element (hair) in about the middle of the cloth.

(4) Tie ends A and B together tightly in a single knot around the handle.

(5) Taking hold of the cloth at points C + D bring it over the brush and tie ends C and D together in a single knot around the handle.

The assembly then has the appearance of Fig. 1A and is ready for use.

4. PROCEDURE

4.01 To dust, grasp the brush near the end of the handle and sweep across the surface to be dusted in long, even wiping strokes without lifting the tool until the stroke is completed. Best results will be obtained if the tool is held so that the sides of the bristles are pressed lightly against the surface being dusted.

Whenever possible, each stroke should be started and completed at the edges of the furniture, window sills, dado sills, etc., to prevent a line of dust from remaining where the stroke was begun or ended. The tool should not be whipped over the surfaces being dusted.

4.02 When the outer surface of the cloth becomes soiled, the cloth should be reversed and replaced on the brush in the prescribed manner to provide a clean surface.

4.03 When dusting radiators the cloth covered brush should be stroked across section connections then downward along the section, followed by dusting the baseboard and floor behind and underneath the radiator.

4.04 Ash trays should be emptied into a pail and later disposed of with the sweepings. The trays are wiped with a piece of dampened dust cloth. Brass trays are polished with metal polish periodically as required to maintain a good appearance.

5. CARE OF TOOLS AND SUPPLIES

5.01 Where the daily usage of dust cloths in a building does not exceed 15 or 20 pieces, they are usually hand washed on the premises. Where the quantities are greater, they may be sent to local laundries or washed in an electrically operated washing machine.

5.02 For hand washing use a solution of two ounces of powdered soap to the pail of water, preferably hot, then rinse in clear water and hang up to dry in a clean, well ventilated room. Prior to hand washing of the cloths they should be inspected for any pins or other sharp particles that might injure the hands.

5.03 The same proportion of powdered soap is used for the washing machine.

5.04 The sweeping cloths used in telephone equipment space, being of special lint-free construction, shall not be sent to commercial laundries because of the probability of getting lint on them from other sources. They shall be either hand or machine washed as described in Paragraphs 5.02 and 5.03. The sweeping cloths and dust cloths, however, shall be washed and handled separately to avoid any possible excess lint from the dust cloths getting on the sweeping cloths.

Attached:

Figs. 1 and 1A.

ASSEMBLY OF DUSTING TOOL

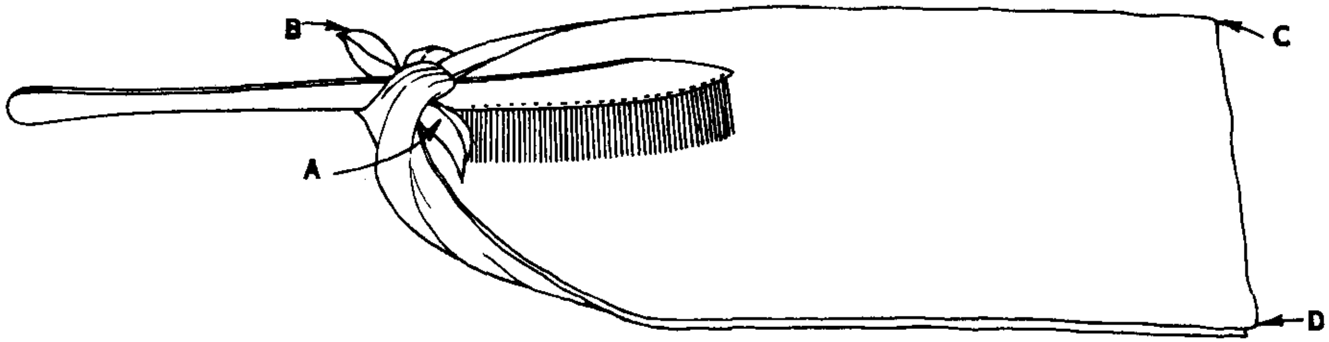


FIG. 1

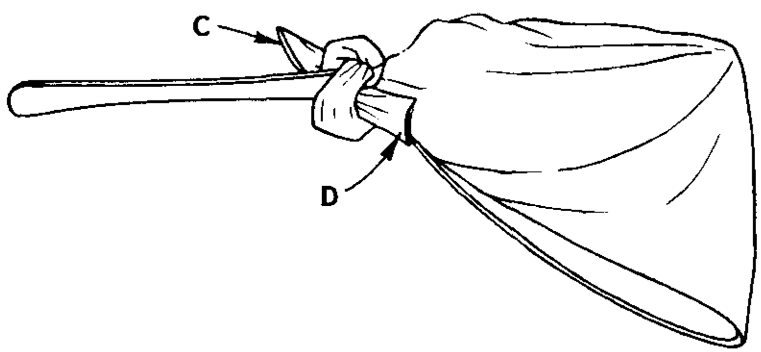


FIG. 1A

DUSTING (FLOOR REACH) DAMP CLOTH METHOD

1. GENERAL

1.01 This section outlines the procedures to be followed for dusting furniture, office equipment, radiators, window sills, wainscoting, fire extinguishers, etc. It covers low or floor reach dusting, that is, such dusting as can be done without the use of a stepladder.

1.02 This section is reissued to eliminate this method as the preferred procedure for dusting in switchrooms and terminal rooms. The preferred method in these areas is covered by Section H51.105.3, Dusting (Floor Reach) Treated Cloth Method, Disposable Type.

1.03 Dusting with laundered treated cloths is covered by Section H51.105.2, Dusting (Floor Reach) Treated Cloth Method, Laundered Type.

1.04 The instructions contained herein are covered also in a sound motion picture film entitled "Dusting." Copies of the film may be ordered from the Western Electric Company as follows: (Quantity) Film, 16 mm, "Dusting."

1.05 Dusting should be done before sweeping so that any loose dust, clips or other debris which may fall to the floor will be removed by the subsequent sweeping operation. Care is required to avoid smearing light colored walls and other surfaces in the course of dusting.

→**1.06** Since dust accumulates more rapidly on horizontal surfaces than on vertical surfaces, dusting operations are divided into two general classifications designated as (1) "tops only" and (2) "complete." "Tops only" dusting consists of removal of dust from the tops of desks, tables, filing cabinets, radiators, etc, and is usually done daily. "Complete" dusting consists of the over-all or thorough dusting of furniture, building equipment and all floor reach surfaces, both horizontal and vertical. Such dusting usually is done weekly or at less frequent intervals.

→**1.07** The time and effort required for dusting desks, tables and filing cabinets is considerably less when their tops are clear. When papers and other objects which retard the dusting operation are regularly left on desks after business hours, it is suggested that the building service people solicit the cooperation of the departments involved, for the purpose of minimizing this condition.

→**1.08** Where the occupants dust the tops of desks and the seats of office chairs of general office space, the remaining surfaces of desks and the chair legs are dusted by the building forces as required. Temporarily unoccupied private offices and unused class and conference rooms need only be dusted periodically, as required.

→**1.09** All ash trays, whether on furniture to be dusted by the building cleaning forces or not, shall be emptied and cleaned daily. They shall be emptied into metal containers provided for this purpose.

→**1.10** No oil, wax or so-called chemical treatment shall be applied to the cloths used by the building service forces for damp dusting.

→**1.11** Any defective, broken or loose objects or parts of furniture or any other hazardous conditions observed while dusting should be reported to the supervisor.

2. TOOLS AND SUPPLIES

2.01 For Dusting

Dust or sweeping cloths, dampened
Two-compartment pail
Blade-type radiator brush or other approved dusting tool
Rubber bands (No. 30, 2″ by 1/8″)

2.02 For Washing Cloths

Pyrophosphate cleaner
Powdered soap
Pails

3. ASSEMBLY OF DUSTING TOOL

3.01 Exhibit A, Figs. 1 to 6 illustrates how the dampened cloth and tool are assembled for dusting.

3.02 The cloth to be held in the hand is bunched by laying it flat (open) on a clean surface and gathering it together in a sweeping motion bringing the outer edges to the center into a rather loose pad about 10 inches or 12 inches in size. There should be no loose ends to trail or fly about and scatter dust.

3.03 Dampening of cloths is a part of the washing operation described in Part 7. The damp cloths shall not be so damp as to wet or smear the surfaces they touch. Clean dust cloths are packed into one section of the two-compartment pail. The other section is for the used cloths.

4. DUSTING WITH THE HAND CLOTH AND TOOL

4.01 To dust with the cloth held in the hand the folded cloth is used with light wiping strokes. For all flat surfaces it is moved across the surfaces in long, straight overlapping strokes without lifting until the stroke is completed. The cloth is held and manipulated at all times so that dust is not shaken or dropped off.

4.02 When dusting furnishings adjacent to walls or partitions, as well as such items as extinguishers which are wall mounted, the cloth is guided carefully to avoid smearing the painted surfaces.

4.03 The dust cloth is refolded from time to time, as required, to present clean surfaces and to retain accumulated dust. When soiled beyond further use, the cloths are placed in the section of the two-compartment pail reserved for soiled cloths.

4.04 To dust with the cloth covered tool, it is moved across the surface to be dusted in long, straight, overlapping wiping strokes without lifting the tool head until the stroke is completed. The sides of the bristles are pressed lightly against the surface being dusted. Insofar as possible the stroke should begin and end at the edges or ends of the furniture top, window sill, etc. The tool should not be used without being covered with a dampened cloth.

4.05 Cloths used for dusting should not be shaken while dusting, either in the room, in hallways or out of windows. Dust laden or dried out cloths are returned to the section of the two-compartment pail reserved for them. REVERSING A SOILED CLOTH ON THE TOOL IS NOT RECOMMENDED because it is usually dried out to a point where it will no longer retain dust.

4.06 Extra steps and effort can be saved when dusting is done in a planned and orderly manner. Always do the items next to each other before moving on, in order to avoid retracing steps. For example, dust chairs adjacent to desks or tables before moving on to the next desk. Dust filing cabinets when passing them rather than return to them after doing other items.

5. TOPS ONLY DUSTING

5.01 The customary day-to-day dusting of furniture, radiators, etc, on a "tops only" basis consists of doing only the floor reach horizontal top surfaces.

5.02 In the case of desks, tables, bookcases, cabinets, radios, scrap bins, etc, only the flat top surfaces are dusted. With chairs, it consists of doing the seats, upper surfaces of the arms and tops of the back section without going in between the slats, and does not include the bases even though they have horizontal areas. With radiators, only the tops of the sections are done.

6. COMPLETE DUSTING

6.01 Complete or over-all dusting consists of doing all accessible floor reach surfaces, i.e., tops, vertical, sloping and curved areas. Complete dusting begins at the highest point of a desk, chair, extinguisher, etc, and progresses downward until completed.

6.02 Items like wall telephones, extinguishers, bulletins, etc, are given "complete" treatment at each dusting. Lamps, ornaments, business papers and magazines on tables and desks are moved and the surfaces underneath done before replacing them. The damp cloth is not allowed to contact fabrics, parchment or other materials that may be damaged by moisture.

7. WASHING DUST CLOTHS

7.01 Used cloths may be sent to a commercial laundry for cleaning under the wet wash classification or laundered on the premises.

7.02 When laundered on the premises, the soiled cloths are placed as soon as practicable in a cleaning solution to soak. Prior to soaking, the cloths are gently shaken out and individually inspected for pins or other hazardous items.

7.03 For soaking, the cleaning solution consists of one tablespoon of pyrophosphate cleaner and one tablespoon of powdered soap per pail (ten quarts) of water, preferably hot. The pyrophosphate cleaner is first dissolved in the water before the soap is added. The cloths are soaked until they are to be washed, which should be deferred until near the time of their next use. It is not intended that the cloths shall be dried after washing. The final wringing following rinsing is intended to leave the proper dampness for damp dusting.

7.04 The washing may be done either by hand or in a washing machine. The washing solution is the same as for soaking as given in Paragraph 7.03. All of the dirt is to be removed but it is neither necessary nor desirable to restore original whiteness and the use of bleach is unnecessary. Rinse until the rinse water remains relatively clear. Usually two or three rinses are adequate.

7.05 Following the washing, rinsing and wringing operations, the cloths are individually folded flat and packed firmly into one side of the two-compartment pails while they are still damp. They are then ready for damp dusting but, cloths so packed, will only retain their dampness for a few hours.

7.06 Under some conditions, it may be desirable to pack a number of dampened dust cloths in one section of the two-compartment pail for use on the day's assignments and when these are soiled to shake, inspect for pins or hazardous items, rinse and wring them out in a service sink for reuse during the course of the tour.

8. CARE OF EQUIPMENT

8.01 The pail and dusting tool should be cleaned and put away in their proper places.

Attached:
Exhibit A.

ASSEMBLY OF DAMPENED CLOTH ON RADIATOR BRUSH

Fig. 1 – Fold the cloth in half and place on a flat surface with the folded edge away from you. Note the position of the rubber band on the tool handle. (Use #30 — 2 x 1/8 inches.)

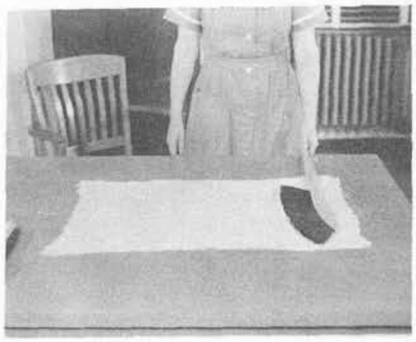


Fig. 2 – Place the radiator brush on the cloth with the wood part about 2 inches from the left edge of the cloth. The end of the bristles should be about 1 inch from the fold.

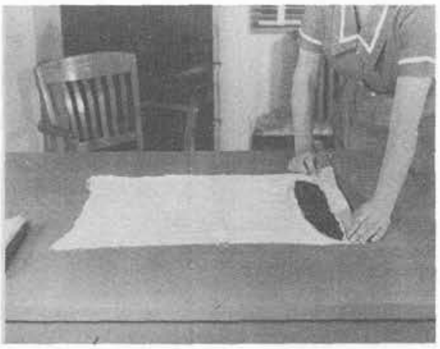


Fig. 3 – Fold the short end of the cloth over the wood part of the brush.

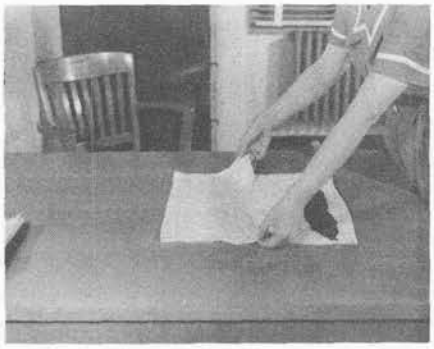


Fig. 4 – Fold the long part of the cloth in half. This extra thickness will help to retain the moisture.

Fig. 5 – Now throw the folded cloth over the bristles and raise the tool from the table.

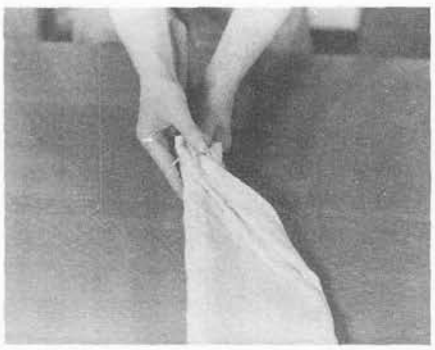


Fig. 6 – Gather the cloth at the handle and slip the rubber band about 3 inches over the cloth.

DUSTING
(FLOOR REACH)
TREATED CLOTH METHOD
LAUNDERED TYPE

1. GENERAL

1.01 This section outlines the procedures to be followed for dusting furniture, office equipment, radiators, window sills, wainscoting, fire extinguishers, etc. It covers low or floor reach dusting, that is, such dusting as can be done without the use of a stepladder.

1.02 This section is reissued to change the title and to eliminate this method as a recommended procedure for dusting in switchrooms and terminal rooms. The preferred method in these areas is covered by Section H51.105.3, Dusting (Floor Reach) Treated Cloth Method, Disposable Type.

1.03 Dusting by the damp cloth method is covered by Section H51.105.1, Dusting (Floor Reach) Damp Cloth Method.

1.04 This section describes an alternate dusting procedure employing a cloth which has been treated with an oil-water emulsion and dried. The treatment leaves the dry cloth lightly impregnated with sufficient mineral oil to absorb dust and soil, yet insufficient to leave any oil on the surfaces cleaned.

1.05 The use of a treated cloth for dusting is more effective than a dry untreated cloth. The sufaces are left cleaner, the dust is retained in the cloth and the scattering of dust inherent in the dry method is avoided.

1.06 As compared to the damp cloth method, dusting with a treated cloth affords the following advantages:

(1) The dust absorbent treatment is nondrying and is not depleted by evaporation before or during the dusting operation.

(2) When dusting with the dusting tool (Part 5), both sides of the dusting cloth may be used rather than only one side because of the nondrying feature. Thus the number of cloths required in a given space is reduced.

(3) Dusting is made somewhat easier because the cloth is dry and moves more readily over the suface.

1.07 The treated cloth is not as effective in removing finger marks from desk tops and other surfaces as a damp cloth. Accordingly, an untreated damp cloth is employed as necessary for this purpose.

1.08 The compound used for treating the dusting cloths is an oil-water emulsion having an oil content such that when a cloth is treated and dried, the amount of oil retained by the cloth will equal 16 to 22 per cent of its dry weight. By this method of processing, the oil is so finely dispersed in the cloth and the amount so well controlled that the oil has affinity only for dust and soil and for the cloth itself rather than for the surfaces cleaned. Impregnations of less than 16 per cent of the dry weight of the cloth are ineffective and impregnations in excess of 22 per cent are unnecessary. When the amount of oil exceeds 30 per cent of the dry weight, the impregnation becomes so excessive that oil residues may be left on the cleaned surfaces.

1.09 The laundering and close control required in processing the cloths can be carried out to best advantage by commercial laundries. The treating compound incorporates a soluble yellow dye (or other color) which gives the dusting cloths a depth of color that indicates whether or not they are impregnated to the proper degree. Too light color indicates insufficient treatment and too deep color, more than is required. Sample cloths may be set up locally to check for proper treatment.

1.10 The treated cloths are used dry. They should not be used wet or damp as any moisture left behind will contain oil and oil residues will result. Dampening is unnecessary as the cloths are sufficiently treated to pick up and retain dust and soil fully as well as by the damp cloth method. The dusting cloth furnished by commercial laundries is a heavy fabric. The heavy weight provides the durability necessary for processing in the laundries. It is approximately 16" by 27" and is hemmed at the two cut edges.

1.11 The impregnating treatment is nonoxidizing and there is no hazard of spontaneous combustion. However, the cloths should be stored in a metal cabinet. The treated cloths will not leave an oil deposit when left on nonabsorbent surfaces such as metal, wood, linoleum, etc, but when left for a period of time on an oil absorbent material such as fabric or paper, they will stain. The treatment is nonirritating to normal skin.

1.12 A sound motion picture film entitled "Dusting" covers the information contained herein with the exception that it refers to the damp cloth dusting as described by Section H51.105.1. The film is fully adaptable for training in the treated cloth method as outlined in the supplement to the Instructor's Manual, "Dusting."

2. PROCEDURE

2.01 Dusting should be done before sweeping so that any loose dust, clips or other debris which may fall to the floor will be removed by the subsequent sweeping operation.

2.02 Since dust accumulates more rapidly on horizontal surfaces than on vertical surfaces, dusting operations are divided into two general classifications designated as (1) "tops only" and (2) "complete." "Tops only" dusting consists of removal of dust from the tops of desks, tables, filing cabinets, radiators, etc, and is usually done daily. "Complete" dusting consists of the over-all or thorough dusting of furniture, building equipment and all floor reach surfaces, both horizontal and vertical. Such dusting usually is done weekly or at less frequent intervals. Further information is given in Parts 6 and 7.

2.03 Extra steps and effort can be saved when dusting is done in a planned and orderly manner. Always do the items next to each other before moving on in order to avoid retracing steps. For example, dust chairs adjacent to desks or tables before moving on to the next desk. Dust filing cabinets when passing them rather than returning to them after doing other items.

2.04 All ash trays, whether on furniture to be dusted by the building cleaning forces or not, shall be emptied and cleaned daily. They shall be emptied into metal containers especially provided for this purpose.

2.05 The time and effort required for dusting desks, tables and filing cabinets is considerably less when their tops are clear. When papers and other objects which retard the dusting operation are regularly left on desks after business hours, it is suggested that the building service people solicit the cooperation of the departments involved, for the purpose of minimizing this condition.

2.06 Where the occupants dust the tops of desks and the seats of office chairs in general office space, the remaining surfaces of desks and the chair legs are dusted by the building forces as required. Temporarily unoccupied private offices and unused class and conference rooms need only be dusted periodically.

2.07 Any defective, broken or loose objects or parts of furniture or any other hazardous conditions observed while dusting should be reported to the supervisor.

2.08 Treated dust cloths should not be used for cleaning telephone equipment.

3. TOOLS AND SUPPLIES

3.01 For daily use:

Cloth, Dust, Treated, Laundered Type

Pail, two-compartment type for carrying both the clean and soiled cloths

Brush, Radiator, blade-type or other approved dusting tool

Band, Rubber (#30, 2" by 1/8")

3.02 For occasional use:

Cloth, Dust, ***Untreated*** (to be dampened)

4. ASSEMBLY OF DUSTING TOOL

4.01 Exhibit A, Figs. 1 to 6, illustrates how the treated cloth and tool are assembled for dusting.

4.02 The cloth to be held in the hand is bunched by laying it flat (open) on a clean surface and gathering it in a sweeping motion bringing the outer edges to the center into a rather loose pad about 10 inches or 12 inches in size. There should be no loose ends to trail or fly about and scatter dust.

4.03 Clean dust cloths are packed into one section of the two-compartment pail. The other section is for the used cloths. A lightly dampened cloth that is ***untreated*** is used as required to remove finger marks from desk tops and other surfaces.

5. DUSTING WITH THE HAND CLOTH AND TOOL

5.01 To dust with the cloth held in the hand the folded cloth is used with light wiping strokes. For all flat surfaces, it is moved across the surfaces in long, straight, overlapping strokes without lifting until the stroke is completed. The cloth is held and manipulated at all times so that dust is not shaken or dropped off.

5.02 When dusting furnishings adjacent to walls or partitions, as well as such items as extinguishers which are wall mounted, the cloth is guided carefully to avoid contacting the painted surfaces.

5.03 The dust cloth is refolded from time to time, as required, to present clean surfaces and to retain accumulated dust. It may be used on both sides. When soiled beyond further use, the cloths are placed in the section of the two-compartment pail reserved for soiled cloths.

5.04 To dust with the cloth covered tool, it is moved across the surface to be dusted in long, straight, overlapping, wiping strokes without lifting the tool head until the stroke is completed. The sides of the bristles are pressed lightly against the surface being dusted. Insofar as possible the stroke should begin and end at the edges or ends of the furniture top, window sill, etc. The tool should not be used without being covered with a treated cloth.

5.05 Cloths used for dusting should not be shaken while dusting, either in the room, in hallways or out of windows. When soiled on one side, the cloth can be removed from the tool, reversed and replaced on the tool for further use. Dust laden cloths are returned to the section of the two-compartment pail reserved for them.

6. TOPS ONLY DUSTING

6.01 The customary day-to-day dusting of furniture, radiators, etc, on a "tops only" basis consists of doing only the floor reach horizontal top surfaces.

6.02 In the case of desks, tables, bookcases, cabinets, radios, scrap bins, etc, only the flat top surfaces are dusted. With chairs, it consists of doing seats, upper surfaces of the arms and tops of the back section without going in between the slats, and does not include the bases even though they have horizontal areas. With radiators, only the tops of the sections are done.

7. COMPLETE DUSTING

7.01 Complete or over-all dusting consists of doing all accessible floor reach surfaces, i.e., tops, vertical, sloping and curved areas. Complete dusting begins at the highest point of a desk, chair, extinguisher, etc, and progresses downward until completed.

7.02 Items like wall telephones, extinguishers, bulletins, etc, are given "complete" treatment at each dusting. Lamps, ornaments, business papers and magazines on tables and desks are moved and the surfaces underneath done before replacing them.

8. CARE OF EQUIPMENT

8.01 The accumulation of soiled dust cloths is placed in a bag and stored in a metal ← container or cabinet (along with soiled sweeping cloths) in a suitable location until picked up by the commercial laundry. The pail and brush should be cleaned and put away in their proper places after each use.

ASSEMBLY OF DUST CLOTH ON RADIATOR BRUSH

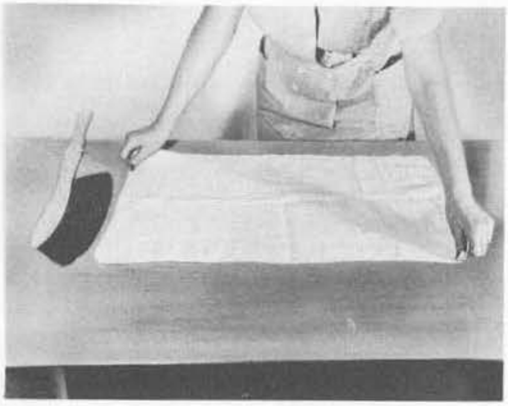


Fig. 1 – Place the cloth on a flat surface. Slip the rubber band over the end of the tool handle (Use #30 — 2 x 1/8 inches).

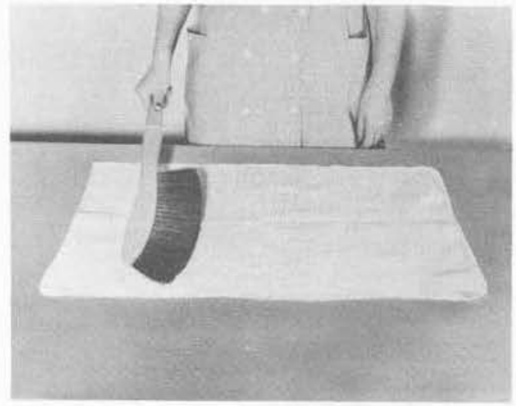


Fig. 2 – Place the radiator brush on the cloth with the wood part about 4 inches from the left edge of the cloth. The end of the bristles should be about 1 inch from far edge.

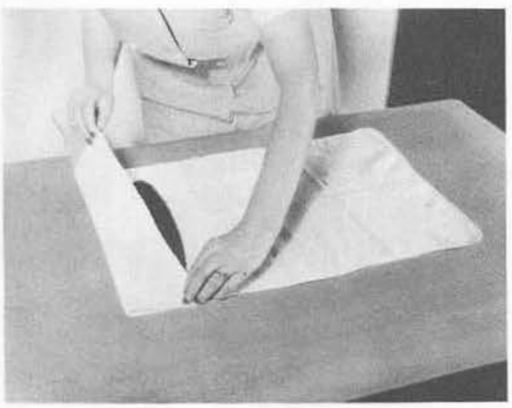


Fig. 3 – Fold the short end of the cloth over the brush.

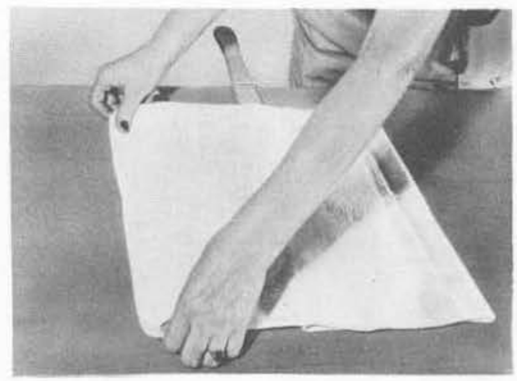


Fig. 4 – Fold the long part of the cloth over the brush so that about 7 inches extends beyond the handle.

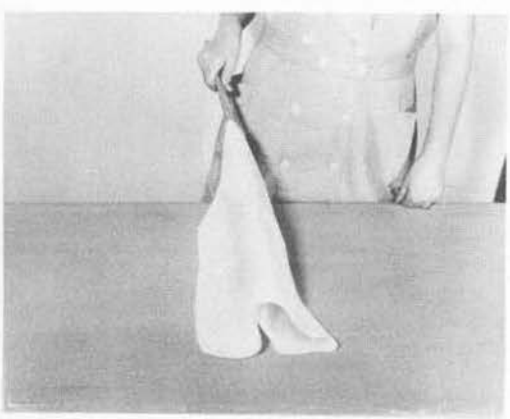


Fig. 5 – Raise the tool from the table.

Fig. 6 – Gather the cloth at the handle and slip the rubber band about 3 inches over the cloth.

DUSTING
(FLOOR REACH)
TREATED CLOTH METHOD
DISPOSABLE TYPE

1. GENERAL

1.01 This section outlines the procedures to be followed for dusting furniture, office equipment, radiators, window sills, wainscoting, fire extinguishers, etc. It covers low or floor reach dusting, that is, such dusting as can be done without the use of a stepladder.

1.02 This section is reissued to recommend disposable treated cloths as the preferred method for dusting in switchrooms and terminal rooms.

1.03 This section describes a dusting procedure employing a dry disposable cloth which has been chemically treated. The treatment leaves the cloth lightly impregnated with sufficient mineral oil to absorb dust and soil, yet insufficient to leave any oil on the surfaces cleaned. The cloth is not reused but is disposed of in accordance with Paragraph 8.02.

1.04 The use of a treated cloth for dusting is more effective than a dry untreated cloth. The surfaces are left cleaner, the dust is retained in the cloth and the scattering of dust inherent in the dry method is avoided.

1.05 As compared to the damp cloth method, dusting with a treated cloth affords the following advantages:

(1) The dust absorbent treatment is nondrying and is not depleted by evaporation before or during the dusting operation.

(2) When dusting with the dusting tool (Part 5), both sides of the dusting cloth may be used rather than only one side because of the nondrying feature. Thus the number of cloths required in a given space is reduced.

(3) Dusting is made somewhat easier because the cloth is dry and moves more readily over the surface.

1.06 The treated cloth is not as effective in removing finger marks from desk tops and other surfaces as a damp cloth. It is also unsuitable for cleaning between the sections of cast iron radiators. Accordingly, an untreated damp cloth is employed as necessary for these purposes.

1.07 The disposable cloth is a nonwoven fabric made of a mixture of long staple rayon and cotton fibres held together by an adhesive. The cloth is not as strong as woven material but has adequate strength for one-time use. The size approximates 24-in. by 24-in. The fabric is white but the impregnation dyes it a bright yellow (or other color) to show that the cloth is treated and to the proper degree. The cloth should not be dampened. Dampening is unnecessary as the cloths have sufficient chemical treatment to pick up and retain dust. Because the fabric is made of long staple rayon and cotton fibres and the cloth is used but once, it does not lint as much as woven cotton cloth which sheds fine particles of lint due to repeated wear and laundering. For this reason the disposable type treated cloth is preferred for switchrooms and terminal rooms.

1.08 The chemical treatment is nonoxidizing and there is no hazard of spontaneous combustion. However, the cloths should be stored in a metal cabinet. The treated cloths will not leave an oil deposit when left on nonabsorbent surfaces such as metal, wood, linoleum, etc, but when left for a period of time on an oil absorbent material such as fabric or paper, they will stain. The treatment is not irritating to normal skin.

1.09 A sound motion picture film entitled "Dusting" covers the information contained herein with the exception that it refers to the damp cloth dusting as described by Section H51.105.1. The film is adaptable for training in the treated cloth method.

2. PROCEDURE

2.01 Dusting should be done before sweeping so that any loose dust, clips or other debris which may fall to the floor will be removed by the subsequent sweeping operation.

2.02 Since dust accumulates more rapidly on horizontal surfaces than on vertical surfaces, dusting operations are divided into two general classifications designated as (1) "tops only" and (2) "complete." "Tops only" dusting consists of removal of dust from the tops of desks, tables, filing cabinets, radiators, etc, and is usually done daily. "Complete" dusting consists of the over-all or thorough dusting of furniture, building equipment and all floor reach surfaces, both horizontal and vertical. Such dusting usually is done weekly or at less frequent intervals. Further information is given in Parts 6 and 7.

2.03 Extra steps and effort can be saved when dusting is done in a planned and orderly manner. Always do the items next to each other before moving on in order to avoid retracing steps. For example, dust chairs adjacent to desks or tables before moving on to the next desk. Dust filing cabinets when passing them rather than returning to them after doing other items.

2.04 All ash trays, whether on furniture to be dusted by the building cleaning forces or not, shall be emptied and cleaned daily. They shall be emptied into suitable metal containers →especially provided for this purpose.

2.05 The time and effort required for dusting desks, tables and filing cabinets is considerably less when their tops are clear. When papers and other objects which retard the dusting operation are left regularly on desks after business hours, it is suggested that the building service people solicit the cooperation of the departments involved, for the purpose of minimizing this condition.

2.06 Where the occupants dust the tops of desks and the seats of office chairs in general office space, the remaining surfaces of desks and the chair legs are dusted by the building forces as required. Temporarily unoccupied private offices and unused class and conference rooms need only be dusted periodically, as required.

2.07 Any defective, broken or loose objects or parts of furniture or any other hazardous conditions observed while dusting should be reported to the supervisor.

2.08 Masslinn cleaning cloth No. 1050 should not be used for cleaning telephone equipment.

3. TOOLS AND SUPPLIES

3.01 The following are required:

Cloth, Cleaning, Masslinn No. 1050

Pail, two-compartment type for carrying both the clean and soiled cloths

Brush, Radiator, blade-type or other approved dusting tool

Band, Rubber (#30, 2" by 1/8")

3.02 For occasional use:

Cloth, Dust (to be dampened)

4. ASSEMBLY OF DUSTING TOOL

4.01 Exhibit A, Figs. 1 to 6, illustrates how the treated cloth and tool are assembled for dusting.

4.02 The cloth to be held in the hand is laid out on a flat surface and folded into a pad or gathered in a sweeping motion to bring the outer edges to the center into a rather loose pad about 10 inches or 12 inches in size. There should be no loose ends to trail or fly about and scatter dust.

4.03 Clean cloths are packed into one section of the two-compartment pail. The other →section is for soiled cloths.

5. DUSTING WITH THE HAND CLOTH AND TOOL

5.01 To dust with the cloth held in the hand the cloth is used with light wiping strokes. For all flat surfaces, it is moved across the surfaces in long, straight overlapping strokes without lifting until the stroke is completed. The cloth is held and manipulated at all times so that dust is not shaken or dropped off.

5.02 When dusting furnishings adjacent to walls or partitions, as well as such items as extinguishers which are wall mounted, the cloth is guided carefully to avoid contacting the painted surfaces.

5.03 The dust cloth is refolded from time to time, as required, to present clean surfaces and to retain accumulated dust. It may be used on both sides. When soiled beyond further use, the cloths are placed in a pail for disposal. If only lightly soiled, the cloths may be placed on the sweeping tool and used for sweeping in areas other than switchrooms and terminal rooms.

5.04 To dust with the cloth covered tool, it is moved across the surface to be dusted in long, straight, overlapping wiping strokes without lifting the tool head until the stroke is completed. The sides of the bristles are pressed lightly against the surface being dusted. Insofar as possible, the stroke should begin and end at the edges or ends of the furniture top, window sill, etc. The tool should not be used without being covered with a treated cloth.

5.05 When the outer surfaces of the cloth are soiled, it is removed from the tool and replaced so that clean surfaces are exposed. This can be done several times. Cloths should not be shaken while dusting, either in the room, in hallways or out of windows. Dust laden cloths are placed in a pail for disposal.

5.06 The dampened dust cloth is used as required to remove finger marks from desk tops and other surfaces. The dampened cloth placed on the dusting tool is preferred for dusting between the sections of cast iron radiators especially those having narrow openings.

6. TOPS ONLY DUSTING

6.01 The customary day-to-day dusting of furniture, radiators, etc, on a "tops only" basis consists of doing only the floor reach horizontal top surfaces.

6.02 In the case of desks, tables, bookcases, cabinets, radios, scrap bins, etc, only the flat top surfaces are dusted. With chairs, it consists of doing seats, upper surfaces of the arms and tops of the back section without going in between the slats, and does not include the bases even though they have horizontal areas. With radiators, only the tops of the sections are done.

7. COMPLETE DUSTING

7.01 Complete or over-all dusting consists of doing all accessible floor reach surfaces, i.e., tops, vertical, sloping and curved areas. Complete dusting begins at the highest point of a desk, chair, extinguisher, etc, and progresses downward until completed.

7.02 Items like wall telephones, extinguishers, bulletins, etc, are given "complete" treatment at each dusting. Lamps, ornaments, business papers and magazines on tables and desks are moved and the surfaces underneath done before replacing them.

8. CARE OF EQUIPMENT

8.01 Cloths used for dusting which are not soiled to the extent that the yellow (or other) color of the cloth is completely obscured, may be used for dustless sweeping as described in BSP H51.104.3, Sweeping, Dustless, Treated Cloth Method, Disposable Type.

→**8.02** The accumulations of soiled treated cloths are placed in a metal waste container with a suitable cover until they are removed from the building as trash or burned in an incinerator. Do not place a large number of cloths in the incinerator at one time.

→**8.03** The pail and radiator dust brush are cleaned and put away in their proper storage places after each use.

ASSEMBLY OF CLEANING CLOTH ON RADIATOR BRUSH

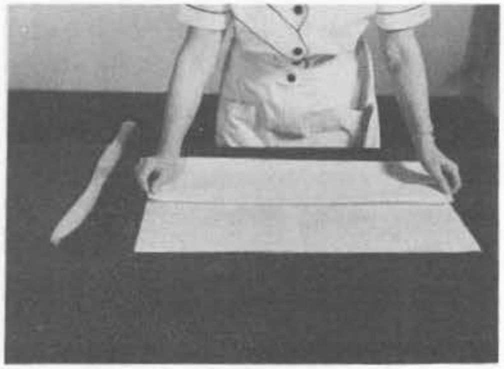


Fig. 1 – Place the cloth on a flat surface and fold over about one-third of the cloth on itself. Slip a rubber band (#30 – 2 x 1/8 inches) over the tool handle.

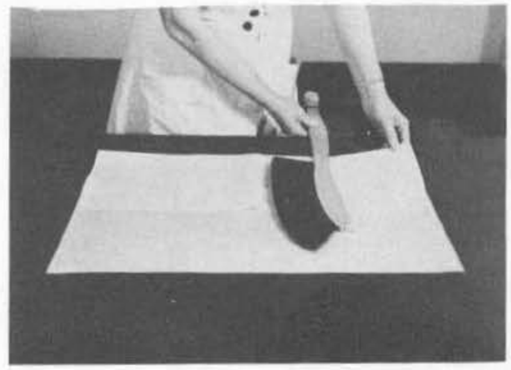


Fig. 2 – Place the radiator brush on the cloth with the wood part about 6 inches from the left edge of the cloth. The end of the bristles should be about 1 inch from the far edge.

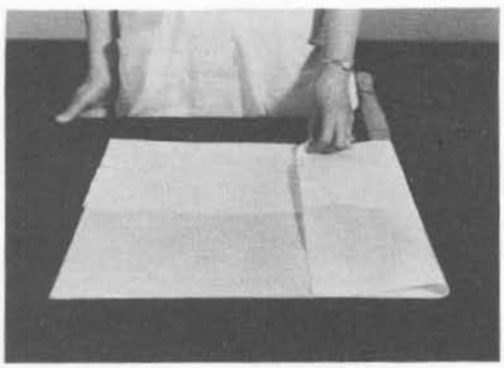


Fig. 3 – Fold the short end of the cloth over the brush.

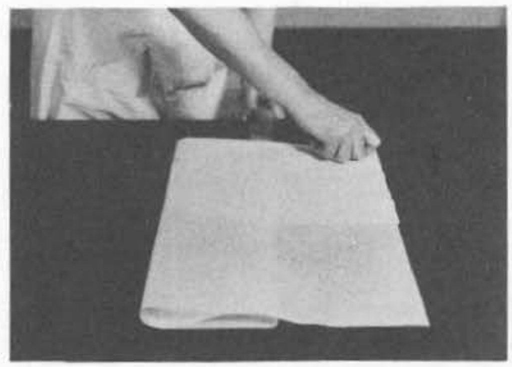


Fig. 4 – Fold the long part of the cloth over the brush so that about 6 inches extends beyond the handle.

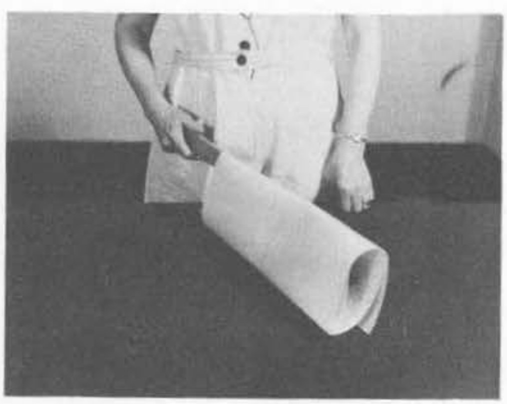


Fig. 5 – Raise the tool from the table.

Fig. 6 – Gather the cloth at the handle and slip the rubber band about 2 inches over the cloth.

FLOOR WAXING

CONTENTS PAGE

1. GENERAL

1.01 This section describes the procedures to be followed for waxing floors.

1.02 This section has been revised to include the use of an improved special slip resistant type of floor wax designated as Floor Wax W-8. It contains "Ludox," a colloidal silica.

1.03 Waxing is recommended for the following kinds of floors:

ASPHALT TILE
LINOLEUM - SHEET AND TILE
RUBBER - SHEET AND TILE
VINYL ASBESTOS TILE
VINYL - SHEET AND TILE

1.04 Waxing provides a readily renewable and sanitary coating that improves appearance and protects floor surfaces against wear and dirt penetration. It offers the easiest and most economical maintenance method by reducing cleaning frequencies. Frequent mopping or scrubbing is detrimental to resilient floorings, particularly linoleum.

1.05 Waxing is a commonly accepted and safe method of maintaining resilient floor coverings. Experience has demonstrated that proper application and maintenance procedures will assure maximum resistance to slipping. All Bell System waxes have been examined and listed by the Underwriters Laboratories as having a safe coefficient of friction. Procedures for measuring the slip resistance of resilient floors are described in Bell System Practices, Section H51.119. Measurement of Slip Resistance of Resilient Floors.

1.06 Two recommended types of liquid floor wax are available: (1) Liquid Floor Wax, and (2) Floor Wax W-8. Both are water emulsions. Liquid Floor Wax has a high carnauba content which provides maximum appearance and wear, as well as good soil and slip resistant properties. Floor Wax W-8 is of similar composition with a proportion of the wax content replaced by the special slip resistant ingredient, colloidal silica (Ludox). Floor Wax W-8 soils somewhat more quickly than the Liquid Floor Wax and consequently floors maintained with it may require more frequent cleaning and rewaxing.

1.07 Both of these waxes are suitable for application on any type of resilient floor covering. Liquid Floor Wax finds application in general office and equipment areas, particularly for linoleum, rubber and vinyl floor coverings. Floor Wax W-8 finds application as an alternate to ANTI-SLIP FLOOR FINISH in operating rooms, locker rooms, and other locations that are heavily trafficked especially by women. It is indicated particularly for asphalt and vinyl tile floorings in such locations. Specific recommendations for floor dressings for various types of resilient floor coverings are given in Bell System Practices, Section H51.109, Cleaning and Protecting Resilient Floor Coverings.

1.08 Wax coatings have a tendency to build up in areas that are not subject to traffic. Heavy wax coatings that accumulate become discolored and are very difficult to remove. To avoid such build-up, it is important that only the first coat be applied over the entire floor. Subsequent coats should be applied only in traffic lanes and to within about six inches of walls, partitions, file cabinets and other permanently placed objects.

1.0: Water emulsion waxes tend to thicken and solidify on aging, even when in unopened cans. Stocks of floor wax should be rotated to insure use of older material first. To facilitate rotation the date of manufacture is shown on the cans.

1.10 Being water emulsions these waxes should be protected from freezing. Freezing breaks the emulsion and makes the wax lumpy and unusable. Accordingly, supplies of wax sufficient for the winter season should be ordered for delivery before freezing weather.

1.11 Water emulsion wax films are affected also by atmospheric conditions particularly humidity. Consequently, they tend to be more slip resistant during the more humid summer months than during the winter when heating systems are in operation and humidity levels are low.

2. SAFETY PRECAUTIONS

2.01 The following summarizes the measures which minimize the possibility of slipping and fallng accidents on waxed floors.

(1) Keep the floors well waxed and maintain adequate coatings in traffic paths. Two coats of wax, full strength, should be applied following reconditioning cleaning, i.e., complete removal of previous coatings.

(2) So far as practicable uniform coatings should be maintained over the entire floor. Uneven coatings having different resistance to slipping may create a hazardous condition. The use of different types of coatings having different coefficients of friction should be avoided on the same floor.

(3) Floors given applications of wax whether on a spot or over-all basis should be thoroughly dry before being opened to traffic. For maximum safety several hours drying time is preferable but in no case should the floor be opened to traffic with less than one-half hour drying time and in such cases the floor should be buffed before traffic is permitted.

(4) Polishing the wax tends to increase the slip resistance of the coating. Periodic polishing keeps the wax alive and aids in maintaining maximum resistance to slipping.

(5) Since waxed floors are slippery when wet, floor mats should be placed at entrances during wet weather to avoid the liability of slipping on wet areas. The mats should be of a type and size to provide adequate foot wiping to dry the soles of footwear.

(6) Block off floor areas that are being cleaned or waxed so that persons can not inadvertently walk on them. Place caution signs where they may be readily seen and leave them in place until the floor is thoroughly dry.

(7) Keep floors clean and dry.

3. TOOLS AND MATERIALS

3.01 For specific details regarding the tools, materials and procedures to be used in cleaning any particular kind of flooring preparatory to rewaxing, refer to the following practices:

Section H51.101 – Table of Building Cleaning Procedures and Materials

Section H51.107 – Floor Mopping and Scrubbing

Section H51.109 – Cleaning and Protecting Resilient Floor Coverings

3.02 For wax application:

Pail and mop wringer
Mop – 16 oz. dampened
Liquid Floor Wax or Floor Wax W-8
Caution signs and barricades

3.03 For polishing:

Two brush type electric floor polishing machines of appropriate size, i.e., large 21 in., medium 17 in. or small 11 in.

4. PREPARING THE FLOOR

4.01 Preparatory to over-all waxing, the entire floor is thoroughly cleaned by wet mopping as described in Section H51.107, Floor Mopping and Scrubbing. Wet mopping provides a uniformly clean surface and removes residual coatings from previous waxings. Attention should be given to the latter particularly near surbases and in other areas which are not walked on. The same cleaning procedure is followed for touch-up or spot waxing operations. Spot waxing is done where specific areas have become dirty or where the wax coating has worn thin. These include such areas as passageways, desk wells, entrances, paths of heavy traffic and in front of counters, powder bars, etc.

4.02 When cleaning or waxing the floor in quarters that are occupied at the time, signs bearing such wording as "CAUTION, FLOOR BEING WAXED" must be placed conspicuously to warn the occupants against the hazard of slipping on the floor while it is wet. Also, the area being worked on shall be blocked off or barricaded so that occupants can not walk on the floor during treatment. The barricades and caution signs should be left in place until the floor is thoroughly dry, or if only minimum drying time is permitted, until the floor has been polished.

5. APPLYING THE WAX

5.01 Where practical, begin applying wax at the point farthest from the exit, and work toward the exit.

5.02 Apply the wax full strength, i.e., as received, with a thoroughly clean mop which has just previously been immersed in clean water, preferably warm, and wrung as dry as possible with a mop wringer.

5.03 Pour the wax from the container into a pail equipped with a wringer. Fill the pail about 1/3 full unless a smaller quantity is enough for the job at hand. Dip the dampened mop into the wax and then wring it sufficiently so it will not drip. Apply the wax to the floor using side to side strokes. However, draw the mop parallel to walls, rows of filing cabinets, equipment frames or any other straight runs to prevent the splashing that may occur when ending side to side strokes at such points. Overlap each stroke sufficiently to avoid skipping any areas. Apply the wax evenly and thinly and do not go back over waxed sections while the wax is drying as this causes the partially dried wax to become tacky producing a drag on the mop and to dry dull and streaky.

5.04 Two applications are required following a cleaning operation that has removed the previous wax coatings. A third coat may be required for older and more porous floorings. While coverage will vary somewhat with the person applying the wax and the porosity of the floor normal coverage is about 1500 square feet per gallon of wax for a two coat application. The wax coatings normally dry in about one-half hour. Subsequent coats should not be applied until the previous coating is dry (approximately one-half hour) to avoid redissolving the undercoats.

5.05 Any wax remaining in the pail should not be poured back into the container of fresh wax. If a substantial amount is left over it should be placed in a separate can for reuse at the next waxing. Wax containers should be kept well closed to prevent thickening of the wax. Any wax that has thickened to the point where uniformly even applications can not be made, should be discarded. If the date on the can shows that the thickened wax is less than one year old it should be returned for credit.

5.06 The finished job should not show streaks or mop strand marks, skipped areas or other evidence of uneven application.

6. POLISHING

6.01 Freshly waxed floors that must be opened to traffic with minimum drying time should be polished to assure thorough drying. Floors may be polished periodically thereafter in accordance with local schedules. Polishing waxed floors improves appearance and increases slip resistance. It tends to make the floor less susceptible to the accumulation of casual dirt thereby deferring cleaning frequencies.

6.02 Polishing is done with the two-brush type electric machine of appropriate size which is pushed over the floor at a moderate, but not slow, walking pace. The handle of the large size machine should be adjusted so that the full weight of the machine shall rest upon the brushes.

7. CARE OF TOOLS

7.01 Clean the pail and mop wringer and put them away in their proper places.

7.02 Clean the waxing mop within a few minutes after use, i.e., before the wax has set. This is done by immersing the mop in clear water, preferably warm, for a few minutes followed by two or three rinsings. Hang the mop (strands down) in a clean place where it can readily dry.

7.03 Wipe off the electric floor polishing machine following use, with a dampened cellulose sponge.

7.04 After the waxed floor is thoroughly dry restore the caution signs to their proper storage places.

FLOOR MOPPING AND SCRUBBING

CONTENTS PAGE

1. GENERAL

1.01 This section describes the procedures for damp mopping, wet mopping and scrubbing of floors. Damp mopping is a once-over cleaning operation using plain water; wet mopping and scrubbing are the more thorough procedures employing cleaning agents.

1.02 This section is generally revised to simplify the text and to include the latest techniques.

1.03 Damp mopping is used principally for day-to-day cleaning of marble, tile and terrazzo floors in lobbies, halls and washrooms and during wet weather for removing tracked in dirt and water. It is also used for resilient floor coverings in cafeterias, lounges and other quarters for removing spillages and tracked in dirt.

1.04 Wet mopping is employed where the damp method is inadequate. It is used at intervals for cleaning all hard floorings such as marble, terrazzo, tile, etc; also for the periodic washing of the resilient floor coverings - asphalt tile, linoleum, rubber and vinyl, in preparation for spot or over-all rewaxing or application of anti-slip floor finish.

1.05 There are two classifications of scrubbing as follows:

(a) Spot scrubbing which supplements mopping in areas such as traffic paths and under desk wells where the dirt cannot be satisfactorily removed by mopping.

(b) Over-all scrubbing which is employed to recondition entire floors that cannot be otherwise restored to a satisfactorily clean appearance. Over-all scrubbing is usually done at infrequent intervals and only when wet mopping is inadequate for a complete reconditioning job. Over-all scrubbing is required when a floor is cut over from wax maintenance to anti-slip floor finish or vice versa.

1.06 Reference should be made to one of the following Bell System Practices to determine the proper cleaning materials and protective finishes. Also to determine whether there are any variations from usual procedures that should be followed in wet mopping or scrubbing any type of floor.

SECTION H51.101 - TABLE OF BUILDING CLEANING PROCEDURES AND MATERIALS

SECTION H51.102 - APPLICATION OF ANTI-SLIP FLOOR FINISH

SECTION H51.106 - FLOOR WAXING

SECTION H51.109 - CLEANING AND PROTECTING RESILIENT FLOOR COVERINGS

SECTION H51.110 - CLEANING HARD FLOORS

2. SAFETY PRECAUTIONS

(a) Precautions shall be taken against possible slipping and falling on the floor being mopped or scrubbed. Signs on easels or standards reading "Caution Floor Being Cleaned" and enclosing or blocking off of the area are important safety measures.

(b) The mops used should always be wrung in a mop wringer and never by hand as pins or other sharp objects may cause injury.

(c) Mop handles should be controlled so that they will not strike furniture, walls or equipment. When immersing the mop and when wringing, the handle is held at an angle rather than vertically, to avoid striking lighting fixtures, low ceilings or other objects.

(d) Workers should walk carefully on wet floors and particularly when removing floor waxes and anti-slip floor finish coatings.

3. DAMP MOPPING PROCEDURE

3.01 Tools and Supplies: Pail and mop wringer, small mopping unit or mopping tank as appropriate for the area to be cleaned

Mop, 16, 24 or 32 oz. size
Water, preferably warm

3.02 It is generally not necessary to clear the area to be damp mopped of furniture, equipment, etc. The area should, however, be blocked off to traffic in accordance with Paragraph 2(a). The area is not reopened to traffic until the work is finished and the floor is completely dry. Floors are first swept, if necessary, to remove visible litter.

3.03 Damp mopping consists of going over the floor with a mop dampened as follows: A clean mop is immersed in clean water, then wrung as dry as possible with a mop wringer.

3.04 The mop is moved over the floor in unobstructed areas by side-to-side strokes reaching as far as convenient without stretching, or striking walls or furnishings. Random strokes or forward and backward strokes are used for getting about and underneath furniture and equipment. The mop is drawn along parallel to surbases, closed base lockers and rows of filing cabinets to avoid smearing them. Spillages and other resistant soil should be rubbed with heel of mop.

3.05 The mop is turned over every four or five strokes to present fresh portions to the floor. The mop is rinsed frequently and wrung dry. The water is changed often enough to maintain a clean mop.

3.06 When the damp mopping operation is properly done there should be no streaking or residue left by the mop.

4. WET MOPPING PROCEDURE

4.01 Tools and Supplies: Pails and mop wringers, mopping units or mopping tanks as appropriate for the area to be cleaned as follows:

Container for cleaning solution
Container for rinse water
Container for waste water

Mop for applying and picking up of cleaning solution
Mop for rinse water
Floor polishing machine (small, medium or large size two brush type) equipped with scrubbing brushes, or deck scrub brushes for small areas
Cleaning material - See appropriate Bell System Practices Section as mentioned in Paragraph 1.06
Putty knife
Cellulose sponge for wiping spatterings from surbases, furniture legs, etc.
Water, preferably warm
Caution signs

4.02 The same procedures are followed for spot and for over-all mopping.

4.03 The area should be cleared in so far as practicable by moving aside furniture and equipment. Chairs, waste baskets and other equipment should not be placed on desks or tables. The area should be blocked off as outlined in Paragraph 2(a) and is not reopened to traffic until the work is finished, the floor is dry, and the furniture is returned to its proper place.

4.04 The floors are first swept, if necessary, to remove visible litter and loose soil. Gum, tar or other adhesive substances are removed before mopping by means of a putty knife.

4.05 When mopping resilient type floor coverings, areas of approximately 200 sq. ft. (per man) should be done completely at one time, i.e., mopped and rinsed before moving to the next area. Work progress should be such that cleaning solutions will not dry before being picked up and rinsed.

4.06 The amount of cleaning solution and rinse water applied to the floor should be kept to a minimum. This is especially important in the vicinity of electrical and telephone installations such as floor outlets, plug receptacles and floor metal or rubber mouldings. Careful forward and backward strokes are used when mopping in their vicinity, instead of the customary side-to-side strokes.

4.07 Care is taken to avoid splashing walls, furniture and equipment. If splashing occurs it should be wiped off immediately with a clean damp cellulose sponge.

4.08 The wet mopping procedure is comprised of the following steps:

(a) Preparation

For large areas: use a three-compartment mopping tank, or if not available, two two-compartment tanks. The wringer compartment is left empty to receive the wash and rinse water picked up from the floor. Fill the other two compartments with water to the appropriate level and add the proper kind and amount of cleaning material in one of the filled compartments, leaving the other for rinsing. Where only one two-compartment tank is available a pail should be used for the wash water. The cleaning material should be completely dissolved in the wash water by stirring. Two mops are used, one for applying and picking up the washing solution and the other for rinsing.

For small areas: use a two-pail mopping outfit and one additional pail or three separate pails. Pail equipped with wringer is left empty to receive wash and rinse water picked up from the floor. Fill second pail with water and add proper kind and amount of cleaning material. A piece of cardboard is placed underneath the pail containing the cleaning solution to avoid leaving a ring on the floor. Fill the third pail with clean water for rinsing. Two mops are used as above unless the total area treated is very small, i.e., less than 200 sq. ft. or for spot cleaning where one will suffice.

(b) Application of the Cleaning Solution to the Floor

Immerse the mop in the cleaning solution and to avoid splashing hold it a few seconds above the container to allow the excess liquid to drain off. Spread the solution over the area to be cleaned using side-to-side strokes in open spaces. Stop about four to six inches short of baseboards, furnishings or equipment. Turn the mop over every four or five strokes to facilitate the distribution of the cleaning solution. Random or forward and backward strokes are used around and under furniture. The mop is drawn along parallel to surbases, closed base lockers and rows of filing cabinets.

(c) Cleaning the Floor

In the case of removal of floor waxes or Anti-Slip Floor Finish the cleaning solution is allowed to remain in contact with the floor for about three minutes to permit the cleaner to soften and emulsify the residual film. In the case of hard floors no waiting period is required after application of the cleaning solution. The floor is cleaned with side-to-side strokes or by short scrubbing strokes with a downward pressure on the heel of the mop to remove heavily imbedded dirt. Scouring powder sprinkled sparingly to the heavily soiled portions of the wet floor may be required where imbedded dirt cannot otherwise be removed. Where it appears that the above procedure will not adequately clean the floor, a deck scrub brush or an electric floor machine of appropriate size may be used on heavily soiled portions as described in Paragraph 4.01(b). Small, hard to reach areas where the mop can not be directed by its handle are done by stooping and directing it by hand.

(d) Pickup

The mop used for applying the washing solution is placed in the wringer and wrung as dry as possible. It is shaken out to free the strands. It is then passed over the floor doing approximately 50 square feet for each wringing of the mop. Side-to-side and backward and forward strokes, are used turning the mop over from every four to five strokes until it is saturated. The mop is again wrung dry and the operation repeated until the cleaning solution is removed from all portions of the floor.

(e) Rinsing

Clean rinse water is applied to the floor with a clean mop using the same procedure as described for the application of the cleaning solution in Paragraph 4.08 (b) and picked up in the manner as described in Paragraph 4.08 (d). Rinsing is an important operation to insure removal of cleaning agents from the floor, especially for resilient floors which are to receive wax or anti-slip floor finish. Resilient floors are rinsed at least twice.

4.09 Upon completion of a room or area, the floor is inspected to see that it is free from streakiness, mop strands or cleaning material residues and is thoroughly clean. If the area is maintained with wax or Anti-Slip Floor Finish, application may be undertaken as soon as the floor is completely dry. Finally when the floor is again ready for occupancy any furniture which has been moved should be restored to its proper place and caution signs removed.

5. SCRUBBING PROCEDURE

5.01 The same procedures are employed for scrubbing as for wet mopping except that an electric floor machine or deck scrub brush is used for removing the soil instead of a mop. Accordingly, the preparation, application of cleaning materials, pickup and rinse operations are used as described in Paragraphs 4.08(a), (b), (d) and (e). When the work is completed the floor is inspected, and restored to service as described in Paragraph 4.09.

5.02 Scrubbing the Floor

The floor machine or deck scrub brush is applied to the floor beginning with the area which was wet down first. The floor machine is moved forward and backward for a convenient distance. If the deck scrub brush is used it is moved forward and backward in strokes two to three feet long with downward pressure on the handle. Care should be taken to avoid striking furniture, filing cabinets, equipment, etc. When deeply imbedded dirt or stains are encountered which can not be removed with the cleaning solution scouring powder may be sprinkled very sparingly on these specific points.

6. SPOT CLEANING

6.01 Spot cleaning is done in the same manner as over-all mopping or scrubbing except that it is confined to limited soiled areas. The edges of the spot cleaned areas are rubbed with the wrung mop to minimize a patched effect. When spot cleaning, care should be exercised to avoid spilling cleaning or rinse water on adjacent areas. The wet mop deck scrub brush or scrubbing machine brushes, if used, are not permitted to rest on the floor in either clean areas or portions still to be done. When a pail is used for the cleaning solution a piece of cardboard is placed under it to avoid leaving a ring on the floor.

6.02 The soiled areas are cleaned by short scrubbing strokes with a downward pressure on the heel of the mop, deck scrub brush or electric floor machine. Scouring powder sprinkled sparingly to heavily soiled areas may be required where the imbedded dirt cannot otherwise be removed. Where the heavily soiled areas are numerous a small or medium size electric floor polishing machine equipped with scrub brushes may be used.

7. CARE OF EQUIPMENT

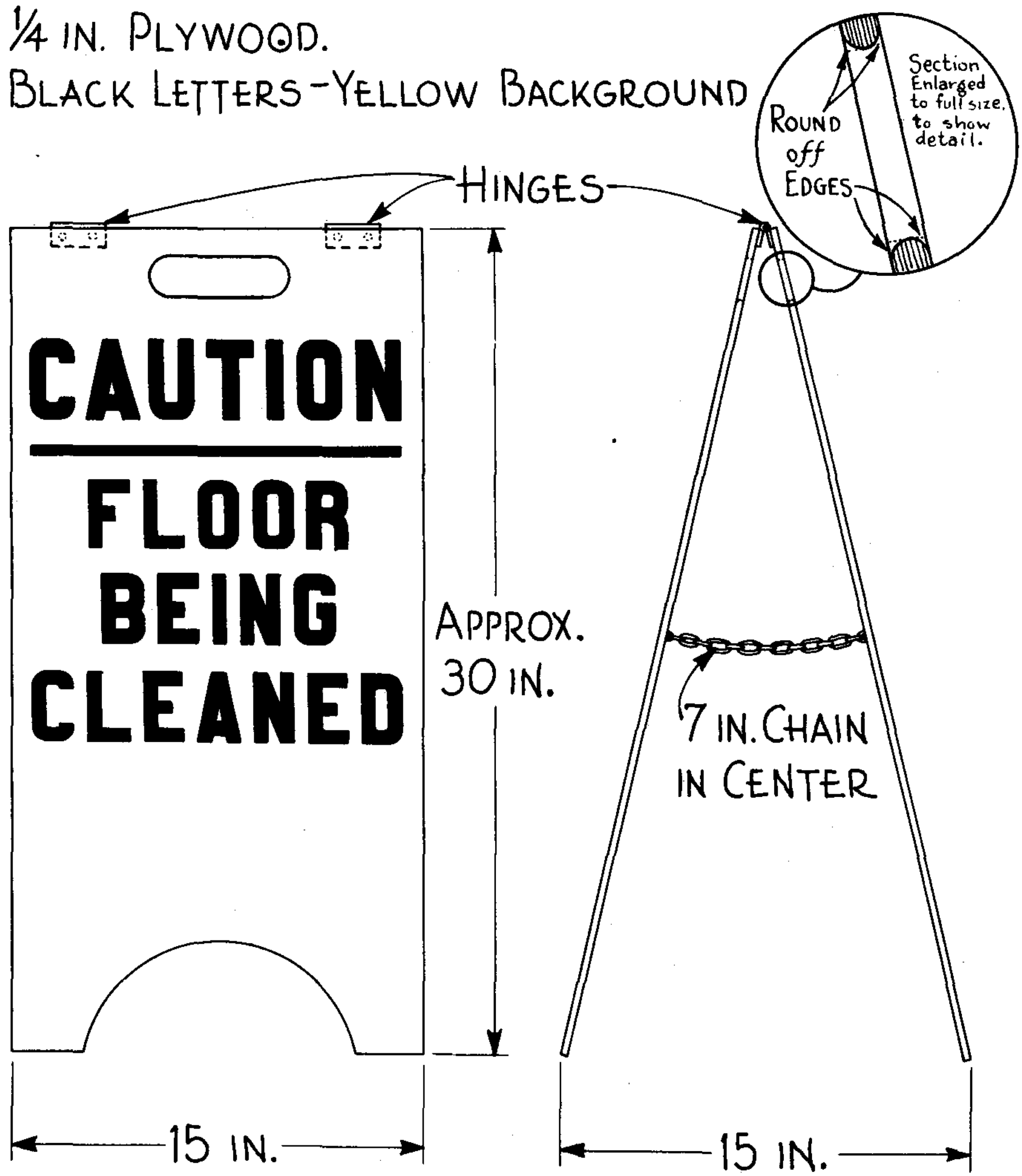
7.01 All mops, pails, scrub brushes, either hand or machine type, floor machines, tanks and wringers should be cleaned thoroughly following use and returned to the place of storage. Hang the mops (strands down) in a clean, well-ventilated place where they can readily dry. Any irregular strands should be trimmed off and if necessary the strands combed with a piece of pointed wood or mop comb.

7.02 Mops which have lost one-third or more of their original strands should be replaced. Scrub brushes should be replaced when the bristles are worn one-third to one-half of their original length.

8. CAUTION SIGNS

8.01 Exhibit "A" illustrates a caution sign which is used when mopping and scrubbing on either an over-all or spot basis. The sign is easy to carry and to set up. It folds flat for convenient storage.

EASEL SIGN
FLOOR BEING CLEANED



SCALE- 3/16 IN. = 1 IN.

FLOOR SCRUBBING

1. GENERAL

1.01 This section describes the procedures for scrubbing various kinds of floors such as concrete, marble, terrazzo, tile and travertine, and floor coverings such as asphalt, linoleum and rubber.

1.02 It is reissued and generally revised to include additional details regarding machine and manual scrubbing operations and tools.

1.03 Scrubbing is usually done at infrequent intervals and only when wet mopping is inadequate for the job at hand.

1.04 There are two classifications of scrubbing as follows:

(a) Spot scrubbing which supplements mopping in areas such as traffic paths and under desk wells where the dirt can not be satisfactorily removed by mopping.

(b) Over-all scrubbing which is employed to recondition entire floors that can not be otherwise satisfactorily restored to a satisfactorily clean appearance.

1.05 Precautions shall be taken before starting the scrubbing operation to prevent any persons from crossing the floor area that is being cleaned. Signs on easels reading "Caution Floor Being Cleaned" and blocking off of the area are important safety measures. The area is not reopened to traffic until the work is finished, the floor is dry and the furniture restored to its proper place.

1.06 Prior to scrubbing any type of floor, reference should be made to one of the following Bell System Practices to determine whether there are any special precautions to be taken or any variations from usual procedures that should be observed:

Section H51.109 - Maintenance of Linoleum

" H51.110 - Maintenance of Marble, Terrazzo, Travertine, Hard Composition and Hard Tile Floors

" H51.111 - Maintenance of Rubber Floors

" H51.112 - Maintenance of Asphalt Composition Floors

1.07 Any mops used must be wrung in a mop wringer and never by hand as pieces of glass, pins or other sharp objects may cause injury.

2. TOOLS AND SUPPLIES

2.01 The following items are required:

Pails and mop wringers, small mopping units or mopping tanks as appropriate for the area to be cleaned

Electric floor machine, small or large size equipped with scrubbing brushes; or deck scrub brush as appropriate for the area to be cleaned

Mops

Floor squeegee, for large areas

Pickup pan, for large areas

Putty knife

Water, preferably warm

Cleaning material - See B.S.P. Section H51.101 Building Cleaning (Materials and Procedures)

3. PROCEDURE

3.01 The same procedure is followed for spot and for over-all scrubbing.

3.02 The area to be cleaned should be cleared in so far as practicable by moving aside furniture and equipment. Chairs, wastebaskets and other equipment should not be placed on desks or tables. The area should be blocked off as outlined in Paragraph 1.05.

3.03 The section of the floor to be scrubbed is first given a dry sweeping to remove loose dirt and debris. Gum, tar or other adhesive substances are removed with a putty knife. If necessary, a solvent such as trichlorethylene may be applied in small amounts to a wiping cloth and used to supplement the putty knife. Trichlorethylene should not be applied to asphalt tile floors.

3.04 The proper cleaning material to be used is determined by reference to B.S.P. H51.101 Building Cleaning Schedule (Materials and Procedures) or to the Practices listed in Paragraph 1.06 pertaining to the various types of floors. The cleaning material should be completely dissolved in the wash water. Detergent solutions clean most effectively when allowed to remain in contact with the soiled floor for several minutes before beginning the scrubbing operation.

3.05 Areas of 200 to 300 square feet should be done completely at one time, i.e., scrubbed and rinsed before moving to the next section. Areas of this size permit the cleaning solution to remain in contact with the floor for a sufficient time to aid in cleaning. The area treated should not be so large that the wash water dries before the floor can be scrubbed and rinsed.

3.06 The amount of cleaning solution and rinse water applied to the floor should be kept at a minimum. This is especially important in the vicinity of electrical or telephone installations such as floor outlets, plug receptacles and metal mouldings. Careful forward and backward strokes are used in mopping in their immediate vicinity, instead of the customary side to side strokes. Care is also taken to prevent splashing walls, furniture and equipment and if splashing inadvertently occurs it should be wiped off immediately. Mop handles and scrubbing machines should be controlled so that they will not mar furniture, walls or other equipment. When immersing the mop in wash or rinse water and when rinsing, the handle should be held at an angle rather than vertically to avoid striking lighting fixtures, low ceilings or other objects.

3.07 The scrubbing procedure is as follows:

(a) Preparation.

For large areas: Use two mopping tanks. Leave the wringer compartment in each empty to receive the water picked up from the floor. Fill the second compartment in each with warm water to the appropriate level. Place the proper kind and amount of cleaning material in one of the filled compartments. Two mops are used, one for applying the washing solution and the other for rinsing.

For moderate size areas: Use a mopping tank. Leave the wringer compartment empty. Fill the other compartment with warm water and add the proper kind and amount of cleaning material. Fill a second container, e.g., a pail with warm water for rinsing. Use two mops, one for the washing solution and the other for rinsing.

For small areas: Use a two-pail mopping outfit, or two separate pails. Leave pail equipped with wringer empty. Fill second pail with warm water and add proper kind and amount of cleaning material. Fill a third pail with warm water for rinsing. Two mops are used as above unless the area treated is very small.

(b) Application of the cleaning solution to the floor.

Immerse the mop in the washing solution and hold it a few seconds above the container or wring it lightly to remove excess liquid. Spread the solution over the area to be treated (up to 200 to 300 square feet) using side to side strokes in open areas, being careful not to strike walls or furnishings. Random or forward and backward strokes are used around and under furniture. The mop is drawn along parallel to surbases, closed base lockers and rows of filing cabinets to avoid striking them. The mop is turned over from time to time to facilitate distributing the solution.

(c) Scrubbing.

When the floor has been wet with the cleaning solution, and a few minutes allowed for the solution to loosen the dirt, the deck scrub brush or machine is applied. In the case of the deck scrub brush it is stroked forward and backward in strokes about two to three feet long and with downward pressure on the handle. Shorter strokes with more pressure are used for hard to remove dirt. The small size (two brush) electric floor machine also is stroked slowly forward and backward preferably with slight downward pressure. The large size electric machine is moved forward and backward but because of its weight no downward pressure is required. In all cases, the brush or machine is directed so that the cleaning solution is moved progressively in the direction in which the scrubbing is being done. When doing relatively large areas (400 square feet or more) a floor squeegee may be used to advantage in moving the wash water in the path of travel. Where the dirt can not be satisfactorily removed with the cleaning solution, scouring powder may be sprinkled very sparingly and only to the specific points required.

(d) Pick up.

The mop used to apply the washing solution is placed in the wringer and wrung as dry as possible. It is then passed over the floor in side to side strokes or otherwise until saturated. Turning it over from time to time aids the pick up. The mop is again wrung dry and the operations repeated until the cleaning solution is removed from the floor. When the quantity of solution is considerable, a squeegee may be used to concentrate it at a convenient point for picking up with the mop or with a pickup pan. The water collected by the pickup pan is placed in the mop tank compartment reserved for waste water.

(e) Rinsing.

Clean rinse water is applied to the floor with a clean mop as described in Paragraph (b) and picked up by the same mop in the manner described in Paragraph (d). Rinsing is an important operation to insure removal of cleaning agents from the floor. If necessary, the floor is rinsed a second time. In the case of spot scrubbing, the edges of the cleaned area are rubbed with the wrung mop to minimize the contrast with the adjacent area.

3.08 When applying the cleaning solution and when rinsing, the mop strokes should stop about four to six inches short of baseboards, furnishings or equipment. These undone areas are gone over when the mop has lost most of its charge of water or after being partially wrung out. Small inaccessible areas where the mop can not be guided by the handle are cared for by directing the mop by hand. When spot cleaning, care should be exercised not to spill cleaning or rinse water on adjacent areas. Also, the deck scrub brush and the machine brushes which are wet with cleaning solution should not be allowed to rest on portions of the floor that are not to be cleaned.

3.09 Upon completion of a room or area, the floor is inspected to see that it is free from streakiness, mop strands or cleaning residues and is thoroughly clean. If the area is maintained with wax or other floor dressing, application may be undertaken as soon as the floor is dry. Finally, when the floor is again ready for occupancy, any furniture which has been moved should be restored to its proper place and caution signs removed.

4. CARE OF EQUIPMENT

4.01 All mops, pails, scrub brushes, either hand or machine type, tanks and wringers should be cleaned thoroughly following use and returned to the place of storage. The mops are hung with the strands hanging downward free from contact with walls and other objects so that air can circulate freely about them. Any irregular strands should be trimmed off and if necessary the strands combed with a piece of pointed wood or mop comb.

4.02 Mops which have lost one-third or more of their original strands should be replaced. Scrub brushes should be replaced when the bristles are worn one-third to one-half of their original length.

CLEANING AND PROTECTING RESILIENT FLOOR COVERINGS

CONTENTS — PAGE

1. GENERAL

1.01 This section describes the procedures to be followed for cleaning resilient type floor coverings and for applying protective coatings to preserve them against wear and soil penetration. The resilient floor coverings included are the following:

Asphalt Tile

Linoleum - Sheet and Tile

Rubber - Sheet and Tile

Vinyl Asbestos Tile

Miscellaneous - Vinyl, Cork, Wood

1.02 This section is reissued and generally revised to include vinyl asbestos tile, vinyl, cork and wood floorings. Also, to include the use of a Liquid Floor Cleaner and Floor Wax W-8 containing "Ludox" a colloidal silica which contributes slip resistant properties to the wax.

1.03 The resilient floor coverings listed in Paragraph 1.01 are used in telephone buildings for the following purposes:

(a) To provide durable, resilient, and safe walking surfaces.

(b) To provide floor surfaces that are smooth and easy to maintain.

(c) To improve the appearance of the space. Marbleized designs in contrasting color combinations afford the best appearance. They obscure soiling and scuffing and give good light reflection values for better seeing. It is desirable from a maintenance standpoint to avoid solid colors, very light and very dark colors, as each readily shows soil.

2. LIMITATIONS OF RESILIENT FLOOR COVERINGS

2.01 The several types of resilient floor coverings listed will provide long service if they are properly maintained, and their limitations are recognized. Damage to such floorings results from the use of improper cleaning materials, improper cleaning methods and mechanical injury. It is important that only the recommended cleaning materials be used and in the stated quantities.

2.02 To provide maximum service life, enhance appearance and reduce maintenance effort, the surfaces of resilient floors are treated with floor waxes or Anti-Slip Floor Dressing. These coatings take the wear resulting from traffic and minimize dirt penetration into the material. It is essential that such protective coatings be easily renewed on a spot and over-all basis. The Bell System water emulsion waxes meet this requirement as does also the Bell System Anti-Slip Floor Finish. When applying such coatings care should be exercised to avoid build-up in areas not subject to traffic.

2.03 Resilient floor coverings are given a surface treatment of wax by the manufacturer for protection during storage, handling and installation. This factory finish must be removed prior to the application of the recommended Anti-Slip Floor Finish to insure satisfactory application and maximum slip resistance.

2.04 The primary cause of mechanical injury to the surface of resilient floorings is improper furniture footings and bases. To prevent such injury, chairs should have casters, with soft wheel treads, desk legs adequate flat undersurfaces or protective rubber cups. "Domes of Silence" should be removed from chairs, desks, settees, etc, in favor of approved footings. Lockers should be placed on boards with the bases enclosed or fitted with adequate shoes. Such items as file cabinets and bookcases which rest directly on the floor should have asphalt floor runners or other suitable nonstaining water resistant protective material placed between the base and the floor surface. This prevents rust stains due to water penetration which may occur in the course of cleaning. Rust stains can not be removed without damage to the surface. Heavy objects such as furniture, cable reels and telephone equipment should be moved across resilient floors only on dollies having wheels with wide rubber tired treads. Heavy material or equipment is stored on resilient floors only after the floor has been protected with boards or plywood. During construction work, areas exposed to heavy traffic and severe dirt conditions, solder drippings or other mechanical injury incident to carrying out the work, should be protected with asphalt floor runners or other protective material.

2.05 At focal points of traffic such as at doorways in front of switchboards, etc, where considerable soiling occurs and relatively frequent spot cleaning and waxing are required, consideration should be given on new installations to providing a contrasting color at these locations. The area where the contrasting color is installed provides a cutoff for spot cleaning and waxing.

3. ASPHALT TILE

3.01 Asphalt tile is made of asbestos fiber, clay fillers, color pigments and asphaltic or resinous binders. It is manufactured in two basic types - regular and greaseproof. The latter employs resinous binders only. The tiles are furnished in four color grades ranging from plain dark to light marbleized colors. Each color grade carries a price differential, with the lighter and more striking colors the more expensive.

3.02 Asphalt tile is the lowest cost resilient flooring. It is also the least durable, and therefore should be protected against wear with wax or Anti-Slip Floor Finish. The regular grade is dissolved by oils and greases, but the greaseproof grade resists damage from these sources. Asphalt tile is especially suitable for floors laid on or below grade where moisture penetration may occur. It is resistant to moisture and accompanying alkaline conditions commonly encountered in concrete floors.

3.03 Day-to-day cleaning of asphalt tile consists of dustless sweeping as covered by:

SECTION H51.104.1 - SWEEPING, DUSTLESS, DAMP CLOTH METHOD, OR

SECTION H51.104.2 - SWEEPING, DUSTLESS, TREATED CLOTH METHOD

Periodic cleaning on either a spot or over-all basis involves wet mopping and scrubbing as covered by:

SECTION H51.107 - FLOOR MOPPING AND SCRUBBING

Where asphalt tile floors are maintained with wax, either Powdered Soap or Liquid Floor Cleaner is employed as the cleaning agent. Powdered Soap is used in the ratio of one to two tablespoonfuls to ten quarts of warm water. The Powdered Soap may be fortified with one to two tablespoonfuls of Pyrophosphate Cleaner when necessary, particularly in hard water areas, where soil conditions are severe, and for removing old or excessive wax coatings. When Powdered Soap and Pyrophosphate Cleaner are used in the same cleaning solution the pyrophosphate is added first and completely dissolved before adding the soap. Where the floors are maintained with Anti-Slip Floor Finish, Liquid Floor Cleaner is used for routine cleaning in the ratio of one part cleaner to sixteen parts of warm water.

3.04 In converting asphalt tile from wax maintenance to Anti-Slip Floor Finish or vice versa, Liquid Floor Cleaner may be used in ratios up to one part cleaner to five parts of warm water to insure complete removal of all old wax. Also it may be necessary to use similar high concentrations of Liquid Floor Cleaner for removing coatings of Anti-Slip Floor Finish which have not been renewed for a long period and have become hard to remove. Liquid Floor Cleaner in normal concentration also is effective for removing old wax coatings. All cleaning agents are more effective in warm water. Where warm water is not available, the Liquid Floor Cleaner is preferable to the powdered materials. Scouring powder may be applied sparingly on tenaciously soiled spots for either type of maintenance. Steel wool should not be used on asphalt tile floors.

3.05 Asphalt tile is maintained with Liquid Floor Wax, Floor Wax W-8 or Anti-Slip Floor Finish as covered by:

SECTION H51.106 - FLOOR WAXING, OR

SECTION H51.102 - APPLICATION OF ANTI-SLIP FLOOR FINISH

Asphalt tile when waxed has the least slip resistance of any of the resilient floorings because of its hard composition. Accordingly, Anti-Slip Floor Finish is recommended for public business offices, cafeterias, lobbies or other areas where moisture may be tracked onto the floor or where spillages may occur. As an alternate selection for office areas having heavy female traffic and for traffic quarters the special slip resistant Floor Wax W-8 containing "Ludox" provides good slip protection and somewhat easier maintenance. Liquid Floor Wax is suitable for lightly or occasionally occupied floor areas such as switch rooms, CDO's, etc, as it affords maximum wear and ease of maintenance.

3.06 No petroleum base liquid or paste wax should be used on asphalt tile because it will dissolve the asphalt composition. Floor sweeping compounds containing oil should also be avoided. Varnish, lacquers or floor sealers containing organic solvents are harmful and should not be used.

3.07 Asphalt tile requires maximum protection from mechanical damage because its indentation resistance does not exceed 25 pounds per square inch of sustained load and the surface does not recover from indentations. This is in contrast to the recovery from indentations characteristic of the other types of resilient floorings. All furniture footings and bases should be examined for smooth under surfaces and adequate floor area contact to avoid indentations. Only casters with soft rubber treads should be used on asphalt tile floors. It is essential to protect the regular grade from oil and grease drippings from installed machinery.

4. LINOLEUM

4.01 Linoleum is basically a mixture of wood flour or finely ground cork, oxidized linseed oil, color pigments, mineral fillers and resinous binders bonded to burlap or felt. Burlap backed linoleum is greatly preferred to the felt backed variety because of the ease of removal and reuse and its greater resistance to indentation. Marbleized patterns while slightly higher in price have replaced solid colors as the small differential is compensated for by lower upkeep expense.

4.02 Linoleum in the "heavy" or 1/8-inch grade, is the most extensively used of the resilient floor coverings and is found in such areas as offices, operating rooms, switch rooms, corridors and lounges. Linoleum is not suitable for laying on floors that are in contact with the ground. Such floors are subject to moisture penetration which will cause linoleum to deteriorate.

4.03 Day-to-day cleaning of linoleum consists of dustless sweeping as covered by:

SECTION H51.104.1 - SWEEPING, DUSTLESS, DAMP CLOTH METHOD, OR

SECTION H51.104.2 - SWEEPING, DUSTLESS, TREATED CLOTH METHOD

Periodic cleaning on either a spot or over-all basis involves wet mopping and scrubbing as covered by:

SECTION H51.107 - FLOOR MOPPING AND SCRUBBING

Where linoleum floors are maintained with wax, either Powdered Soap or Liquid Floor Cleaner is employed as the cleaning agent. Powdered Soap is used in the ratio of one to two tablespoonfuls to ten quarts of warm water. The Powdered Soap may be fortified with one to two tablespoonfuls of Pyrophosphate Cleaner when necessary, particularly in hard water areas, where soil conditions are severe, and for removing old or excessive wax coatings. The Pyrophosphate is dissolved in the water before adding the Powdered Soap. Where the floors are maintained with Anti-Slip Floor Finish, Liquid Floor Cleaner is used for routine cleaning in the ratio of one part cleaner to sixteen parts of warm water.

4.04 In converting linoleum from wax maintenance to Anti-Slip Floor Finish or vice versa or to remove factory finish from new linoleum, Liquid Floor Cleaner may be used in ratios up to one part cleaner to five parts of warm water to insure complete removal of all wax. Also, it may be necessary to use similar high concentrations of Liquid Floor Cleaner for removing coatings of Anti-Slip Floor Finish which have not been renewed for a long period and have become hard to remove. Liquid Floor Cleaner in normal concentration also is effective for removing old wax coatings. All cleaning agents are more effective in warm water. Where warm water is not available, the liquid cleaner is preferable to the powdered materials. Scouring Powder may be applied sparingly on tenaciously soiled spots for either type of maintenance. Steel wool should not be used on linoleum floors.

4.05 Linoleum is maintained with Liquid Floor Wax, Floor Wax W-8 or Anti-Slip Floor Finish as covered by:

SECTION H51.106 - FLOOR WAXING, OR

SECTION H51.102 - APPLICATION OF ANTI-SLIP FLOOR FINISH

Linoleum when waxed provides greater slip resistance than asphalt tile due to its more resilient composition. Liquid Floor Wax is suitable for general application since it affords maximum wear and ease of maintenance. Where additional slip protection is desired, as in traffic quarters, the special slip resistant Floor Wax W-8 containing "Ludox" may be used. Anti-Slip Floor Finish is an alternate selection to Floor Wax W-8. Anti-Slip Floor Finish is recommended particularly for public business offices, cafeterias, lobbies and other areas where moisture may be tracked onto the floor or where spillages may occur.

4.06 Floor sweeping compounds containing oil should not be used on linoleum floors as the oil residues may create a slipping hazard. Varnish, lacquers or floor sealers containing organic solvents are harmful and their use should be avoided.

4.07 Linoleum will withstand static pressures up to 70 pounds per square inch before permanent indentation occurs. All furniture footings and bases should be examined for smooth undersurfaces and adequate floor area contact to avoid permanent indentations. Only casters with soft rubber treads should be used on linoleum floors.

5. RUBBER

5.01 Rubber floor covering is made from synthetic and natural rubber or combinations thereof, fillers and color pigments. It is highly resistant to wear, is expensive, very decorative from the standpoint of color brilliance and highly slip resistant. Rubber tile has a "plate" finish when manufactured and preservation of the plate is essential, for when it is worn through or damaged, maintenance becomes quite difficult.

5.02 Rubber in sheet or the more usual tile form is provided where special conditions, decorative effects, maximum durability and slip resistance warrant a premium quality material.

5.03 Day-to-day cleaning of rubber flooring consists of dustless sweeping, as covered by:

SECTION H51.104.1 - SWEEPING, DUSTLESS, DAMP CLOTH METHOD, OR

SECTION H51.104.2 - SWEEPING, DUSTLESS, TREATED CLOTH METHOD

Periodic cleaning on either a spot or over-all basis involves wet mopping and scrubbing, as covered by:

SECTION H51.107 - FLOOR MOPPING AND SCRUBBING

Where rubber tile floors are maintained with wax, either Powdered Soap or Liquid Floor Cleaner is employed as the cleaning agent. Powdered Soap is used in the ratio of one to two tablespoonfuls to ten quarts of warm water. The Powdered Soap may be fortified with one to two tablespoonfuls of Pyrophosphate Cleaner when necessary, particularly in hard water areas, where soil conditions are severe, and for removing old or excessive wax coatings. The Pyrophosphate is dissolved in the water before the soap is added. Where the floors are maintained with Anti-Slip Floor Finish, Liquid Floor Cleaner is used for routine cleaning, in the ratio of one part cleaner to sixteen parts of warm water.

5.04 In converting rubber tile from wax maintenance to Anti-Slip Floor Finish or vice versa, Liquid Floor Cleaner may be used in ratios up to one part cleaner to five parts of warm water to insure complete removal of all wax. Also, it may be necessary to use similar high concentrations of Liquid Floor Cleaner for removing coatings of Anti-Slip Floor Finish which have not been renewed for a long period and have become hard to remove. Liquid Floor Cleaner in normal concentration also is effective for removing old wax coatings. All cleaning agents are more effective in warm water. Where warm water is not available, the Liquid Cleaner is preferable to the powdered materials. Scouring Powder may be applied sparingly on tenaciously soiled spots for either type of maintenance. Since Scouring Powder may damage the plate finish, care should be exercised in its use. Steel wool should not be used on rubber tile floors.

5.05 Rubber flooring is maintained with Liquid Floor Wax, Floor Wax W-8, or Anti-Slip Floor Finish as covered by:

SECTION H51.106 - FLOOR WAXING, OR

SECTION H51.102 - APPLICATION OF ANTI-SLIP FLOOR FINISH

Rubber flooring when waxed has the greatest slip resistance of any of the resilient floorings. Liquid Floor Wax is recommended for general application since it affords excellent wear and ease of maintenance. Where additional slip protection is desired, the special slip resistant Floor Wax W-8 containing "Ludox" or Anti-Slip Floor Finish may be used.

5.06 No petroleum base liquid or paste or sweeping compound containing oil should be applied to rubber as they deteriorate the composition and create a slipping hazard. Varnishes, lacquers or floor sealers containing organic solvents also are harmful.

5.07 Adequate protection should be afforded rubber tile against mechanical damage. While this flooring has a resistance up to 200 pounds per square inch against permanent indentation, it is well to be assured that all furniture and other objects placed upon it have suitable footings or bases. Only casters with soft rubber treads should be used on rubber tile floors.

6. VINYL ASBESTOS TILE

6.01 Vinyl asbestos tile consists of a composition of asbestos fiber, fillers, color pigments and binders including vinyl plastic resin. Good grades contain from twenty-five to thirty per cent vinyl resin. It has a smoother surface than the similar appearing asphalt tile and therefore better resists soil penetration. It is easier to clean than asphalt. The colors are brighter and do not bleed in cleaning.

6.02 Vinyl asbestos tile, while more expensive than asphalt tile is more resilient and is not damaged by oils and greases. It also is resistant to mild acids and alkalies. It is especially suitable for floors laid on or below grade where moisture penetration may occur. While vinyl asbestos tile wears better than asphalt it also should be protected against wear with wax or Anti-Slip Floor Finish.

6.03 Day-to-day cleaning of vinyl asbestos tile consists of dustless sweeping as covered by:

SECTION H51.104.1 - SWEEPING, DUSTLESS, DAMP CLOTH METHOD, OR

SECTION H51.104.2 - SWEEPING, DUSTLESS, TREATED CLOTH METHOD

Periodic cleaning on either a spot or over-all basis involves wet mopping and scrubbing as covered by:

SECTION H51.107 - FLOOR MOPPING AND SCRUBBING

Where vinyl asbestos tile floors are maintained with wax, either Powdered Soap or Liquid Floor Cleaner is employed as the cleaning agent. Powdered Soap is used in the ratio of one to two tablespoonfuls to ten quarts of warm water. The Powdered Soap may be fortified with one to two tablespoonfuls of Pyrophosphate Cleaner when necessary, particularly in hard water areas, where soil conditions are severe, and for removing old or excessive wax coatings. The Pyrophosphate is dissolved in the water before the soap is added. Where the floors are maintained with Anti-Slip Floor Finish, Liquid Floor Cleaner is used for routine cleaning in the ratio of one part cleaner to sixteen parts of warm water.

6.04 In converting vinyl asbestos tile from wax maintenance to Anti-Slip Floor Finish, or vice versa, Liquid Floor Cleaner may be used in ratios up to one part cleaner to five parts of warm water to insure complete removal of all wax. It may be necessary to use similar high concentrations of Liquid Floor Cleaner for removing coatings of Anti-Slip Floor Finish which have not been renewed for a long period and have become hard to remove. Liquid Floor Cleaner in normal concentration also is effective for removing old wax coatings. All cleaning agents are more effective in warm water. Where warm water is not available, the liquid cleaner is preferable to the powdered materials.

6.05 Vinyl asbestos tile is maintained with Liquid Floor Wax, Floor Wax W-8 or Anti-Slip Floor Finish as covered by:

SECTION H51.106 - FLOOR WAXING, OR

SECTION H51.102 - APPLICATION OF ANTI-SLIP FLOOR FINISH

Vinyl asbestos tile is not as slip resistant as linoleum or rubber floor coverings, because of its harder composition. However, vinyl asbestos tile is somewhat more slip resistant than asphalt tile as it is more resilient than asphalt. Accordingly Anti-Slip Floor Finish is recommended for public business offices, cafeterias, lobbies, or other areas where moisture may be tracked onto the floor or where spillages may occur. As an alternate selection for office areas and traffic quarters the special slip resistant Floor Wax W-8 containing "Ludox" provides good slip protection and somewhat easier maintenance. Liquid Floor Wax is suitable for lightly or occasionally occupied floor areas such as switch rooms, CDO's, etc, as it affords maximum wear and ease of maintenance.

6.06 Varnish, lacquers or floor sealers containing organic solvents should not be used. Floor sweeping compounds containing oil should not be used on vinyl asbestos tile as oil residues may create a slipping hazard.

6.07 Vinyl asbestos tile will withstand static pressures up to fifty pounds per square inch before permanent indentation occurs. All furniture footings and bases should be examined for smooth undersurfaces and adequate floor area contact to avoid permanent indentations. Only casters with soft rubber treads should be used on vinyl asbestos floors.

7. MISCELLANEOUS

7.01 In addition to the above there are other types of resilient floors which, however, are used in very limited quantities in telephone buildings. They are CORK, VINYL and WOOD.

7.02 CORK tile is comprised of relatively coarse particles of cork compressed into tile form by means of pressure and heat. Since cork tile is inherently porous, the wear surface is usually sealed by the manufacturer with a clear flexible finish to minimize penetration of soil during use. Cork floor coverings are available only in tile form and only in natural cork colors.

7.03 CORK tile is very resilient as compared with other floor coverings. It will withstand static pressures up to forty pounds per square inch without permanently indenting. However, as with other resilient floor coverings, subject to disfigurement resulting from permanent indentation, furniture bases and chair casters should be reviewed to assure adequate floor protection.

7.04 CORK tile is cleaned and maintained similar to linoleum as described in Paragraphs 4.03, 4.04 and 4.05 except that because of its porosity the amount of water is kept to a minimum.

7.05 VINYL tile is the most expensive of all resilient floor coverings. It is composed of fillers and color pigments combined with vinyl plastic resin and is available in sheet and tile forms. It is more resilient than asphalt or vinyl asbestos floor coverings and is also slightly more slip resistant. Its surface is resistant to oils, greases, mild alkalies and acids. However, coarse scouring powders may damage its surface.

7.06 While some manufacturers state that it does not require waxing such protection is desirable to minimize scratching of the surface under traffic and to facilitate cleaning. Maintenance with wax or Anti-Slip Floor Finish will prolong its service life.

7.07 VINYL tile will withstand static loads up to seventy pounds per square inch and, of course, as with other resilient floor coverings, furniture footings and bases should be examined to prevent permanent indentation.

7.08 VINYL tile is maintained by the procedures described in Paragraphs 6.03, 6.04 and 6.05 recommended for vinyl asbestos floor coverings.

7.09 WOOD floorings require somewhat different treatment than the resilient floor coverings, principally because unless thoroughly sealed the use of water or water emulsion waxes or the water emulsion Anti-Slip Floor Finish will raise the grain of the wood. If water is used excessively it can warp the boards. Wood floorings are of the hard varieties, i.e., maple, oak, beech, etc. While they are not subject to permanent indentation, furniture bases and footings should have smooth undersurfaces of adequate area to prevent scratching and marring the finish.

7.10 Where wood floors are not thoroughly sealed by means of varnish or bakelite sealers they are maintained with either paste or petroleum solvent type liquid waxes which do not raise the grain. Where they are adequately sealed, the water emulsion type floor waxes or Anti-Slip Floor Finish may be used. Thus thoroughly sealed wood floors are maintained in a manner similar to linoleum as described in Paragraphs 4.03, 4.04 and 4.05 but with minimum use of water.

CLEANING HARD FLOORS

1. GENERAL

1.01 This section describes the procedures for cleaning the following hard floors:

Concrete, Painted and Unpainted

Marble and Travertine

Terrazzo

Tile, Unglazed

1.02 This section was formerly issued under the title "Maintenance of Marble, Terrazzo, Travertine, Hard Composition and Hard Tile Floors." It is reissued and generally revised to (1) include the care of concrete floors, (2) specify the use of pyrophosphate cleaner, (3) include the use of oil absorbent powder and garage floor cleaner, and (4) provide information regarding the characteristics of hard floors.

1.03 Hard floors should not be considered indestructible. Some are susceptible to deterioration by strong acids, chemicals and harsh abrasives. The procedures described should be followed in order to avoid damage to hard floor surfaces.

2. CONCRETE FLOORS, PAINTED AND UNPAINTED

2.01 Concrete forms the underlying or base floor in most areas of telephone buildings. In occupied space, the concrete floor is covered with linoleum, asphalt tile or rubber flooring to improve appearance, to provide a resilient walking surface and to facilitate maintenance. In less frequented areas, such as portions of basements, penthouses and storage areas, the concrete floor is not usually covered except possibly by runners in paths of traffic.

2.02 The surface of a concrete floor is troweled to provide a dense smooth surface. If the concrete is not properly mixed or cured, the uncombined cement will continually dust off the surface of the floor. This condition can be alleviated by treating the floor with a chemical hardener as described in Section H53.105 - Hardening and Dust-Proofing Concrete Floors.

2.03 To improve appearance in frequented basement space, the concrete floor is often painted with a concrete floor paint. Paint wears off cement rapidly when subject to relatively heavy traffic and to prevent rapid wear, saturated felt floor runners are placed in the normal traffic paths. Such runners also serve to guide traffic off the painted areas. Rubber matting having proper dielectric properties is used in front and rear of power switchboards.

2.04 Unpainted concrete floors which have a smooth dense surface (except garages) and painted concrete floors may be cleaned by dustless sweeping as described in Section H51.104.1 - Sweeping, Dustless, Damp Cloth Method or Section H51.104.2 - Sweeping, Dustless, Treated Cloth Method, supplemented by damp or wet mopping as described in Section H51.107 - Floor Mopping and Scrubbing.

2.05 Concrete floors which have a surface that can not be successfully cleaned by dustless sweeping are dry swept as described in Section H51.103 - Sweeping - General. For mopping unpainted concrete floors (except garages), one to two tablespoonfuls of pyrophosphate cleaner per pail (10 quarts) of water, preferably warm, is used. Painted concrete floors are mopped with a solution of one to two tablespoonfuls of powdered soap per pail (10 quarts) of water, preferably warm.

2.06 Garage floors are dry swept as described in Section H51.103 - Sweeping - General, or hosed. However, as a preliminary step to either, any grease or oil drippings are covered by sprinkling with oil absorbent powder. The powder is allowed to remain in place 1/2 hour or longer. Heavy grease deposits should first be scraped up before application of the oil absorbent powder. Garage floors which are dry swept on a routine basis, are hosed at suitable frequencies to supplement dry sweeping. Before the start of the hosing operation, any oil or grease drippings which were not removed by the oil absorbent powder are cleaned with garage floor cleaner. Two to three tablespoonfuls of garage floor cleaner are dissolved in a pail (10 quarts) of water, preferably warm. The areas having oil or grease drippings are mopped with this solution before hosing. As an alternate method, the garage floor cleaner may be sprinkled on the previously wet soiled areas then rubbed with a deck scrub brush or electric floor scrubbing machine, followed by flushing or hosing to the floor drains. Hosing is begun at the highest floor level and the water directed on the floor toward the drains. When the hosing is completed, any remaining water is cleared by pushing it into the drains with a squeegee or Palmyra floor brush. At suitable intervals, the garage floor drains and associated traps are cleared of accumulated dirt and debris. A high pressure water source is used if available.

3. MARBLE, TRAVERTINE AND TERRAZZO FLOORS

3.01 Marble is a natural stone combining maximum durability and high decorative qualities and easy maintenance. It is expensive and its use is limited to special locations where appearance and durability are controlling. Terrazzo is comprised of marble chips combined with cement. Marble and terrazzo floors require minimum care since they resist soiling and when soiled, are readily cleaned. The travertine variety, which has numerous and some relatively large voids, is sometimes used more commonly for floors. Large holes in the travertine are filled with cement of a suitable mixture and color.

3.02 Terrazzo floors offer excellent appearance in a wide color selection because of the many varieties of chips that may be chosen. Chips of contrasting shade and color can be selected to mask soiling to an appreciable degree. Abrasive aggregate can be incorporated in the mixture of chips and cement to increase slip resistance on inclines and stairtreads. Terrazzo floors are found in some entrance and elevator lobbies and related heavily trafficked corridors where maximum resistance to wear and soil penetration is required.

3.03 Day-to-day cleaning of any of the above varieties of marble and terrazzo floors consists of dustless sweeping or damp mopping depending upon soil conditions. These operations are described in Section H51.104.1 - Sweeping, Dustless - Damp Cloth Method, or Section H51.104.2 - Sweeping, Dustless - Treated Cloth Method, and in Section H51.107 - Floor Mopping and Scrubbing. Periodic cleaning by wet mopping or scrubbing is usually necessary as a supplementary cleaning procedure. As a detergent, pyrophosphate cleaner is used in the proportions of one to two tablespoonfuls per pail (10 quarts) of water, preferably warm. Pyrophosphate cleaner develops a sheen on marble and terrazzo floors which improves their appearance and affords a protective coating against wear and stains. Where necessary to remove tenacious soiling while mopping, sparing quantities of scouring powder are sprinkled over the soiled area which is rubbed with the heel of the mop, a deck scrub brush or an electric floor machine. It is important that only the standard material be employed in order to insure against possible serious damage to the floor surface. Some types of scouring powder contain silica abrasives which will scratch marble. After the use of any detergent cleaners, marble or terrazzo floors should be thoroughly rinsed.

3.04 It is desirable to avoid the use of soap in caring for hard floors as it leaves insoluble residues that give the floor a dull, greasy appearance. Strong acids such as muriatic are destructive to marble and terrazzo floors. No waxes, varnish sealers or the like are necessary for maintenance purposes.

4. VITRIFIED FLOOR TILE

4.01 Vitrified unglazed floor tiles provide a dense, impervious surface that resists soiling. Carborundum may be incorporated in the surface during manufacture to improve slip resistance. These floors are found in washrooms, kitchens and in serving space in cafeterias where spillages are frequent and easy maintenance is of first importance.

4.02 Vitrified tiles in kitchens and other associated areas where food spillages are frequent require daily wet mopping. Pyrophosphate cleaner in the proportion of two tablespoonfuls per pail (10 quarts) of water, preferably warm, is used as a detergent. Occasional scrubbing with the supplementary use of scouring powder to remove tenaciously soiled spots may be required at periodic intervals.

4.03 The vitrified tiles should not be waxed or coated with sealers.

GARAGE FLOOR MAINTENANCE

CONTENTS PAGE

1. GENERAL

1.01 Garage floor maintenance was formerly included in Section H51.110 Cleaning Hard Floors. However, since garage floor maintenance involves different materials and techniques than those used in central office buildings, a separate section is hereby provided.

1.02 This section describes the procedures for sweeping, hosing and removing oil and grease deposits, mud, sand, etc., from concrete garage floors.

1.03 Garage Floor Cleaner which is the detergent used for cleaning garage floors is a granular powder comprised of 92 per cent sodium metasilicate and 8 per cent powdered soap. This combination is a strongly alkaline cleaner that is highly effective for oil and grease removal. Its continued use is not harmful to the concrete floor as are some of the other forms of alkaline cleaning materials. However, the material will remove any paint markings that may be on the floor.

1.04 The oil absorbent powder (Sol-Speedi-Dri or equivalent) is a specially treated coarsely ground Fuller's earth which is applied over oil deposits. It has no detergent properties but is very effective in absorbing motor oil deposits. The special treatment of the powder prevents the material from caking when wet. In the course of subsequent over-all manual sweeping the oil impregnated oil absorbent powder serves as a sweeping compound tending to minimize the raising of dust. Its oil absorbing properties continue for several days and the powder is usually left on the floor for the period between over-all sweeping or hosing.

1.05 Sweeping compounds are used where necessary for reducing dust when manually sweeping garage floors. Type 1 described in Federal Specification P-S-863 is the kind preferred. Since this compound contains mineral oil it should not be used on asphalt tile floors such as are commonly used in garage office space.

2. SAFETY PRECAUTIONS

2.01 Precautions should be taken to eliminate the hazard of slipping and falling by covering deposits of oil or grease on the floor as soon as they are observed or when the cars have left the garage.

2.02 When hosing or scrubbing, warning signs bearing the legend "Floor Being Cleaned" are placed at points where they will prevent vehicles or persons from entering the area when hosing or scrubbing is being done.

2.03 Close garage entrance doors and also doors leading to offices, washrooms, etc., in the area to be swept or cleaned.

2.04 When operating a power-driven sweeping machine it should be slowed down when passing near doors that may be opened unexpectedly.

2.05 Gasoline, kerosene or other flammable materials must not be used for cleaning garage floors.

2.06 When mopping or scrubbing with garage floor cleaner or when sprinkling it on the floor, care should be taken to avoid getting it on the skin or clothing. It should not be used for any cleaning operation which involves contact with the skin. Also solutions of it should not be splashed on walls, doors or automotive equipment.

2.07 Care should be taken while cleaning garage floors to assure that no material containers or tools are left, even temporarily, where a motor vehicle may run over them.

2.08 When garage floors are wet from melted snow, car or floor washing operations, the cleaning forces should wear boots or rubbers with anti-slip soles.

3. APPLICATION OF OIL ABSORBENT POWDER

3.01 Tools and Supplies

Oil Absorbent Powder
Putty Knife or Long Handled Scraper

3.02 Oil absorbent powder is sprinkled over oil and grease deposits as soon as practical after the automobiles have left the garage. Hard deposits should be scraped up before applying the powder.

3.03 The powder is spread uniformly to completely cover each deposit. The quantity of powder applied should be sufficient to absorb the oil. It is allowed to remain on the deposits for several hours and, if practical, until the next over-all sweeping operation.

3.04 Oil absorbent powder is removed by sweeping and placed in a waste receptacle. It should not be hosed into drains.

4. SWEEPING PROCEDURE

4.01 Tools and Supplies

Palmyra Floor Brush or
Power-Driven Floor Sweeping Machine
Counter Dust Brush
Dust Pan
Lobby Brush and Pan - for spot sweeping
Putty Knife or Long Handled Scraper
Sweeping Compound, if required

4.02 Sweeping as covered in this section is divided into two classifications as follows:

(a) "Pickup" sweeping for removal of light random visible debris. This can serve as an alternate method to over-all sweeping when the dirt accumulation is not general and is of light quantity.

(b) Over-all sweeping for removal of general dirt including the oil absorbent powder. It may be done manually or by means of a sweeping machine.

4.03 "Pickup" sweeping is done with a lobby brush and pan. The visible debris, except oil absorbent powder, is swept into the pan at each point noted. Special attention is given to metallic items which may damage automobile tires. After sweeping, the debris is placed in the rubbish containers.

4.04 Oil absorbent powder remaining on the floor usually serves similar to a sweeping compound in minimizing dust. However, if dust is a problem, the use of a sweeping compound may be necessary. Only a non-flammable type should be used.

4.05 Over-all manual sweeping is done by a 30 in. Palmyra floor brush. It is manipulated by using moderately long rhythmic forward sweeping strokes (2-1/2 ft. to 3 ft.) as described in B.S.P. Section H51.103 Sweeping - General. The stroke path in progressing along the floor is comprised of about three such strokes in a line making the path about seven to eight feet wide before progressing forward in like manner. This reduces the amount of walking by about one-third and reduces the total effort required to move the debris. When the amount of debris in the stroke paths becomes somewhat heavy it is picked up for disposal or swept to one side for disposal when the entire floor is swept. The sweeping is then continued to the end of the garage. When the accumulations at the ends of each stroke path are not too heavy they are swept to a corner of the garage or other convenient area for picking up and disposal. Sweeping underneath work benches about automobiles and automotive equipment is done by drawing the brush, using pull strokes. The putty knife or long handled scraper is used to remove tenacious deposits which can not be swept up.

4.06 When a power-driven cylindrical type brush sweeping machine is used, the Palmyra floor brush is first used for sweeping the outside edges of the room and about work benches, automotive equipment, etc. The debris is not picked up but is swept into the path of the machine. However, debris of large size such as cartons, pieces of wood, etc., are picked up, as the machines may not remove them. Since power-driven floor sweeping machines are equipped with vacuum attachments to prevent dust, sweeping compounds are not required. The machines are operated at speeds of approximately four miles per hour for the type where the operator walks and six to ten miles per hour for the "ride-on" type. The machines are first operated around the periphery of the area to be swept, such as the entire parking area or in the case of large garages one or more parking rows. The sweeping continues inward in rectangular paths ending in the center of the space being swept.

4.07 Upon completion of the sweeping the debris is emptied from the hopper of the machine into the refuse receptacles. The vacuum equipment is also thoroughly cleaned following each use. Other tools used are cleaned and returned to their place of storage.

5. SPOT CLEANING PROCEDURE

5.01 Tools and Supplies

- Pail for water, if needed
- Deck Scrub Brush or
- Electric Floor Machine equipped with Scrub Brushes
- Garage Floor Cleaner
- Hose with adjustable nozzle for flushing areas clean
- Squilgee, if necessary to remove cleaning solution or water from depressed areas
- Putty Knife or Long Handled Scraper

5.02 When the over-all floor does not require cleaning with a solution but it is desired to remove oil, grease or tar stains the specific areas may be mopped or scrubbed. Scrubbing is most effective and should be employed where there are numerous areas to be cleaned.

5.03 The areas to be cleaned are swept and then are wet with water. Garage floor cleaner is sprinkled over the soiled area. However, where the deposits are heavy enough to be scraped up with the putty knife or scraper, this should be done prior to application of the water and cleaner. Where practicable it is desirable to wet and apply the garage floor cleaner to several spot areas allowing several minutes for the cleaner to soften the deposits before beginning to scrub.

5.04 When the areas are scrubbed with the deck scrub brush short forward and backward strokes with downward pressure on the handle are used. When using the electric floor machine it is moved slowly forward and backward over the soiled areas.

5.05 When the scrubbing has loosened the dirt deposits, the area is hosed down in the direction of the drain, following the dirty solution to the drain.

6. OVER-ALL CLEANING PROCEDURE

6.01 Tools and Supplies

- Pail for water, if needed
- Electric Floor Machine equipped with scrub brushes
- Garage Floor Cleaner
- Putty Knife or Long Handled Scraper
- Hose with adjustable nozzle for wetting and flushing the floor
- Squilgee, if necessary to remove cleaning solution or water from depressed areas

6.02 All loose debris is removed by sweeping and any heavy deposits which can be removed with a putty knife or scraper are scraped as clean as possible before over-all mopping or scrubbing is performed. The floor area to be cleaned is cleared of all vehicles and equipment which can be readily moved.

6.03 Proceed as described in Paragraph 5. The area to be done is wet down with a hose. The garage floor cleaner is sprinkled specifically over the oil and grease deposits. It is not usually necessary to spread the garage floor cleaner over the entire floor area as that placed on the oil and grease deposits and subsequently distributed over the remaining area in the course of scrubbing is usually adequate.

6.04 The electric floor machine is used, first going over the soiled areas then to adjacent areas beginning at the higher level of the floor and working toward the drains. After the floor has been scrubbed clean it is hosed down in the direction of the drains as described in Paragraph 7.07. When hosing, the stream should be directed so that none of the solution is splashed on walls, automobiles or automotive equipment as it will damage the paint or finishes.

6.05 After use, the tools should be cleaned and returned to their place of storage.

7. HOSING PROCEDURE

7.01 The hosing procedure described in this paragraph consists of the use of a hose for the over-all cleaning operation to supplement or replace the over-all sweeping operation where the character of the dirt to be removed consists principally of wet or dry mud and sand deposits which can not be satisfactorily removed by sweeping. Ordinarily such hosing does not involve the use of cleaning agents, but when hosing is done as a routine operation, garage floor cleaner may be used when necessary to spot clean oil and grease deposits.

7.02 Tools and Supplies

- Lobby Brush and Pan or
- Palmyra Floor Brush
- Putty Knife or Long Handled Scraper
- Hose equipped with adjustable nozzle
- Squilgee, if required to remove residual water from depressed areas
- Deck Scrub Brush, if required

7.03 The water pressure used for hosing should not be increased above the normal supply pressure. Normal water pressure of 30 to 50 psi should be adequate.

7.04 The floor area to be cleaned is cleared of all vehicles and equipment which can be readily moved.

7.05 "Pickup" sweeping as described in Paragraphs 4.02 and 4.03 is done to remove random debris and oil absorbent powder before beginning the hosing operation. The oil absorbent powder and heavy deposits of dirt should not be hosed into floor drains. Should any appreciable oil or grease deposits remain after the "pickup" sweeping, the areas are wet down and garage floor cleaner sprinkled upon them, followed by scrubbing with a deck scrub brush prior to hosing.

7.06 In garages having more than twenty to twenty-five cars it is usually advisable to hose about the area occupied by twenty to twenty-five cars at a time rather than the entire garage. In this case only the area to be hosed need be blocked off with warning signs. The preliminary spot sweeping also may be confined to such areas.

7.07 Hosing is started at the outside edges of the area to be cleaned with the stream of water directed at an angle of about 40° to 45° to the floor and toward the nearest drain. The floor is flushed with water using a side to side pattern in an eight to ten foot path always keeping the nozzle of the hose pointed toward the drain. Continue until all of the section has been completed to the drain. Water that has collected in low areas of the floor is moved to the drain by a squilgee.

7.08 When hosing, the stream should be directed so that water will not splash on walls, columns, motor vehicles or equipment.

7.09 To clean under work benches, tool racks, etc., care should be exercised to avoid spattering the walls and adjacent equipment by partially closing the hose nozzle.

7.10 Care should be taken so that vehicles shall not run over the hose and damage it.

7.11 To prevent clogging the drain sumps should be checked periodically to remove any dirt and trash.

7.12 After use, the hose should be disconnected, drained and neatly coiled for storage. All other tools should be cleaned and returned to their place of storage.

WALL WASHING

PAINTED

1. GENERAL

1.01 This section covers the cleaning of interior walls that are finished with enamels, flat, semi-gloss and gloss paints, and the painted type washable wall coverings.

1.02 It is reissued to delete Paragraph 5 of Issue 3 covering the tool method as the tools are no longer available. Also to recommend pyrophosphate cleaner instead of soap for spot washing and to replace steel wool with scouring powder.

1.03 Pyrophosphate cleaner is recommended for washing walls. It is most effective when the pyrophosphate solution is permitted to remain in contact with the surface being cleaned for a few minutes, before rubbing to remove the dirt. Such procedure, in addition to producing better results, also substantially reduces the effort required to do the job.

1.04 Pyrophosphate cleaner has about the same degree of alkalinity as high grade toilet soap and will not injure normal skin in the recommended concentrations even upon prolonged use. However, a few individuals may be allergic to the cleaner and in these cases the hands should be protected by wearing suitable rubber gloves. Pyrophosphate cleaner generates heat on going into solution and for this reason it should be placed in the pail of water by means of a tablespoon. Contact of the wet hands and dry powder should be avoided since a burning sensation, which is of a thermal rather than a chemical nature, may result.

1.05 There are two classifications of wall washing covered by this section.

(a) Spot washing - cleaning of specific soiled areas such as finger marks about doors, columns, lighting switches, etc.

(b) Over-all cleaning - removal of general dirt accumulations to restore an over-all clean appearance.

1.06 Ceilings, when finished the same as the walls, are washed in the same manner.

1.07 It is important that precautions be taken to fully protect dial and other telephone equipment during the cleaning activities. The nature and extent of the safeguards should be arranged with the cooperation of the person in charge of the equipment.

2. EQUIPMENT AND MATERIALS

2.01 For spot cleaning

1 pail (Twin Type)
Sponges or pieces of terry cloth
Pyrophosphate cleaner
Scouring powder, if necessary
Utility cloths (sweeping cloths in switchrooms)

2.02 For over-all jobs

Drop cloths
Stepladders or scaffolding
2 pails
Sponges or pieces of terry cloth
Pyrophosphate cleaner
Scouring powder, if necessary

3. PROCEDURE - SPOT WASHING

3.01 Spot washing is done as required as indicated by evidence of finger marks, smudges, pencil marks and other defacements on walls, columns, partitions and door jambs.

3.02 In one side of a two compartment pail prepare two or more quarts of pyrophosphate cleaning solution using one level teaspoonful of pyrophosphate cleaner per quart of water. The pyrosphosphate cleaner should be completely dissolved in the water, stirring it if necessary. Clean water for rinsing is placed in the other side of the pail.

3.03 A sponge or cloth is immersed in the pyrophosphate solution and wrung thoroughly so that the solution does not drip when applied to the wall. The sponge or cloth arranged in pad form is applied to the soiled areas, rubbing with a circular motion and light pressure until the dirt is removed. The rubbing is tapered off about the edges of the area being cleaned so that it will blend in with the surrounding wall area.

3.04 Where the dirt is so imbedded that the cleaning solution does not remove it, a very small quantity of scouring powder is sprinkled on the washing tool and rubbed lightly over the area. Care must be taken to avoid cutting too deeply into the paint film and the rubbing should be carefully tapered toward the edges of the area to minimize contrast with the surrounding wall.

3.05 Before the cleaned area has dried, rinse with a clean sponge or cloth which has been immersed in the clean water and wrung as dry as possible, again taking care to taper off at the edges.

3.06 After the washed areas are thoroughly dry, if they appear conspicuously dull compared with the unwashed sections, buffing with a clean dry cloth aids in blending the over-all appearance. When this operation is done in terminal or switchrooms the sweeping cloth (identified by a reinforced center hole) shall be used.

4. PROCEDURE - OVER-ALL WASHING

4.01 Ladders and scaffolding shall be in good condition and shall be carefully placed to insure safety. Stepladders should be used in accordance with the safety precautions given in Bell System Practice Section H51.201 "Step Ladders - Use and Care" always making certain that they are fully opened and the braces engaged. Scaffold planking should extend at least one foot beyond the supporting point and in stairwells it should be lashed.

4.02 Tarpaulins or drop cloths shall be used to protect equipment, furniture and floors as may be necessary. Extreme care shall be taken when using water around telephone and electrical equipment. Wall washing about such equipment should be done only with the cooperation of the person in charge of the equipment.

4.03 Move furniture away from the wall where the work is to be performed. This is done as the work progresses and is replaced as soon as the area is finished.

4.04 For flat, semi-gloss and gloss paints and enamels, a solution of one to two tablespoonfuls of pyrophosphate cleaner to a pail (10 quarts) of water, preferably warm, is used. The pyrophosphate cleaner should be sprinkled into the water to avoid caking and should be stirred until dissolved. The concentration is dependent upon the character and the degree of dirt, the nature of the wall surface and in some localities upon the hardness of the water. Lesser concentrations are usually required for washable wall coverings as their surfaces are usually relatively smooth and their coatings are less porous than painted plaster walls.

4.05 It is important that special care be taken in washing mottle-toned, blended and other special finishes or any finish having an overglaze to avoid the possibility of damage to the design. One to two tablespoonfuls of pyrophosphate cleaner should be used. However, where there is question regarding possible damage to the finish, small trial sections in remote areas should be tried before proceeding with the over-all job. If the surface appears to be unduly attacked by the pyrophosphate solution a tablespoonful of powdered soap per pail of water may be tried.

4.06 Two pails and two sponges, or, if preferred, two pieces of terry cloth are used; one for the cleaning solution and washing sponge or cloth and the other for the clean water and rinse sponge or cloth. The cleaning solution should be changed often enough to maintain full cleaning effectiveness and to avoid resmearing the accumulated dirt over the surfaces being cleaned. The rinse water also should be changed frequently as it has an important bearing on the brightness of the finished results and on avoidance of streaking.

4.07 Walls are usually washed in three sections about 4 ft. by 5 ft. beginning normally at the baseboard and working upwards. This procedure avoids streaks which may result if the cleaning solution runs down over uncleaned areas. Such streaks are hard to remove.

4.08 The solution is applied with the sponge or cloth wrung sufficiently to avoid dripping or running. It is applied over an area of about ten or twelve square feet, simply wetting the surface without rubbing to remove the dirt. After the section has been covered, repeat the operation, rubbing, if necessary, to remove the dirt.

4.09 For deeply imbedded and tenacious dirt spots scouring powder sparingly sprinkled on the sponge or cloth is rubbed lightly over the spots using a circular motion. Care must be taken to avoid cutting too deeply into the paint film and the rubbing should be tapered toward the edges of the area to minimize contrast.

4.10 Immediately following the washing operation and before the wall has become dry, rinse the section washed with a clean sponge or cloth which has been wrung as dry as possible.

5. CARE OF TOOLS

5.01 Clean all tools and equipment after use, in the building service quarters.

5.02 Clean all buckets and sponges and restore them to their proper places.

5.03 Brush all superficial dust from drop cloths with a counter dust brush and fold them carefully before storing them.

5.04 Damp wipe all ladders and scaffolding and store them in their proper places.

WALL WASHING

MARBLE AND TILE

1. GENERAL

1.01 This section covers the washing of interior marble and tile walls, wainscoting and trim. It is also applicable to asbestos-cement wall boards and tiles having smooth, baked enamel finishes.

1.02 It is reissued to reduce to about one half the quantities of pyrophosphate cleaner recommended in Issue 2 as the new granular form of this material is approximately twice as effective as the crystalline form initially furnished.

1.03 The pyrophosphate solution is most effective when it is permitted to remain in contact with the surface being cleaned for a few minutes before rubbing to remove the dirt. Such procedure, in addition to producing better results also substantially reduces the physical effort required to do the job.

1.04 Most people can use the cleaning materials recommended herein without adverse effect on the hands but those whose hands may be affected should wear suitable rubber gloves.

1.05 There are three classifications of wall cleaning covered by this section.

(a) Spot washing - cleaning of specific soiled areas such as finger marks about doors, columns, lighting switches, elevator signal buttons, etc.

(b) Over-all cleaning - removal of general dirt accumulations to restore a clean appearance. This may be done by the hand method using sponges or cloths, or by the cellulose sponge tool method.

The tool method is most advantageous where there are large unobstructed wall areas and for stairwell walls. Most room walls can be washed from the floor and by means of an extension handle stairwell walls can usually be washed without need for scaffolding.

(c) Stain removal - application of a poultice made of scouring powder to specific or general areas as needed.

1.06 Natural stones such as marble, travertine, etc., especially those of lighter color tend to become stained if not kept clean and on aging require somewhat costly restoration measures such as poulticing or resurfacing. To minimize staining, such walls should be washed whenever dirt can be removed by a sweeping motion with the finger tips or a fog or film becomes visible when the wall is viewed at an angle toward strong light.

1.07 It is important that precautions be taken to fully protect dial and other telephone equipment during the cleaning activities. The nature and extent of the safeguards are arranged with the cooperation of the wire chief.

2. EQUIPMENT AND MATERIALS

2.01 For spot cleaning

1 pail
1 cellulose sponge
dust or wiping cloths
Soap - white floating or toilet

2.02 For over-all jobs - hand method

Drop cloths or newspapers, if needed
Stepladders or scaffolding
2 pails
2 sponges
Pyrophosphate cleaner

2.03 For over-all jobs - sponge tool method

Drop cloths or newspapers, if needed
Stepladders or scaffolding, if needed for supplementary hand work
2 sponge tools
2 square pails with wringers
1 hand size cellulose sponge
Pyrophosphate cleaner

2.04 For poulticing

2 pails
1 trowel
1 cellulose sponge
Scouring powder
Chlorinated lime

3. PROCEDURE - SPOT WASHING

3.01 Spot washing is done as required, which is indicated by evidence of finger marks, smudges, pencil marks and other defacements on walls, columns, partitions, etc.

3.02 In the case of natural stones and stone compositions the area to be cleaned is first wet with clean water in order to prevent the soap and loosened dirt from penetrating into the pores of the material. Preliminary wetting of the surface is not required for glazed tiles, baked enamel finishes and other non-porous surfaces.

3.03 The cake of soap is rubbed against one side of the moistened sponge to produce a lather, which in turn is rubbed against the dirty areas until the dirt is removed. The area is immediately rinsed with the clean portion of the sponge or with a separate clean sponge and wiped with clean dry pieces of dust or wiping cloths.

3.04 Where washing does not remove dirt such as sub-surface penetrations from natural stones about elevator signal buttons, door jambs, etc., spot poulticing as described in Section 6 may be employed.

4. PROCEDURE - OVER-ALL WASHING - HAND METHOD

4.01 Any ladders and scaffolding shall be in good condition and shall be carefully placed to insure safety. Stepladders should be fully opened and the braces engaged. Scaffold planking should extend at least one foot beyond the supporting point and in stairwells it should be lashed.

4.02 Where needed, drop cloths or newspapers shall be used to protect equipment, furniture and floors. Washing about telephone or electrical equipment should be done only with the cooperation of the person in charge of the equipment.

4.03 Move furniture away from the wall where the work is to be performed. This is done as the work progresses and is replaced as soon as the area is finished.

4.04 A solution of one to two tablespoonfuls of pyrophosphate cleaner to a pail (10 qts.) of water, preferably warm, is used. The concentration is dependent upon the character and the degree of dirt, the nature of the wall surface and in some localities upon the hardness of the water. Lesser concentrations usually suffice for glazed tiles and other smooth non-porous materials.

4.05 When washing the natural stones such as marble and travertine it is important that they first be wet with clean water immediately before the cleaning solution is applied.

4.06 Two pails and two sponges are used; one for the cleaning solution and washing sponge and the other for the clean water and rinse sponge. The cleaning solutions should be changed often enough to maintain full cleaning effectiveness and to avoid resmearing the accumulated dirt over the surfaces being cleaned. The rinse water also should be changed frequently as it has an important bearing on the freedom from streaks and brightness of the finished results.

4.07 The solution is applied with the sponge wrung sufficiently to avoid dripping or running. It is applied over an area of about ten or twelve square feet, simply wetting the surface without rubbing to remove the dirt. After the section has been covered, repeat the operation, rubbing if necessary to remove the dirt.

4.08 Immediately following the washing operation and before the wall has become dry, rinse the section washed with a clean sponge squeezed as dry as possible.

5. PROCEDURE - OVER-ALL WASHING - TOOL METHOD

5.01 With the tool method the work is done from the floor, or from stairs or landings in the case of stairwell washing. Stepladders or scaffolding are used only when there is need for supplemental hand washing that cannot be reached from the floor.

5.02 A solution of one to two tablespoonfuls of pyrophosphate cleaner to ten quarts of water, preferably warm, is used. The concentration is dependent upon the character and degree of dirt, the nature of the wall surface and in some localities upon the hardness of the water. Lesser concentrations usually suffice for glazed tiles and other smooth non-porous materials.

5.03 When washing the natural stones such as marble and travertine it is important that they first be wet with clean water, immediately before the cleaning solution is applied.

5.04 Two buckets are used, i.e., one for the cleaning solution and the other for clean water for the rinsing operation. A cellulose sponge tool is assigned to each bucket. One hand size cellulose sponge is also provided for the occasional areas that are hard to get at with the special tool.

5.05 For space above shoulder level, the sponge head is held above the handle and stroked upwards. For space lower than shoulder level, the sponge head is held below the handle and the strokes are made downward toward the baseboard. The areas (considered vertically) are therefore done in two sections.

5.06 The wall washing tool is immersed in the cleaning solution and placed under the wringer and given a partial squeeze, i.e., sufficient solution is removed so that it does not drip when the tool is applied to the wall. It is then applied to the wall using, where possible, straight upward and downward strokes of some four to six feet in length to cover an area of about twenty to thirty square feet. This is done to wet the wall with the cleaning solution thereby enabling it to loosen the dirt.

5.07 After the area has been wet down the tool is rinsed in the solution bucket and the area again gone over with the tool, with sufficient pressure applied to remove the dirt. The sponge face is intended to be in flat contact with the wall but where there are dirty spots that are especially tenacious the corner of the sponge can be used.

5.08 The washed areas should be rinsed before they have had opportunity to dry, i.e., within a few minutes, using the sponge tool which has been immersed in the clean water and given a full squeeze.

5.09 In larger areas, best results are obtained with two operators, one washing and one rinsing.

5.10 Where washing does not remove dirt such as sub-surface stains from natural stones, poulticing as described in Section 6 or in severe cases refinishing of the surfaces may be required to restore a satisfactory appearance.

6. PROCEDURE - POULTICING

6.01 The poultice treatment is helpful in the removal of stains and discolorations which are so imbedded in hard walls as to resist removal by the customary washing processes. It should be employed as a special rather than a routine treatment. Poulticing is not always fully successful in single applications and further improvement in some cases may be obtained by a second application. However, poulticing is not effective if the stain is coming from the back of the slab. Preliminary trial on a few inches of obscure surface is desirable to establish that it is not in any manner harmful. Roughing or dulling of the surface or bleaching of the color of the stone are evidences of damage.

6.02 The poultice is made in the proportion of one pound of chlorinated lime well mixed with ten pounds of scouring powder; sufficient warm water is added to produce a paste capable of adhering to a vertical wall surface. It is desirable to make it as wet as possible rather than dry; four to six pints of water is usually sufficient for ten pounds of the powder, and it should be freshly prepared when required for use and only in sufficient quantity for the immediate job as it does not keep. One pound of the powder mixed as above covers approximately two square feet.

6.03 The poultice is applied to the wall by means of a trowel in a layer approximately 1/8 to 1/4 inch thick. It is, however, essential that the thickness decided upon shall be maintained consistently to obtain uniform results. It is permitted to remain from 12 to 48 hours after which it is carefully scraped off with a thin piece of wood. The area is then copiously rinsed with warm water and dried with sponges or cloths. After drying, if the surface does not have its normal sheen, buffing with dry dust or wiping cloths will be helpful. The poulticing operation may be repeated if the first treatment is not fully satisfactory and it is known that the discoloration does not come from the back of the slabs.

7. CARE OF TOOLS

7.01 All tools and equipment are cleaned, after use, in the building service quarters.

7.02 Clean all buckets, sponges and tools and restore them to their proper places.

7.03 Brush all superficial dust from drop cloths with a counter dust brush, fold carefully and store them in their proper places.

7.04 Damp wipe all ladders and scaffolding and store them in their proper places.

WALL WASHING
MARBLE AND TILE

1. GENERAL

1.01 This addendum outlines precautions to be observed when washing marble.

1.09 Marble is a material readily attacked and discolored by certain chemicals which are used in various cleaning compounds and especially by the alkalies present in soaps and soap compounds.

1.10 High grade marbles, rich in coloring and configuration are especially vulnerable because of fault lines and partially open seams.

1.11 Such marbles where used in halls and entrance vestibules for their decorative effect should never be washed with anything but clean warm water. In case a more vigorous cleaning procedure is occasionally necessary, the work should be done by trained employees of one of the local firms who supply, cut and set marble.

1.12 This restriction does not usually apply to marble used in toilet rooms, chosen for its dense non-absorptive surface and uniform color, where the treatment prescribed in the tabulation is satisfactory but even here the careless use of cleaning materials either strongly alkaline or mildly acid in their characteristics should be avoided.

MEASUREMENT OF

SLIP RESISTANCE OF RESILIENT FLOORS

PRINCIPLES AND EVALUATION

CONTENTS PAGE

1. GENERAL

1.01 This section reviews the factors affecting the slip resistance of resilient floors and various methods which have been used to evaluate this property. A method for appraising slip resistance by means of the foot is described. Instructions are given for obtaining numerical values representing comparative slip resistance by means of a polishing machine brush test.

1.02 The methods described are particularly designed for checking the slip resistance of resilient floorings maintained with wax or resin finishes. The resilient floorings include:

Asphalt tile

Linoleum - Sheet and tile

Rubber - Sheet and tile

Vinyl asbestos tile

Vinyl - Sheet and tile

The maintenance coatings covered are the following Bell System standards:

LIQUID FLOOR WAX

FLOOR WAX W-8

ANTI-SLIP FLOOR FINISH

1.03 Slip resistance consists of two components: (1) the slip resistance of the surface and (2) the slip resistance of the body of the film. The first represents the resistance to a flat surface, such as the sole of the foot, and is largely controlled by the tackiness of the film. The second represents the resistance to a point contact, such as the heel of the shoe as it meets the floor, and measures the shear resistance of the film once a slip has started. Both types are important. The resistance to the sole of the shoe is the type most obvious to the general personnel. It prevents slips from starting. The shear resistance determines whether the slip, once started, is arrested or results in a fall.

1.04 Testing for slip resistance has certain psychological as well as practical advantages. For example, the floor may have a high gloss as a result of a recent waxing or polishing which may give the occupants the erroneous impression that the floor is slippery. A test with the machine can demonstrate that this is not so and that the floor has a satisfactory slip resistance. If a slip and fall has occurred the test can determine whether or not action on the part of the building people is required.

1.05 The maintenance of resilient floors by waxing or resin application is covered in the following sections:

SECTION H51.109 - CLEANING AND PROTECTING RESILIENT FLOOR COVERINGS

SECTION H51.106 - FLOOR WAXING

SECTION H51.102 - APPLICATION OF ANTI-SLIP FLOOR FINISH

2. FACTORS AFFECTING SLIP RESISTANCE

2.01 Slip resistance is affected by many factors including the nature of the protective finish, the character of the underlying floor, the preparation of the floor and the application of the coating, climatic and atmospheric conditions, traffic conditions, the age of the film, and the type of foot wear worn by the personnel.

2.02 The finishes used to maintain resilient floors represent a balance. For example, to achieve slip resistance, durability and ease of maintenance must be sacrificed to some extent. The Bell System floor finishes have all been checked and approved by the Underwriters' Laboratories as meeting a specified minimum coefficient of friction. However, while all are considered safe products they vary in slip resistance in the following order of increasing magnitude: Liquid Floor Wax, Floor Wax W-8, and Anti-Slip Floor Finish. Liquid Floor Wax is a high carnauba content wax. Floor Wax W-8 contains an appreciable quantity of "Ludox", a colloidal silica anti-slip ingredient. Anti-Slip Floor Finish is a wax-free resin product.

2.03 The density and resilience of the underlying flooring has a marked effect on the slip resistance of the wax or resin film. In general, the commonly used flooring materials run in the following order of resilience and slip resistance, from least to most: Asphalt Tile, Vinyl Tile, Linoleum, and Rubber. Appreciable differences, however, can be expected between different brands, grades and color of the same type flooring. In general, floorings tend to harden on aging with a corresponding loss in slip resistance.

2.04 To achieve satisfactory slip resistance it is essential that the floor be properly cleaned, and rinsed free from soap residues. Mops that are used for wax must not be subsequently used for Anti-Slip Floor Finish. Failure to observe this precaution may result in a fast, i.e., slippery, floor. In general, two coats give better slip resistance than a single coat. In the case of wax, buffing tends to improve the slip resistance. This is particularly true of freshly applied films where moisture is retained in the film for some time even though the wax appears to be dry. The buffing dries out the film.

2.05 All of the Bell System maintenance coatings are water emulsions. The residual films on the floor are accordingly affected by atmospheric conditions, particularly humidity. Consequently, they tend to be more slip resistant during the more humid summer months than during the winter when heating systems are in operation and humidity levels are low. Similarly the same wax will be appreciably more slip resistant in the south where it is hot and humid than in the north where it is cold and dry.

2.06 Traffic conditions which tend to wear the film thin decrease slip resistance. On the other hand, ground-in abrasive dirt increases the slip resistance. Also as the coating ages it tends to oxidize, harden, and become less slip resistant.

2.07 The presence of tracked in or spilled water greatly decreases the coefficient of friction and creates a hazardous condition. All such water should be promptly mopped up. When the soles of the shoes are damp, the coefficient of friction between the soles and the wax film is appreciably decreased. This, however, is not true of Anti-Slip Floor Finish.

2.08 The type of footwear has a major bearing on slip resistance. Low heeled shoes with a broad contact area insure maximum safety. For this reason slips and falls among men are comparatively rare. Under dry conditions much higher anti-slip coefficients are provided by rubber heels than leather heels. Under wet conditions this difference largely disappears.

2.09 Care should be exercised to minimize so far as possible the difference in slip resistance between parts of the same floor or adjacent floors. If the personnel are not aware of this difference, there is an element of surprise due to the sudden change in the slip resistance of the floor. A change in slip resistance requires a change in pace.

3. SLIP TESTING PROCEDURES

3.01 Many different devices and methods have been proposed for the measurement of slip resistance of floors. These can be divided into two classes: (1) the determination of the coefficient of static friction between the floor surface and a test piece, usually a leather sole, and (2) the measurement of kinetic or dynamic friction. The first evaluates mainly the surface resistance of the film while the second measures to a considerable degree the shear resistance of the coating. In general the static devices have been based on the inclined plane or oblique thrust principles. Kinetic apparatus have varied from pulling a weighted object across the floor and measuring the resistance by means of a spring scale, to a device that propels a steel puck across the floor, the distance slid being a measure of the slip resistance.

3.02 The best known static device is the James machine used by the Underwriters' Laboratories. It operates on the oblique thrust principle. It consists of a 3-inch square test shoe shod with a piece of sole leather that contacts the test surface. A vertically downward load of 75 pounds is applied through a 10-inch arm that is hinged to the shoe. By a controlled mechanism the angle of the test arm to the vertical is progressively increased until the horizontal force becomes sufficient to cause the test piece to slip. By means of a chart the coefficient of friction is automatically recorded. A minimum safe coefficient of friction of .50 has been established by the Underwriters' Laboratories. All Bell System floor finishes have been tested on this equipment and exceed the minimum requirement.

3.03 The most widely used kinetic tester is the Sigler machine developed by the Bureau of Standards. It consists of a weighted pendulum which sweeps a leather heel across the test surface. The degree to which the swing is retarded by the resistance of the treated flooring gives a direct measure of the anti-slip coefficient. The Bell System floor finishes have been tested on this equipment and give satisfactory values.

3.04 The James and Sigler machines are essentially laboratory equipment that do not lend themselves readily to field testing. They are not easily transported and require exact adjustments to obtain dependable results.

3.05 Experience indicates that the best methods for checking the slip resistance of floors in the field is by practical evaluation with the foot and by means of a polishing brush test as described in the following paragraphs.

4. EVALUATION WITH THE FOOT

4.01 The floor should be tested for the two types of slip resistance, i.e., to the sole of the foot and the point of the heel. Leather soled shoes should be worn. In testing to the sole of the foot, the floor should be appraised both by sliding the sole on the floor and by turning on the ball of the foot. In testing for shear resistance the side of the shoe rather than the heel is used as a matter of convenience, particularly if the heel is rubber which will make any wax seem slow. The test is made by advancing the right foot with the edge of the sole in contact with the floor a little at a time and periodically shifting the weight from the left foot to the right until the foot slips. Before making tests the bottom and side of the shoe should be wiped off with a cloth or paper towel to insure freedom from foreign matter.

4.02 The person testing the floor then appraises the slip resistance of the coating based on his combined impression of the two slip components. It is helpful to use a rating system in recording the results, such as the following: (1) very fast, (2) fast, (3) satisfactory, (4) slow, (5) very slow. It is desirable to have a number of people engage in the rating, and make independent appraisals. After some experience surprisingly close agreement can be obtained.

5. POLISHING MACHINE METHOD

5.01 This test operates on the principle that the amount of current drawn by a polishing machine varies directly with the amount of work performed. If the brushes are not in contact with the floor only sufficient current is required to overcome the frictional resistance of the machine itself. If the brushes are placed on the floor additional current is required to overcome the frictional resistance of the floor. If the floor is coated with a slippery wax less current is required than if the wax is highly slip resistant. Accordingly if an ammeter is connected in series with the polishing machine to measure the current being consumed, a direct measure of the slip resistance of the floor is obtained.

5.02 To obtain significantly different readings, a light two-brush machine should be used. The Congoleum Nairn Model H floor polishing machine which weighs only 17 pounds has been found entirely satisfactory. It is included in the building service supplies section of the List of Bell System Standards, and is obtainable on order from the Western Electric Company. Any suitable ammeter, preferably covering the range 0 to 5 amperes, may be used.

5.03 Before making the test the machine must be run for a period of about 10 minutes to thoroughly warm it up. This is done by laying the machine on its back and running with the brushes in the air. The ammeter readings will slowly decrease as the machine warms up. Finally the pointer will remain steady. A typical value when running free is 1.6 amperes. It is advisable to take a free reading before and after any set of tests to be sure there has been no radical change in electrical current.

5.04 In making the test the brushes are in contact with the floor and the handle is laid in a horizontal position so that the weight on the brushes is constant. Due to the two brush construction very little effort is required to prevent the machine from traveling. Do not apply any downward pressure on the handle in holding the machine in place. Allow a few seconds for the needle to steady, then read. Usually about 10 seconds are sufficient. Prolonged polishing in one spot will create heat and give abnormally high results. Any such reading should be discarded. It is usually advisable to take about 10 readings at different locations and average the results.

5.05 With the Bell System waxes and resin finish there is little tendency for sufficient wax to get on the brushes to affect the test. However, it is desirable to "dry clean" the brushes fairly frequently by pressing a stick, a ruler is suitable, against the brushes as they rotate. On occasion the brushes should be thoroughly washed with a powdered soap solution fortified with pyrophosphate, or a 1 to 16 solution of Liquid Floor Cleaner.

5.06 The polishing machine test has certain advantages. The equipment is inexpensive, readily available, and easily transported. It is simple to operate and suited for testing in the field. The results agree well with complicated laboratory tests and practical foot evaluations in that waxes are rated in the same order. It's greatest value is for checking floors where complaints have been received that the floor is fast or where actual slips and falls have occurred.

5.07 The results should be considered comparative in character and may vary somewhat from machine to machine. Each location may have to establish their own par values. As a guide, however, the following limits are fairly typical:

	Amperes
Liquid Floor Wax	2.3-2.5
Floor Wax W-8	2.6-3.0
Anti-Slip Floor Finish	2.6-3.0

6. SAFETY PRECAUTIONS

6.01 The following paragraphs summarize measures that should prove helpful in minimizing the possibility of slipping and falling accidents on resilient floors.

6.02 Before applying wax or resin finish be sure that the floor has been thoroughly cleaned and rinsed.

6.03 In cutting over from wax to resin, or from resin to wax, be sure all residues of the old finish have been thoroughly removed.

6.04 In applying Anti-Slip Floor Finish do not use mops that have previously been used for waxing.

6.05 Avoid too little or too much wax. In general, following reconditioning cleaning, two coats, full strength, will be found to provide the optimum amount.

6.06 So far as practicable uniform coatings should be maintained over the entire floor. Uneven coatings may produce different resistances to slipping and create a hazardous condition.

6.07 Avoid the use of different types of coatings having different coefficients of friction on the same floor, or so far as practicable on adjacent floors.

6.08 Following the application of wax or Anti-Slip Floor Finish, allow the floor to dry thoroughly before being opened to traffic. For maximum safety, several hours drying time is preferable. In no case should the floor be opened to traffic with less than one-half hour drying time. In such cases, if wax has been used, the floor should be buffed before traffic is permitted.

6.09 Periodic polishing tends to keep wax coatings alive and aids in maintaining maximum resistance to slipping. Under certain conditions a damp mopping prior to the buffing will be found helpful. These suggestions do not apply to Anti-Slip Floor Finish.

6.10 Since resilient floors are slippery when wet, floor mats should be placed at entrances during wet weather to prevent tracking water or snow into the building. The mats should be of a type and size to provide adequate foot wiping to dry the soles of footwear.

6.11 Keep floors clean and dry. Mop up immediately any liquids that are spilled on the floor. Sweep up as soon as practicable such objects as pencil leads, paper clips, rubber bands and cigarette butts that can create a hazardous condition under foot. Encourage occupants to pick up such litter whenever noted.

6.12 Block off floor areas that are being cleaned or waxed so that persons can not inadvertently walk on them. Place caution signs where they may be readily seen and leave them in place until the floor is thoroughly dry.

6.13 If a slip and fall occurs, study the various factors which may have contributed to the accident to avoid similar mishaps in the future. In making these analyses cooperate with other departments who may be concerned.

6.14 Use only the waxes or finishes that are recommended for Bell System use. These standards are delivery inspected and checked periodically for slip resistant properties.

DILUTION OF LIQUID TOILET SOAP

1. GENERAL

1.01 The 15 per cent. concentration of Bell System liquid soap should be used for all valves and dispensers delivering the soap in liquid form. A concentration of approximately 7 per cent. should be used for valves and dispensers delivering the soap in lather form.

1.02 Bell System liquid soap is available in 15 and 40 per cent. concentrations and in general the 40 per cent. grade should be purchased for dilution with water on the premises for all excepting the smaller buildings having a monthly usage of one gallon or less. The 15 per cent. grade is used as received for all equipment delivering the soap to the user in liquid form.

1.03 Since soap is susceptible to becoming rancid under some conditions, such as contamination with older soap or other substances and being stored for long periods where it is warm, stocks should ordinarily be limited to not more than one month's supply.

1.04 Tap water is ordinarily satisfactory for diluting liquid soap but it often produces a cloudiness when mixed with the soap which is caused by certain chemicals present in the water commonly known as hardness. The flocculent particles causing the cloudiness will settle to the botton of the container on standing and all diluted soap which is not clear immediately following dilution should not be introduced into dispensers or supply lines until the cloudy particles have settled out. The remaining supernatant clear soap solution is the only portion to be used in dispensing equipment.

1.05 The container in which the liquid soap is to be settled should have a spigot located about one inch from the bottom for each foot of depth so that the supernatant clear diluted soap may be drawn off without disturbing the settled sediment. If the container is of such size as not to be easily lifted for emptying out the dregs, it should have another outlet at the lowest point for withdrawal of the portion to be discarded.

2. EQUIPMENT AND MATERIALS

2.01 Drum, barrel, keg or other suitable container.
Stirring paddle.
Water.

3. PROCEDURE

3.01 To prepare the 40 per cent. soap for use in liquid dispensing units mix it with two parts of tap water. A convenient manner of measuring the water is to fill the container from which the soap was poured twice with water. Stir, to thoroughly mix the water and soap and permit to stand without further agitation for three to six days or longer if necessary for the upper portion of the liquid to become clear. Soap may then be withdrawn through the spigot located some inches from the bottom of the settling container for use in dispensers or tanks or introduced directly into soap supply lines. Do not stir or agitate the mixture of soap after it has settled. Aside from the hardness chemicals which separate and settle out when the soap is initially mixed with water no further separation takes place thus any further stirring of the settled soap is superfluous. When all of the clear soap has been withdrawn discard the remaining soap containing the precipitated particles and thoroughly clean the container as described in paragraph 4.01.

3.02 To prepare the 40 per cent. soap for use in lather dispensing units mix it with four parts of water and stir, then permit it to stand as described in paragraph 3.01.

3.03 To prepare the 15 per cent. soap for use in lather dispensing units mix it with equal parts of water, then stir and permit it to stand as described in paragraph 3.01.

3.04 There is no need for settling of the 15 per cent. soap which is to be placed in dispensers or tanks without dilution.

4. CARE OF SETTLING CONTAINERS

4.01 It is important that containers used for settling liquid soap and water mixtures be thoroughly cleaned following each use to avoid possibility of contaminating succeeding batches. This is done by scrubbing the interiors with plain hot water using a toilet bowl brush that is kept exclusively for this purpose followed by a thorough flushing with hot water. The container should be free from foreign odor after cleaning.

CLEANING AND POLISHING

WOOD AND METAL FURNITURE

1. GENERAL

1.01 This section describes the procedures and materials used in cleaning and polishing all types of wood and metal office furniture including metal trim, linoleum and plastic desk tops, and upholstery.

1.02 It is recommended that furniture polish be applied to all new furniture before it is placed in service to minimize subsequent maintenance.

1.03 Office furniture requires washing and polishing only at infrequent intervals. Day-to-day dusting is covered in Section H51.105.1 - Dusting, Damp Cloth Method, and Section H51.105.2 - Dusting, Treated Cloth Method.

1.04 Bell System furniture polish consists essentially of wax plasticized with silicones in a petroleum solvent. It is easy to apply and produces a hard lasting glossy finish that makes routine dusting easier. Because the polish leaves a residual film, the surface of the furniture is protected from soiling and abrasion. As a result, the interval between washings and the need for refinishing is greatly extended.

2. SAFETY

2.01 Check carefully to see that no splintered edges are evident on wood furniture and that no sharp metal projections exist on the edges of metal furniture.

2.02 Any defective, broken, or loose parts of furniture, or any hazardous condition observed while cleaning furniture, should be promptly reported to the supervisor. Also report improper or defective furniture footings which may damage the floor.

2.03 The recommended furniture polish is classed as a combustible mixture. Do not use it near fire or open flame.

3. EQUIPMENT AND SUPPLIES

3.01 The following are required:

Powdered soap.
Pail, two-compartment for cleaning solution and rinsing water.
Utility wiping cloths.
Sponges (natural or cellulose).
Bell System liquid furniture polish.
Bell System liquid automobile polish (optional).
Leather dressing, Lexol (Lexol Corporation, Caldwell, N. J.).

4. CLEANING

4.01 Cleaning soiled wood and metal furniture having varnished, lacquered, painted, or enameled finishes is done by washing with a solution of one tablespoonful of powdered soap to a pail, approximately 5 quarts of water, preferably warm. This solution is used also for cleaning linoleum and plastic desk tops. The washing is done with a sponge which has been immersed in the soap solution and partially wrung out. Very little solution should be applied to the surfaces to be cleaned. The furniture is washed by rubbing with the sponge, applying pressure at points of excessive soil, until all the surface is uniformly clean. Tenacious soil, on linoleum or plastic surfaces, that is not removed by the soap solution, will generally respond to a light rubbing of the soiled areas with a very light sprinkling of scouring powder applied to the sponge. If the stains are deep seated, it is better not to attempt their removal since excessive rubbing with scouring powder or other abrasive may damage the surface. Any soil on the metal surfaces of steel furniture that resists cleaning with the soap solution may be removed with Bell System liquid automobile polish.

4.02 After washing with the soap solution, the surfaces are rinsed by wiping with a sponge wrung out in clean water, preferably warm. The excessive use of rinse water should be avoided. The rinse water is wiped up in turn with a well wrung sponge and the surface dried with a cloth. All excess water is wiped from the underside of furniture tops, drawer edges and joints, and filing cabinet drawers.

4.03 The liquid solvent of the polish affords some cleaning action and is effective in cleaning lightly soiled areas without washing.

4.04 Genuine leather upholstery is cleaned in the following manner. For the removal of light soil, apply a thin coat of Lexol dressing with a clean cloth and rub the leather briskly until all dirt is removed. Permit the surface to dry from 10 to 20 minutes, then buff with a clean dry cloth.

4.05 When there are residues from previously used dressings or where an excessively dirty leather is encountered, the surfaces should be cleaned with the soap solution mentioned in Paragraph 4.01, applied with a sponge, and immediately rinsed off with a second clean damp sponge, before the Lexol dressing is applied.

4.06 CAUTION: When washing or using leather dressing for the first time on leather upholstery of unknown finish, it should first be tried on a small and obscure area to assure that the treatment does not remove the color, soften, or otherwise adversely affect the finish. Slight bleeding of color is not considered harmful.

4.07 Synthetic leather upholstery, e.g., Cavalon, Koroseal Fabricoid, Fabrilite, and other brands of rubber base or vinyl materials should simply be washed with the soap solution mentioned in Paragraph 4.01. The solution is applied with a sponge and rinsed with a sponge. The surface is buffed with a clean dry cloth. Lexol should not be used.

4.08 The cleaning procedures of this section are applicable to such table top materials as "Formica," "Textolite," "Micarta," etc. Because of the hard, dense, and highly polished finishes of the above materials, the application of furniture polish is not necessary.

5. POLISHING

5.01 Furniture polish should be applied sparingly, using a utility wiping cloth (approximately 12 in. by 24 in.) that has been previously wet with clean water and wrung out as dry as possible, then folded into a 6-in. by 6-in. pad. Apply the polish in a thin uniform coating over the entire surface.

5.02 After the polish has thoroughly dried, requiring about 5 minutes, the surface is buffed with a clean dry cloth. Apply sufficient pressure to get a uniformly smooth polished surface.

5.03 Two cloths should be used for polishing. The first will accumulate wax after a period of use and become unfit to produce the final dry lustrous finish. The final cloth is then substituted for the first polishing cloth and a clean finishing cloth used. Straight rather than circular strokes are preferred for the final buffing of the furniture surface.

5.04 One application of the polish is usually adequate for all surfaces except those that may have become worn and porous. On metal chairs, the furniture polish may be used on the plastic upholstery as well as on the baked enamel and metallic surfaces.

6. CARE OF EQUIPMENT

6.01 The cloths used for applying the wax are discarded. They should be placed in a metal container. Those used for buffing may be retained for future use. The pails and sponges are cleaned and returned to their proper storage places.

MAINTENANCE OF WINDOW SHADES

1. GENERAL

1.01 This section describes the procedures for maintaining the recommended plastic coated window shades in clean presentable appearance.

1.02 It is reissued and generally revised to recommend the use of treated dust cloths for dusting, and scouring powder for spot washing the shades. Also, it provides additional details regarding maintenance procedures for both the single and double hung shades.

1.03 Painted or starch coated (Holland type) shades may be damaged by spot cleaning or washing treatment and, therefore, should not be spot washed as described in this section.

1.04 The maintenance of uniformly clean and neat appearing window shades is important, aside from reflecting good housekeeping, because in most instances they are seen by the public. Clean shades create a favorable impression, soiled ones do not. When shades are not kept clean the casual dirt or dust is pressed into the surface as the shades are raised and lowered. More drastic cleaning effort is then required and there is likelihood of permanent stain especially at the midpoint.

1.05 Where shades can not be maintained at a satisfactory appearance level by routine dusting and/or spot washing, the recommended type may be over-all washed. However, over-all washing can be done more advantageously by window shade washing concerns because of the specialized kind of equipment needed to do the work effectively. It is preferable to replace shades which have been in service for ten or more years rather than to over-all wash them because the remaining service life may not justify the washing expense.

1.06 It is intended that ordinarily single hung shades shall be dusted or spot cleaned from the floor by pulling them down. However, if the soiled areas can not be reached from the floor, a stepladder is used observing the safety precautions described in Bell System Practice Section H51.201, Stepladders - Use and Care. A stepladder will be required to dust or spot clean the upper portion of double hung shades.

2. EQUIPMENT AND MATERIALS

2.01 For dusting:

- Clean oil emulsion treated dust cloths. If not available use slightly dampened dust cloths.
- Radiator brush.
- Stepladder, if required.

2.02 For spot washing:

- Sponges (natural or cellulose).
- Two-compartment pail.
- Scouring powder.
- Water, preferably warm.
- Stepladder, if required.

3. DUSTING - PROCEDURE

3.01 Routine dusting of window shades is done at suitable intervals ranging from monthly to semiannually or longer depending upon local dirt conditions. The purpose is to remove the casual dust, soot, and lightly imbedded dirt. It is usually required only on the bottom half of the shade in the case of single shades and the top in addition to the bottom sections of double hung shades.

3.02 The dusting tool is assembled by mounting the oil emulsion treated or slightly dampened dust cloth on the blade type radiator brush by folding it over and fastening with a rubber band as illustrated in Bell System Practice Sections H51.105.1 and H51.105.2.

3.03 The window is first closed. Single hung shades are pulled down nearly to the sill or as far as necessary to reach slightly higher than its midpoint. The surface of the shade facing the window is dusted, holding it away from the window by grasping at the slat and using side-to-side strokes. The strokes should include the slat area as dust accumulates more readily at that point. When doing the surface facing the room the slat is also held to maintain firmness and the shade is similarly dusted using side-to-side or other convenient strokes. The top half of the shade does not ordinarily require dusting but it should be done if needed.

3.04 With double hung shades the upper portion is raised nearly to the top of the window. A stepladder is placed at the side of the window facing parallel to it and as close to the wall as possible. Since it is under constant tension, the side of the shade facing the street is held out from the window a few inches by grasping one end of the slat. The dusting tool is stroked downward reaching in for at least half of the shade width. While on the stepladder at that position the side of the shade facing the room is dusted, again using downward strokes. The stepladder is moved to the other side of the window and similar treatment is given to the other half of the upper portion. The top surfaces of the roller areas are done by drawing the dusting tool over both of the rollers. This may require that the bottom shade be pulled down about one foot and held outward by the slat while the dusting tool is rubbed along the upper surface of the lower roller. The lower half of the shade is done by pulling it down to within three or four inches of the window sill or window deflector level. If under tension each side of the surface facing the window is stroked downward the same as for the upper portion, holding it outward by the slat. If the lower portion is not under tension, it is pulled down, held away from the window, and stroked as described in Paragraph 3.03.

4. SPOT WASHING - PROCEDURE

4.01 Spot washing is done where needed when routine dusting fails to remove such imbedded soil as fingermarks, rain spots, etc. This operation is not intended to replace overall washing, if required. One side of the two-compartment pail serves for the wash water and the other for rinse water, and two sponges are used.

4.02 The soiled spots or areas are cleaned by rubbing with a damp sponge on which scouring powder is sprinkled very sparingly. The sponge is wrung quite dry so that it will not drip when rubbed against the shade. It is rubbed against the soiled area with pressure but the pressure is decreased about the edges of the area so as to avoid showing a conspicuously clean spot. The sponge is rinsed frequently in the wash water to avoid smearing the shade.

4.03 The cleaned area is wiped clean with the rinse sponge which is rung nearly dry to avoid dripping. This sponge is also frequently rinsed to effectively remove any remaining scouring powder or loosened dirt. Again lighter pressure is applied about the edges of the cleaned area to blend in with the rest of the shade. No drying operation is required.

5. CARE OF EQUIPMENT

5.01 All pails, cloths, and sponges are cleaned following their use and returned to the place of storage. The sponges are allowed to dry thoroughly before being placed in storage. The soiled oil emulsion treated cloths are placed in the containers reserved for them.

INSECT EXTERMINATION

CONTENTS PAGE

1. GENERAL

1.01 This section describes procedures for exterminating insects found on telephone premises. It includes a description of insecticides, their properties and applications.

1.02 The section is generally revised and reissued to consolidate the following sections which have been canceled:

Section H51.129 — Insect Extermination, Roaches

Section H51.130 — Insect Extermination, Bedbugs

Section H51.131 — Insect Extermination in Switchboards.

1.03 Three insecticides are recommended. They are:

(a) Bell System Liquid Insecticide

(b) Aerosol Insecticide — Space Spray

(c) Aerosol Insecticide — Residual Spray

The Bell System Liquid Insecticide is available from the Western Electric Company. The Aerosol Insecticides should be purchased locally.

1.04 In some localities the insecticides mentioned in this section may be applied only by persons who have been licensed to do so in compliance with local ordinances.

1.05 The procedures described in this section are intended primarily for use by the building forces for the control of small or infrequent infestations. When extensive treatment is required, as in quarters where food is handled and stored, the services of a competent professional exterminator may be needed.

1.06 The most effective means for preventing insect infestations is to maintain thorough cleanliness, especially in dining service quarters, storerooms and areas where garbage is stored. Following are specific suggestions:

(a) Give special attention to maintaining a high degree of cleanliness in difficult to reach places.

(b) Remove promptly food particles and spillages from floors, counters, shelves and tables.

(c) Maintain a clean and orderly condition in supply rooms and in employees' lockers.

(d) Use screens when necessary to prevent entry of flying insects.

1.07 When it is necessary to apply insecticide in switchboards, do so with the concurrence of the equipment maintenance and Traffic forces. When applying insecticides in dining room quarters, secure the cooperation of the responsible personnel.

2. DESCRIPTIONS AND PROPERTIES OF INSECTICIDES

2.01 Insecticides intended for the control of insect pests in the home and in public buildings are known as household insecticides as distinguished from those intended for agricultural or industrial purposes. While there are hundreds of formulas, these are in general different combinations of the same basic ingredients. Those intended for household use require the approval of the United States Department of Agriculture. A list of the active ingredients must appear on the label.

2.02 There are two types of insecticide sprays, residual and space. The residual type is a coarse particle spray which wets the surface treated with a coating of insecticide. Upon evaporation of the liquid solvent, a residual coating of the basic insecticide remains. This residual coating is lethal to insects upon contact for periods as long as several months. Space sprays are fine particle mists which are airborne and intended to kill flying insects on contact.

2.03 The Bell System Liquid Insecticide consists essentially of a 5% solution of DDT, .04% pyrethrins, and .32% piperonyl butoxide in a petroleum distillate, commonly known as deodorized kerosene. This is a widely used commercial formula. Although basically a residual spray, it may also be used as a space spray if carefully used.

2.04 The recommended Aerosol Insecticide — Space Spray is intended primarily for the extermination of insects in switchboards. Suitable formulas are based on pyrethrins, synthetic pyrethrins and various synergists, which are nontoxic. Aerosols containing up to 2% DDT may also be used. These sprays are nonflammable due to the high proportion of Freon propellant.

2.05 The recommended Aerosol Insecticide — Residual Spray is used for crawling insects. It is based on chlordane, malathion or dieldrin. The high percentage of petroleum distillates and the coarseness of the particle size insure a residual film. The ingredients are toxic and are not permissible in space sprays. The spray is combustible.

2.06 Following are descriptions of the ingredients in the Bell System Liquid Insecticide.

DDT — an abbreviation for the compound dichloro-diphenyl-trichloroethane, has been widely used in household insecticides since World War II. Its outstanding characteristic is residual toxicity. DDT sprayed on indoor surfaces will retain its killing power for months. When an insect contacts the treated surface, DDT is absorbed by the insect's tissues. Its lethal action is somewhat slow but sure. DDT is moderately toxic to humans. Care must be exercised not to breathe it or to let it come in contact with the skin.

Pyrethrins — are extracted from Pyrethrum flowers. They provide a fast knockdown and are added to DDT insecticides for this purpose. Sprays can be made from straight Pyrethrins, but if used alone high concentrations are needed and the cost is prohibitive. Pyrethrins are not toxic to humans.

Piperonyl Butoxide — when used with Pyrethrins has a synergistic effect. A synergist is an ingredient which when used in combination with another insecticide produces an effect that is considerably greater than the same percentage of either alone.

2.07 The following are brief descriptions of other commonly used insecticides. A number of them will be found in the formulas of the recommended aerosol space and residual sprays.

Allethrin — is a synthetic chemical that resembles Pyrethrins in its structure and its properties. It is frequently called synthetic Pyrethrum. It is of low toxicity to humans.

Chlordane — a chlorinated synthetic insecticide, is one of the most effective of all against a wide variety of insects. It is, however, more toxic to humans than DDT. It is not used as a space spray but only as a residual spray. The residual coating is a highly viscous liquid.

Dieldrin — is a chlorinated synthetic closely related to Chlordane. It is slightly more toxic to humans than DDT and should be used with caution. It is less toxic than Chlordane and for these reasons preferred to it. The residue is a dry coating.

Malathion — is an organic phosphate insecticide of relatively low toxicity to humans.

Methoxychlor — is a chlorinated synthetic related to DDT. It is less toxic to humans but also less effective against insect pests.

Lindane — is a purified form of Benzene Hexachloride. It is comparable to DDT in action and toxicity but is apt to have a disagreeable odor.

N-Octyl Bicycloheptene Dicarboximide — also known as MGK 264, is a nontoxic synergist used to boost the effect of piperonyl butoxide.

Sodium Fluoride — is particularly effective for roach control. It is extremely poisonous to humans if taken internally and is not recommended.

2.08 There are various electrical devices for spraying, fogging and vaporizing insecticides on the market. They are not required for the exterminating work done by employees. Some types present a health hazard. The simple hand-operated spray or aerosol can is adequate for telephone building requirements.

3. SAFETY PRECAUTIONS

3.01 The materials used for insect extermination are often combustible and to some degree poisonous. Accordingly, the following precautions should be observed in their use:

(a) Only approved insecticides and procedures should be used for exterminating activities in telephone buildings.

(b) The Bell System Liquid Insecticide contains DDT. Aerosol space sprays may also contain this chemical. DDT is moderately toxic but is not considered a health hazard when properly used. Inhaling the vapors should be avoided. The room should be well ventilated. Sprays should not be used in areas that are occupied by personnel or where foodstuffs could be contaminated.

(c) In operating an aerosol container be sure spray nozzle points outward. Keep protective cover on when not in use.

(d) The Liquid and Aerosol Insecticides are not to be used in the vicinity of open flame or while smoking.

(e) The insecticides should be stored in a metal container. Only relatively small quantities should be stored at one time, e.g., one or two gallons of liquid and not more than a dozen aerosol cans. Both types should be stored away from sources of heat.

(f) Do not puncture an aerosol insecticide container if it becomes inoperative.

(g) Do not throw an aerosol can into a fire or incinerator.

(h) Persons handling or applying any insecticides should wash their hands with soap and water following use.

4. ANTS

4.01 ***Equipment and Materials***

Bell System Liquid Insecticide and hand sprayer or

Aerosol Insecticide — Residual Spray.

4.02 There are 20 or more kinds of common ants which may be found in telephone buildings. They differ as to size, from 1/8" to nearly 1/2" in length, and vary in color from light red to brown and black. All have similar breeding and feeding habits and are exterminated in the same manner. Ants are the chewer type insects which prefer the kinds of food usually eaten by humans and especially sweets.

4.03 The most effective preventive measure against ant infestations is to keep clean those areas where candies, foodstuffs and beverages are stored or dispensed. Usually, the occasional ants seen foraging for food will leave the premises if no food is found. The continued presence of a large number of ants is evidence of a source of food and this must be eliminated.

4.04 The first step in extermination is to observe the path the ants travel between the food supply and their nesting places to determine where they entered the building. Spray the points of entry with Bell System Liquid Insecticide or Residual Aerosol, thoroughly wetting the surface in order to leave a residual film. Pay particular attention to baseboards, door and window frames. Spray the accumulated colonies within the building with either the liquid or aerosol residual insecticide. Repeat as necessary. The areas of infestation are thoroughly cleaned to eliminate the source of food. If the infestation persists, more effective measures may be necessary requiring professional attention.

5. BEDBUGS

5.01 *Equipment and Materials*

Bell System Liquid Insecticide and hand sprayer.

Vacuum cleaner with upholstery tool.

5.02 Bedbugs are the sucker type of insect which obtains sustenance from blood, preferably from humans. For this reason they can not be exterminated by means of baits or poisons. Bedbugs breed from eggs deposited in crevices and cracks of furniture and building trim. The eggs are cream colored, oval in shape and slightly smaller than the head of a pin. If the exterminating procedure does not destroy all the eggs as well as the insects, reinfestation can occur even though no new insects are brought in.

5.03 Upholstered furniture and beds are thoroughly vacuum cleaned before applying the insecticide. Special attention is given to pleating, tufting and cushions in the upholstered furniture. Pillows, cushions and mattresses are removed to facilitate the vacuum cleaning and are themselves thoroughly vacuummed. Removing these articles facilitates application of the insecticide to the furniture and beds. Mattresses and upholstery are lightly sprayed.

5.04 The frames, springs, underneath sections, corners, and crevices of furniture and cots are sprayed to thoroughly wet the surface with the insecticide. The spraying should be done at such time as to permit adequate drying before the furniture is to be used in order to avoid the possibility of the insecticide getting on the person or clothing of those using it. From 5 to 10 hours or preferably overnight should be adequate.

5.05 The hand sprayer should be adjusted to discharge a coarse spray for crevices in building trim, e.g., baseboards, molding, window and door frames and other points affording the bugs a place to hide and breed.

5.06 A treatment is effective for a period of 2 to 6 months.

6. ROACHES

6.01 *Equipment and Materials*

Bell System Liquid Insecticide and hand sprayer or

Aerosol Insecticide — Residual Spray.

6.02 There are several varieties of roaches which differ as to size (1/2″ to 1-1/2″) in length and in color ranging through brown, red and black. All are exterminated in the same manner. Roaches are chewer type insects and may be exterminated by powders as well as by contact with liquid insecticides. They are relatively slow in reproducing but their cleverness in hiding largely accounts for their prevalence. Roaches nest in obscure locations preferring warm, moist and dark places, such as underneath sinks, about water piping, kitchen equipment, beverage vending machines and in basement floor drains.

6.03 The nuisance of roach infestations can be reduced by keeping the premises free from sources of food such as spillages and open or uncovered food containers. Roaches will not remain where food is not available. They eat the same food as humans. Infestations in general offices may be due to the storage of foods and candies in desk drawers or in employees' lockers.

6.04 Two exterminating procedures can be followed. First, the Bell System Liquid Insecticide is used. This will chase the insects from hiding and possibly drive them from the premises. Roaches hit by the direct spray will be killed. If the foregoing treatment is not fully effective, it is supplemented by application of the Residual Spray Aerosol Insecticide. This will kill the remaining insects and discourage recurrent infestation. Spray thoroughly around piping, kitchen equipment, lockers, beverage vending machines and floor drains as well as any other suspected hiding places or paths of travel. Hold container about one foot from surface and spray until surface is uniformly wet.

7. FLIES AND MOSQUITOES

7.01 *Equipment and Materials*

Aerosol Insecticide — Space Spray.

7.02 Careful screening of windows and doors and closing of other possible points of entry are the most important steps in fly and mosquito control. When numerous flies or mosquitoes gather in the rooms, inspection should be made of the condition and fit of window and door screens, as these insects do not normally breed indoors under the conditions prevailing in telephone buildings.

7.03 The action of the spray is that on initial contact the insects fall and usually death follows. However, in some cases this may not occur for several hours or some of the insects may recover. It is, therefore, advisable to sweep up those that have fallen and dispose of them following spraying.

7.04 Spraying should be done when the room is unoccupied. First, close the windows and doors while spraying to avoid air currents and the escape of the insects to other areas. Use the Aerosol Insecticide space spray which creates a very fine fog-like mist. Direct a spray at an angle towards the ceiling generally about the room.

8. TERMITES

8.01 There are two kinds of termites, the drywood and subterranean species. The subterranean termite is the most widely distributed and most destructive. Very little damage is done by drywood termites so only the former will be discussed. This species requires in all cases contact with moist soil through wood or earthlike runways. Masonry walls can conceal runways in cracks or interior pores without visible indication unless solid concrete or metal is encountered; in which case a mud tunnel may be built as a bypass around the obstacle to palatable wood. Termites feed on cellulose in food, paper, cloth and wood.

8.02 A termite may be distinguished from a flying ant under a magnifying glass. The termite has four large wings, the ant two large and two small wings. The termite has one restriction behind the head which forms the neck. The ant has a restriction behind the head and a second one forming a waste behind the legs.

8.03 Frame one-story buildings without basements are the easiest and most likely target for termites. The attraction may be dampness under the building with wooden forms or scrap wood as backfill around the foundation or under the building. Once this is eaten the termites start looking for other sources of cellulose. They will usually enter floor joists, flooring, stairs, windows, door frames and any other wooden materials easily reached from the ground.

8.04 Termites can be discouraged if wooden forms and scrap lumber are not left in or around the building foundation upon completion of the building construction. Further discouragement may be necessary in areas of known termite infestations in the form of metal shields around the foundation, pipes, or other facilities touching the ground.

8.05 Infestations may be in advanced stages before they are discovered. Indications of termites are flights when a new colony is being created, mud runways, and painted wood looking as though water is pushing off the paint. The mud runway is an effort to move to a new source of wood. Any of these indicators should be followed by a probing of the wood with a metal tool near the ground level or near the areas of blistered paint or mud runways. The interior of the wood may be eaten away leaving only a shell. These chambers follow the grain and there will be no sawdust. Sawdust contains cellulose and is eaten by the termites.

8.06 When termite damage is noted, a reliable exterminator should be consulted. Any pressure or surface treatment of infested wood with chemicals is best handled on a professional basis. After the termites have been exterminated in the wooden portions of the building it is advisable to treat the ground to prevent a reinfestation. Chlordane in a 2% water emulsion is recommended for this purpose. This chemical treatment, which will last about five years, is applied in a trench several inches deep dug about the width of a shovel along the foundation. The trench is then filled in and the fill similarly treated. A more lasting preventative program should include treatment of replaced wood with preservatives, the placing of shields on the foundation and pipes, providing ventilation or drainage to remove moisture, and the removal of all scrap wood or wood contacting the ground.

8.07 There are various chemicals for treating lumber such as creosote, arsenic, and pentachlorophenol. Arsenical preservatives should be used with caution. Some arsenic compounds used to treat lumber may be highly toxic to humans and may present a toxic fume hazard in case of fire. Also, termites and their burrows are universally infested by fungi, including many common molds, a number of which turn arsenic into a volatile form diffusing and contaminating the air.

8.08 When visible signs of termites are seen, an investigation should be made at once. In areas where termite infestations are common or have previously occurred, special attention should be given to the possibility of infestations during the course of routine building inspections.

9. INSECTS IN SWITCHBOARDS

9.01 ***Equipment and Materials***

Aerosol Insecticide — Space Spray.

9.02 When exterminating activities are required in switchboards, it is done with the concurrence and cooperation of the equipment maintenance forces and the Traffic people concerned. If commercial exterminators are employed in the vicinity of telephone equipment, they should be warned of the hazards and precautions to be observed.

9.03 Fleas, gnats and similar insects are the types which usually infest switchboards and annoy personnel. These insects do not ordinarily nest and breed in switchboards but rather seek temporary refuge near a source of food which for them is the blood of persons upon whom they alight. Ants, roaches or bedbugs may be occasionally encountered.

9.04 The Aerosol Insecticide, space type, will not damage telephone equipment or cause interference with telephone service.

9.05 First remove the panel from the rear of one portion of the switchboard and confine the spray to one area. The fine mist spray is directed towards the switchboard cables and to the dark corners near the floor. Three or four momentary depressions of the aerosol valve are adequate for each switchboard position. After spraying, replace the switchboard panel before opening the next one. Proceed in the same manner until the area inside each panel has been sprayed. If necessary, repeat the procedure the following day.

9.06 It is of the utmost importance that no portion of the telephone equipment or adjacent area be wet with the insecticide. For this reason the following precautions must be observed:

(a) The nozzle of the aerosol can is held no closer than two feet from the surface upon which the insecticide is applied.

(b) The aerosol valve is depressed only momentarily while the bomb is moved from side to side or up and down as appropriate while the mist is being dispersed.

INSECT EXTERMINATION

ROACHES

1. GENERAL

1.01 Data essential both for extermination of roaches and for reducing roach infestation probability are included in this Section. Complete extermination of existing infestations is assured by application of the material and procedures contained herein if a systematic and persistent plan is pursued. This Section does not take precedent over any conflicting local ordinances involving materials or personnel employed for roach extermination. It also does not apply to extermination of roaches from switchboards, terminal rooms and switchrooms.

1.02 Exterminating services of any kind in cafeteria quarters are carried on only with the cooperation of the Traffic Department.

1.03 Only sodium fluoride that is colored blue should be used. The blue color serves to identify the material and to prevent its inadvertently being mixed with or applied on foods. Substantial quantities, if taken internally may prove poisonous to human beings and the precautions accorded to poisons should attend its use.

1.04 There are several varieties of roaches which differ as to size and color but all are exterminated in the same manner. Roaches are relatively slow in reproductive rate requiring about one year per generation and only some eight to twelve are produced at a time. It is because of their cleverness in concealing themselves rather than rapid reproduction which accounts for their prevalence. They normally confine their feeding and activities to periods of darkness and often avoid detection for a long time unless surprised such as in switching on a light.

1.05 The nuisance of roach infestations can be greatly reduced if not removed entirely by keeping the premises free from attractive substances, capable of being utilized for food, as roaches will not remain unless they have access to foodstuffs. In general the same foods used by human beings are acceptable to roaches but they will also feed on almost any dirty accumulations or residues.

1.06 Roaches are classified as a filthy insect in that they nest in remote places, preferably unclean crevices. They exude a dark colored oily fluid which is of disagreeable odor and accumulates in the nests and on their runways, i.e., paths to and from sources of food. They favor warm, moist and dark places and thus are more likely found underneath sinks and about water piping, kitchen equipment and in basement quarters.

2. EQUIPMENT AND MATERIALS

2.01 Powder bellows.
Blue colored sodium fluoride powder.

3. PROCEDURE

3.01 Sodium fluoride, colored blue is used for exterminating roaches. When it is used in dining service quarters the work should be performed only in the presence of the Chief Matron.

3.02 Thorough attention to cleanliness in and about kitchens, dining rooms, locker rooms, basement quarters and other points where foodstuffs are kept or where warmth and dampness prevail is the most effective means for elimination. Annoying infestations in general offices are sometimes promoted by the storing of foods or candies in desk drawers. This also applies to employees' lockers.

3.03 It is not necessary to place the sodium fluoride on the roaches as the material ordinarily gets into the stomach of the insect by the habit of passing their legs and feelers through the mouth following their walking on the powder. The action of sodium fluoride is not quick as some hours and possibly days elapse from the time of contact with the material before death occurs but contact is almost invariably fatal.

3.04 A powder bellows should be used for spreading the sodium fluoride. The bellows distributes the powder sparingly and in finer condition thus securing maximum effectiveness when it is filled not more than half full. The powder should be spread in the form of a light dust and permitted to remain for some days or longer, where feasible, as its effectiveness continues for some time if kept dry. The powder should not be spread in such manner as to get on foods, food containers, dishes, kitchen utensils and equipment and no residue should be permitted to remain where it can come in contact with these items.

3.05 Since roaches hide in obscure cracks and crevices the application of the exterminating powder (sodium fluoride) to these places is most effective. However, it is often impossible to reach the most remote hiding places but spreading the powder on the areas over which the roach must pass in search of food will result in ultimate extermination. After all crevices have been treated, distribute a thin line of the powder along the edges of floors and on horizontal sections of the piping underneath sinks but only where there are no underlying shelves or other places where equipment or utensils are stored.

3.06 Sodium fluoride may also be used as a preventative in cafeterias, garbage vaults, waste paper vaults, storerooms and in basement quarters susceptible to infestation by distributing a thin line around the edges of the floor and on pipes, etc.

4. CARE OF EQUIPMENT AND MATERIAL

4.01 It is necessary that the tool used for applying the powder shall be kept clean and dry and in good operating condition. Any remaining in the bellows following its use should be removed and placed in a covered container.

4.02 Sodium fluoride is adversely affected by moisture; therefore all supplies should be kept in a dry place.

4.03 All tools and supplies of insect powder should be stored outside of dining service quarters, storerooms or other places where food is kept.

INSECT EXTERMINATION

BEDBUGS

1. GENERAL

1.01 This Section includes data covering the extermination of bedbugs and for minimizing infestation. Complete extermination of existing infestations is assured by application of the material and procedures specified if a systematic and persistent plan is employed. This Section does not apply to extermination of bedbugs from switchboards, terminal rooms and switchrooms.

1.02 Bedbugs breed somewhat rapidly and numerously. The eggs are deposited in crevices of upholstery and in other cracks of furniture and building trim at the rate of one to five eggs per day during the laying periods which are of two months duration. Four such broods are usually produced a year. Hatching of the eggs ordinarily requires from one to three weeks and the life span of the insect ranges from about eight to forty five weeks. Therefore if exterminating procedure does not destroy all of the eggs as well as the insects there is potential probability of reinfestation, aside from that of new coming insects, for some three weeks, through the hatching of undisturbed eggs.

1.03 Bedbugs feed exclusively upon blood, preferably human, and thus cannot be effectively exterminated by means of baits or poisons. Contact with kerosene is fatal to bedbugs and also destroys the eggs. The residue of kerosene remaining in crevices for some days or weeks following its application also serves to make the areas uninhabitable for the insects and unfavorable for egg development.

1.04 For buildings in certain localities where there is tendency for frequent annoyance from bedbugs a routine schedule of using the insecticide is helpful in greatly reducing or eliminating infestations.

2. EQUIPMENT AND MATERIALS

2.01 Hand sprayer
Bell System liquid insecticide
Whisk broom and/or vacuum cleaner with upholstery tool.

3. PROCEDURE

3.01 Partial dismantling of the furniture to be treated, i.e., removal of cushions and other sections which are readily removable without the aid of tools, should be done to insure thorough cleaning of the not readily accessible places affording concealment for vermin. It also facilitates thorough application of the insecticide to the underneath sections and remote crevices. All pockets, tufting, pleating and crevices in the fabric and especially those points where the fabrics join the wood members should be thoroughly brushed and/or vacuum cleaned before applying the insecticide.

3.02 The liquid must come in contact with both the insects and the eggs to destroy them. Therefore when using the sprayer it should be directed to those places where the insects or eggs are likely to be, i.e., the points mentioned in 3.01 and also crevices in adjacent building trim and fittings, including picture moulding wainscoting, surbases, window and door frames. Picture frames shall be examined and treated if necessary. In the case of metal springs special attention should be given to the points where they connect to the angle irons and the liquid should also be directed into the hollow tubing of cots or furniture where accessible.

3.03 The sprayer should be adjusted to discharge a fine needle stream when used for crevices and a mist when treating wicker furniture, drapes, cushions, mattresses, cot springs, etc. The crevices should be thoroughly wet with the insecticide so as to penetrate into their remote points. However when using the mist on the flat or smooth surfaces it should not be applied sufficiently to wet them. This is especially to be avoided on those surfaces with which persons using the furniture come in contact as thorough evaporation of the liquid requires some five to ten hours or longer depending upon the ventilation.

3.04 It is not ordinarily advisable to remove the furniture from the room for treatment but in cases of very bad infestation, particularly with pieces such as wicker or others affording many places for concealment, removal to basement or roof quarters or other convenient locations is desirable. Such pieces should be very thoroughly sprayed and permitted to air for two or three days before returning to use.

3.05 In localities where continuous introduction of new insects is experienced a routine schedule of applying the liquid insecticide aids in controlling the situation. This is done by applying the insecticide every two to four weeks as described in 3.02, confining the activity, however, to the use of the fine stream in the crevices.

3.06 Success in the extermination and prevention of insect conditions is greatly dependent upon a thorough and systematic plan of extermination as the insects readily locate and nest in any nearby crevices which have not been treated.

3.07 While the liquid insecticide is not hazardous to use from the standpoint of the effects of the vapor or mist upon human beings it should not be sprayed close to open flame.

4. CARE OF EQUIPMENT AND MATERIAL

4.01 The liquid insecticide should be accorded the same care in handling and storage as paints. Supplies should be limited to one or two gallons and they should be kept clean to avoid possibility of stain to furnishings.

4.02 The sprayer should be emptied following use and kept in a clean and good operating condition.

INSECT EXTERMINATION IN SWITCHBOARDS
(Including terminal and switchrooms)

1. GENERAL

1.01 The extermination of any insects from switchboards, terminal and switchrooms is covered by this Section. Fleas, gnats and similar insects are the types which usually cause annoyance. They are objectionable chiefly because of annoyance to the personnel rather than because of damage to the equipment or interference with the service. Roaches, bedbugs or ants may also get into equipment quarters and if so require special procedure or treatment supplementing that given in the Sections covering these types.

1.02 When exterminating activity is required in terminal and switchrooms or in switchboards it should be done only with the cooperation of the equipment maintenance forces.

1.03 No liquid type of insecticide shall be used in switchboards or in the vicinity of telephone equipment and it is important that any material used shall be chemically inert and electrically non-conductive to avoid possibility of damage or service interruption. Pyrethrum powder meets these requirements and while its effectiveness for vermin control is generally recognized it has the added desirable feature of being non-poisonous to human beings.

1.04 The insects which ordinarily may get into switchboards do not usually nest and breed in them but rather seek temporary refuge near their source of food, i.e., in the case of all but roaches and ants, blood from the persons upon which they alight. Their elimination therefore consists simply of specific treatments for reported conditions and the systematic procedures to care for the eggs and different life cycles described in the Sections covering extermination in general quarters are not normally required.

2. EQUIPMENT AND MATERIAL

2.01 Powder bellows
Pyrethrum powder

3. PROCEDURE

3.01 The powder bellows should not be filled to more than one half capacity so that it will discharge it finely and sparingly. It is desirable where feasible to permit the powder to remain where applied, especially in the crevices, for a few days to discourage the return of insects dislodged by the treatment.

3.02 For fleas, gnats, mosquitoes and the like in switchboards the pyrethrum powder is blown into all crevices capable of affording concealment. It should not, however, be blown into or collect on jacks, keys, relays or other telephone apparatus.

3.03 For roaches in the switchboards the same treatment is used as described in 3.01 and 3.02 supplemented by sprinkling a thin line of blue colored sodium fluoride around the base of the switchboard in such manner that the roaches must pass through it when seeking food. The sodium fluoride is also permitted to remain for a few days, when possible, but it must be kept dry or its effectiveness will be lost. When roaches require extermination from terminal or switchrooms the procedure described in Section H51.129 Insect Extermination - Roaches is followed but care should be taken that none of the powder or its dust comes into contact with any telephone equipment.

3.04 Bedbugs are also eradicated from switchboards and vicinity by the procedure described in 3.01 and 3.02. However, in cases where the annoyance continues following this treatment it should be supplemented by spraying Bell System liquid insecticide into crevices in nearby building trim and also operators' chairs. The sprayer should be adjusted to deliver a fine stream rather than a mist for this work and care should be taken not to get any of the liquid on the switchboard equipment. In the event of bedbugs in terminal or switchrooms the procedure described in Section H51.130 Insect Extermination - Bedbugs is employed but it is important that the liquid spray does not come into contact with any telephone equipment. The sprayer should be adjusted only so as to discharge a fine stream which facilitates confining the application of the liquid to the crevices.

3.05 For flies and mosquitoes in terminal and switchrooms owing to the possibility of causing equipment troubles through the use of fly sprays objectionable conditions in these quarters should be cared for only by means of adequate screening or air filtering equipment.

3.06 Ant conditions are cared for in the manner described in Section H51.128 Insect Extermination - General.

4. CARE OF EQUIPMENT AND MATERIALS

4.01 The tools used should be kept clean and in good operating condition. Any powder remaining in the bellows after use should be removed and placed in a covered container. Any liquid should also be replaced in its container.

4.02 It is essential that both of the powders mentioned should be stored in a dry place in covered containers. The pyrethrum powder particularly loses its effectiveness on aging and supplies should be limited to a few weeks' requirements.

STEP-LADDERS

USE AND CARE

1. GENERAL

1.01 This section covers the use, care, and maintenance of step-ladders and includes safety precautions to be followed in their use.

1.02 This section is reissued to include minor changes in text and to make Fig. B consistent with the text.

2. DESCRIPTION OF STANDARD STEP-LADDERS

2.01 Two types of step-ladders are provided as standard for building service work. They are designated as Mechanics, and Building step-ladders. The front or step section of the Mechanics step-ladder is provided with steps and the back section with oval rungs to permit working from either section. The Building step-ladder is lighter in construction, and the back section rungs are round and not intended to carry weight. A pail rest is provided in the rung section to adapt it to cleaning operations.

3. SELECTING LENGTH OF STEP-LADDERS

3.01 In selecting the proper length of ladder for a job it should be borne in mind that although the ladder itself may be stable on its base, the workman, if he stands on the top or the top step, cannot brace his legs against the ladder or readily grasp it to steady himself. For this reason it is desirable to use a ladder of sufficient length so that work can be performed while standing no higher than two steps from the top.

4. SELECTING FOOTING FOR STEP-LADDERS

4.01 Step-ladders should not be used on soft or uneven footing unless precautions are taken to prevent tipping by blocking the legs or lashing the ladder in position. Where it is necessary to block the legs a strong broad support that will not shift or break under load should be used.

4.02 Step-ladders may safely be used on moderate slopes provided that they are placed so that the direction of slope is downward from the step section to the rung section. When it is necessary to erect a step-ladder under such conditions, the footing should be examined for slipperiness to insure against the ladder sliding. If there is any doubt as to its stability the ladder should be steadied by another workman.

4.03 Step-ladders should, where possible, be placed with respect to the location of the work so that it will not be necessary for the workman to extend his body beyond the sides. Where conditions will not permit of this, additional precautions should be taken, such as having another workman steady the ladder.

4.04 WHERE IT IS NECESSARY TO ERECT STEP-LADDERS IN FRONT OF ELEVATOR DOORS AND DOORWAYS, IN OR NEAR PASSAGEWAYS OR AT ANY LOCATION WHERE THE LADDER MAY BE STRUCK BY VEHICLES OR PEDESTRIANS, THE LADDER SHOULD BE PROTECTED BY LOCKING THE DOORS OR PLACING WARNING SIGNS. WHERE THIS IS NOT PRACTICABLE ARRANGEMENTS SHOULD BE MADE TO HAVE THE STEP-LADDER GUARDED BY ANOTHER WORKMAN.

5. CARRYING STEP-LADDERS

5.01 Step-ladders up to and including the 8-foot size may conveniently be carried by one person as shown in Fig. A. When carrying the ladder in busy corridors or on crowded sidewalks it should be held as nearly vertical as possible.

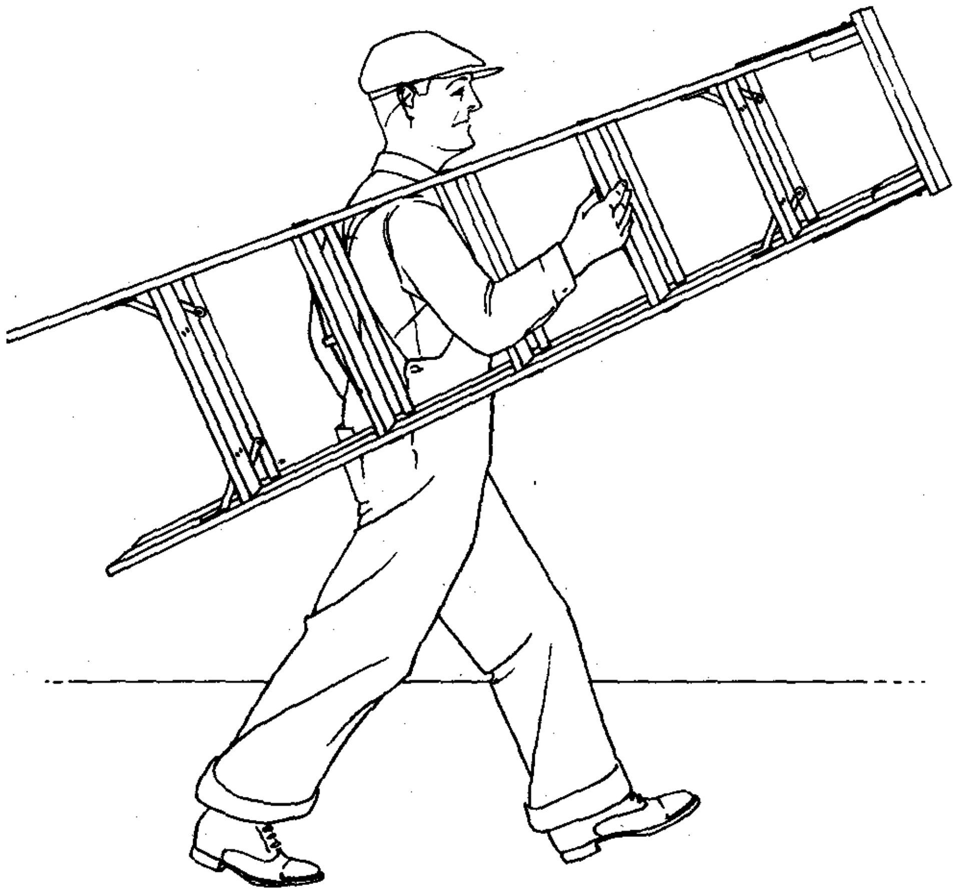
5.02 Ladders over 8 feet in length should generally be carried by two persons, particularly where it is necessary to pass through equipment or office space, operating rooms or busy corridors.

5.03 Where it is necessary to handle ladders in narrow corridors, stairways or in congested space of any type, a workman should not attempt it alone if there is any doubt as to his ability to completely control the ladder.

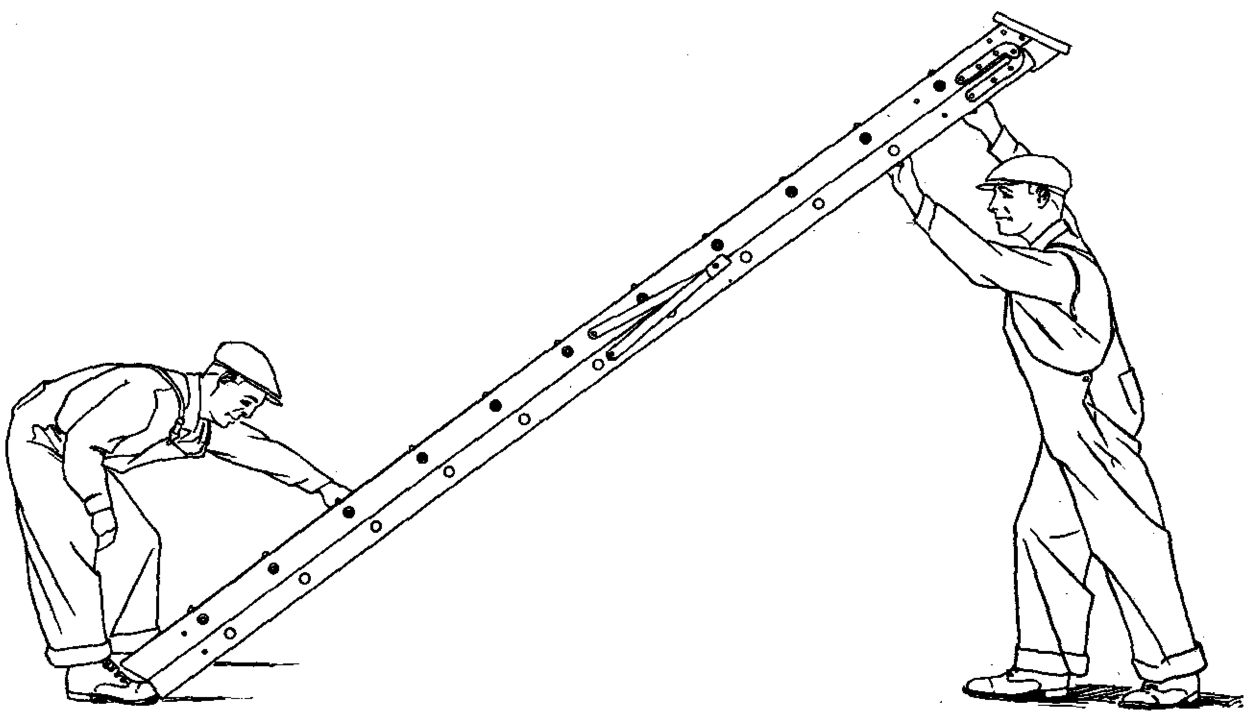
6. RAISING AND LOWERING STEP-LADDERS

6.01 Ladders up to 8 feet in length may conveniently be erected by holding the ladder vertically balanced on the step section legs The rung section is then pushed away from the step section as far as the workman can reach. The ladder then rests on all four legs and the spreaders are locked down.

6.02 In lowering ladders up to 8 feet in length the spreaders are first lifted to form an acute angle at the joint. The workman then faces the side of the ladder and with a hand on each rail, pulls the front and back sections together. Care must be taken to grasp the rails so that the finger tips are not in a position where they will be pinched between the side rails or spreaders when the ladder is closed. When both sections have been brought together, the workman lowers the ladder.



(A)



(B)

6.03 Raising or lowering ladders over 8 feet in length in congested space or in close proximity to telephone equipment or moving machinery should be done by two workmen as outlined in 6.04 and 6.05 below.

6.04 In raising long step-ladders, the ladder is first laid on the floor with the step section up and the feet at approximately the location where it is desired to have it stand. With the foot of the ladder securely braced by one of the workmen in the manner shown in Fig. B, it is raised to a vertical position by another workman. After raising the ladder to the vertical position, the workman at the rung section then pulls this section open and locks the spreaders down.

6.05 In lowering long step-ladders one workman faces the step section with his feet braced against the bottom of the section. Another workman lifts the spreaders to form an acute angle, then grasps the rung section and lifting it slightly above the floor, pushes it against the front section. The same workman then backs up, lowering the closed ladder while the other man holds it braced against his feet.

7. INSPECTION ROUTINE

7.01 Each employee using a step-ladder shall at all times assume the responsibility of determining that the ladder is in good condition and that its appearance indicates neither deterioration nor injury sufficient to affect its strength.

7.02 If a ladder has been dropped or subjected to any other treatment which might damage it, the ladder shall not be used until it has been inspected as described in Part 8 and found to be satisfactory for use.

7.03 The supervisor shall inspect all step-ladders used by his forces at least quarterly.

8. INSPECTION

8.01 The ladder shall be examined to determine the condition of all parts as suggested in the following paragraphs. In order to facilitate a careful inspection for defects, it is advisable to place the ladder in a good light and in a convenient position for examining all parts. If any of the defects listed are found, or if the condition of the ladder be such that there is any doubt about it being safe to use, it shall be exchanged at once for one in good condition in accordance with the Company's established practice.

8.02 The important defects to look for in side rails are as follows:

(a) Damage to rail which may appear as a fine crack or as a fold or crease in the wood fibers or as a splintering of the wood fibers. Such defects are usually caused by overloading a ladder or subjecting it to a hard blow, and may subsequently result in breakage of the ladder under normal loads. The cracks or folds in the wood fibers are most likely to occur at rung-rail intersections and a very careful inspection is usually required to detect them. In most cases the folds or creases appear alone, but in some cases there also may be some splintering of the wood fibers on the opposite side of the rail.

(b) Splits that extend from one face of the rail through to the opposite face and are more than 24 inches in length, or that result in loosening of rungs, braces or steps.

(c) Protruding nailheads.

8.03 The important defects to look for in the steps and rungs are:

(a) Cracked, split, badly splintered or decayed steps or rungs.

(b) Loose step braces and loose tie rods.

8.04 Important defects to look for in fittings are:

(a) Loose spreader hinges and loose spreader attachment plates.

(b) Loose hinge joints and loose rivets holding hinge arms.

(c) Loose pail rests.

8.05 Ladders should be tested particularly for any tendency to sway or "walk" when shaken slightly in the open position. A ladder that sways easily should not be used until it has been tightened.

9. DISPOSITION OF STEP-LADDERS REQUIRING REPAIRS

9.01 Step-ladders which have developed defects which cannot be repaired in the field shall be immediately withdrawn from service for repair or destruction. Employees in the field shall see that such step-ladders in their possession are tagged or marked "Dangerous, Do Not Use" and returned to the storeroom. If the Company has established the practice, employees remote from the storeroom shall destroy and dispose of irreparable ladders, on the job, upon instructions to do so by the supervisor. Step-ladders that are considered junk shall not be destroyed if they are required in connection with an investigation that may be made to determine the cause of an accident or a ladder failure.

9.02 When disposing of a ladder remove and return to the storeroom all hardware which can be used to advantage in repairing other ladders. The defective ladder shall then be destroyed.

10. CARE OF STEP-LADDERS

10.01 Step-ladders should not be dropped and heavy objects should not be allowed to fall or rest upon them.

10.02 So far as practicable, keep ladders free from accumulations of dirt, oil, paint, plaster, etc.

10.03 Ladders may be painted if desired but before being painted they should be carefully inspected as described in Section 8. New ladders which are painted before being placed in use do not require this inspection.

10.04 When the paint on a ladder is worn excessively, the ladder should be repainted in accordance with the Company's established routine.

10.05 Ladder rails, rungs and steps should be kept free from splinters. Splinters may be removed by dressing them with a knife, file or sandpaper.

11. STORAGE OF STEP-LADDERS

11.01 Step-ladders that are not being used should be stored at a location where they will not be exposed to the elements but where there is ventilation. Never store ladders near radiators, stoves, steam pipes, nor in places where the wood may be subjected to excessive heat or dampness.

11.02 Ladders should be stored in such a manner as to provide ease of access for inspection and prevent danger of accident when withdrawing a ladder for use.

11.03 Where ladder racks have not been provided, step-ladders should preferably be stored in a vertical position. Do not store ladders in such a position that they will be subject to pressure that would cause warping or twisting.

12. SAFETY PRECAUTIONS

12.01 Observe the following precautions when using step-ladders:

(a) DO NOT USE OR STAND ON BOXES, BARRELS, RADIATORS, STOOLS, CHAIRS AND OTHER UNSAFE SUBSTITUTES FOR LADDERS.

(b) Using ladders that are too short is a common cause of ladder accidents. Be sure to select a ladder of adequate length as described in Part 3.

(c) Do not leave tools or other articles on the steps, pail rest or top of a ladder.

(d) Before moving a step-ladder always make sure that there are no tools or articles resting on the steps or top.

(e) Always face the ladder when ascending or descending and do not hurry or try to take more than one step at a time.

(f) When getting off a ladder avoid stepping on loose debris. If practicable, clear the area around the base of the ladder before ascending.

(g) When working on ladders, take care not to overbalance. When it is necessary to reach to the side, take care that the body is not extended so far beyond the side rails as to unbalance the ladder. When it is necessary to exert a strong pull or push on a tool, apply the force in such a manner that if the tool slips the body will move toward the ladder and not to the side or backwards.

(h) A step-ladder is designed to be self-supporting and its use as a straight ladder should be avoided except where the feet can be securely braced or the ladder lashed in position.

(i) Never step from one ladder to another without first descending.

(j) Never use the pail rest of a Building ladder as a step.

(k) Mechanics working on step-ladders should avoid carrying tools in their pockets if there is any possibility that the tools may fall out.

(l) A workman holding a ladder for another should give it full attention. The safety of the man on the ladder is dependent upon the holder's vigilance.

(m) THE WORKMAN SHOULD ALWAYS REMEMBER TO FIRST ERECT THE LADDER SO THAT IT IS STEADY AND THEN STAND ON IT SO THAT HE IS WELL BRACED, AND WILL NOT BECOME UNBALANCED AND FALL IF SOMETHING GOES WRONG. THE MANNER IN WHICH THE WORKMAN DOES THIS WILL DEPEND, OF COURSE, ON THE CONDITIONS OF THE JOB.

INSPECTION AND MAINTENANCE

OF VENTILATING FANS

1. GENERAL

1.01 This section outlines procedures for inspecting and maintaining large ventilating fans. Small floor or wall type fans are not included. When available, manufacturers' maintenance instructions should be used in conjunction with the information listed herein.

1.02 There are two general types of fans: (1) centrifugal or radial flow, and (2) axial flow or propeller type illustrated in Figs. 1 and 2, respectively.

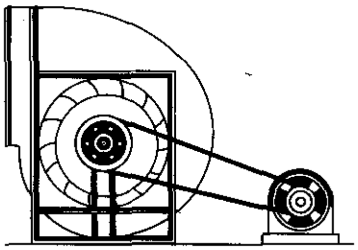


Fig. 1 - Typical Centrifugal Fan

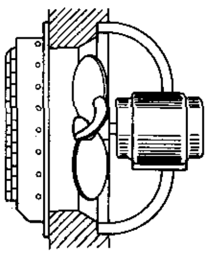


Fig. 2 - Typical Axial Flow Fan

1.03 Centrifugal fans are used almost exclusively in systems where air must be moved through ducts.

1.04 Centrifugal fans are classed, depending on the inclination of the rotor blades, into two general types as illustrated by Figs. 3 and 4.

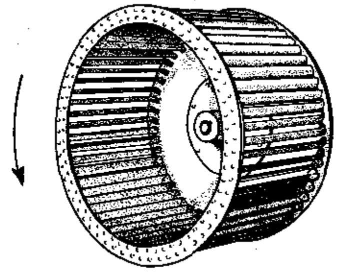


Fig. 3 - Forward Inclined Blades Viewed from Inlet Side

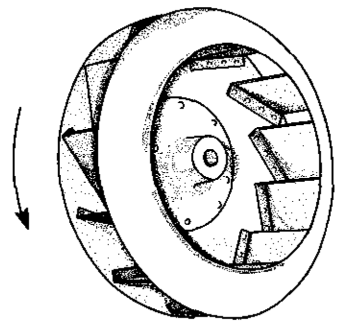


Fig. 4 - Backward Inclined Blades Viewed from Inlet Side

1.05 The slope or angularity of the blades determines the operating characteristics of a fan; a forward-curved or sloped blade is found in a fan having low speed characteristics, while a backward-curved or sloped blade is found in a fan having higher speed operating characteristics.

1.06 Axial flow fans are made with various numbers of blades of a variety of shapes, and are suitable where large quantities of air are required to be moved against little or no static pressure or resistance. In general fans of this type are designed to move the maximum amount of air possible with the least possible noise.

1.07 When handling ventilating fans, the following precautions should be observed:

(a) Avoid, by careful handling, the dropping or jarring of small completely assembled units. Lift units by the base only and not by the shaft coupling, motor or fan housing.

(b) Special care should be exercised in handling dismantled individual parts, such as the fan wheel, housing, shaft and bearings to prevent their mechanical distortion.

(c) Fan wheels and assemblies are factory balanced to give smooth and vibrationless operation. If the fan wheel is damaged or a shaft is dropped and bent, rebalancing of the assembly, after repairs will generally be found necessary.

(d) A fan wheel should never be lifted by, or allowed to rest its entire weight on, the side plates or blades. The fan wheel and shaft assembly can be lifted by slings around the shaft on each side of the wheel so the wheel is supported by its hub. If a chain is used there must be sufficient padding on the shaft and wheel to prevent scoring of the shaft or damage to the wheel. The chain or slings should be spread with timbers, or braced by some other method to prevent damage to the wheel side plates. If the fan wheel is received separate from the shaft, a suitable bar should be placed through the hub for lifting, making sure not to damage the finished bore of the wheel.

1.08 Fans placed in storage or laid up for an extended interval should be protected against moisture, corrosion and the accumulation of dirt and dust. Wheels should be blocked to prevent their rotation by natural draft or stack effect. Periodic inspections of these fans should be made to insure that no damage is developing.

2. SAFETY

2.01 A ventilating fan can be a very dangerous piece of equipment to perform work on unless certain safety precautions such as the following are observed:

(a) Before starting to work on a fan, be sure the motor disconnect switch is in the open position, and then remove the fuses. To lessen the possibility of these fuses being inadvertently replaced by other employees while the work is in progress, it is suggested that the employee doing the work should carry them on his person until the work is finished.

(b) When deemed necessary and where the fan is subject to a natural draft or stack effect which may cause the wheel or blades to rotate they should be blocked, when at a complete standstill, with a suitable piece of wood (2 x 4).

(c) Never operate a fan unless the belt guard is securely in place. If the guard must be removed to perform certain work operations, it should be replaced before the fan is restored to service.

3. INSPECTION

Dirt

3.01 Although the air which reaches the fan is usually relatively clean, it always contains a quantity of finely divided dust. Over a long period of time this dust frequently accumulates in a dense layer on the forward surface of the rotor blades. Such accumulations, by altering the shape of the surface of the blades, reduce the efficiency of the fan. An accumulation of dirt can also cause a centrifugal unbalance in the fan, Fig. 5. Any substantial amount of dirt should not be allowed to build up on the blades or fan housing.

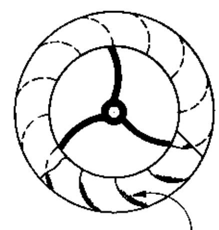


Fig. 5 - Dust Accumulations Cause Wheel Unbalance

Excessive Vibration

3.02 An excellent indication of fan trouble is excessive vibration. The amount of vibration to be termed excessive must be determined from experience with each type of fan. There are no fixed rules on allowable vibration.

3.03 When a fan exhibits excessive vibration, the following probable causes should be checked:

(a) Alignment and level.

(b) Shaft bent.

(c) Wheel or sheaves loose on shafts.

(d) Loose or worn bearings.

(e) Loose foundation bolts.

(f) Motor out of balance.

(g) Fan or motor sheaves out of balance.

(h) Coupling misalignment.

3.04 If the vibration is not due to any of the above causes, check the fan wheel for worn blades and for the accumulation of dirt, paint, or other foreign material.

Bearings

3.05 The bearings of ventilating fans are usually either the oil ring or the ball bearing type as illustrated by Figs. 6 and 7. Ball bearings may be either the grease or oil lubricated type. All bearings must receive periodic attention. When inspecting bearings, the following items should be checked:

(a) The bearings are properly aligned.

(b) No lubricant is dripping from the bearing.

(c) Bearing temperature is not excessive. Fan bearings generally should run cool enough to allow hand contact.

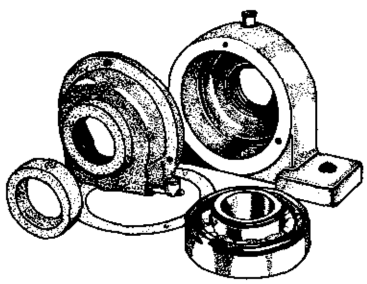


Fig. 6 - Disassembled View of Pillow Block Ball Bearing

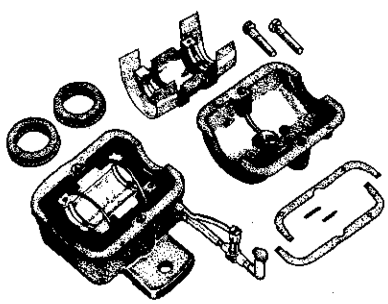


Fig. 7 - Disassembled View of Self-aligning Ring Oiling Bearing

Oil Ring Bearings

(d) Oil ring bearings are lubricated with the proper type oil as listed in Paragraph 4.04(g). The oil level in the gauge shall be:

Min. 1/2 full
Max. 3/4 full

(e) When checking the oil level in a bearing the shaft should not be turning or a false oil level may be indicated.

(f) The oil has been replaced with fresh oil within at least two years.

(g) Oil rings turn and deliver oil to the shaft and bearings.

(h) Oil gauges are free from leaks, and glass gauges, where provided, are free from cracks.

Ball Bearings

(i) The bearing contains the proper amount of lubricant. A grease bearing should be 1/3 full. A greater amount may cause bearing failure.

(j) The bearing has been relubricated within three years.

Wheel

3.06 The wheel or rotor of the fan should be inspected for the following items:

(a) With the power off, the wheel is rotated by hand to assure its easy movement.

(b) There is ample clearance between the wheel and housing so that the wheel does not strike the housing.

(c) Excessive corrosion and erosion because these defects may cause the wheel to collapse.

Drives

3.07 The two main types of drives between a fan and motor are V-belts and direct coupling. The items to be checked when inspecting each are listed below:

V-Belts

(a) Proper tension in all belts.

(b) No foreign material on belts.

(c) Sheaves are aligned.

(d) Excessive belt wear.

(e) Belt guard is properly installed.

service for a year or more shall be relubricated with (220-260 S100) oil or

(d) Wheel is free of dirt.

4.02 Periodic cleaning of the accumulated dirt   into a pail or other receptacle. Clean the

to be sure that the shaft is not bent. The only sure way to check for slightly bent shaft is with a shaft indicator. With long heavy shafts it is sometimes necessary to take the shaft out of the fan and put it in a lathe to check.

5.03 If an unbalanced fan is allowed to run, it will gradually get worse by loosening foundation bolts, pounding and burning out bearings, springing shaft and possibly damaging the fan wheel itself.

5.04 Fan balance can be determined by chalking the shaft. This method of balancing is a trial and error method and requires no elaborate equipment. Clean shaft and hold sharply pointed chalk stick so that the point just touches the shaft when the fan is running. This will scribe a line on the shaft. The length of line will depend on the amount of unbalance. A short line will indicate the fan is badly out of balance. When the fan is in balance a line will be all around the shaft. Make 3 or 4 lines on the shaft so that an average reading can be taken.

5.05 Take for an example a single width fan, overhung wheel type as illustrated by Fig. 9 (both bearings on the same side of the fan). Run the fan up to speed and chalk the shaft between the inboard bearing and the fan. Then stop the fan and turn the wheel by hand to see how long and heavy the marks show. The heavy side will throw out so that the marks will show up on the heavy side. A weight is then usually required on the heel of the blade opposite the heavy side or 180 degrees away.

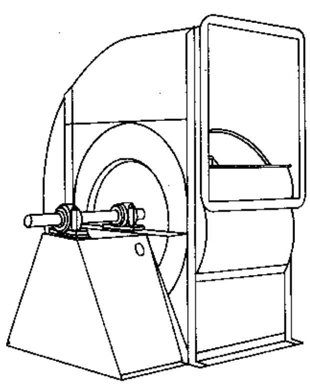


Fig. 9 - Typical Single Width Fan

5.06 A double width or center plate type fan has to be treated a little differently. A fan of this type, as illustrated by Fig. 10, has one bearing on each side of the fan and has to be chalked on each side between the bearing and wheel as in reality two wheels have to be balanced at the same time, and one side affects the other if not carried out this way. Now with marks on both sides of the fan, see if the marks are on the same side of the shaft. If so, weights are usually used on each side of the wheel same as in Paragraph 5.05. If marks shift, the weights are moved till best results are obtained.

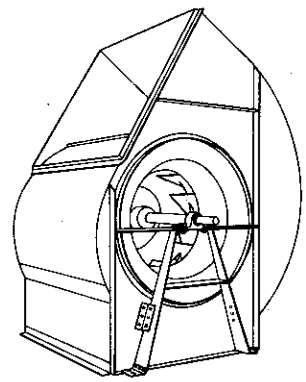


Fig. 10 - Typical Double Width Fan

5.07 A single width fan with a bearing on each side can usually be treated the same as outlined in Paragraph 5.06.

5.08 The balancing of large ventilating fans is usually a project requiring the assistance of the fan manufacturer.

6. MAINTENANCE AND INSPECTION RECORD

6.01 For scheduling and recording maintenance information for ventilating fans, refer to Section H51.350 "Building Mechanical Equipment Scheduling Routine Maintenance."

SAFETY VALVES FOR LOW PRESSURE STEAM BOILERS

1. GENERAL

1.01 This section describes A.S.M.E. Standard safety valves, spring loaded types, recommended for installation on low pressure (15 pounds or less) steam boilers used for heating systems or hot water supply systems, to prevent excess pressure in the boiler under all conditions of operation.

1.02 This section includes recommendations for minimum and maximum safety valve sizes and installation of safety valves, and it also applies to boilers operating under vapor conditions.

1.03 This section replaces Section H34.222, Issue 1, March 1944, Safety and Relief Valves. It is issued to place safety valves in a separate section. The replaced section also dealt with pressure relief valves for hot water storage tanks, hot water heating boilers and hot water supply boilers which are now outlined in the following sections:

(a) Section H34.190, Issue 1, January 1952, Relief Valves for Hot Water Storage Tanks.

(b) Section H34.291, Issue 1, January 1952, Relief Valves for Hot Water Heating Boilers.

(c) Section H34.292, Issue 1, January 1952, Relief Valves for Hot Water Supply Boilers.

It also includes additional information on method of installation not mentioned in the replaced section.

1.04 This section applies generally to new installations. In existing installations non-standard safety valves need not be replaced and installed in accordance with this section provided they are of the spring loaded type, are in operative condition, are testable by means of a substantial integral lifting lever, and have no shutoff valve or other obstruction between the boiler and the safety valves or on the discharge side of these valves.

If, however, there is any doubt as to the effectiveness of an existing valve, it is recommended that a new valve be installed as outlined herein.

1.05 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPE

2.01 Each low pressure steam boiler is provided with one or more A.S.M.E. Standard safety valves of the spring pop type and so constructed that the valve cannot be reset to release at a pressure greater than 15 pounds.

2.02 Seals are attached in such a manner as to prevent safety valve from being taken apart without breaking the seal.

2.03 The standard valve has a substantial integral lifting device. The seats and discs are of non-corrosive materials.

3. MINIMUM AND MAXIMUM INLET SIZE

3.01 The inlet size of standard safety valves used on a boiler is not smaller than 3/4-inch iron pipe size and not larger than 4-1/2-inch iron pipe size.

3.02 Where the capacity of a boiler requires the size of a safety valve to be larger than 4-1/2-inch iron pipe size, two or more safety valves are installed to provide the required capacity. Cross-sectional areas of openings in boilers for safety valves, and of connecting piping when used, are at least equal to the total cross-sectional area of the valves.

4. MARKINGS

4.01 Each standard safety valve is plainly labeled with the manufacturer's name or registered trade mark, the letters "A.S.M.E. Standard" and with the pressure in pounds per square inch at which it is set to blow. These data are usually stamped or cast on a plate securely attached to the casing so as not to be obliterated in normal service.

5. INSTALLATION

5.01 A safety valve is installed on a steam boiler in the opening provided by the boiler manufacturer for this purpose. (See Paragraph 3.02.)

5.02 To insure functional operation of the safety valve at all times, no shutoff and cutout valves or any other means of obstruction are installed between the safety valve and the boiler.

6. DISCHARGE PIPE

6.01 Where a discharge pipe is used, the cross-sectional area is not less than the full area of the safety valve outlet or the total of the outlets of the valves discharging thereinto.

6.02 No shutoff of any description is placed on the discharge pipe between the safety valve and the atmosphere.

6.03 The discharge pipe is run and terminated in such a manner that its end cannot be plugged, capped, frozen or obstructed in any way and so arranged as to properly protect persons and property.

7. MEANS FOR TESTING

7.01 The integral lifting lever on the standard safety valve provides a means for manual testing. By hand operating the lever, the valve disc is raised and the valve will discharge if in operable condition.

LOW WATER CUT-OFF CONTROLS FOR OIL BURNERS

1. GENERAL

1.01 This section describes a type of control recommended to be used to stop oil burners of steam boilers before the water in the boiler drops to a dangerous level and prevents further operation of the burner until the water in the boiler is returned to a safe level. This form of control is commonly known as a low water cut-off.

1.02 This section replaces Section H34.225, Issue 1, February 1945, Low Water Shut-off Controls. It is issued to place this type of control for oil burner in a separate section. It also includes recommendations for method of installation not mentioned in the replaced section. Low water cut-off controls for gas burners and mechanical stokers will be covered in separate sections.

1.03 This section applies to both new and existing oil burner installations in steam boilers. The use of an approved automatic device for shutting down an oil burner associated with a steam boiler if low water occurs in the boiler is recommended by the National Board of Fire Underwriters in Pamphlet No. 31, Paragraph 6, Section 20.

1.04 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPE

2.01 Each steam boiler is equipped with a low water cut-off which automatically stops the operation of the oil burner before the water line drops below the lowest safe water level of the boiler. It may be a separate control or in combination with an automatic water feeder on the boiler.

2.02 Each separate low water cut-off control has a sediment chamber, or if in combination with an automatic water feeder the sediment chamber on the water feeder serves the purpose. An A.S.M.E. approved blow-down valve is used at bottom of the control or water feeder, and this allows the draining of the float chamber of the control or water feeder faster than it flows in from the boiler, thus permitting a check of operation. Also, this blow-down feature provides a means for ridding the unit of sludge, rust and scale which might impair its effective operation. Self-cleaning low water cut-off devices are not recommended.

2.03 Low water cut-off controls in both the separate type and the type in combination with an automatic water feeder automatically reset when a safe water level is restored and allows the burner to start if low water has been the only cause for cutting off the burner. Each type is obtainable with an alarm feature to identify a low water shut down and with a manual reset in place of an automatic reset if either or both are desired.

3. INSTALLATION

3.01 A low water cut-off is connected electrically into the main oil burner supply circuit in such a manner as to shut off the electric power supply to the burner in the event the water level falls to 1/2 inch in the gauge glass of the boiler and restores this power supply when the water level is raised above the 1/2-inch level.

3.02 A separate low water cut-off control may be attached directly either to:

(a) The boiler or water column connections with the bottom equalizer connection of non-ferrous metal, or to

(b) The gauge glass connections using a Y with the gauge glass piping connected to the straightway tapping of the Y and the control connected to the branch of the Y with both equalizer connections of non-ferrous metal. The connecting pipe and fittings are of the size of the fittings in the device if practicable, but need not exceed 1-inch iron pipe size and in no case may they be less than 1/2-inch iron pipe size.

3.03 Regarding the installation of automatic water feeders for boilers, it is recommended that they be attached directly either to boilers, to water column connections or to gauge glass connections as prescribed in Paragraph 3.02 for a separate low water cut-off control. Under this arrangement, where the low water cut-off device is in combination with an automatic water feeder, the requirements recommended for installation of a separate low water cut-off control described in Paragraph 3.02 are fulfilled.

3.04 The blow-down valve of a separate low water cut-off control, or if in combination with an automatic water feeder the blow-down valve of a water feeder, is connected with a vertical straightway drain sized full area of valve connection. This drain is terminated so that the condition of the discharge may be observed, and end is cut at angle of 45 degrees to prevent its being fitted with a plug or cap.

4. MEANS FOR TESTING

4.01 The blow-down valve at the bottom of an individual low water cut-off control or, if in combination with an automatic water feeder, the blow-down valve of the water feeder provides a means for manual testing. By opening this valve, the float chamber of the control or water feeder can be drained of water faster than it flows into it from the boiler, thus causing a condition of low water in the boiler and permits a check on the operation of the low water cut-off mentioned in Paragraph 2.03.

REPLACEMENT PARTS AND PROCEDURES
AIR DRYER KS-16432, LIST 1

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the KS-16432, List 1 air dryer used to furnish dry compressed air to cable systems maintained under continuous gas pressure. It also covers approved procedures for replacing these parts.

1.02 Part 2 of this section covers the part numbers and names of parts which it is practicable to replace in the field in the maintenance of this apparatus. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Replacement Parts.

1.03 Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

2. REPLACEMENT PARTS

2.01 The figures included in this part of the section show various parts in their proper relation to other parts of the appartus. The part numbers and names given are those assigned by the Puregas Equipment Corporation and listed by the Western Electric Company's Merchandise Department. When the part names differ from those in general use in the field, the latter names, in some instances are shown in parentheses.

2.02 When ordering a replacement part, state the part number and name, specify for the KS-16432, List 1 air dryer, and give the Western Electric Company's serial number. For example: "7378B Heater for KS-16432, List 1 Air Dryer, WECo Ser. No. . . . ." Do not refer to the BSP number or to any information given in parentheses.

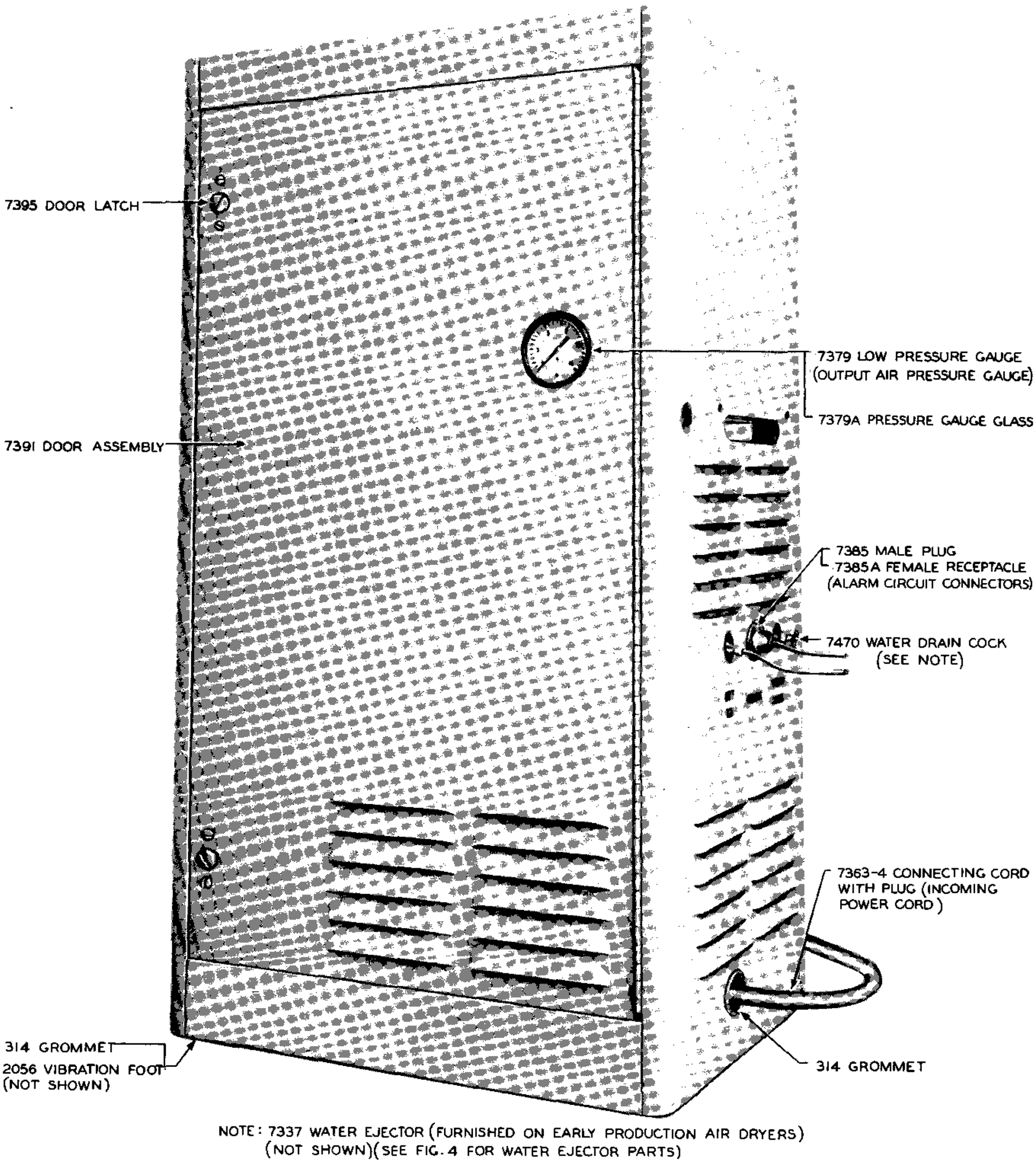


Fig. 1 — KS-16432, List 1 Air Dryer

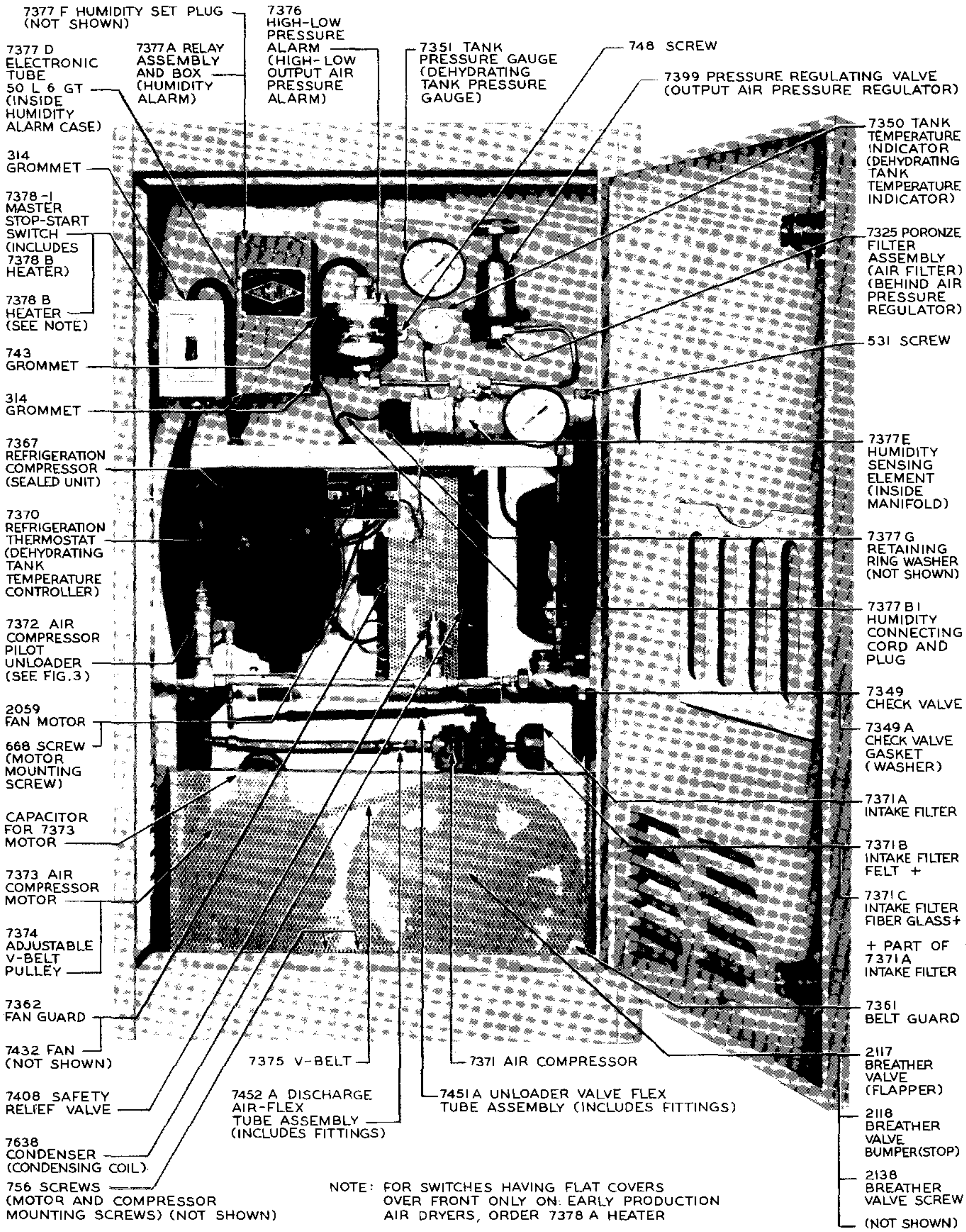


Fig. 2—KS-16432, List 1 Air Dryer — Interior View

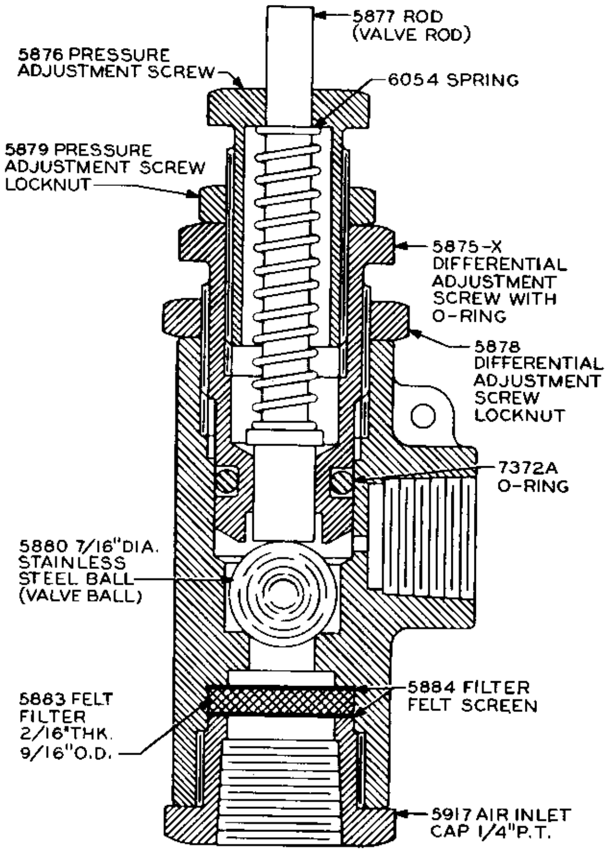


Fig. 3 — 7372 Air Compressor Pilot Unloader

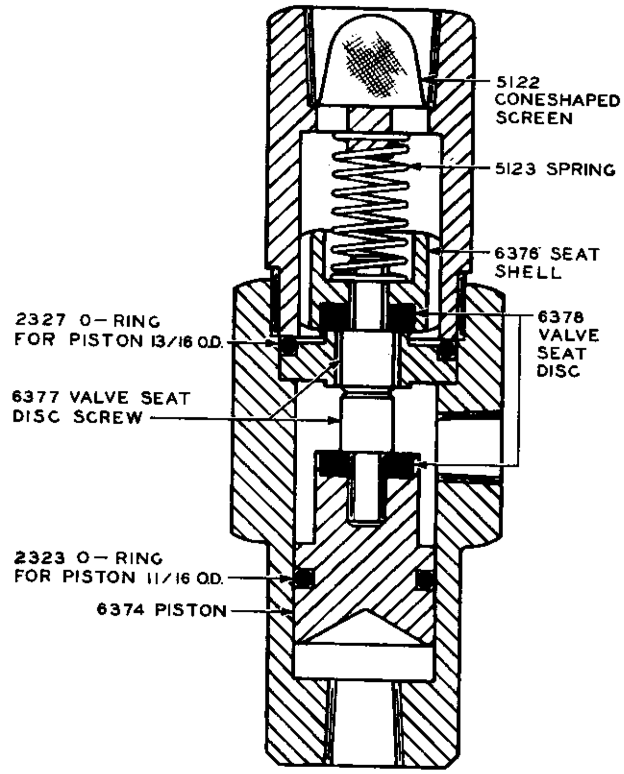


Fig. 4 — 7337 Water Ejector — Furnished on Early Production Air Dryers

3. REPLACEMENT PROCEDURES

3.01 *List of Tools, Gauges, and Materials*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
33	11/32-inch Hex. Single-end Socket Wrench
565A	90-degree Offset Screwdriver
566A	45-degree Offset Screwdriver
KS-14164	Red Sable Round Artist's Show Card Brush
R-1542	6-inch Adjustable Wrench
R-2485	5/32-inch Allen Socket-Screw Wrench

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
R-2512	8-inch Adjustable Wrench
R-2652	9-inch Thin Monkey Wrench
R-5850	5/8- and 3/4-inch Open Double-end Offset Flat Wrench
—	9/16- and 11/16-inch Special Socket Wrench and Crossbar, Stevens-Walden No. 2623
—	8-inch Pipe Wrench, Erie Tool Works
—	3/4- and 13/16-inch Open Double-end Flat Wrench, J. H. Williams & Co No. 731
—	15/16- and 1-inch Open Double-end Flat Wrench, J. H. Williams & Co No. 33C

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	7/16- and 1/2-inch 12-point Offset Box Wrench, J. H. Williams & Co No. 8725
—	Spanner Wrench, American Instrument Co No. 4-4896A
—	4-ounce Riveting Hammer
—	Combination Pliers
—	P-Long-nose Pliers
—	1-1/4-inch Screwdriver, Stanley Tools No. 2012
—	3-inch Cabinet Screwdriver
—	4-inch Regular Screwdriver
—	No. 2 Phillips Type Screwdriver
—	Bearing Puller, Owatonna Tool Co No. 1002 With No. 1002-L1 Single-end Arms
GAUGES	
KS-6938	Feeler Gauge
MATERIALS	
KS-6824	Sealing Compound
—	Electricians Tape
—	Maintenance Kit, Puregas Equipment Corp. 500M. Consists of:
	2323 O-ring for Water Ejector (1)†
	2327 O-ring for Water Ejector (1)†

†Included only in kits ordered for air dryers having serial numbers indicating that they are equipped with water ejectors.

CODE OR SPEC NO.	DESCRIPTION
MATERIALS	
	5883 Felt Filter for Pilot Unloader (2)
	7349A Check Valve Gasket (2)
	7371B Intake Filter Felt (4) — Air Compressor
	7371C Intake Filter Fiber Glass (4) — Air Compressor
	7372A O-ring for Pilot Unloader (2)

3.02 Before making replacement of parts, shut off the air supply to the cable system, remove the alarm circuit connector from the right side of the cabinet, move the master start-stop control to the OFF position, and remove the plug of the power cord from the power supply. Completely release the air pressure in the air dehydrating tank by pulling up on the finger ring of the safety valve. When it is necesary to move the air dryer in order to work from the back of the cabinet, disconnect the cable system air line at the right side of the cabinet. Take care not to damage the air-line tubing while moving the cabinet.

3.03 When it is necessary to take the air dryer out of service, follow local instructions regarding the need for connecting a cylinder of nitrogen gas to the cable system.

3.04 Ordering information for the sealed refrigeration unit and the condensing coil is given in Fig. 2. However, no replacement procedures for these parts are covered in Part 3, since their replacement requires the services of personnel trained in the maintenance of refrigeration equipment.

3.05 No replacement procedures are specified for screws, pipe fittings, grommets, pressure gauge glasses, or other parts where the procedure consists of a simple operation.

3.06 When connecting the threaded fittings, except pressure fittings on copper tubing, apply a small amount of KS-6824 sealing compound to the male pipe thread using the KS-14164 brush. Take care to keep the compound away from the end of the fitting to avoid getting compound into the air system.

3.07 After completing work on the air dryer, check that any tubing disconnected has been reconnected and any guards removed, remounted. Connect the power cord to the power supply and move the master start-stop control to the ON position. When the pressure gauges and temperature indicator show correct pressures and temperature, reconnect the alarm circuit and open the air supply to the cable system.

3.08 After making any replacement of parts, the part or parts replaced shall meet the requirements involved as specified in Section A401.929/H51.330. Other parts whose adjustment may have been directly disturbed by the replacement operation shall be checked to applicable requirements.

3.09 ***Air Compressor: Fig. 2***

(1) Remove the drive belt as covered in 3.12. Disconnect the tubing from the fittings in the cylinder head using the R-1542 wrench. If the tubing does not have flexible sections, also disconnect the other end and remove the tubing to facilitate removal of the compressor. Remove the compressor mounting screws with the Williams No. 8725 wrench and remove the compressor. Transfer the fittings in the cylinder head to the corresponding ports in the cylinder head of the new compressor using the R-1542 wrench.

(2) Mount the compressor and connect the tubing. Mount the drive belt as covered in 3.12. Check the alignment of the compressor and motor pulleys with reference to the belt. If necessary, shift the pulley on the motor shaft. To do this, loosen the setscrew in the inner hub with the R-2485 wrench, reposition the pulley, and securely tighten the setscrew. Mount the belt guard.

3.10 ***Air Compressor Intake Filter Felt and Fiber Glass: Fig. 2***—Unscrew and remove the intake filter from the air compressor. Remove the retaining spring and the screen from the filter housing using the P-long-nose pliers. Remove the filter felt and fiber glass and substitute the new parts. Position the screen against the felt and snap the retaining spring into the groove in the housing. Mount the filter housing on the compressor.

3.11 ***Air Compressor Breather Valve: Fig. 2***— The breather valve is located behind the compressor pulley. To replace parts of the valve, first remove the belt guard mounting screws at each end of the guard using the 3-inch cabinet screwdriver and remove the guard. Remove the valve mounting screw with the Williams No. 8725 wrench and remove the valve stop and flapper. Substitute new parts as required and mount the parts. In order to obtain satisfactory operation of the valve, the clearance between the stop and the flapper at the outer end should be .030 to .035 inch. Use the KS-6938 gauge to check this clearance. If necessary, bend the stop at the mounting screw to obtain this clearance. Mount the belt guard.

3.12 ***Drive Belt: Fig. 2***—Remove the belt guard mounting screws at each end of the guard with the 3-inch cabinet screwdriver and remove the guard. Loosen the setscrew in the front hub of the motor pulley using the R-2485 wrench. Turn the front flange of the pulley counterclockwise and remove this part of the pulley from the shaft. Substitute the new belt. Remount the front flange of the pulley. Position the flange to meet the tension of drive belt requirement in Section A401.929/H51.330. Mount the belt guard.

3.13 ***Motor Capacitor: Fig. 2***—Remove the capacitor housing from the top of the motor using the 1¼-inch Stanley screwdriver. Remove the capacitor and unsolder the leads at the capacitor. Solder the leads to the terminals of the new capacitor. Position the capacitor on the motor and mount the housing.

3.14 ***Motor: Fig. 2***—To replace the motor, proceed as follows:

(1) Remove the drive belt as covered in 3.12. Loosen the setscrew in the rear hub of the pulley with the R-2485 wrench. Remove the pulley from the motor shaft using the bearing puller if necessary. Remove the key from the motor shaft with the combination pliers. Remove the mounting screws at the front of the motor using the Williams No. 8725 wrench.

(2) Loosen the motor terminal box cover screws with the 3-inch cabinet screwdriver and remove the cover. Remove the cord clamp nut from the clamp using the screwdriver and the 4-ounce riveting hammer. Tag and disconnect the external leads using the No. 33 wrench. Remove the nut from the ends of the leads and remove the leads and clamp from the terminal box. Remove the mounting screws at the rear of the motor with the Williams No. 8725 wrench. Remove the motor.

(3) Lubricate the new motor as covered in Section A401.929/H51.330. Remove the plug from the cord clamp hole in the side of the terminal box. Mount the motor and partially tighten the mounting screws at the front. Position the key in the slot in the motor shaft so that the key will be under the setscrew in the rear hub when the pulley is mounted. Mount the rear flange of the pulley. Mount the drive belt as covered in 3.12. Check the alignment of the compressor and motor pulleys with reference to the belt. If necessary, shift the motor on its mounting and the pulley on the shaft to obtain correct alignment and belt tension. Tighten the motor mounting screws and both setscrews in the pulley. Insert the external leads into the terminal box and mount the cord clamp. Connect the leads and mount the terminal box cover. Mount the belt guard.

(4) If, after replacing the motor, the compressor pulley does not rotate in the direction of the arrow on this pulley, reverse the direction of rotation of the motor. Instructions for doing this are given on the back of the terminal box cover or on the motor nameplate.

(5) If the motor speed varies noticeably while the compressor is pumping air, the wiring in the motor terminal box is probably connected for 230-volt instead of for the required 115-volt operation. Instructions for changing the motor to 115-volt operation are given on the back of the terminal box cover, on the nameplate, or on a tag attached to the motor.

3.15 *Master Start-Stop Control Heater*

(1) ***Heater in Control Having Flat Cover (7378A Heater):*** Remove the control cover with the 3-inch cabinet screwdriver. Disconnect the single lead at the bottom of the switch. Remove the switch mounting screws and remove the switch from the housing. Remove the rear cover of the switch. Remove the heater mounting screws and remove the heater. Substitute the new heater and remount the parts in reverse order of removal.

(2) ***Heater in Control Having U-shaped Cover (7378B Heater):*** Remove the control cover with the 3-inch cabinet screwdriver. Pull out the heater, which is located below the switch lever. Plug in the new heater and remount the control cover.

3.16 *Master Start-Stop Control*

(1) ***Control Having Flat Cover:*** Remove the control cover with the 3-inch cabinet screwdriver. Tag and disconnect the leads from the switch terminals. Remove the switch mounting screws and remove the switch from the housing. Remove the mounting nut from the cord clamp using the screwdriver and the 4-ounce riveting hammer. Pull the leads and the cord clamp from the housing. Remove the grommet from the side of the housing and, if satisfactory, use it in the new control. Remove the housing mounting screws using the 4-inch regular screwdriver and remove the housing. Mount the new control having the U-shaped cover as described in (2)(b).

(2) ***Control Having U-shaped Cover***

(a) Remove the control cover with the 3-inch cabinet screwdriver. Tag and disconnect the leads from the switch terminals. Remove the switch mounting screws and remove the switch from the housing. If the housing is satisfactory, mount the switch of the new control in it as covered in (c). If it is necessary to replace the housing, remove the mounting nut from the cord clamp using the screwdriver and the 4-ounce riveting hammer. Pull the leads and cord clamp from the housing. Remove the grommet from the top of the housing and, if satisfactory, use it in the new control. Remove the housing mounting screws with the 4-inch regular screwdriver and remove the housing.

(b) Remove the cover of the new control with the 3-inch cabinet screwdriver. Remove the switch mounting screws and remove the switch from the housing. If the housing of the switch being replaced is to be re-used, proceed as covered in (c). If the housing of the new control is to be used, open the knockout holes in the top and bottom and also those in the back needed for mounting using the 4-ounce riveting hammer. Mount the housing and place a grommet in the top knockout hole. Insert the leads held in the cord clamp through the bottom knockout hole and mount the clamp. Insert the other leads through the top of the housing.

(c) Mount the switch in the housing and connect the leads. Mount the control cover.

3.17 ***Check Valve Washer: Fig. 2***—Remove the check valve cap with the Williams No. 33C wrench while holding the valve body with the R-2652 wrench to avoid bending the tubing attached to the valve. Remove the plunger from the valve body. Remove the washer retaining nut from the bottom of the plunger with the No. 33 wrench. Substitute the new washer and securely tighten the nut. Place the plunger in the valve body and mount the cap.

3.18 ***Check Valve: Fig. 2***—Disconnect the tubing attached to the elbow in the inflow end of the valve using the R-2512 wrench. Hold the fitting in the outflow end of the valve with the R-2512 wrench and remove the valve from the fitting using the R-2652 wrench. Transfer the elbow from the valve being replaced to the inflow end of the new valve. The direction in which the valve passes air can be determined by holding the valve with the cap at the top and blowing through each end. Connect the outflow end of the valve to the fitting on the horizontal tubing with the cap at the top of the valve. Connect the other tubing to the elbow in the valve.

3.19 ***Safety Valve: Fig. 2***—Hold the pipe tee on which the valve is mounted with the 8-inch pipe wrench and remove the valve with the Williams No. 731 wrench. Mount the new valve on the pipe tee. Operate the valve at least once manually under pressure before checking for the requirement covering operation of the safety valve in Section A401.929/H51.330.

3.20 ***Air Compressor Unloader: Fig. 2***—Disconnect the tubing from the fitting in the side of the unloader using the R-2512 wrench. Remove the fitting with the wrench. Hold the pipe tee on which the unloader is mounted with the 8-inch pipe wrench and remove the unloader from the tee using the Williams No. 731 wrench applied to the air inlet cap at the bottom of the unloader. Mount the new unloader on the pipe tee. Mount the fitting in the side of the unloader and connect the tubing.

3.21 ***Air Compressor Unloader Parts***

(1) ***Spring: Fig. 3***—Loosen the pressure adjustment screw locknut with the R-2512 wrench. Remove the pressure adjustment screw with the wrench, taking care not to move the locknut on the screw in order to avoid appreciable change in the pressure setting when the unloader is reassembled. Remove the valve rod. Substitute the new spring on the rod and position the rod in the unloader. Mount the pressure adjustment screw so that its locknut is against the differential adjustment screw. Tighten the locknut.

(2) ***Valve Ball and O-ring: Fig. 3***—Loosen the differential adjustment screw locknut with the R-2512 wrench. Remove the differential adjustment screw with the wrench taking care not to move the locknut on the screw in order to avoid appreciable change in the differential pressure setting when the unloader is reassembled. If the valve ball is to be replaced,

remove the unloader body as covered in 3.20 but do not remove the fitting from the side of the unloader. Tilt the unloader body so that the ball rolls out. Carefully insert the new ball. Mount the unloader body on the pipe tee and reconnect the tubing. Examine the O-ring on the differential adjustment screw and, if it is cracked or shows other signs of deterioration, remove it and substitute a new O-ring. Mount the differential adjustment screw so that its locknut is against the unloader body. Tighten the locknut.

(3) ***Air Inlet Cap, Felt Filter, and Filter Screens: Fig. 3***—To replace any of these parts, remove the unloader as covered in 3.20 but do not remove the fitting from the side of the unloader. Place the unloader in a vise or hold it with the 8-inch pipe wrench and remove the air inlet cap with the Williams No. 731 wrench. Remove the two screens and the filter using a bent piece of wire as a hook. Discard the filter and replace the other parts if necessary. Assemble the new filter, the screens, and the air inlet cap in the unloader body. Remount the unloader and reconnect the tubing.

3.22 ***Water Ejector (Early Production Air Dryers Only): Fig. 4***—Disconnect all tubing from the fittings in the ejector with the R-2512 wrench. Remove the ejector and transfer the fittings to the corresponding ports of the new ejector using the R-2512 and R-2652 wrenches. Reconnect the tubing to the ejector.

3.23 ***Water Ejector Parts: Fig. 4***—Remove the ejector as covered in 3.22. Place the ejector in a vise or hold it with the R-2652 wrench and replace parts as covered below. After replacing parts, reconnect the ejector to the tubing.

(1) ***Screen:*** Remove the fitting from the hexagonal end of the ejector using the R-2512 wrench. Substitute the new screen and remount the fitting.

(2) ***Spring, Valve Seat Discs, Valve Seat Disc Screws, and O-rings:*** Remove the hexagonal end from the midsection of the ejector taking care not to drop the parts as the end is removed. Substitute new parts as required. If a valve seat disc screw is broken and cannot be removed, replace the part in which the screw is mounted. Assemble the parts in the ejector as shown in Fig. 4.

3.24 ***Humidity Alarm***

(1) Remove the alarm cover with the 3-inch cabinet screwdriver. Remove the sensing element cable plug from the receptacle in the alarm. Push out the grommet associated with this cable and withdraw the cable and plug from the alarm housing. Tag and disconnect the 115-volt ac leads from the L1 and L2 terminals and withdraw the leads from the housing. Tag and disconnect the remaining leads and withdraw them. Remove the panel which mounts the alarm parts from the housing by removing the panel mounting screws at each side of the housing using the No. 565A and 566A offset screwdrivers. Take care not to let the panel fall out of the housing when the screws are removed.

(2) Remove the cover of the new alarm and remove the panel which mounts the alarm parts using the 3-inch cabinet screwdriver. Mount the panel in the housing which was left in the air dryer using the No. 565A and 566A offset screwdrivers. Insert the leads into the housing and connect them to the proper terminals. Make sure that the 115-volt ac leads are connected to the L1 and L2 terminals. Insert the sensing element cable and place the plug in the receptacle. Mount the grommet on the cable in the housing. Set the alarm as covered in Section A401.929/H51.330. Mount the alarm cover.

3.25 ***Humidity Sensing Element: Fig. 2***—Using the spanner wrench, remove the ring nut in the end of the manifold. Remove the sensing element carefully from the manifold by pulling on the cable. Take care not to lose the washer behind the molded retaining ring on the cable. Remove the sensing element mounting screw from the bottom of the axial hole in the element using the 3-inch cabinet screwdriver. Remove the element from its socket and substitute the new element. Tighten the mounting screw. Carefully insert the element into the manifold, seat the washer on the cable retaining ring and push the retaining ring into the manifold. Mount and tighten the ring nut.

3.26 ***Humidity Sensing Element Cable: Fig. 2***— To replace the cable, which includes the plug on one end and the socket on the other, proceed as follows:

(1) Remove the sensing element cable plug from the receptacle in the humidity alarm. To do this, remove the alarm cover with the 3-inch cabinet screwdriver. Push out the humidity alarm grommet and withdraw the cable and plug from the alarm housing. Remove this grommet from the cable.

(2) Remove the conduit cover mounting screws at each end of the conduit. Carefully move the temperature controller tubing away from the cover and swing the left end of the cover away from the panel. Remove the sensing element grommet from the U-shaped hole in the cover and remove the cable. Remove the tape from the cable, straighten the cable, and remove the grommet.

(3) Remove the sensing element from the manifold and the element from the cable socket as covered in 3.25. Remove the ring nut from the cable.

(4) Slide the ring nut over the plug end of the cable and position the nut adjacent to the molded retaining ring. Place a new retaining ring washer on the retaining ring from the socket end of the cable. Mount the sensing element in the cable socket and the element and socket in the manifold as covered in 3.25.

(5) Insert the plug and cable through the hole in the humidity alarm housing and mount the plug in the alarm receptacle. Mount the humidity alarm grommet. Remount the alarm cover.

(6) Loop the sensing element cable and slide the conduit grommet on the loop. Fold the looped portion of the cable and hold the folds together with electricians tape. Place the folded portion of the cable in the conduit, mount the grommet in the conduit cover, and remount the cover.

3.27 ***High-low Output Air Pressure Alarm: Fig. 2***

(1) To replace the pressure alarm, first remove the humidity alarm cover using the 3-inch cabinet screwdriver. Tag and disconnect the pressure alarm leads from terminals 1 and 2 and remove these leads from the humidity alarm. Disconnect the tubing attached to the elbow in the bottom of the pressure alarm using the R-1542 wrench. Remove the pressure alarm mounting screws with the 4-inch regular screwdriver and remove the alarm. Remove the elbow from the alarm with the wrench.

(2) Remove the sealing plug from the port in the bottom of the new alarm and mount the elbow in the port. Mount the alarm and connect the tubing to the elbow. Insert the pressure alarm leads into the humidity alarm. Referring to the tracer markings on the tagged leads of the alarm being replaced, connect the leads of the new alarm to the proper terminals in the humidity alarm. Mount the humidity alarm cover. Check the requirement for operation of high-low output air pressure alarms in Section A401.929/H51.330.

3.28 ***Dehydrating Tank Temperature Indicator:*** Grasp the indicator mounting bushing in the panel behind the indicator and carefully pull it out of the hole in the panel. In doing this, take care not to damage the temperature controller tubing which is inserted in the panel hole with the bushing. Slide the stem of the tank temperature indicator out of the coiled portion of the temperature controller tubing. Then slide the stem of the indicator out of the bushing. Mount the new tank temperature indicator by following the above procedures in reverse order.

3.29 ***Dehydrating Tank and Output Air Pressure Gauges: Fig. 1 and 2***— To replace either gauge, apply the R-5850 wrench to the square section at the back of the gauge case and unscrew the gauge from its mounting. In removing or mounting a gauge, do not put any strain on the case in order to avoid damaging the mechanism. Mount the new gauge.

3.30 ***Output Air Pressure Regulator: Fig. 2***— To replace the regulator proceed as follows:

(1) Remove the dehydrating tank temperature indicator as covered in 3.28 and the tank pressure gauge as covered in 3.29.

(2) Remove the manifold as follows. Using the R-1542 wrench, remove the tubing between the manifold and output air pressure regulator and between the manifold and output air pressure alarm. Disconnect the tubing at the bottom of the manifold. Remove the manifold clamp mounting screws with the No. 2 Phillips screwdriver. Support the manifold by a piece of wire attached to the pressure alarm. Take care not to damage the sensing element cable or the pressure gauge on the manifold.

(3) Loosen the regulator handwheel locknut with the R-1542 wrench. Remove the handwheel and unscrew the regulator from its mounting using the Williams No. 33C wrench.

(4) Transfer the fitting in the regulator being replaced to the corresponding port of the new regulator. Remove the handwheel from the new regulator. Mount the new regulator and other parts removed by following the above procedures in the reverse order.

3.31 *Air Filter: Fig. 2*—To replace the air filter which is part of the fitting on which the output air pressure regulator is mounted, proceed as follows. Remove the regulator as covered in 3.30. Remove the air filter using the Stevens-Walden socket wrench and crossbar. Mount the new air filter and other parts removed by following the above procedures in reverse order.

3.32 *Refrigeration Fan: Fig. 2* — Remove the fan motor bracket mounting screws and nuts using the R-1542 and the Williams No. 8725 wrenches. Shift the bracket so that the fan mounting nut is accessible. Remove the nut using the R-1542 wrench. Substitute the new fan and securely tighten the nut. Position the fan motor mounting bracket and tighten the mounting screws and nuts.

3.33 *Refrigeration Fan Motor: Fig. 2*

(1) Using the 3-inch cabinet screwdriver disengage the mounting screw of the terminal cover on the refrigeration unit. Slide the cover back on the leads. Note the terminals to which the motor leads are connected. Disconnect these leads and withdraw them from the cover.

(2) Remove the fan motor bracket mounting screws and nuts using the R-1542 and the Williams No. 8725 wrenches. Remove the bracket and motor. Remove the fan mounting nut with the R-1542 wrench and remove the fan. Remove the motor mounting screws with the No. 2 Phillips screwdriver and remove the motor.

(3) Mount the new motor on the bracket and tighten the mounting screws. Mount the fan on the motor shaft and tighten the fan mounting nut. Position the fan motor mounting bracket and tighten the mounting screws and nuts. Pass the motor leads through the terminal cover and connect the leads to the proper terminals. Mount the terminal cover and tighten the cover screw.

3.34 *Dehydrating Tank Temperature Controller: Fig. 2*

(1) Remove the tank temperature indicator and associated temperature controller tubing by grasping the mounting bushing in the panel behind the indicator and carefully pulling it out of the hole in the panel. Slide the stem of the indicator out of the coiled portion of the tubing.

(2) Pull the knob off the shaft of the temperature controller. Support the controller and remove the controller mounting screws at the front of the controller using the 3-inch cabinet screwdriver. Remove the controller. Remove the rear cover mounting screw and remove the cover. Disconnect the leads from the controller terminals.

(3) Remove the rear cover of the new controller and connect the leads to the terminals. Remount the cover. Mount the controller in the air dryer.

(4) Measure the uncoiled portion of the tubing of the controller being replaced. Lay off this length on the tubing of the new controller and starting at this point coil the

remainder of the tubing around the stem of the temperature indicator. Position the coiled portion of the tubing on the stem so that the outer end of the coil is in line with the end of the stem. Carefully insert the stem of the indicator with the coiled tubing through the hole in the panel and seat the indicator mounting bushing in the hole.

AIR DRYER — KS-16523, LIST 1

1. GENERAL

1.001 This addendum supplements Section A401.930/H51.332, Issue 1.

1.002 This addendum is issued to revise the requirements covering lubrication, operation of the air compressor unloader and water ejector; to add caution on draining the tank after checking the water ejector operation on air dryers equipped with manual drain valves; to add a requirement and procedure covering cleaning of the humidity sensing element; to revise the list of tools and materials, the procedures covering lubrication, the operation of air compressor unloader and the water ejector, the information on the intervals for checking requirements, and on the humidity alarm.

2. REQUIREMENTS

The following changes apply to Part 2 of the section.

(a) 2.04 — revised

(b) 2.10 — replaced by 2.10(a) and (b)

(c) 2.11 and 2.12 — heading revised

(d) 2.08(c) and 2.14 — added

2.04 *Changing Oil in Crankcase of Air Compressor:* The oil in the crankcase shall be changed after the first month of operation and thereafter at 3-month intervals. After removing the oil, the crankcase shall be flushed and then refilled with fresh KS-16729, List 1 oil.

2.08 *Operation of Compressor Unloader*

(c) The compressor unloader shall be cleaned at 6-month intervals.

2.10 *Operation of Water Ejector*

(a) The water ejector shall operate to discharge condensate from the air dehydrating tank during operation and release of the air compressor unloader. This requirement shall be checked weekly.

Gauge by feel.

To check this requirement, place a finger at the water drain outlet. If a pipe is attached to the outlet, disconnect the pipe. Discharge of condensate and air through the water drain will be indicated by a short discharge whenever the compressor unloader operates and releases.

Caution: After checking this requirement on air dryers equipped with a manual drain valve adjacent to the water ejector, open the valve to remove any water remaining in the tank in order to avoid build up of water in the tank under certain conditions.

(b) The water ejector shall be cleaned at 6-month intervals.

2.11 *Operation of Output Air Pressure Regulator:* (also applies to KS-16648 Dual Pressure Kit, if provided — see 1.06)

2.12 *Operation of High-Low Output Air Pressure Alarms:* (applies also to KS-16648 Dual Pressure Kit, if provided — see 1.06)

2.14 *Cleaning of Humidity Sensing Element*

(a) The sensing element shall be cleaned at 3-month intervals.

(b) The sensing element inside the shield shall be free from oil.

Gauge by eye.

3. ADJUSTING PROCEDURES

The following changes apply to Part 3 of the section.

(a) 3.001, 3.02(1), 3.04(3), 3.08(6)(7), and 3.10(2) — revised

(b) 3.14 — added

3.001 *List of Additional Tools and Materials*

CODE OR SPEC. NO.	DESCRIPTION
TOOLS	
—	Combination Pliers
MATERIALS	
KS-16729, List 1	Oil

3.02 *Lubrication of Air Compressor* (Rq 2.02)

(1) Remove the plug and attached stick oil gauge from the filler hole in the crankcase. Add sufficient KS-16729, List 1 oil to bring the oil level in the crankcase to just below the top mark in the stick gauge. Remount the plug and gauge. Move the air compressor start-stop control to the ON position and observe the oil pressure gauge.

3.04 *Changing Oil in Crankcase of Air Compressor* (Rq 2.04)

(3) Flush the crankcase as follows. Put approximately three pints of fresh KS-16729, List 1 oil in the crankcase. Remount the filler plug. Operate the compressor for several minutes. Remove the oil as covered in (1). If an oil drain is provided, close the valve and disconnect the pipe extension. Refill the crankcase as covered in 3.02. The capacity of the crankcase is three pints.

3.08 *Operation of Air Compressor Unloader* (Rq 2.08)

(6) Place the unloader in a vise and referring to Fig. 4, loosen the pressure and differential adjustment screw locknuts and the air inlet cap with the R-2652 wrench. Remove the two adjustment screws, the spring, valve rod, and valve ball from one end of the unloader body and the air inlet cap, filter screens, and felt filter from the opposite end. Discard the felt filter and the 0-ring. Clean the other parts and the inside of the unloader body using a KS-14666 cloth moistened with KS-7860 petroleum spirits.

(7) Place a new 0-ring on the differential adjustment screw. Reassemble the unloader as shown in Fig. 4 using a new felt filter. Remount the unloader and reconnect the tubing.

3.10 *Operation of Water Ejector* (Rq 2.10)

(2) Place the ejector in a vise, and referring to Fig. 5, remove the cap with the R-2512 wrench. Remove the seat shell, spring, and screen from the cap, and the seat insert and piston from the body. Remove and discard the 0-rings on the seat insert and the piston. Remove the valve seat disc screws from the seat shell and the piston using the combination pliers. Remove and discard the valve seat discs. Clean the valve parts and the inside of the cap and the body with a KS-14666 cloth moistened with KS-7860 petroleum spirits. Clean the screen by washing it in KS-7860 petroleum spirits. Wipe the parts with a dry KS-14666 cloth. Mount new 0-rings and valve seat discs and reassemble the ejector as shown in Fig. 5 and mount it in the air dryer. Reconnect the tubing.

3.14 *Cleaning of Humidity Sensing Element* (Rq 2.14)

(1) Before removing the sensing element, remove the office alarm circuit connector from the alarm plug on the top rear of the cabinet to prevent operation of the office alarm. Shut off the air supply to the cable system. Loosen the locknut on the output air pressure regulator using the R-1542 wrench. Shut off the regulator by turning the handwheel a few turns counterclockwise.

(2) Remove the sensing element cable retaining nut from the end of the manifold containing the element using the spanner wrench if it is a ring nut and the R-2652 wrench if it is a hex nut. Remove the element from the manifold by pulling gently on the cable taking care not to lose the 0-ring behind the retaining ring molded on the cable.

***Caution:** Avoid excessive flexing of the cable since this might damage the leads. Extreme care should be taken in removing and han-*

dling the sensing element. Do not use an ohmmeter to measure the resistance of the sensing element or in any manner apply a dc voltage to the element as this will damage it.

(3) Clean the outer surfaces of the sensing element shield by wiping with a clean KS-14666 cloth. Make sure that oil or other foreign material is removed. Also wipe the inside of the manifold with a clean cloth, successively using different sections of the cloth, until the cloth indicates that the inner surfaces of the manifold are clean and free from oil.

(4) Observe the condition of the sensing element by looking through the holes in the shield. If there is any indication of oil on the element, replace the element.

(5) Before mounting the sensing element in the manifold, check for operation of the humidity alarm as covered in 4.05.

4. GENERAL INFORMATION

The following changes apply to Part 4 of the section.

(a) 4.03, 4.04 and 4.05 — revised

4.03 *Intervals for Checking Requirements:* Checking intervals are specified in connection with requirements 2.02, 2.04, 2.05, 2.08(c), 2.10, and 2.14 covering lubrication and changing oil of the air compressor, replacement of the air inlet filter felt, operation of air compressor unloader, operation of the water ejector and cleaning of humidity sensing element. Questions may arise regarding suitable intervals for checking other requirements in setting up maintenance programs for the air dryer. These intervals may vary with local conditions and practices and have not been specified in connection with the requirements. However, the following list of suggested checking intervals may serve as an aid in formulating maintenance programs.

REQUIREMENT		SUGGESTED CHECKING INTERVAL
2.01	(Cleaning)	See Note
2.06	(Tension of Drive Belts)	Weekly
2.07	(Safety Valve)	3 Months
2.08 (a) (b)	(Air Compressor Unloader)	Weekly
2.09	(Air Compressor)	Weekly
2.11	(Output Air Pressure Regulator)	Weekly
2.12	(Output Air Pressure Alarm)	3 Months
2.13	(Refrigeration System)	Weekly

Note: In order to maintain proper operation of the refrigeration system, the fins and tubing of the refrigerant condensing coil and the blades of the fan should be inspected frequently and cleaned when necessary.

Humidity Alarm

4.04 *Alarm Setting:*

(a) Fig. 7 is a schematic of the alarm and shows the adjustable resistor used to set the alarm to the proper control point by turning a slotted shaft inside the alarm housing. On air dryers W.E. Serial No. 206 and higher, the resistor shaft is locked in this position by the manufacturer by means of a threaded sleeve on the shaft. On earlier air dryers the locking sleeve was not provided and the shaft is positioned as described in (b). The set plug furnished with these air dryers is not required and may be discarded. The alarm is set in the following manner with the air dryer delivering air to the cable system and with the dehydrating tank temperature about 40F.

(b) To set the alarm remove the office alarm circuit connector from the alarm plug on the top rear of the cabinet and connect the 81A test set to the plug to indicate closure of the alarm contacts. Remove the alarm cover using the Stanley screwdriver and turn the slotted shaft counterclockwise to the stop. Turn the shaft slowly clockwise until the test set buzzer operates, then counterclockwise just sufficiently to cut out the buzzer.

4.05 ***Operating Check***

(a) The alarm should operate if the relative humidity of the air passing through the manifold exceeds about 5 per cent at 70F. Although it is impracticable to test the sensitivity of the alarm in the field, a rough operating check can be made as described in (b). This check should be made with the sensing element removed from the manifold after cleaning the element as covered in requirement 2.14.

(b) With the office alarm circuit connector removed from the alarm plug, remove the humidity alarm cover using the Stanley screwdriver. Then, using the 3-inch cabinet screwdriver, disconnect the lead to the air pressure alarm from terminal 1 taking care not to remove the lead to the alarm plug. With the air compressor start-stop control in the ON position, connect the 81A test set to the alarm plug. Operation of the buzzer indicates operation of the alarm. If the buzzer does not operate, breathe on the sensing element. If the buzzer still does not operate, make sure that the cable from the sensing element is securely plugged into the receptacle in the alarm case. Examine the cable for a broken conductor and replace the cable, if necessary. If the cable is satisfactory, replace the sensing element.

(c) Mount the sensing element in the manifold and open the air line to the cable system. Adjust the output air pressure regulator to meet requirement 2.11. Reconnect the air pressure alarm lead to terminal 1 on the humidity alarm and mount the cover. When the buzzer stops, remove the test set from the alarm plug and connect the office alarm circuit.

RELIEF VALVES FOR HOT WATER SUPPLY BOILERS

1. GENERAL

1.01 This section describes A.S.M.E. Standard relief valves, spring loaded types, recommended for installation on hot water supply boilers to prevent excess pressure in the boiler under all conditions of operation.

1.02 This section includes recommendations for minimum and maximum relief valve sizes and installation of these relief valves.

1.03 This section is issued to place relief valves for hot water supply boilers in a separate section. Pressure relief valves for hot water supply boilers were treated in Section H34.222, Issue 1, March 1944, Safety and Relief Valves, which is replaced by Section H34.290, Issue 1, January 1952, Safety Valves for Low Pressure Steam Boilers. It also includes recommendations for installation not mentioned in the replaced section.

1.04 This section applies generally to new installations. In existing installations non-standard relief valves need not be replaced and installed in accordance with this section provided they are of the spring loaded type, are in operative condition, are testable by means of a substantial integral lifting lever, and have no shutoff valve or other obstruction between the boiler and the relief valves or on the discharge side of these valves.

If, however, there is any doubt as to the effectiveness of an existing valve, it is recommended that a new valve be installed as outlined herein.

1.05 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPE

2.01 Each hot water supply boiler is provided with A.S.M.E. Standard pressure relief valve set by the manufacturer to release at a pressure not to exceed the maximum allowable working pressure of the boiler.

2.02 Standard pressure relief valves are of the spring loaded type without disc guides below seat and have a substantial integral lifting device. Seats and discs are of non-corrosive material.

2.03 Each standard pressure relief valve has a relief outlet connection.

2.04 The relief valves are selected with a rating in relieving capacity in British Thermal Units per hour at least matching the gross output of the hot water supply boiler in British Thermal Units per hour to prevent excess pressure under all conditions of operation such as improperly prolonged firing, a bottled up system, etc.

3. MINIMUM AND MAXIMUM INLET SIZE

3.01 The size of standard pressure relief valves used in connection with hot water heating boilers is not smaller than 3/4-inch iron pipe size and not larger than 2-inch iron pipe size.

3.02 Where the capacity of a hot water heating boiler requires the size of a relief valve to be larger than 2-inch iron pipe size, two or more relief valves are installed to provide the required capacity. Cross-sectional areas of the openings in the boilers for relief valves, and of the connecting piping when used, are at least equal to the total cross-sectional area of the valves.

4. MARKINGS

4.01 Each standard pressure relief valve is plainly labeled with the manufacturer's name or registered trade mark, the letter "A.S.M.E. Standard," the pressure in pounds per square inch at which it is set to release and the relieving capacity in British Thermal Units per hour. These data are usually stamped or cast on a plate securely attached to the casting so as not to be obliterated in normal service.

5. INSTALLATION

5.01 A pressure relief valve is installed on a hot water supply boiler in the opening provided by the boiler manufacturer for this purpose. (See Paragraph 3.02.) The purpose of this pressure relief valve is to provide individual protection for the supply boiler and is in addition to the pressure relief device described in Section H34.190, Issue 1, January 1952, Relief Valves for Hot Water Storage Tanks.

5.02 The relief outlet is connected with discharge piping, brass or copper, sized full area of this outlet connection. The discharge is run within the building and terminates at an open plumbing fixture where available or within 12 inches of the boiler room floor. This piping pitches down from the valve it serves to prevent trapping of water. If piping is run into the drainage system, it is not connected directly but as an indirect waste. Terminating end of discharge piping is cut at 45 degrees to prevent its being capped or plugged, thus insuring full relief discharge. Where two or more valves are connected to same discharge, the pipe area is not less than area of all valves it serves. This arrangement of the discharge adequately protects personnel and property.

5.03 To further insure functional operation of the relief valves at all times, no shutoff or cutout valves or any means of obstruction are installed between the relief valves and the boiler or on the discharge piping.

6. MEANS FOR TESTING

6.01 The integral lifting lever on the standard pressure relief valve provides a means for manual testing. By hand operating the lever, the valve disc is raised and the valve will discharge if in operable condition.

RELIEF VALVES FOR HOT WATER STORAGE TANKS

1. GENERAL

1.01 This section describes A.S.M.E. Standard pressure and temperature relief valves, spring loaded types, recommended for installation on hot water storage tanks to prevent excess pressure and temperature in the tank under all conditions of operation.

1.02 This section includes recommendations for minimum and maximum relief valve sizes and installation of relief valves. In addition, it advises of a device for vacuum relief for use only where required by local and/or state regulation.

1.03 This section is issued to place relief valves for hot water storage tanks in a separate section. Pressure relief valves for hot water storage tanks were mentioned under Section H34.222, Issue 1, March 1944, Safety and Relief Valves, which is replaced by Section H34.290, Issue 1, January, 1952, Safety Valves for Low Pressure Steam Boilers. It also includes recommendations for temperature relief and for vacuum relief where required together with methods of installation not covered in the replaced section.

1.04 This section applies generally to new installations. In existing installations non-standard relief valves need not be replaced and installed in accordance with this section provided they are of the spring loaded type, are in operative condition, are testable by means of a substantial integral lifting lever and have no shutoff valve or other obstruction between the tank and the relief valves or on the discharge side of these valves.

If, however, there is any doubt as to the effectiveness of an existing valve, it is recommended that a new valve be installed as outlined herein.

1.05 Hot water storage tanks referred to in this section include:

(a) Tanks in which hot water is stored but is heated in a separate hot water supply boiler or heater used exclusively for that purpose.

(b) Tanks in which hot water is stored but is heated by means of heat exchanging devices, either inside or outside the tank, connected to the building heating plant or to a separate steam boiler provided for that use.

(c) Tanks of storage type gas fired, electric, and oil fired water heaters.

1.06 Where local and/or state codes, rules, and regulations call for higher requirements than these indicated or implied in this section, such authority takes precedence and its requirements are followed; where those requirements are lower than these in this section, compliance with the provisions of this section is recommended.

2. RECOMMENDED TYPES

2.01 Each hot water storage tank is provided with A.S.M.E. Standard relief valves set by the manufacturer to discharge at a pressure not more than 15 pounds higher than the maximum working pressure stamped on the tank and to discharge when hot water from tank is at a temperature not higher than the boiling point of water at atmospheric pressure; the temperature relief closes when temperature of hot water has been reduced approximately 35 degrees lower than relief temperature. Only where required by local and/or state authority is relief for vacuum in a tank provided; this type of device relieves vacuum instantly at a minus pressure not greater than 1 inch of vacuum.

2.02 A standard combination pressure and temperature relief valve or two individual relief valves, one for pressure and one for temperature, may be used. The use of individual valves is recommended. (See Paragraph 5.03.)

2.03 The standard valves are of the spring loaded type without disc guides below the seat or pressure side of the valve. If the valve is an individual pressure relief or a combination pressure and temperature relief, it has a substantial integral lifting device.

2.04 The standard individual temperature relief valve is an automatic type in that it discharges hot water until the hot water has been reduced to a temperature below the atmospheric boiling point, then the valve closes; its capacity is governed by the maximum heating rate of the hot water heating equipment.

2.05 Standard relief valves have seats and discs of non-corrosive materials.

2.06 Each standard individual pressure and temperature relief valve and combination pressure and temperature relief valve has a relief outlet connection.

2.07 Where vacuum relief is required, valves of the ball check type are not allowed for this purpose. Vacuum relief devices do not have relief outlet connections as none is necessary. A vacuum relief valve is made of materials that will not corrode or hold fast to the seat after prolonged use.

2.08 Pressure and temperature relief valves are selected with a rating in relieving capacity in British Thermal Units per hour at least matching the gross output of the heating medium for the water of the storage tank in British Thermal Units per hour to prevent excess pressure and increase in water temperature in the tank above the relieving temperature under all conditions of operation such as improperly prolonged firing of the heating source, a bottled up system, etc.

3. MINIMUM AND MAXIMUM INLET SIZE

3.01 The inlet size of standard relief valves used in connection with hot water storage tanks is not smaller than 3/4-inch iron pipe size and not larger than 2-inch iron pipe size.

3.02 Where the capacity of a hot water storage tank requires the size of a relief valve to be larger than 2-inch iron pipe size, two or more relief valves are installed to provide the required capacity. Cross-sectional areas of tappings in tanks for relief valves and of piping used in this connection are at least equal to the total cross-sectional area of the valves.

4. MARKINGS

4.01 Each standard relief valve is plainly labeled with the manufacturer's name or registered trade mark and the letters "A.S.M.E. Standard."

4.02 In addition to the foregoing markings, other markings are as follows:

(a) On combination pressure and temperature relief valves, the pressure in pounds per square inch, the temperature in degrees Fahrenheit, and relieving capacity in British Thermal Units per hour at which the valve is set to discharge.

(b) On an individual pressure relief valve or on an individual temperature relief valve, the pressure in pounds per square inch or temperature in degrees Fahrenheit, and relieving capacity in British Thermal Units per hour at which the valve is set to discharge.

4.03 These data are usually stamped or cast on a plate securely attached to the casting so as not to be obliterated in normal service.

4.04 In the case of a vacuum valve or other approved device used to prevent a vacuum in the tank, any vacuum valve or similar device bearing the mark of a recognized manufacturer is acceptable.

5. INSTALLATION

5.01 An individual temperature relief valve or a combination pressure and temperature relief valve is installed directly on top or within 12 inches of top of a hot water storage tank in a tapping in tank. Such valves may be placed on the flow pipe from top of tank within 8 inches, developed length, from top of tank and within 2 inches of flowing water. The tapping or piping is not smaller in cross-sectional area than the cross-sectional area of the inlet of the valve.

5.02 An individual pressure relief valve is installed in the hot or cold water supply above tank between control valve and tank and this piping is not smaller in cross-sectional area than the cross-sectional area of the inlet of the valve. If installed in this manner on the cold water supply, contact of the valve disc with hot water is eliminated thus reducing the possibility of the valve leaking.

5.03 It is recommended that a standard individual temperature relief valve and a standard individual pressure relief valve be installed in preference to a combination pressure and temperature relief valve; the temperature relief valve is installed on the tank and the pressure relief valve is located in the cold water piping as described in Paragraphs 5.01 and 5.02, respectively. The installation of the pressure relief valve on the cold water supply piping reduces the tendency for the build-up of scale which might interfere with the operation of the valve.

5.04 The relief outlet is connected with discharge piping, brass or copper, sized full area for this outlet connection. The discharge piping is run within the building and terminates at an open plumbing fixture where available or in the basement within 12 inches of the floor. This piping pitches down from the valve it serves to prevent trapping of water. If piping is run into the drainage system, it is not connected directly but as an indirect waste. Terminating end of discharge piping is cut at 45 degrees to prevent its being capped or plugged, thus insuring free relief discharge. Where two or more valves are connected to same discharge, the pipe area is not less than area of valves it serves. This arrangement of the discharge adequately protects personnel and property.

5.05 Where required, a vacuum relief valve is installed on the cold water supply piping to tank above tank; where cold water supply enters below top of tank from a water supply located below tank, the supply pipe is raised to above top of tank forming a loop and the vacuum valve is placed on top of loop above tank.

5.06 To further insure functional operation of the relief valves at all times, no shutoff or cutout valves or any means of obstruction are installed between the relief valves and the tank or on the discharge piping.

6. MEANS FOR TESTING

6.01 The integral lifting lever on the standard combination pressure and temperature relief valve and individual pressure relief valve provides a means for manual testing. By hand operating the lever, the valve disc is raised and the valve will discharge if in operable condition.

REPLACEMENT PARTS AND PROCEDURES

KS-16001 DEHYDRATOR

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the KS-16001 dehydrator. It also covers the approved procedures for replacing these parts.

1.02 This section is reissued to include information for the KS-16001 dehydrator operating on a humidity-cycled basis. Distribution of issue 2 of this section was limited. It was cancelled on discovery of a printing error.

1.03 Part 2 of this section covers the part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of the dehydrator. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Replacement Parts.

1.04 Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

2. REPLACEMENT PARTS

2.01 The figures included in this part show the replaceable parts in their proper relation to the other parts of the apparatus. The part numbers of the various parts are given together with the names listed by the Western Electric Company Merchandise Department. When these names differ from those in general use in the field, the latter names, in some instances, are shown in parentheses.

2.02 When ordering parts for replacement purposes, give both the part number and the name of the part and state that the part is for the KS-16001 Dehydrator. For example: "C-1527-9 Blower Motor for the KS-16001 Dehydrator." The part numbers and names specified in this section, except the pressure switch, are names of parts assigned by the Pittsburgh Lectrodryer Corporation. Do not refer to the BSP number or to any information shown in parentheses.

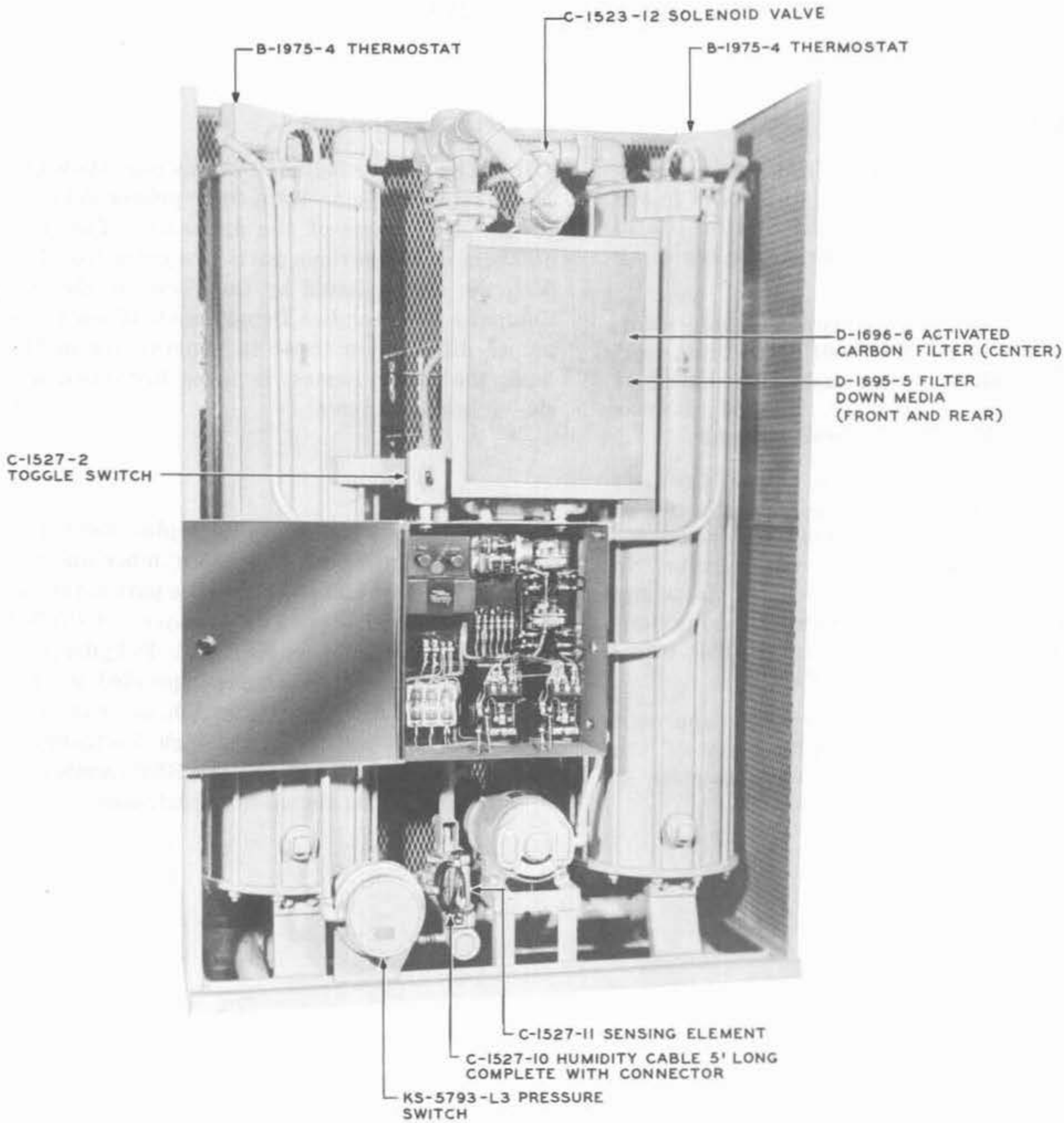


Fig. 1 – Front View With Time Cycle Operation

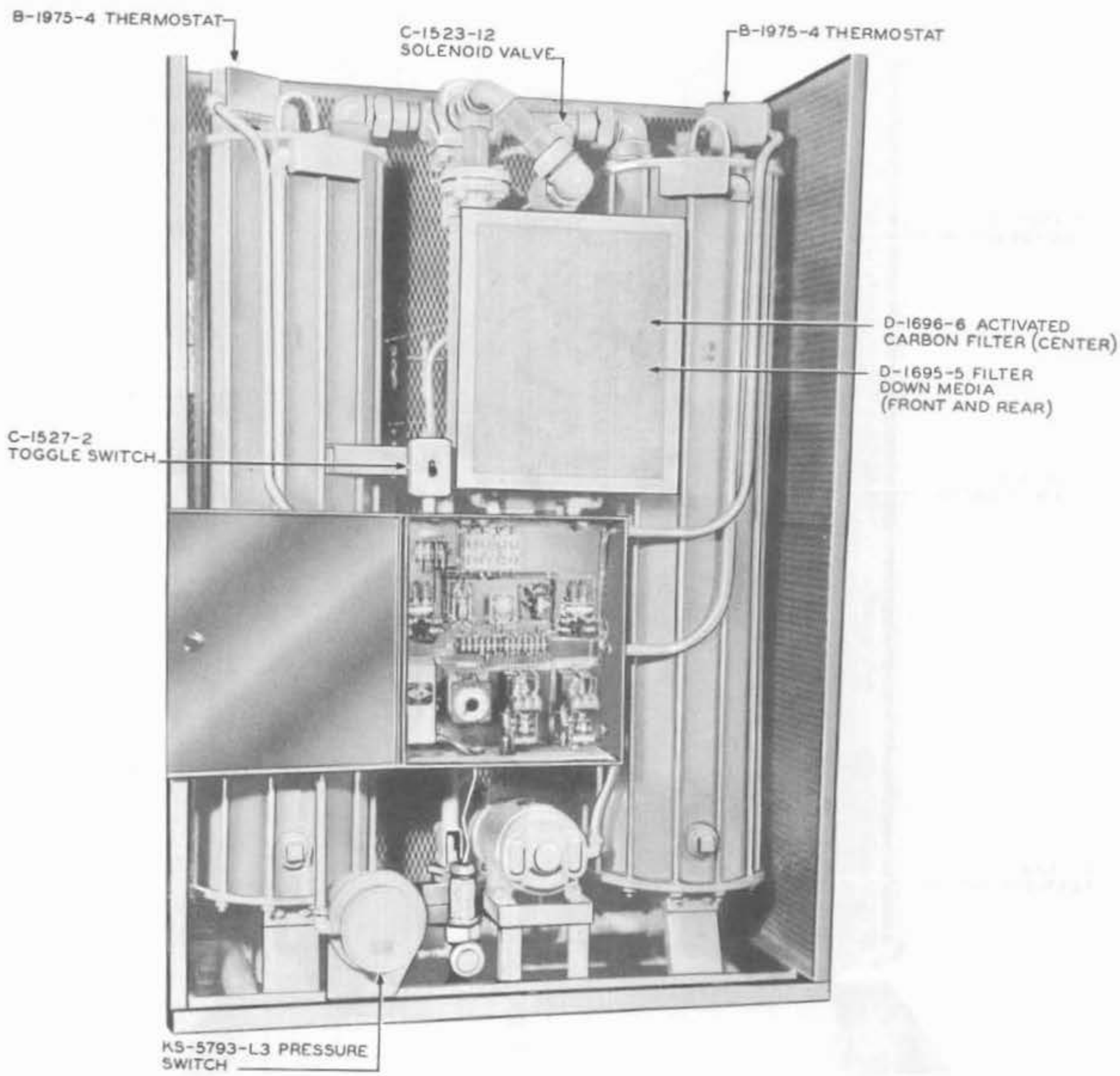


Fig. 2 – Front View With Humidity Cycle Operation

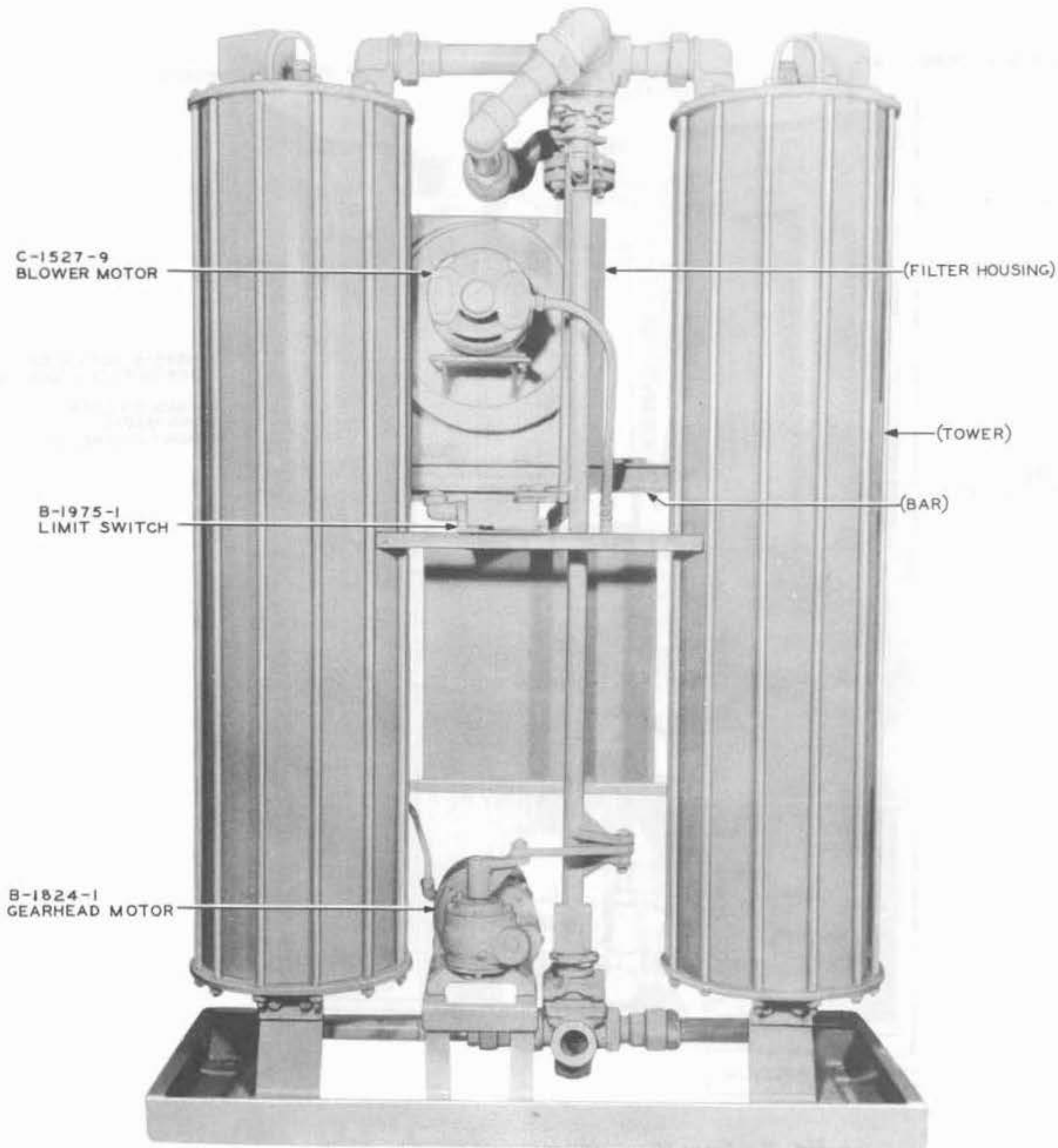


Fig. 3 – Rear View

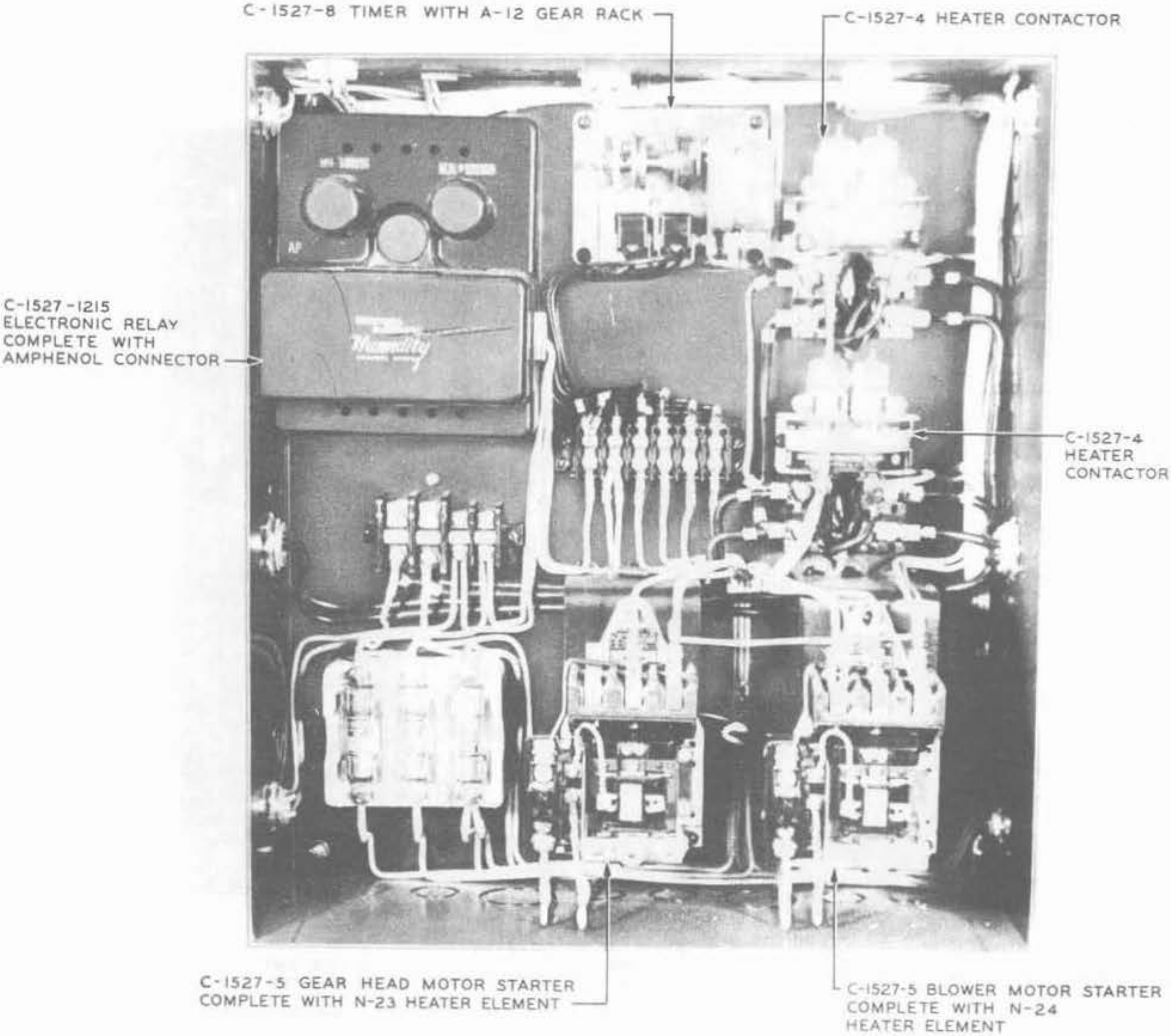


Fig. 4 – Control Box For Time Cycle Operation

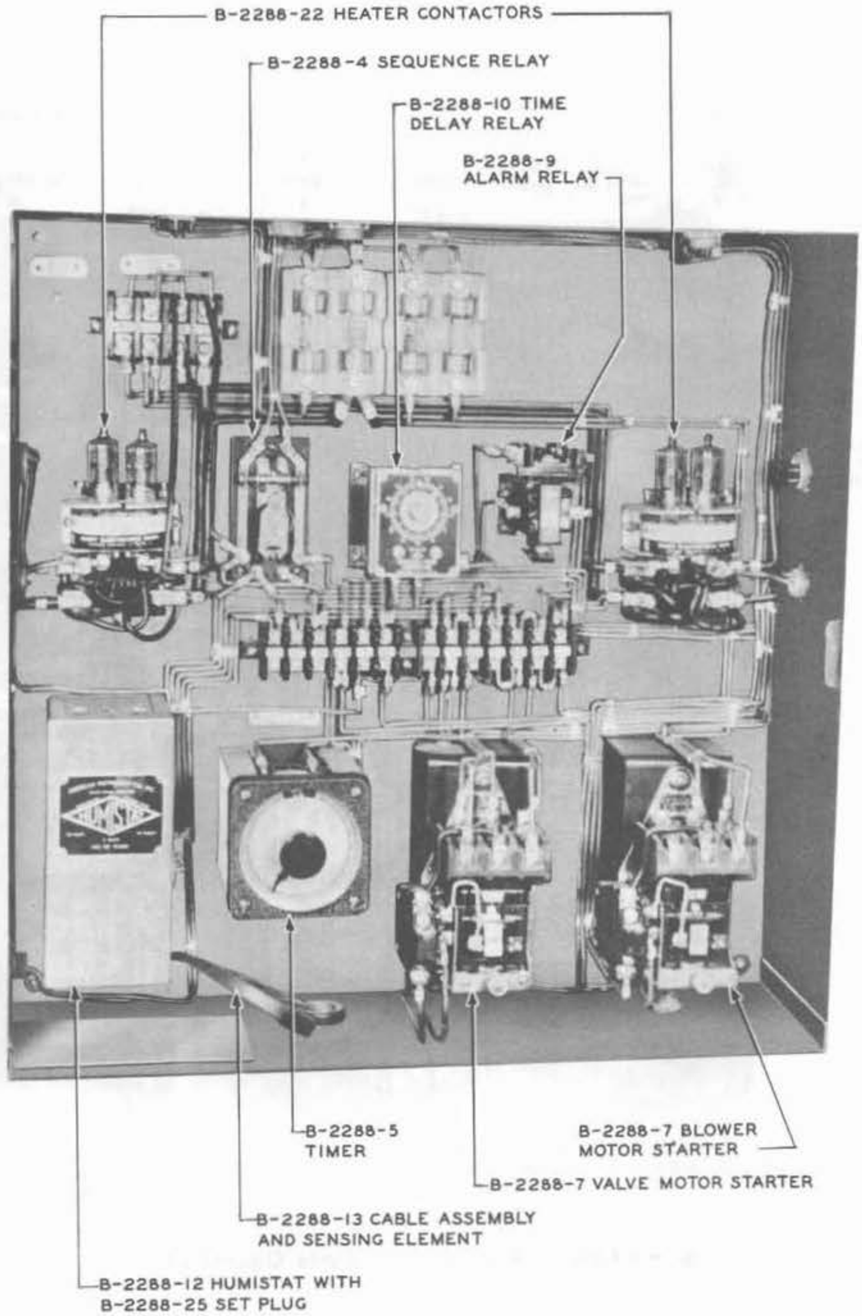


Fig. 5 – Control Box For Humidity Cycle Operation

3. REPLACEMENT PROCEDURES

3.01 *List of Tools and Materials*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-6854	Screwdriver
R-1539	Pipe Wrench
R-1542	6-inch Adjustable Wrench
R-2512	8-inch Adjustable Wrench
—	3-inch Cabinet Screwdriver
—	4-inch Regular Screwdriver
—	Spanner Wrench, Cat. #4-4896, American Instrument Co
—	Monkey Wrench, 15 inches, No. 90 Billings and Spencer Co
—	D-1858 Wheel Puller (Obtained from the Pittsburgh Lectrodryer Corporation, Pittsburgh, Penn)
— (2 rqd)	*Cap Screw 3/8 by 6 inches long (Obtained from Owatonna Tool Co, Owatonna, Minn)
—	**Pilot Bearing Puller #MD-955 (Obtained from Owatonna Tool Co, Owatonna, Minn)
—	*Gear and Pulley Puller #515A (Obtained from Owatonna Tool Co, Owatonna, Minn)
—	*Bearing Puller Attachment #950 (Obtained from Owatonna Tool Co, Owatonna, Minn)

*For removing ball-bearing race from shaft.

**For removing ball-bearing race from end-bell if required.

MATERIALS	
KS-7860	Petroleum Spirits
KS-14666	Cloth
260-300P	Grease (See Section A710.012)

3.02 Before starting to make any replacements on the dehydrator remove the fuse designated DEHY CONT in the power supply fuse cabinet and the 20-ampere fuse in the telephone company service panel when a separate fuse is furnished for the dehydrator heaters. In general, before starting to make any replacements it will be necessary to remove the guard screen that protects that portion of the equipment where the work is to be done.

3.03 No replacement procedures are specified for screws or other parts where the procedure consists of a simple operation.

3.04 After making any replacement of parts of the dehydrator, the part or parts replaced shall meet the readjust requirements involved as specified in Section A401.916. Other parts whose adjustments may have been directly disturbed by the replacing operation shall be checked to the readjust requirements and an over-all operation check shall be made of the dehydrator before restoring the circuit to service.

KS-16001 DEHYDRATOR TIME OR HUMIDITY CONTROLLED ←

Gearhead Motor

3.05 To replace the gearhead motor, remove the coverplate on the end of the motor using the 3-inch cabinet screwdriver. Tag and disconnect the wires. Loosen the nut on the conduit on the side of the motor using the R-2512 wrench. Remove the screw holding the linkage to the shaft with the R-2512 wrench, loosen the two setscrews on the operating arm with the 3-inch cabinet screwdriver, and remove this linkage. Remove the screws from the motor base using the R-2512 wrench and remove the motor. Mount the replacing motor on its mounting and securely tighten the screws. Remount the other parts that were removed in the reverse order of removal.

Gearhead Motor Bearing (Front End)

3.06 To replace the bearing, remove the motor as covered in 3.05.

3.07 Remove the four end-bell through bolts using the R-1542 wrench.

3.08 Remove the end-bell on the terminal box end of the motor.

Caution: The brush ring assembly is provided with two notches, left side of frame, one of which is engaged with a stationary tension clip. The position of the brush ring assembly with respect to the tension clip, determines the direction of rotation of the rotor. Note which notch is engaged.

3.09 Lift the brush tension springs from the brushes and temporarily place them in front of the spring back stops, thus removing tension from the brushes. Pull the brushes half way out of the brush holders in order to clear the centrifugal starter assembly and ball bearing. Remove the brush assembly from the end of the motor housing.

→**3.10** Remove the ball-bearing races with the → No. 515A puller.

3.11 Clean all the parts except commutator with KS-7860 petroleum spirits and wipe dry with a KS-14666 cloth.

3.12 Pack the bearing with 260-300P grease and mount it on the armature shaft with the closed side of the bearing facing the armature.

3.13 Hold the brushes clear of the bearing and the commutator and assemble the brush ring assembly, taking care to engage the stationary clip in the notch from which it was removed.

3.14 Assemble the end-bell on the motor pulling the motor leads out through the entrance in the terminal box. Assemble the end-bell through bolts taking up on the nuts a little at a time until all are tight.

3.15 Remount the motor on its mounting and securely tighten the screws. Remount the other parts that were removed in the reverse order of removal.

Filters

3.16 To replace the filters, proceed as follows.

3.17 Remove the frame from the filter housing. In some cases the frame is secured in place by screws which should be removed using the 4-inch regular screwdriver, after which the frame can be removed.

3.18 Remove all the filters, discarding the outermost one. If the center filter which is activated carbon requires replacement, return the filter for reconditioning to the Western Electric Company Distributing House.

3.19 Clean the interior of the housing if necessary, using a KS-14666 cloth.

3.20 Mount the filter so that the replacing filter is innermost and the one that was previously innermost is now outermost.

3.21 Assemble the frame to the filter housing.

Blower Motor

3.22 To replace the blower motor, remove the frame from the filter housing as covered in 3.16 and remove the filters. Note the clearance between the impeller and the periphery around the lip of the filter housing for future reference when reassembling.

3.23 Remove the coverplate screws from toggle switch using the 3-inch cabinet screwdriver. Remove the screws from the switch receptacle using the 4-inch regular screwdriver and free the switch from the mounting bar.

3.24 Remove the bolts from the blower output flange using the R-2512 wrench, taking care not to damage the gasket. Remove the cap screws from the bar attached to the towers using the R-2512 wrench. Tilt the framework forward and remove the terminal box cover on the motor. Disconnect the incoming wires from the motor wires. Loosen the nut on the conduit and free the cable from the motor. Remove the blower assembly from the dehydrator. Remove the cap screws from the circular plate using the R-2512 wrench and remove the motor assembly.

3.25 Remove the setscrew from the hub of the impeller. Note the separation between the impeller and the back of the round mounting plate and with the D-1858 wheel puller remove the impeller from the motor shaft. Remove the motor from the bracket using the R-2512 wrench. Mount the new motor and reassemble the parts in the reverse order. In reassembling the impeller on the motor shaft the separation between the impeller and the plate shall be equal to the amount noted above.

Blower Motor Bearings

3.26 To replace the bearings, remove the motor as covered in 3.21 to 3.24, inclusive.

3.27 Remove the four end-bell through bolts using the R-1542 wrench.

3.28 Remove the end-bell on the terminal box end of the motor.

Caution: The brush ring assembly is provided with two notches, left side of frame, one of which is engaged with a stationary tension clip. The position of the brush ring assembly with respect to the tension clip, determines the direction of rotation of the rotor. Note which notch is engaged.

3.29 Lift the brush tension springs from the brushes and temporarily place them in front of the spring backstops, thus removing the tension from the brushes. Pull the brushes half way out of the brush holders in order to clear the centrifugal starter assembly and ball bearing. Remove the brush assembly from the end of the motor housing.

3.30 Remove the end-bell on the shaft end of the motor.

3.31 Remove the armature from the shaft end of the motor by carefully pulling it through the stator. Note the position of the bearing spacer washer on one or both ends of the outside flat surfaces of the bearings, and place in exact positions when reassembling the motor.

3.32 Remove the ball-bearing races with the No. 515A bearing puller.

3.33 Clean all parts with KS-7860 petroleum spirits and wipe dry with a KS-14666 cloth.

3.34 Pack the new bearings with 260-300P grease and mount the bearings on the armature shaft with the closed side of the bearings facing the armature.

Caution: In handling the new bearings extreme caution should be taken to avoid contact with foreign materials such as dirt or grit. If it is necessary to tap the bearings into position, use a metal tube that fits squarely against the inner bearing race and then tap the end of the tube.

3.35 Inspect the armature and remove any foreign particles.

3.36 Reassemble the end-bell over the shaft end of the armature and see that the bearing race is positioned properly in the end-bell.

3.37 Assemble the armature carefully in the stator, commutator end first.

3.38 Hold the brushes clear of the bearing and commutator and reassemble the brush ring assembly, taking care to engage the stationary clip in the notch from which it was removed.

3.39 Place the end-bell on the motor, pulling the motor leads out through the entrance in the terminal box.

3.40 See that the armature turns freely after the end-bells have been assembled and that the brushes are seated properly on the commutator.

3.41 Assemble the through bolts, tightening the nuts a little at a time until all the bolts are tight.

3.42 See that the armature turns freely and the starting mechanism is satisfactory.

3.43 Assemble the motor as covered in 3.21 to 3.24, inclusive.

Other Parts

3.44 *Solenoid Valve:* To replace the solenoid valve, remove the plate from the side of the valve with the 3-inch cabinet screwdriver. Tag and disconnect the wires. Loosen the coupling nuts on each side of valve using the 15-inch monkey wrench. Remove the pipe connections to the valve using the R-1539 pipe wrench. Assemble a new valve to the pipe connections. Mount the valve assembly in place and securely tighten the coupling nuts. Reconnect the wires to the terminals and remount the cover.

3.45 *Thermostat:* To replace the thermostat, remove the coverplate screws on the front of the thermostat using the 3-inch cabinet screwdriver and remove the wires. Remove the conduit connectors using the R-2512 adjustable wrench. Remove the thermostat from the mounting bracket. Mount a new thermostat on the mounting bracket taking care that the element extends to the bottom of the well of the tower. Reconnect the conduit connector and the wires to the terminals. Remount the cover.

3.46 *Toggle Switch:* To replace the toggle switch, remove the cover mounting screws using the 3-inch cabinet screwdriver. Tag and remove the wires to the switch terminals. Remove the switch from its mounting using the 4-inch regular screwdriver. Mount a new switch on its mounting and remount the other parts that were removed in the reverse order of removal.

3.47 *Motor Starter (Gearhead Motor or Blower Motor):* To replace the motor starter, tag and disconnect all external leads to the starter. Remove the three screws securing the starter to the bracket using the 4-inch regular screwdriver. Mount a new starter on the bracket and securely tighten the screws. Connect the wires to their proper terminals.

3.48 *Limit Switch:* To replace the limit switch, remove the cover and disconnect the wires. Loosen the conduit nut using the R-2512 wrench and remove the switch. Note the position of the arm on the switch to be replaced. Mount a new switch. The trip arm of the new switch should be adjusted by loosening the setscrews that hold it in place and moving the arm to the same position as the replaced switch. Connect the conduit nut to the switch and connect the wires to their proper terminals. Remount the cover.

3.49 *Sensing Element:* The sensing element is mounted at the inner end of the hexagonal fitting in the air outlet. To replace the element, proceed as follows. Unscrew the ring nut from the fitting, using the American Instrument Co spanner wrench. Then slowly remove the element from the fitting. Remove the mounting screw at the inner end of the element using the KS-6854 screwdriver. The element plugs into the element socket. Substitute a new element and tighten the screw securely. Insert the element into the fitting and securely tighten the ring nut.

3.50 *Heater Contactors:* To replace the heater contactors, tag and remove the connections from the terminals. Remove the screws holding the contactor to the back of the control box using the 4-inch regular screwdriver. Install a new contactor and reconnect the wires to their proper terminals.

3.51 *Pressure Switch:* To replace the pressure switch, loosen the two screws on the side of the switch using the 3-inch cabinet screwdriver and remove the cover. Tag and disconnect the wires from the terminals. Loosen the conduit nut using the R-2512 wrench. Remove the three mounting screws using the 4-inch regular screwdriver and remove the switch. Mount a new switch, securely tighten the screws. Reconnect the conduit nuts and connect the leads to the terminals. Mount the cover and securely tighten the screws.

→KS-16001 DEHYDRATOR TIME CONTROLLED

3.52 *Timer:* To replace the timer, tag and disconnect the wires from the terminals. Remove the screws holding the timer to the back of the control box using the 4-inch regular screwdriver. Note the position of the cams on the timer to be replaced. Install a new timer and securely tighten the screws. Adjust the new timer by manually rotating the knurled wheel in a downward direction until the cams are in the same position as the replaced timer. Connect the wires to the proper terminals on the timer.

3.53 *Electronic Relay:* To replace the relay, loosen all the captive screws on the relay unit and remove the unit from the mounting. Hold the new relay unit against the base with the captive screws inserted in the correct holes in the terminal blocks of the base. Start all screws first and then tighten them securely.

Humidity Cable

3.54 To replace the humidity cable, proceed as follows. Disconnect the cable from the electronic relay by manually loosening the knurled locking ring from the connector and pull out the plug. Unscrew the ring nut from the mounting receptacle in the air supply, using the American Instrument Co spanner wrench. Then slowly lift the element from the receptacle. Remove the mounting screw at the inner end of the element using the KS-6854 screwdriver. The element plugs into the receptacle at the end of the cable. Mount the element in the replacing cable and securely tighten the screw. Assemble the ring nut over the cable. Insert the element into the mounting receptacle and securely tighten the ring nut. Plug the connector into the electronic relay connector and manually tighten the knurled nut.

KS-16001 DEHYDRATOR HUMIDITY CONTROLLED

3.55 ***Humistat:*** To replace the humistat, proceed as follows. Remove the cover. Tag and disconnect the wires from the terminal block. Remove the element cable plug from the socket in the humistat and remove the sensing element cable. Loosen the mounting screws using the 4-inch regular screwdriver and remove the humistat. Mount the new humistat and securely tighten the mounting screws. Insert the cable plug through the hole in the controller box. Insert the groove pin provided into the hole located in the center of the sensing element socket in the humistat. Plug the sensing element cable plug into the socket; the groove pin will hold the cable firmly in place. Remount the cover.

3.56 ***Time-delay Relay:*** To replace the relay, tag and disconnect the wires. Remove the mounting screws using the 4-inch regular screwdriver and remove the relay. Mount a new relay, securely tighten the mounting screws and connect the wires to their proper terminals. Adjust the relay by turning the knob until the pointer on the dial is in the same position as on the replaced relay.

3.57 ***Sequence Relay:*** To replace the relay, tag and disconnect the wires from the relay terminals. Remove the mounting screws using the 4-inch regular screwdriver and remove the relay. Mount a new relay and securely tighten the mounting screws. Connect the wires to their proper terminals.

3.58 ***Timer:*** To replace the timer, tag and disconnect the wires. Remove the mounting screws using the 4-inch regular screwdriver and remove the timer. Mount a new timer and securely tighten the mounting screws. Connect the wires to their proper terminals. Adjust the timer by turning the knob until the pointer is in the same position as on the replaced timer.

3.59 ***Alarm Relay:*** To replace the alarm relay, tag and disconnect the wires from the relay terminals. Remove the mounting screws using the 4-inch regular screwdriver and remove the relay. Mount a new relay and securely tighten the mounting screws. Connect the wires to their proper terminals.

3.60 ***Cable and Sensing Element:*** To replace the cable and sensing element, proceed as follows. Remove the element cable plug from the socket in the humistat and remove the cable. Unscrew the ring nut from the mounting receptacle in the air supply, using the American Instrument Co spanner wrench. Then slowly lift the element from the receptacle. Assemble the sensing element of a new cable and sensing element into the receptacle and securely tighten the ring nut. Insert the other end of the cable through the hole in the control box. See that the groove pin is in the hole located in the center of the sensing element socket in the humistat. Plug the cable into the socket; the groove pin will hold the cable firmly in place.

KS-16001 DEHYDRATOR AND ASSOCIATED WAVEGUIDE ALARMS

1. GENERAL

1.01 This section covers the operation of the KS-16001 dehydrator and associated waveguide alarms for use in the TD-2/TH radio systems.

1.02 This section is reissued to include information for KS-16001 dehydrators equipped for humidity cycle operation, and KS-16001 dehydrators equipped for time cycle operation using a Humistat. Since this section covers a general revision, arrows ordinarily used to indicate changes have been omitted.

KS-16001 Dehydrator

1.03 The dehydrator is used to furnish a source of dry air for pressurizing the antenna and waveguide runs. The unit is designed to deliver dry air continuously at flow rates not greater than 400 cubic feet per hour at a delivered pressure of between 0.2 and 0.3 pounds per square inch. In operation, ambient air is drawn in through a filter arrangement to a centrifugal blower and passed through one of two drying towers, each of which contains approximately 150 pounds of activated alumina, where the moisture vapor in the air is removed. After drying, the air is delivered to a common outlet where it is distributed through the necessary piping and manifolds to the waveguide and antenna system. The dehydrator may be arranged for drying the air on a time or humidity cycling basis.

1.04 When the KS-16001 dehydrator is arranged to operate on a time cycling basis, it is equipped with a 24-hour timer. Air to be dried is passed through one drying tower for 12 hours while the second tower is being reactivated. When the KS-16001 dehydrator is arranged to operate on a humidity cycling basis, it is equipped with a 5-hour timer. Air to be dried is passed through one drying tower until the relative humidity reaches approximately 4 per cent at 70°F, at which time the air to be dried is automatically routed through the second tower and the first tower is then reactivated.

1.05 In both the time and humidity cycle dehydrators reactivation consists of heating the alumina for 4 hours by internal nichrome heating coils which are embedded in the drying agent. Proper reactivation temperatures are maintained in the bed through the use of internal thermostats in series with the heating coils. During the 4-hour heating period, a small flow of ambient air purges the moisture released by the alumina from the system. Control of reactivated air flow is achieved through a solenoid valve which diverts the required purge flow through the reactivating tower.

1.06 Alarm facilities are provided which operate on either low pressure or high humidity. This alarm is connected to a pair of terminals on a terminal strip to which a low-pressure switch and an electronic relay or Humistat are connected. A humidity sensing element is connected to the electronic relay or Humistat. The low-pressure switch is connected to the delivered air stream and will operate the alarm when the delivered air pressure falls below approximately 1.4 inches of water. The humidity sensing element, which is mounted in the air outlet, will cause the alarm to operate when the relative humidity in the air exceeds a predetermined value.

1.07 A measurement on the pressure gauge located on the manifold will indicate whether low pressure or high humidity has developed in the dehydrator. If the pressure on the gauge is greater than 1.4 inches of water, the trouble may be due to high humidity. If the pressure on the gauge is less than 1.4 inches of water, the trouble is probably due to low pressure.

1.08 The instructions for the KS-16001 dehydrator operating on a time cycling basis are based on drawing SD-59698-01 and when operating on a humidity cycling basis on drawings SD-59841-011 and SD-59841-012. For detailed description of the operation, see the corresponding circuit description.

Waveguide Alarms

1.09 An individual pressure switch is connected by a length of copper tubing to each antenna system at the waveguide pressure window. The switches are electrically connected in parallel to the station alarm circuit and will register an alarm in the event that antenna pressure drops below a predetermined value.

1.10 The instructions for the waveguide alarms are based on drawing SD-59812-01. For detailed description of the operation, see the corresponding circuit description.

General

1.11 For more detailed information on the operation and maintenance of the apparatus refer to the following sections. All apparatus should be adjusted in accordance with these sections and with the circuit requirements table or circuit description associated with the circuit drawing.

A401.916 H51.342 — KS-16001 Dehydrator

A501.916 H51.343 — KS-16001 Dehydrator

2. LIST OF TOOLS, GAUGES, AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
R-2652	9-inch Adjustable Wrench (for the latest design sensing element) or
—	Spanner Wrench, American Instrument Co. Catalog No. 4-4896A
—	B Pressure Hose
—	3-inch Cabinet Screwdriver
GAUGES	
—	Gauge, U. S. Gauge Company No. 633S, 0-15 Inches of Water, 1/4 inch N. P. T.
TEST APPARATUS	
KS-14510,L1	Volt-ohm Milliammeter
—	200,000-ohm Resistor
—	270,000-ohm Resistor
—	Set Plug, American Instrument Co., No. 15-6220

3. OPERATION

Preparation for Starting Dehydrator

3.01 *Caution: Before starting, check that the dust cap on the reactivation air outlet is removed. This outlet is located on the back of the bottom 4-way valve. Do not remove any restriction plate found in this outlet.*

3.02 Operate the START-STOP switch to ON. The blower motor should operate.

3.03 Absence of an alarm indicates that the dehydrator is operating properly and that the pressure in the system is satisfactory.

3.04 The manifold pressure gauge should read at least 5 inches of water.

3.05 *Timer*

(a) ***Dehydrator Equipped for Time Cycle Operation:*** The timer, located inside the control box, cycles the dehydrator and controls the operation of the components in the proper sequence. The timer is driven by a synchronous motor and makes one complete revolution in 24 hours. A thumb wheel near the left end, when rotated outward and downward, may be used to test the series of operations. All manual operations of the thumb wheel should be sufficiently slow to insure that one operation is completed before the next operation.

(b) ***Dehydrator Equipped for Humidity Cycle Operation:*** The timer is set to terminate the heating period in about 4 hours, at which time the heater is shut off and the solenoid in the reactivation exhaust is closed. The tower is cooled for the balance of the cycle until reversal again occurs. The adsorption, reactivation and cooling cycle will be continued until the START-STOP switch is moved to the OFF position. The dehydrator cannot be operated manually through its cycle of operation.

Waveguide and Antenna Alarm System

3.06 The pressure switch in each antenna system should close its contacts and cause an alarm when the pressure within the system drops to approximately 1.4 inches of water.

4. ROUTINE CHECK

Dehydrator

4.01 ***Caution: Where a reset of the 5-hour timer is specified in the following routine checks do not attempt to reset the 5-hour timer during a timing period, otherwise damage to the timer will result. At the conclusion of the test reset the timer to 4 hours. Failure to reset the timer will disable the dehydrator.***

4.02 *Routine Intervals:* The following are suggested maintenance intervals for making routine checks. These intervals may be changed depending on local conditions.

	INTERVAL	PARAGRAPH
Pressure Switch	3 Months	4.03
Sensing Element	3 Months	4.04
Electronic Relay	3 Months	4.05
Humistat	3 Months	4.06,4.07
Tower Heater	As Required	4.08
Waveguide and Antenna Alarm Pressure Switch	3 Months	4.09

4.03 ***Pressure Switch***

(a) ***Dehydrator Equipped for Time Cycle Operation:*** To check the operation of the dehydrator pressure switch, operate the STOP-START switch to OFF. The alarm should sound within a few minutes. Operate the switch to ON. The alarm should stop after a short interval.

(b) ***Dehydrator Equipped for Humidity Cycle Operation:*** To check the operation of the pressure switch, make sure that both towers are cold, then turn the timer (black hand) to zero to prevent 4-hour heating cycle from starting. Operate the STOP-START switch to OFF. The alarm should sound within a few minutes. Operate the switch to ON. The alarm should stop after a short interval.

Caution: Reset the 5-hour timer (black hand) for 4-hour operation.

4.04 ***Humidity Sensing Element***

(a) ***Dehydrator Equipped for Time Cycle Operation:*** To check the operation of the sensing element, unscrew the nut from the hexagonal fitting, using the spanner wrench or the adjustable wrench as required. Then, slowly remove the sensing element from the fitting. If the removal of the sensing element into room conditions does not cause an alarm to sound, breathe on it. This should cause the alarm to sound. To clear the alarm, insert the element in the fitting. The alarm should stop when the element is sufficiently dry. Repeat the operation several times to make sure that the element is satisfactory. After completing the test, remount the sensing element.

(b) ***Dehydrator Equipped for Humidity Cycle Operation:*** Remove the cover of the Humistat using the 3-inch cabinet screwdriver. Disconnect the lead to the sequence relay from terminal 1 on the Humistat using the screwdriver. With the KS-14510, List 1 voltmeter set to read 300 volts ac, connect it to terminals 1 and L1 on the Humistat. Remove the nut from the hexagonal fitting using the spanner wrench or the adjustable wrench as required. Then slowly remove the sensing element from the fitting. Breathe on the sensing element. This should cause the Humistat to operate as indicated by the meter reading of 115 volts ac. If the Humistat does not operate, make sure that the plug on the cable from the sensing element is firmly plugged into the receptacle in the Humistat case and examine the cable for a broken conductor. If the Humistat still does not operate, adjust the setting as covered in 4.07. Remount the sensing element, but do not connect the lead from the sequence relay to terminal 1 on the Humistat until the meter reads zero. Disconnect the meter.

Caution: Do not use an ohmmeter to measure the resistance of the sensing element or in any manner apply a dc voltage to the sensing element as this will damage it.

4.05 *Electronic Relay:* To check the operation of the electronic relay, disconnect the sensing element connector from the relay. Momentarily bridge a 200,000-ohm resistor across terminals B and W on the relay. The alarm should operate.

4.06 *Humistat (Dehydrator Equipped for Time Cycle Operation):* To check the operation of the Humistat, insert the set plug furnished with the Humistat in the jack inside the Humistat case. The alarm should operate. Remove the set plug.

4.07 *Humistat (Dehydrator Equipped for Humidity Cycle Operation):* To check the operation of the Humistat, disconnect the lead to the sequence relay from terminal 1 on the Humistat using the 3-inch cabinet screwdriver. With the KS-14510, List 1 voltmeter set to read 300 volts ac, connect it to terminals 1 and L1 on the Humistat. Insert the set plug furnished with the Humistat in the jack inside the Humistat case. Turn the slotted potentiometer shaft clockwise with the screwdriver until the relay in the Humistat operates as indicated by the meter reading of 115 volts ac. Note the position of the potentiometer shaft. Then turn the shaft of the potentiometer counterclockwise until the meter reads 115 volts ac. Again note the position of the potentiometer shaft. Finally turn the shaft clockwise to a point midway between the two positions of the potentiometer shaft described above.

Caution: When the setting is completed, remove the set plug from the jack but do not connect the lead from the sequence relay to terminal 1 on the Humistat until the meter reads zero.

Disconnect the meter. Replace the Humistat cover.

4.08 ***Operation of the Tower Heater Circuit***

(a) ***Dehydrator Equipped for Time Cycle Operation:*** To check the operation of the heater circuit, manually operate the timer through several time cycles. Alternate operation of the two heater contactors will indicate whether the circuits are functioning properly. To determine that the towers are heating, allow 30 minutes before shifting to the alternate tower. To determine whether the tower is heating, gauge by feel.

(b) ***Dehydrator Equipped for Humidity Cycle Operation:*** To check the operation of the heater circuit proceed as follows. The check should be made when both towers are at approximately room temperature to avoid circulation of hot moist air in the antenna system.

Caution: Set the 5-hour timer (black hand) for 30-minute operation before removing sensing element.

Unscrew the nut from the hexagonal fitting using the spanner wrench or the adjustable wrench as required. Then slowly remove the sensing element from the fitting. If the removal of the sensing element into ambient room humidity does not cause the towers to shift, breathe on it. This should cause the towers to shift. Insert the sensing element in the fitting. Allow 30 minutes to elapse and check by feeling the towers to make sure that one of the towers is heating. Completion of the 30-minute heating period as set by the timer is indicated by observation of the heater contactors. Observe that the spring coils of the contactor associated with the reactivating tower are in the down position during the 30-minute heating period. At the end of this period the spring coils should be in the up position. Set the timer to 30 minutes as covered in the Caution, above. Remove the sensing element and blow on it as covered above. This should cause the towers to shift. Insert the sensing element in the fitting. Again allow 30 minutes to elapse and check the second tower for heating as covered above. The switch of the towers the second time should restore the original tower to the antenna system.

Caution: Reset the 5-hour timer for 4-hour operation.

Waveguide and Antenna Alarm Pressure Switch

4.09 To check the operation of the individual waveguide pressure switch, remove the valve cap from the pressure testing valve at the pressure switch. Attach the No. 633S gauge equipped with the snap-on chuck to its testing valve. Stop the air flow into the pressure window (single air supply to a single antenna) or pressure windows (dual air supplies for waveguides connected to a common antenna) by disconnecting the tubing at the pressure window or windows. Record the pressure reading on the gauge at the time the alarm sounds. The reading should be approximately 1.4 inches of water. If the alarm does not sound or if it sounds at a pressure other than above, proceed as covered in 5.09. Repeat the test on each pressure switch.

5. CORRECTING TROUBLE

Dehydrator Alarm Operating

5.01 If a dehydrator alarm operates, proceed as follows.

(a) ***Dehydrator Equipped for Time Cycle Operation:*** Check the manifold pressure using the No. 633S pressure gauge. If low pressure exists, proceed as covered in 5.04. If the pressure is satisfactory, remove the connection from terminal 2 of the terminal strip inside the pressure switch. If the alarm stops, the trouble is in the pressure switch. Replace the switch. If removing the connection from the terminal strip does not cause the alarm to stop, the trouble is in the sensing element, the electronic relay, the Humistat, or the humidity is too high. Disconnect the sensing element cable from the electronic relay or the Humistat. If the alarm continues with the element cable disconnected, the trouble is in the electronic relay or the Humistat. If the trouble is in the electronic relay, replace the unit. If the trouble is in the Humistat, check the operation of the Humistat as covered in (b). If the alarm stops when the cable is disconnected, the cause is either high humidity or a defective sensing element. Reconnect the sensing element and manually shift towers as described in 4.08(a). If the alarm continues, check the sensing element as covered in 4.04(a). If, with a new element installed the alarm continues, check the humidity in the dehydrator as covered in 5.02.

(b) ***Dehydrator Equipped for Humidity Cycle Operation:*** Check the manifold pressure using the No. 633S pressure gauge. If low pressure exists, proceed as covered in 5.04. If the pressure is satisfactory, remove connection 61 from the terminal strip inside the pressure switch. If the alarm stops, the trouble is in the pressure switch. Replace the switch. If removing the connection from the terminal strip does not cause the alarm to stop, the trouble is in the sensing element, the Humistat or the humidity is too high. Disconnect the sensing element cable from the Humistat. If the alarm continues with the sensing element cable disconnected, the trouble is in the Humistat. Remove the cover from the Humistat using the 3-inch cabinet screwdriver. Disconnect the lead to the sequence relay from terminal 1 on the Humistat using the screwdriver. With the KS-14510, List 1 voltmeter set to read 300 volts ac, connect it to terminals 1 and L1 on the Humistat. Insert the set plug furnished with the Humistat in the jack inside the Humistat case. Turn the adjacent slotted potentiometer shaft clockwise with the screwdriver until the relay in the Humistat operates as indicated by the meter reading of 115 volts ac. Note the position of the potentiometer shaft. Then turn the potentiometer shaft counterclockwise until the meter reads 115 volts ac. Again note the position of the potentiometer shaft. Finally turn the shaft clockwise to a point midway between the two positions of the potentiometer shaft described above.

Caution: When the setting is completed, remove the set plug from the jack, but do not connect the lead from the sequence relay to terminal 1 on the Humistat until the meter reads zero.

Disconnect the meter. If this does not clear the trouble, change the tube and recheck the potentiometer as covered above. If trouble still exists, check the Humistat for defective components or replace the unit. If the alarm stops when the sensing element is disconnected, the cause is either high humidity or a defective sensing element. Turn the timer (black hand) to zero. Install a new sensing element and reconnect; towers will shift. Wait a few minutes; if alarm clears, the cause was due to a defective sensing element.

Caution: Reset the 5-hour timer for 4-hour operation.

If the alarm continues with a new sensing element installed, check the humidity in the dehydrator as covered in 5.02.

5.02 Determine which tower is delivering air to the waveguide system by observing the arrows, if present, on the 4-way valve at the bottom of the dehydrator. The arrow pointing toward the front indicates the tower supplying air; the arrow to the rear indicates the tower in which reactivation is taking place. For those 4-way valves not equipped with arrows, the tower which is delivering air to the waveguide system can be determined by observing the position of the 4-way valve grease fittings. Tower No. 2 is supplying air to the system if the grease fitting is in the forward position. The grease fitting in the rear indicates that tower No. 1 is supplying the air. Shift the air supply to the other tower as covered in 4.08(b). Allow up to 30 minutes for the sensing element to clear. If the alarm stops, the released tower is high in humidity, in which case proceed as follows.

5.03 Determine if the heater in the released tower is operating and observe if the spring coils on the heater contactor are down. If so, allow up to 30 minutes for the heater to rise in temperature. Check for operation by feeling the outside of the tower housing and also check that the air is being purged as covered in 5.05. Failure of the tower to heat or the heater contactor to operate indicates circuit trouble.

(a) ***Dehydrator Equipped for Time Cycle Operation.***

(1) If the heater contactor operates but the tower does not heat, the cause may be due to an open heater. The resistance is approximately 5.3 ohms. To check the resistance, disconnect the commercial power at the service panel. Connect a volt-ohmmeter across terminals 24 and 36 on the heater contactor for the resistance of the heater in tower No. 1, and across terminals 25 and 37 on the heater contactor for the resistance of the heater in tower No. 2.

(2) If the heater contactor does not operate, see if the 6-ampere fuse on the fuse block is blown or an open circuit exists through the thermostat, limit switch, or timer.

(3) Failure of the tower to shift may be caused by the valve drive motor, valve drive motor starter, limit switch, or timer.

(4) Push the left overload reset button on the front of the control panel. If this clears the fault, the trouble was due to an overload condition. Possible cause for an overload condition might be binding in the motor, gear train, or 4-way valve.

(5) If restoral of the overload switch does not clear the trouble, check whether the left 5-ampere fuse on the fuse block is blown, or if the trouble is in the START-STOP switch or the circuit through the timer or limit switch.

(b) ***Dehydrator Equipped for Humidity Cycle Operation.***

(1) If the heater contactor operates but the tower does not heat, the cause may be due to an open heater or blown 30-ampere fuse on the fuse block. If the fuse is blown, replace it. If the fuse is satisfactory, check the resistance of the heater which is approximately 5.3 ohms. To check the resistance, disconnect the commercial power at the service panel. Connect a volt-ohmmeter across terminals 15 and 21 on the heater contactor for the resistance of the heater in tower No. 1, and across terminals 22 and 34 on the heater contactor for the resistance of the heater in tower No. 2.

(2) If the heater contactor does not operate, see if the 6-ampere fuse on the fuse block is blown or an open circuit exists through the thermostat, limit switch, timer, or sequence relay.

(3) Failure of the tower to shift may be caused by the valve drive motor, valve drive motor starter, limit switch, sequence relay, sensing element, or Humistat.

(4) Push the left overload reset button on the front of the control panel. If this clears the fault, the trouble was due to an overload condition. Possible cause for an overload condition might be binding in the motor, gear train, or 4-way valve.

(5) If restoral of the overload switch does not clear the trouble, check whether a 5-ampere fuse on the fuse block is blown, or if the trouble is in the START-STOP switch or the circuit through the sequence relay and limit switch.

5.04 ***Checking Low Dehydrator Pressure:*** To determine the cause of low pressure, check the blower. If the blower is not operating, push the right overload reset button on the front of the control panel. If the motor starts and the pressure returns, the trouble was due to an overload condition. The cause of an overload condition could be binding of the motor or the blower impellers. If the motor does not start after resetting the overload reset button, check whether any of the 5-ampere fuses on the control panel are blown or whether the blower motor starter is faulty.

5.05 ***Checking Tower Purge:*** To determine if the tower is purging during the heating cycle, air should be felt being expelled at the reactivation air outlet at the rear of the lower 4-way valve. Failure of the tower to purge may be due to a faulty solenoid valve or the circuit through the timer. The electrical circuit (to the solenoid valve) should be closed during the 4-hour heating cycle for either tower.

Checking Electronic Relay

5.06 If the alarm does not sound, as covered in 4.05, replace the two electronic tubes one at a time, and check for improper operation of the alarm relay or circuit trouble in the electronic relay proper. If the trouble cannot be cleared, replace the unit.

> ***Note:*** If it is necessary to bench test the relay, remove the relay from its mounting and connect 115 volts ac across terminals 1 and 2. It will be necessary to temporarily connect 270,000 ohms across terminals R and W since the resistor normally connected across these terminals is located in the base and is not removed with the relay.

Checking Humistat (Dehydrator Equipped for Time Cycle Operation)

5.07 If the alarm does not sound, as covered in 4.06, adjust the potentiometer as covered in 4.07. If this does not clear trouble, change the tube and readjust the potentiometer. If trouble still exists, check the Humistat for defective components.

Checking Humistat (Dehydrator Equipped for Humidity Cycle Operation)

5.08 If the Humistat does not operate, as covered in 4.07, change the tube and readjust the potentiometer. If trouble still exists, check the Humistat for defective components.

Checking Waveguide and Antenna Pressure Switch

5.09 If the alarm does not sound, as covered in 4.09, loosen the two screws which secure the cover of the pressure switch in place and remove the cover. Turn the large, knurled adjusting screw until the contacts just close on 1.4 inches of pressure. If the contacts are open when the pressure is 1.4 inches, the adjusting screw should be turned clockwise until the "just close" point is reached on decreasing pressure. If the contacts are closed with a pressure of 1.4 inches, turn the adjusting screw counterclockwise until the "just open" point is reached.

BUILDING MECHANICAL EQUIPMENT

SCHEDULING ROUTINE MAINTENANCE

1. GENERAL

1.01 This section outlines a plan for scheduling the routine maintenance of building mechanical equipment. The procedures suggested apply to mechanical plant permanently located in the building and not to fixtures, tools or portable equipment.

1.02 The procedures include the following:

(a) A numbering system to identify the various items of mechanical plant for record purposes.

(b) A card record system for establishing and maintaining an inventory of the units of equipment in each building and for recording the maintenance procedures to be followed for each unit.

(c) A method of scheduling the routine maintenance required on each item of equipment and for indicating completion of the work.

(d) A procedure for reporting repairs and replacements with provisions for associating these reports with the equipment record.

2. IDENTIFICATION OF EQUIPMENT

2.01 In order to provide a positive means of identification and reference, each major item of equipment is numbered. Following is an illustrative numbering system.

1. Air Conditioning (Package) Unit
2. Air Filter Unit
3. Blower, Ventilating
4. Boiler, Heating
5. Boiler, Hot Water Supply
6. Burner, Gas
7. Burner, Oil
8. Compressor, Air
9. Compressor, Refrigerating
10. Conveyor
11. Damper
12. Drinking Water Cooler
13. Elevator
14. Fan, Ventilating
15. Furnace, Warm Air Heating
16. Generator, Motor
17. Heater, Hot Water
18. Heater, Space
19. Heater, Unit
20. Hoist
21. Incinerator
22. Kitchen Equipment
23. Meter
24. Panel, Switch, Electric
25. Pump, Water
26. Pump, Sump
27. Pump, Vacuum
28. Softener, Water
29. Stoker
30. Tank, Air
31. Tank, Fuel Oil
32. Tank, Hot Water Storage
33. Tank,Water Supply
34. Valve, Motorized

2.02 The number of the major item of equipment is used as a prefix followed by consecutive numbering of the individual units of that type of equipment. For example, if there were two heating boilers in a building, they would be numbered 4-1 and 4-2.

2.03 This method has the advantage of grouping similar items of equipment together in numerical order and allows for the addition of equipment without breaking the numerical sequence of the records. For instance, if in the above example, a heating boiler were added, it would be given the number 4-3.

2.04 Accessories and controls associated with each major item of equipment but located away from it are given the same number as the major unit. This serves to properly identify the accessories and controls and is especially advantageous in cases where switches and relays controlling several major units are mounted together on a remote wall or panel.

2.05 Elevators or other pieces of machinery that are maintained by others under contract are numbered for record purposes.

2.06 The numbers should be applied to each principal unit of mechanical plant and its related accessories and controls in a permanent manner. For easy readability, contrasting colors should be used and the sizes of the numbers should be commensurate with the size of the equipment. Stenciling the numbers on with paint is a satisfactory method and the use of decalcomania numbers is also suitable. The numbers should be located so as to be readily discernible from the normal approach to the equipment.

3. BUILDING MECHANICAL EQUIPMENT RECORD FORM E-3925

3.01 Form E-3925 serves as an inventory record and for posting maintenance information on the various items of equipment. A separate card is used for each major unit. Exhibit 1 shows a completed record card.

3.02 The name of the equipment and its assigned number are written in at the top of the card in the spaces indicated. The city and the address or name of the building are also entered in the appropriate space.

3.03 In the space headed "Description," pertinent data on the equipment item are to be shown. This should include all data usually appearing on the name plate such as make, serial number, size, type, capacity, etc. The use of the equipment, area served by it, or other data may be entered here as may be desirable. Guarantees if any should be noted. Data on electric motors used to drive the unit are recorded on the lower part of the card as described in Paragraph 3.05.

3.04 Data on accessories and controls associated with the equipment are entered in the space headed "Accessories and Controls." This should include such items as switches, relays, limit controls, gauges and other minor items.

3.05 Provision is made at the bottom of the card for entering data on the main drive motor for items which are electrically driven. The necessary information is generally shown on the motor name plate.

3.06 New cards are prepared when existing equipment is replaced and when additional items are installed.

4. ROUTINE MAINTENANCE REQUIREMENTS

4.01 After the descriptive data have been recorded on the obverse of Form E-3925, for each major plant unit and its accessory equipment, the routine maintenance required on each particular piece of equipment is posted on the reverse side. This information may be obtained from various sources such as manufacturer's instructions, Company practices or instructions, and from experience with the type of equipment involved.

4.02 The space on the reverse side of the inventory card is provided for briefly describing the maintenance routines required. When more detailed or supplementary information is considered necessary, it may be incorporated into a Bell System Practice or other suitable form of instruction. Reference is made to such additional information in the column headed "Reference."

4.03 The frequency at which each routine is to be performed is indicated in the column headed "Freq." using the abbreviations shown at the bottom of the card.

4.04 The estimated time required for the performance of each routine is entered in the last column. This information is necessary in order to properly schedule the routines.

4.05 Exhibit 1 shows the reverse side of Form E-3925 filled out for a typical item of equipment.

4.06 If desired, a card identifying the item and bearing the routine maintenance information outlined in Paragraphs 4.02 and 4.03 for a particular piece of equipment may be appropriately mounted on or adjacent to the unit.

5. SCHEDULING ROUTINE MAINTENANCE

5.01 The routine maintenance requirements detailed on the reverse side of Forms E-3925 are used to prepare a schedule for the routine maintenance of all items of mechanical plant in the building. Form E-3926, Building Mechanical Equipment, Routine Schedule and Progress Chart is used for this purpose. (Exhibit 2)

5.02 Form E-3926 provides space for recording the equipment number, name of the equipment, location, description of routine, reference to detailed instructions, name of employee to whom the routine is assigned, and the frequency at which the routine is to be performed. The right side of the form is set up to indicate the week or weeks of the year in which each routine is scheduled to be carried out.

5.03 In a small building, the routines on all equipment can generally be listed on the same schedule. In larger buildings, where there is a considerable amount of equipment consideration may be given to making separate schedules for shifts or individuals or for certain items of equipment as may be appropriate.

5.04 Separate schedules are usually prepared for elevators since such equipment is generally maintained by specialized personnel and a considerable number of routines are required on the various principal components.

5.05 When the grouping of routines has been determined as outlined in Paragraphs 5.03 and 5.04, the description of the routines and associated information is entered on Form E-3926 as shown in Exhibit 2.

5.06 The time each routine is to be performed is indicated by placing a diagonal mark in the space for the appropriate week on the schedule portion of the form. Daily routines should be made a part of the daily work assignments and are not to be included on this schedule. Weekly routines are scheduled first and then those performed biweekly. The less frequent routines are scheduled in turn so that the work is spread out as evenly as practicable throughout the year. Items requiring seasonal work such as boilers must, of course, be scheduled in accordance with seasonal requirements.

5.07 The completed schedules may be posted on a bulletin board or placed in a book, depending on which method is most convenient in each case.

5.08 Completion of the routines is indicated by crossing the diagonal strokes on the schedule.

6. REPORTS ON TROUBLE, REPAIRS AND REPLACEMENT

6.01 It is intended that when the various routines are performed the equipment will be inspected for general condition and for any necessary adjustments or repairs. Minor adjustments or repairs should be made at the time the routine is performed if possible. Unless unduly frequent, minor repairs and adjustments are considered part of normal maintenance and need not be reported.

6.02 Where the inspection discloses trouble that can not be cleared at the time the routine is performed or there is an indication that major repairs or replacements are necessary, a report should be made of the matter for corrective action on Form E-3927, Building Mechanical Equipment, Report of Trouble Found, Repairs, Replacements or Removals. (Exhibit 3)

6.03 The heading of the form is to be filled out as indicated, showing the item, equipment number, location, and date. The form is directed to the foreman or supervisor responsible for the maintenance of the equipment as local practice may require. In the space headed "Trouble Found," the trouble or defect is described and recommendations are made for corrective action.

6.04 When corrective action has been taken, a description of the repairs, replacements or removals is to be reported in the space headed "Repairs, Replacements or Removals." Cost data may be entered here. However, cost data are of secondary importance for the purpose of this Practice and may be omitted. The labor hours required to effect the repair are reported in the space indicated when the work is performed by an employee. These data may be summarized at monthly or other intervals to determine the total hours that the building mechanics devote to repair operations. This time plus the total hours scheduled for routine maintenance on Forms E-3925 provides the data necessary to estimate the time it is necessary for building mechanics to spend in the building or in the case of large buildings, the number of mechanics required.

6.05 Completed Forms E-3927 are filed with Forms E-3925, the inventory record card, as outlined in Paragraph 7.05.

7. FILING OF RECORDS

7.01 The equipment record cards, Form E-3925, are to be filed in numerical order. The 8" x 5" card is a standard size and filing devices are available to suit almost any requirement.

7.02 In general, it is preferable to keep the records in the building in which the equipment is installed. However, it may be desirable to keep the file in a district or area headquarters in cases where several buildings are supervised from an area or district office.

7.03 Where routine maintenance for a number of buildings is performed by a mechanical maintenance group, consideration should be given to maintaining the records in the building to which the group normally reports.

7.04 Reports on trouble, repairs, replacements and removals may be filed with the inventory card so that all information on each particular item of equipment is associated.

7.05 Forms E-3927 related to a particular equipment item are filed with the corresponding inventory card (Form E-3925) in an 8" x 5" kraft file folder. The folder is designed so that when the inventory card is placed in it the name of the item and the equipment number show above the front flap and it is therefore not necessary to label the folders. Forms E-3927 are filed in the folder in back of the inventory card. The folders are packed in lots of 100 and may be ordered as follows:

(Quantity) Folder, File, Vertical, RHP

Attached:
Exhibits 1 through 3, inclusive.

EXHIBIT #1

BUILDING MECHANICAL EQUIPMENT RECORD

E-3925
(1-52)

ITEM Pump, Sump EQUIP. NO. 26-1

CITY Alphatown BUILDING LOCATION 130 Main Street

EQUIP. LOCATION Basement-Boiler Rm. DATE INSTALLED 1947

DESCRIPTION: MAKE Yeoman Bros. Co. SERIAL NUMBER SD-6-45-2-H

Model B - "Drain-Dri"

ACCESSORIES & CONTROLS: Cutler-Hammer Magnetic Switch, Bulletin 9586, Size 0

Index 9586H, 1245-U

Square "D" Line Switch. Cat. #45351, Series 4, 3 phase.

MOTOR DATA: MAKE Howell Elec. Co. SERIAL NO. 11110H15 H.P. 1/2 VOLTS 220 A.C. ~~D.C.~~

PHASE 3 R.P.M. 1725 AMPS. 1.84 FRAME NO. A - 171

FRONT

Reference	Description of Routine Maintenance	Freq.	Est. Time
Mfg.Inst.	Fill Guide Bearing grease cup	M	1/4
" "	Clean Sump and strainer, check float for water,		
	check start and stop adjustment.	SA	2
" "	Check Thrust Bearing Lubrication. Add ball bearing		
	grease as necessary.	SA	1/4
" "	Check switch contacts and operation of switches.	A	1/2
	Clean motor and check operation	A	1/2
	Note: Motor bearings are sealed type and require		
	no additional lubricant.		

D-Daily SM-Semi-Monthly Q-Quarterly A-Annually

W-Weekly M-Monthly SA-Semi-Annually AD-As Directed

Date 4-4-51 Recorded By M. Jackson Approved A. Jones

BACK

E-3926
(1-52)

BUILDING MECHANICAL EQUIPMENT
ROUTINE SCHEDULE AND PROGRESS CHART

CITY Alphatown BLDG. 130 Main St.
YEAR 1951

EQUIP. NO.	NAME OF EQUIPMENT	LOCATION	ROUTINE TO BE PERFORMED	REFERENCE	ASSIGNED TO	FREQ.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
26-1	Pump, Sump	Basmt.	Fill guide bearing grease cup.	Mfg.Inst.	H. Jones	M	X	X	X	X	X	X	/	/	/	/	/	/
"	" "	"	Clean Sump and strainer, check float for water.	" "	" "	SA						X						/
"	" "	"	Check start and stop adjustment.	" "	" "	SA						X						/
"	" "	"	Check thrust bearing lubrication.	" "	" "	SA						X						/
"	" "	"	Check switch contacts and operation.	" "	" "	A						X						
"	" "	"	Check motor and check operation.	" "	" "	A						X						

D-DAILY W-WEEKLY SM-SEMI-MONTHLY M-MONTHLY Q-QUARTERLY SA-SEMI-ANNUALLY A-ANNUALLY AD-AS DIRECTED

EXHIBIT #2

E-3927
(1-52)

BUILDING MECHANICAL EQUIPMENT
REPORT OF TROUBLE FOUND, REPAIRS, REPLACEMENTS OR REMOVALS

ITEM Pump, Sump EQUIP. NO. 26-1

CITY Alphatown BUILDING LOCATION 130 Main

TO Supervisor of Building Maintenance DATE June 25, 1951

TROUBLE FOUND

Float leaks and is water logged. Should be replaced.

REPAIRS, REPLACEMENTS OR REMOVALS

Replaced Float

LABOR HOURS 2 DATE COMPLETED 7-2-51

H. Jones

EXHIBIT #3

VENTILATION

BASEMENT SPACES

1. GENERAL

1.01 This practice covers procedures suggested for the ventilation of power rooms, engine rooms, transformer vaults, cable vaults, boiler rooms, coal storage vaults, oil tank enclosures and gas meter compartments located in basements of telephone buildings.

1.02 The section is reissued to include additional recommendations pertaining to explosion protection and to provide reference to other Bell System Practices relative to the general subject. For operation and maintenance application, the section is dually numbered with this issue and the same issue number is assigned for uniformity.

1.03 The procedures are intended to apply primarily to future buildings, but may be considered, where advisable, for improving existing conditions.

1.04 In order to avoid the possibility of transmitting noxious or explosive gases from the basement to other parts of the building, it is desirable that no portion of the basement space be connected to the recirculatory system of any ventilating plant serving stories above the basement. As an additional precaution, it is advisable wherever practicable, to seal off cable ducts, pipe shafts and similar openings in the basement area to reduce the possibility of explosive pressures penetrating to upper stories.

1.05 The recommended standards for the construction of fire-resistive basement walls and partitions are outlined in B.S.P. Section H41.230, Interior Construction to Restrict Spread of Fire.

1.06 The recommendations pertaining to transformer vault design and explosion venting are based in general, upon the National Fire Codes; Volume V, National Electrical Code, and Volume II, The Prevention of Dust Explosions (Appendix B).

1.07 Where these suggested procedures are exceeded by local or State codes the legislated requirements are followed.

2. TRANSFORMER VAULTS

2.01 The requirements for vaults and their design based upon the type and capacity of the transformers, are outlined in National Fire Codes, Volume V - National Electrical Code, of the National Fire Protection Association. In telephone buildings the vault enclosure of transformers is generally considered advisable for the protection of building personnel and to prevent damage to the building or contents in the event of fire, escape of harmful gases or possible transformer explosion.

Location

2.02 Transformer vaults are generally located where they can be ventilated to the outside air without the use of flues or ducts. Where adjoining lot space or public space is available and may be used for this purpose, transformer installations outside the building have the advantages of being more readily vented for heat or gas dissipation and the release of pressures resulting from possible transformer explosion. Basement installations are preferably located adjacent to an exterior wall with vents opening directly into an areaway, or if above grade, to the outside.

2.03 General fire-protective recommendations for consideration in connection with transformer installations within telephone buildings are outlined in B.S.P. Section H41.230, Interior Construction to Restrict Spread of Fire.

Heat and Gas Dissipation

2.04 For the dissipation of heat, vaults are provided with adequate ventilation to prevent transformer temperatures in excess of the values prescribed in American Standards for Transformers, Publication C57.1 of the American Standards Association. Vaults ventilated to outdoor air without the use of ducts or flues, have a combined net area of all ventilating openings of not less than 3 square inches for each KVA of transformer capacity in service, except that the net area is not less than 1 square foot for any capacity under 50 KVA. In the event it is necessary to use ducts or flues for dissipation of heat, the ventilation area is determined as above, with consideration of the adequacy of the air supply and draft effect of the duct or flue. The duct or flue construction is recommended to conform to the requirements for cable vault vents outlined in Paragraph 3.03.

2.05 Vaults ventilated by natural circulation of air may have roughly half of the total area of required openings in one or more openings near the floor and the remainder in one or more openings in the roof or upper exterior wall; or all of the area of required openings may be provided in one or more openings in or near the roof. It is desirable that no openings for ventilation be constructed through an interior wall common to the vault and the building.

2.06 Ventilation openings are located as remote as practicable from doors, windows, fire escapes and combustible material. Openings are covered with durable gratings, screens or louvers, according to the treatment required to avoid unsafe conditions.

2.07 If automatic dampers are used in the ventilation openings in exterior walls of vaults containing oil-insulated transformers, the actuating device should function at a temperature resulting from fire and not at a temperature which might prevail as a result of an overheated transformer or bank of transformers. It is important that the unintentional closing of the automatic damper be avoided.

2.08 Incombustible insulating liquids used in some transformers, when decomposed by the electric arc in a transformer failure, evolve non-explosive gases which, however, if not released, can build up sufficient pressures to burst the tank, as oil can do, releasing liquid and gas in large amounts and for considerable distances. Ducts or flues for ventilation may serve to distribute the highly objectionable gases if extended through other building areas and it is desirable that direct outside ventilation be provided wherever practicable. Transformers rated in excess of 25 KVA and using non-flammable insulating liquid are furnished with a pressure relief vent and provision is made for absorbing the gases generated by arcing inside the case by a connection to a chimney or flue especially constructed for the purpose or, preferably, openings or vents from the transformer enclosure directly to outside air.

Explosion Relief Venting

2.09 The procedures for explosion relief venting outlined in the following paragraphs, where provided, eliminate the requirements for heat and gas dissipation described in the preceding paragraphs. It is important, however, where explosion relief venting is provided that any ducts or flues formerly used for heat and gas venting, are closed off at the vault wall or roof with construction equivalent to the walls enclosing the vault.

2.10 Vault construction to withstand explosion pressures includes the provision of suitable openings or vents to release explosive gases, and to direct the force of the explosion in a manner which will afford maximum safety to personnel, with a minimum hazard to telephone equipment and the building structure.

2.11 The size of the openings or vents required to release explosion pressures safely is influenced by the expected intensity of an explosion, the shape and strength of the vault, and the location and type of vent used. In the absence of data on the ratio of free open area to vault room volume which will satisfactorily vent transformer vaults of all types, it is suggested that openings of vents be provided on the basis of known ratios for mild to moderate explosion hazards.

2.12 Where adequate venting area may be provided it is recommended that the net area of openings or vents be in the order of 1 square foot for each 80 cubic feet of vault content. Openings or vents of this ratio can be expected to prevent the building up of explosion pressures in excess of 300 pounds per square foot on the walls and roof of a cubicle shaped enclosure, in the explosion of gases of mild to moderate force intensity.

2.13 The walls and roof of transformer vaults are preferably of 6-inch reinforced concrete securely anchored together and to the floor. Where masonry walls are used, they are recommended to be of solid brick, reinforced and securely joined to the floor and roof of the vault. In the event of higher ratios of net area of openings or vents, consideration is given to vault construction to withstand higher explosion pressure. It is suggested that a reasonable factor of safety be included in the design of transformer vaults.

2.14 Wall openings for venting directly to outside air are generally equipped with louvers. Additional venting may be provided, if necessary, by the installation of the louvers and outside entrance door with light construction and wall anchorages which will release in the low pressure limits of an explosion. The use of ventilated sash hinged to swing outward under predetermined pressure from within; fixed sash or perhaps wood louvered panels with light wall anchorages; scored glass or light wall panels are also considered where acceptable. However, with the use of vent closures which will be blown out in an explosion, it is important that protection against flying material be provided.

2.15 In the event it is necessary to extend explosion vent ducts within the building all portions of the ducts are constructed, preferably of reinforced concrete or steel shell, to conform to the requirements for the vault walls and roof.

3. CABLE VAULTS

3.01 The following measures are intended as a reference in providing adequate ventilation and incidental protection against explosion hazards in cable vaults or fire in the general basement.

3.02 Recommended procedures for the design and construction of cable vaults are outlined in B.S.P. Section AG40.60, Conduit Underground Entrances to Central Office Buildings and B.S.P. Section H41.230, Interior Construction to Restrict Spread of Fire.

3.03 Ventilation: Vent flues 8 inches to 12 inches in diameter or rectangular flues of equal capacity extending from the vault ceiling to the roof are recommended for each cable vault. The flues are usually spaced - one at each end of the vault and intermediately at every other wall column, the larger flues being used for the wider vaults. It is desirable that joints in the flue linings be made as tight as practicable. Flues constructed with rigid, impervious and noncorrosive duct such as compressed asbestos-cement pipe have the advantage of specially formed pressure-tight joints. In order to guard against possible leakage of gas between the cable vault and the story above, it is desirable that each initial length of flue lining at the vault ceiling be placed in position prior to pouring the surrounding structural floor slab. In certain instances, cable vaults are ventilated by means of openings through the exterior wall. In such cases these openings are equipped with louvers and wire mesh screen to prevent the intrusion of foreign objects into the vault and are protected by a fire damper constructed of 1/4 inch steel plate held open by a fusible link. It is desirable that these openings face on an unexposed side yard located on company-owned property. It is recommended that the location of such openings on street fronts be avoided.

3.04 Explosion Protection: The following measures are suggested for consideration in guarding against penetration, accumulation and ignition of explosive or flammable gas in cable vaults and in house cable ducts. The transmission of such gas to and from the vault may be minimized by the following provisions:

(1) Plug airtight all underground and house cable ducts, both cabled and empty, where they terminate in the vault. In this connection it may be desirable to design the vault termination of house cable ducts so as to facilitate plugging; also, to set each initial duct unit in place prior to pouring the surrounding structural floor slab to assure integral tightness.

(2) Construct solidly the partitions separating cable vault from basement, making them tight at floor, ceiling and adjacent walls. Other than the entrance doorway, provide no openings between the cable vault and other basement space. Promptly and tightly cement up or otherwise permanently seal all shrinkage, settlement or other cracks that occur at any time in or between walls, partitions, floor slabs, etc.

(3) Place no gas piping in cable vaults or within the construction enclosing them. Arrange cable vault drains, where possible, to discharge into a sump-pit. Direct connection of the vault drain to the sewerage system is undesirable since the drain trap water seal is subject to evaporation.

(4) Avoid locating electric switches inside the cable vault. Switches controlling cable vault electric lights are mounted on the basement side of vault partition adjacent to the entrance door. Equip electrical outlets for soldering pot connection within the vault with special "receptacles with plugs" approved by the Underwriters' Laboratories, Inc., for use in hazardous locations. Explosion-proof lighting is not generally required in cable vaults.

(5) It is recommended that any detected odor of gas be immediately reported, investigated and the leak corrected. Gas may seep through ground into the vault from gas mains in the streets or alley.

4. HEATER ROOMS

4.01 Heater rooms are generally considered hazardous locations and it is important that they be adequately cut off from other basement areas. The boiler room enclosure is also considered desirable because of the adverse draft effect of the building shaftways and of central ventilating equipment or emergency power equipment operating in adjacent areas. For these reasons, it is recommended that the boiler room door be maintained in the closed position and that a separate boiler room air supply be provided from outdoors.

4.02 The provision of an opening adequate in size and properly located between the heater room and outside air generally affords both satisfactory ventilation for the room and ample air supply for heater combustion. It is desirable that the opening be louvered, screened and of such size that its net open area will approximate that of the associated chimney flue. The opening is usually provided by louvering a portion of heater room window or by piercing an adjacent outside wall. Where neither of these methods is practicable, a metal intake duct is installed to connect a remote exterior opening with the heater room. It is customary, of course, to equip such ducts with self-closing fire dampers where they pierce fire walls or fire partitions, also at the outside opening if these are an external fire hazard. Most effective room ventilation is usually obtained by locating the air intake opening as remote as practicable from the heater and breeching air damper.

5. POWER ROOMS

5.01 Where basement power rooms can not be furnished with window openings sufficient to afford adequate natural ventilation, the provision of induced ventilation is suggested. Power exhaust units are, as a rule, sufficient for normal size rooms; large rooms, however, may require powered units in both intakes and exhausts. The ventilation openings are usually furnished with louvers and screens, and if accessible from outside they are equipped with bar guards. Filters are usually provided only in intake openings. Locating the room exhaust openings as remote as possible from the intakes is effective in obtaining maximum air circulation, and in certain instances may require the provision of metal ducts. The number of air changes per hour will, of course, depend upon the relative amount of heat producing equipment in the room.

6. INTERNAL COMBUSTION ENGINE ROOMS

6.01 It is expected that the recommendations contained in Bell System Practice Section AA360.015 entitled, "Ventilating Equipment for Rooms Having Engine Driven Generators - Power Systems" will be followed in providing for dissipation of heat during periods of engine operation. Although the enclosure of diesel engine alternator sets is not normally required, it is recommended that the installation be made with consideration of possible enclosure later if necessary, and arrangement made for future supply of ventilation and combustion air. Where internal combustion engines are located in open basement spaces in the vicinity of boiler rooms, it is suggested that appropriate measures, such as keeping the boiler room door normally closed, be taken to prevent the action of powered exhaust units from adversely affecting the boiler drafts. Air intake openings to engine spaces are amply screened and louvered to prevent the induction of dirt and rain.

6.02 In order to avoid the accumulation of explosive vapors in rooms enclosing gasoline engine driven generators, two vent openings to the outer air are usually provided, each being about 100 square inches in area. These supply and exhaust openings are located generally near the ceiling and remote from each other - the exhaust being equipped with a sheet metal duct arranged to terminate about 6 inches above the floor. Gasoline engine rooms having one or more windows may be readily provided with vent openings by substituting louvered metal panels for upper lights of glass.

6.03 Where the foregoing procedures conflict with or are exceeded by corresponding provisions of local or state legislation, the legislated provisions should, of course, apply.

7. COAL STORAGE VAULTS

7.01 In order to avoid the possibility of spontaneous ignition in stored coal, particularly bituminous coal, it is necessary to exclude, as far as practicable, air, heat and moisture from the storage space. This is on the basis that oxygen is required to originate and maintain combustion, also that its action is aggravated by the presence of heat and moisture. Coal which has been oil treated to reduce dust in handling is particularly subject to spontaneous ignition and storage in large quantities is not recommended.

7.02 Ventilation for coal vaults is therefore undesirable, and it is suggested that all practicable measures be taken to make the vaults reasonably tight against penetration or introduction of air, moisture and heat. Coal chute covers are usually sealed with appropriate gaskets; cracks, sleeves, etc., in surrounding walls are cemented up and entrances made reasonably airtight. Leaks in water and steam pipes, valves and connections within the vault are corrected, and pipes carrying cold water are insulated to preclude condensation. Steam or hot water lines located where they are subject to being covered with coal are protected, for example, with a covering of concrete.

7.03 Suggested procedures for the installation of heating equipment and additional information related to this practice are outlined in B.S.P. Section H42.110, Heating Equipment - Fire Protection.

8. GAS METER COMPARTMENTS

8.01 From the standpoint of minimizing damage to meters and the hazard of escaping gas entering the building due to leaky connections at meters and shutoff valves, it is desirable that gas meters be located in separate compartments or vaults ventilated directly to the outside air. It may be desirable also to place water meters in the same compartment from the standpoint of having all meters at one location.

8.02 Gas meters should be adequately supported and connected to piping in such a manner as not to exert undue strain on the connections.

ATMOSPHERIC ENVIRONMENT

FOR

TELEPHONE EQUIPMENT SPACE

GENERAL CONSIDERATIONS AND HEAT RELEASE DATA

1. GENERAL

1.01 A number of Bell System Practices will be issued under the collective title of "Atmospheric Environment for Telephone Equipment Space" of which this is the first covering "General Considerations and Heat Release Data." Subsequent practices will pertain to other phases of conditioning the air.

1.02 The engineering objective in providing a controlled environment is to obtain improved equipment performance with reduced maintenance costs, offsetting in whole or part the annual charges for the control equipment.

1.03 These practices will cover the requirements for conditioning the air in terms of the degree of control necessary or economically warranted based on experience with existing types of central office equipment operating under varying environmental conditions. They will outline what is believed to be the most suitable means of providing the desired control for air distribution, air movement, atmospheric impurities, humidity and temperature when such control is indicated. It does not necessarily follow that all equipment space will require similar treatment since each location must be studied individually to determine the degree of control which can be economically provided as related to the savings which may be expected in maintenance from such an installation.

1.04 This practice is primarily intended to present engineering data which will be useful in the design of mechanical ventilating systems, with or without cooling, for attended central office equipment space such as dial switchrooms and the AMA space in which the tape processing equipment is located. It is not intended for application to unattended equipment space such as Community Dial Offices, Repeater Huts, Power Rooms and other plant equipment spaces. Also, it is not intended that this practice be applied to the problems of providing comfort air conditioning for Operating Rooms or general office space.

1.05 The "Heating-Ventilating-Air-Conditioning Guide" published by the American Society of Heating and Air Conditioning Engineers is suggested as a reference for additional technical data.

2. NEED FOR A CONTROLLED ENVIRONMENT

2.01 It is recommended that windows of equipment spaces be kept closed at all times to minimize the amount of dust in the outside air which might enter the switchrooms. Dust of a fibrous nature causes open contact troubles. That of an abrasive nature causes impairment of contact treatment; wear on base metal or other contacts; and wear on bearing surfaces. The latter is particularly important with respect to panel and step-by-step apparatus. With closed window operation, it is generally considered necessary for reasons of personal comfort, to install a ventilating system to provide fresh air in motion, to remove stagnant air and odors, and to remove heat generated by the equipment, lights, and personnel. These conditions relate principally to warm weather operation, yet some ventilation is required during cold weather. Ventilation with outside air may adversely affect central office equipment performance as a result of both its dust and moisture content unless precautions are taken to control these conditions within the ventilating system.

2.02 Dial apparatus is designed to operate satisfactorily at room ambient temperatures up to 130°F. Generally, any apparatus which generates enough heat to affect its operation is equipped with a blower to disperse this heat into the room. With this arrangement, room ambient temperatures will rarely exceed 130° F if mechanical ventilation, without cooling, is provided.

2.03 Extreme variations in relative humidity affect the performance of dial equipment because of dimensional changes of nonmetallic materials such as phenol fiber and phenol fabric, paper insulation of panel multiple banks, and cork on panel drive rolls. Under the worst conditions, adjustments are unstable and maintenance effort is increased. Wintertime humidity control minimizes the electrostatic attraction of the dust particles to contact springs and wiring. The latest types of dial apparatus are less subject to adjustment instability and perform more satisfactorily under varying humidity conditions than apparatus used in older dial systems.

2.04 Variations in relative humidity also affect the paper tapes processed in AMA centers. It is suggested that the space occupied by the AMA tape processing equipment be air conditioned with cooling and humidity control in accordance with the design data set forth in Paragraph 3.02(b) and (c).

3. DESIGN OBJECTIVE

3.01 The following engineering criteria are recommended for the design of ventilating systems intended to control the environment in attended central office and AMA center space.

3.02 Temperature and Humidity Control

(a) Summer - Ventilation Only - Maintain a room condition with a maximum of 10° F above the maximum design dry bulb temperature as listed for various localities in the A.S.H. & A.E. "Guide." When room conditions exceed 65 per cent relative humidity, automatically control the ventilating system to deliver a maximum of recirculated air. This will tend to reduce the relative humidity within the room thereby minimizing the detrimental effects which extreme variations in relative humidity have upon switching equipment.

(b) Summer - Ventilation with Cooling - Maintain a room condition having a maximum of 55 per cent relative humidity. To maintain room conditions lower than 55 per cent relative humidity will substantially increase the cost of the refrigeration equipment and operating costs disproportionately to the benefits realized. Maintain a room temperature not lower than 13° F below the maximum design dry bulb temperature as listed for various localities in the A.S.H. & A.E. "Guide." However, a reduced temperature differential is recommended for the lower outside temperatures. Cool air supplied to the room should not be more than 18° to 20° F below the room dry bulb temperature.

(c) Winter - Maintain approximately 35 per cent relative humidity in central office and AMA center spaces. A gradual reduction in relative humidity for short periods of time may be advisable to minimize window condensation as the outside temperatures fall. Double glazing may be helpful in reducing condensation in colder climates.

3.03 Filtration: Research conducted by the Bell Telephone Laboratories indicates that 4 inches of KS-7406 glass wool filter media are adequate to minimize open contact equipment troubles due to dust. The four inches of media are obtained by placing two KS-7406 glass wool filters, each 2 inches thick, in tandem in the filter frame. The second filter will remove approximately 25 per cent of the dust by weight which passes the first filter. Standard household type filters are not recommended. The KS-7406 filter has a graduated pack coated with an adhesive oil which makes these filters more efficient. When the filters require servicing, the filter unit on the dirty air side is discarded, the second filter is moved forward and a new filter installed on the clean air side. More efficient filters may be desirable in areas where the air is contaminated with large quantities of fine dust particles. Generally, electric type filters are not required except for a few locations having extremely large dust concentrations in the air.

3.04 Ventilating Systems - With or Without Cooling: Mechanical ventilation provides a filtered air supply for apparatus areas when closed window operation is practiced. The choice of a large air volume ventilating system or a smaller air volume system with cooling will depend upon a comparison of first costs, operating expenses, and maintenance costs. Without cooling, 8 to 12 air changes per hour may be required to meet the design limits outlined in Paragraph 3.02(a). With cooling, approximately 4-1/2 or 5 air changes per hour will usually meet the limits of Paragraph 3.02(b). Concentrations of high heat producing equipment may require more air changes than indicated for either type of system. Most ventilating systems are designed to deliver a mixture of recirculated and outside air in varying proportions. Since the greatest percentage of dust removed by air filters is dust in the outside air, maintenance costs for filter changes will be reduced if the volume of outside air handled by a system is kept at a minimum consistent with local building and health codes. Systems with cooling generally provide up to 25 per cent of their capacity as outside air. More, up to 100 per cent, may be desirable at certain seasons to reduce the operating costs for the cooling equipment; however, filter maintenance would increase. The handling of larger air volumes requires a greater number of filters and larger duct sizes for air distribution. Low face velocities for air discharge diffusers tend to reduce dust impingement on near-by apparatus.

4. EQUIPMENT HEAT RELEASED

4.01 The average heat released by various types of central office and AMA equipment is listed below. Other information relative to the heating or cooling load needed in the design of ventilating systems may be found in the A.S.H. & A.E. "Guide."

	Watts per Sq Ft of Floor Space
Step-by-Step System	.75 (1) (4) (7)
Panel System	1.25 (1) (4)
Local Crossbar Systems	1.35 (1) (4) (7)
Crossbar Tandem Systems	2.00 (1) (4) (7)
Toll Crossbar Systems	2.50 (1) (2) (4) (7)
Large Repeater Station	3.00 (1) (3) (4)
AMA Accounting Centers Equipment	4.00 (5)

Equipment	Watts per Unit	Watts per Bay (4) (6)	
N-1 Carrier	350 per Term.	1050	
O-1 Carrier	150 per Term.	600	
O or N Thru Channel Unit	Deduct 11 watts per channel unit		
ON Junction Equipment	48 per Group	336 Max	
E2 Repeater	3.8	23-inch Bay	570 Max
E3 Repeater	3.4	23-inch Bay	510 Max
2400-2600 Cycle SF	18	540	
43A Telegraph		Max	Min
Channel Term. Nonserv. Board	24	764	468
Channel Term. Service Board	30	870	735
Loop Pad (Avg)	10	-	-
Filament Pot	5	-	-
96A1 Telegraph Loop Repeater	24	Max of 36 per Bay 870 Watts	
144-Type Coupling Units			
144A1	15	40 Max per Bay 600	
144B1	20	40 Max per Bay 800	
144C1	20	40 Max per Bay 800	
143A2 Regenerative Repeater	32	30 Max per Bay 960 With Filament Pots 1110	

(1) Average watts per square foot per hour of switchroom space based on a 24-hour period.

(2) 2.50 watts per square foot for toll crossbar systems includes a concentration of 17 watts per square foot in the card translator area. Special attention is required for card translators. If partitioned off from the toll switchroom, deduct the following watts from the switchroom space and treat both the switchroom and enclosed area accordingly.

Home translator - 1000 watts per translator per hour.
Foreign Area Translator - 600 watts per translator per hour.
Emergency Translator - This is a substitute for either type of translator. It is only used when either a Home or Foreign Area Translator has failed. Hence, the Emergency Translator does not affect the total heat released by this type of equipment.

(3) May vary from 2 to 15 watts depending on type of equipment.

(4) Add heat released by lights, an average value of which might be one watt per sq ft. However, the heat released by lights may vary depending upon the light intensity engineered for the space.

(5) Heat released only when the AMA equipment is operated during working hours. Add heat released by lights which may vary depending upon the light intensity engineered for the space.

(6) Recommended maximum watts per bay of equipment when equipment layout is based on minimum aisle widths. This does not include the heat generated by lighting.

(7) Recommended maximum watts per square foot of floor space when equipment layout is based on a 20' by 20' building bay. If something other than a 20' by 20' building bay is used for the layout of the identical telephone equipment, multiply the watts by the ratio of the area of the 20' by 20' building bay to the area of the building bay used.

COOLING TOWERS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the operation and maintenance of mechanical draft cooling towers used for air conditioning systems.

2. DESCRIPTION

2.01 A cooling tower cools the water which has been used in the condenser of the refrigeration equipment for extracting heat from the refrigerant. It cools the water sufficiently for reuse and thereby minimizes the amount of water consumed for this purpose. Its place in an air conditioning system is illustrated in Fig. 1.

2.02 Cooling is accomplished by exposing the condenser heated water to outside air so that the water loses heat partly by transfer of sensible heat to the cooler air, but mainly by evaporation of a portion of the water.

2.03 The tower consists of an enclosure of wood, metal or asbestos cement board. Water is admitted to the top of the enclosure and is sprayed or dripped down over a series of slatted decks to be accumulated in a water basin at the bottom of the tower. Means are provided for forcing air through the sprays of falling water. The cooled water is accumulated in the basin of the tower and is returned to the condenser for recirculation.

2.04 Cooling towers are divided into two general types, natural draft and mechanical draft. The natural draft tower relies on prevailing winds, or on chimney effect for air flow through the tower. The mechanical draft tower is equipped with one or more fans to supply the required quantity of air. Disadvantages inherent in the natural draft tower, e.g., large size, spray nuisance, dependence on natural conditions, etc, generally preclude the use of this type for telephone buildings. This practice is accordingly concerned only with the mechanical draft cooling tower.

2.05 The mechanical draft towers are also divided into two general types, forced draft, illustrated in Fig. 1, and induced draft, illustrated by Figs. 2 and 3. In the forced draft tower the fan is located in the air inlet to the tower. In the induced draft the fan is located in the air outlet from the tower.

2.06 The path of air flow through the tower serves to further classify the mechanical draft tower. In the crossflow tower, air flows horizontally across the path of the falling water. In the counterflow tower, illustrated by Fig. 2, air flows vertically upward counter to the path of falling water. The doubleflow tower, illustrated by Fig. 3, has air flowing in horizontally from both ends of the tower, then upward through the fan discharge.

2.07 Various means are used to break up the water into fine particles in order to expose greater water surface to the cooling action of the tower. Spray headers illustrated in Figs. 1 and 2 break the water in fine drops. In another arrangement, illustrated in Fig. 3, the warm water is fed to a distribution basin located at the top of the tower. The floor of this basin is equipped with a number of uniformly spaced ceramic distribution nozzles. Another method, not illustrated, simply utilizes overflowing troughs to distribute the water.

2.08 The water is distributed over a series of staggered slatted decks, called the fill, which retards the rate at which it returns to the catch basin and serves further to break up the water into fine drops. The fill may be of metal, wood or asbestos cement boards.

2.09 Air flowing through the tower will entrain small water particles. Water lost due to this effect is called drift loss. Baffles, called drift eliminators, in the air stream leaving the tower impede the air flow so the small water particles impinge on the eliminator plates and drop back into the tower, thus minimizing drift loss.

2.10 The water basin of the cooling tower is equipped with a float valve to prevent the water from falling below a certain level, and an overflow pipe to prevent the water from rising above a certain level. There is also a drainpipe for emptying the basin, and a screened sump for the pump inlet to screen out debris. Each of the items is illustrated in Figs. 1, 2 and 3.

3. OPERATION

3.01 As noted, the water in a tower is cooled mainly by evaporation of a portion of the water as it passes through the tower. The latent heat required to evaporate a pound of water is approximately 1000 Btu. This heat is taken from the water which does not evaporate and results in a loss of sensible heat. As the water surrenders sensible heat, its temperature will drop one degree per pound for each Btu surrendered. Applying the above figures, the heat absorbed by the evaporation of one pound of water will cool 100 pounds of cooling tower water 10°.

3.02 The cooling tower theoretically can continue to cool the tower water until the water temperature reaches the wet bulb temperature of the air passing through the tower. When this limiting temperature is reached, evaporation ceases. However, a cooling tower designed to cool water to the wet bulb temperature would be of infinite size, so in actual practice, towers are designed to "approach" the wet bulb temperature. The closer the final water temperature approaches the wet bulb temperature, the larger the tower must be for a given capacity. The actual temperature difference between the final temperature of the water cooled by the tower and the wet bulb temperature is called the Approach of the tower. For air conditioning applications, towers are sized to provide an approach of 5° to 10°, usually 7.5°.

3.03 The warm water is fed to the tower and cooled to a certain approach to the wet bulb temperature, the temperature difference between the inlet water and the outlet water is called the Cooling Range of a tower. Cooling towers used for air conditioning applications are sized to provide a cooling range of 5° to 15°, usually 10°.

3.04 As an illustration, a tower which received water at 95° and cooled it to 85° at an ambient (surrounding) wet bulb air temperature of 78° would have a 10° range (95° - 85°) and a 7° approach (85° - 78°). Manufacturers will supply range and approach figures for their towers under various wet bulb temperatures and cooling loads.

3.05 The water cooling tower is generally used with the larger capacity refrigerating systems. Its alternate water saving device, the evaporative condenser is usually made in sizes up to 100 tons. Good design requires that the evaporative condenser be installed near the refrigeration equipment. A cooling tower, on the other hand, may be remotely located from the refrigeration equipment. Thus the tower is well suited for installations in which package units are mounted on various floors of a multistory building, or where the refrigeration equipment is in the basement and the tower is on the roof. It is also used with centrifugal compressors, in which the refrigerant circuit must be kept short.

3.06 During conditions of light load on the refrigerating system, or when outdoor wet bulb temperatures are low, the cooling tower water temperature will drop. When such conditions occur, the capacity of the cooling tower exceeds requirements and is out of balance with the load on the refrigeration system. Abnormally low water temperature in the condenser causes abnormally low compressor discharge pressure. As the discharge pressure drops, the compressor tends to lose its oil to the refrigerant piping system, creating difficulties in compressor lubrication with the possibility of plant shut down.

3.07 To minimize potential trouble of this kind, the fans in the cooling tower may be controlled, either by a pressure controller on the compressor discharge line, or by a temperature controller in the condenser water line from the cooling tower. Such controls will maintain satisfactory compressor discharge pressure.

3.08 Another method of controlling the temperature of the cooled water from the tower is by means of a modulated by-pass valve which by-passes water from the warm water line to the cooled water line without circulating through the cooling tower. The modulated valve is operated by a modulating type temperature controller in the cooled water line from the tower.

3.09 Normally, operation of the refrigeration equipment and the tower is unnecessary in the winter season, and the tower is drained to prevent damage by freeze-ups. However, sometimes on warm winter days the outside air intake ducts are too small to dissipate the heat developed in telephone equipment rooms, and the temperatures in the switch rooms may rise to an uncomfortable degree. If careful study shows increasing the capacity of the outside air ducts to be impractical, it will be necessary to operate the refrigeration equipment and the tower during the winter season. Whenever the outdoor temperature drops below the freezing point, ice will form on the intake louvers and the fill of the tower. Shutting down the tower fan will in most cases melt the ice. One method of preventing ice formation on the tower when operation during freezing weather is necessary is to provide a by-pass arrangement around the spray heads or distribution deck. The warm water coming from the condenser is valved off from the spray heads or distribution deck and piped directly into the collection basin in such a way as to create a swirling motion of the water in the basin. The fill and the air intake louvers remain dry and thus can not form ice. The warm condenser water swirling into the basin prevents the basin from freezing over.

4. CAPACITY RATINGS

4.01 Cooling tower capacity ratings are listed by the manufacturer in table form or in a series of rating curves. The tables or curves specify the amount of refrigeration in tons of capacity that the tower will handle under various conditions of wet bulb temperature, inlet water temperature and gallons per minute of water circulated through the tower. The range and approach of the tower under varying conditions will also be found in the tables or curves.

4.02 Cooling towers are sized to remove 15,000 Btu's per hour per ton of refrigerating capacity. Since a refrigerating system absorbs only 12,000 Btu's per hour per ton, the extra 3000 Btu's capacity of the tower is provided to remove the heat added in compressing the refrigerant, and the heat added by the tower circulating pump.

4.03 It is possible to make a rough test on the performance of the tower to determine if it is functioning properly. The following information is required.

(a) Cooling range of the tower. This is found by subtracting the temperature of the outlet water from the temperature of the inlet water of the tower.

(b) Weight of the water circulated through the tower per hour. This may be measured by several means. If a pitot tube measuring device is available the flow of water through the inlet pipe may be measured. If pump capacity curves are available, the amount of water pumped may be determined by noting the total pumping head on the pump pressure gauges and reading rate of flow corresponding to the head on the pump curve.

(c) Wet bulb temperature of outside air.

(d) Approach. This is found by subtracting the wet bulb temperature from the outlet water.

4.04 The information gathered will give the operating capacity of the cooling tower when substituted in the following formula:

$$\text{Cooling cap. in tons of refrig.} = \frac{\text{Wt. of water circulated per hr x range}}{15{,}000\ \text{Btu/hr/ton}}$$

The result obtained may be checked against the manufacturer's rating tables to see if the tower is performing satisfactorily.

4.05 As an example of the above test, assume a tower serving a 300 ton refrigerating system operating at full capacity. The measured rate of water flow is 900 gallons per minute (gpm). The inlet water temperature is 95° the outlet water temperature is 85° and the wet bulb air temperature is 75°. Substituting in the formula, the solution is:

$$\text{Cooling cap. in tons of refrig.} = \frac{900\ \text{gpm x } 8.33\ \text{lbs/gal x } 60\ \text{min/hr x } 10^\circ\ \text{range}}{15{,}000\ \text{Btu/hr/ton}}$$

$$\text{Cooling cap.} = \frac{4{,}498{,}200}{15{,}000}$$

Cooling cap. = 299.9 tons

The manufacturer's table for this tower rates it at 300 tons with a 10° range and 10° approach at a wet bulb temperature of 75°. This corresponds with the test results so the tower is operating properly.

4.06 If the measured cooling range is greater than specified for the tower it is an indication that the rate of water flow is less than design rate. Generally, cooling ranges and water flow rates follow the following table:

Flow Rate	Cooling Range
2 gpm/ton	15°
3 gpm/ton	10°
4 gpm/ton	7.5°

If the measured approach of the tower is greater than specified it is an indication that the tower is not performing properly. A higher than normal approach may be caused by any of the troubles listed in the trouble chart under the symptom of high head pressure.

5. AIR REQUIREMENTS

5.01 Mechanical draft cooling towers require from 300 to 400 cfm of air per ton of capacity for efficient functioning. Obstructions near the tower which restrict the free entry of air, or which cause recirculation or short-cycling of discharge air into the air inlet of the tower will adversely affect tower efficiency.

6. WATER LOSSES

6.01 Cooling towers circulate from two to four gallons of water per minute per ton of refrigerating capacity. Approximately 1% of the water circulated is evaporated for every 10° of tower cooling range.

6.02 Since a cooling tower is sized to remove 15,000 Btu's/hour per ton of refrigerating capacity, and since one pound of water absorbs 1000 Btu's in evaporating, the evaporation loss of a tower is 15 pounds or 1.8 gallons per hour per ton of capacity.

6.03 Drift loss through entraining of small water particles by air flowing through the tower is minimized by drift eliminators in the discharge air stream and is negligible in a well designed tower. Drift from a redwood tower may stain surroundings due to the water leaching tannin from the redwood.

6.04 Blow down or bleed loss is an intentional loss to a drain and is adjusted to limit the concentration of solids caused by evaporation of the water. It is further described under water treatment in this practice. Bleeding may be accomplished by means of a small valved line from the warm water inlet pipe of the tower to a drain. It may be necessary to provide a solenoid valve in series with the bleed adjusting valve if the bleed line continues to flow when the pump is off and the tower is inoperative. The electrical connections of the solenoid should be tied into the pump starting control to operate only when the circulating pump operates. Another method of bleed-off utilizes a collecting funnel installed in the overflow pipe of the tower in the path of the water falling through the tower. The rate of bleed is adjusted by means of a sliding lid on the rectangular top rim of the funnel. This type is especially suited for smaller rates of bleed where silt or debris might clog a small bleed line.

7. WATER TREATMENT

7.01 The municipal water used to fill the cooling tower and to make up water losses may be broadly classified as either hard or soft. Generally, reservoirs supplied primarily by the surface run-off water or rainfall have soft water. Sources supplied by underground streams and wells contain dissolved minerals and are hard. The hard water tends to form scale in the tower circulating system and damage the wood in the cooling tower. Soft water tends to be corrosive to the metal in the circulating system due to its dissolved oxygen and carbon dioxide content. Treatment is generally necessary, either to control scale formation or corrosion.

7.02 The municipal water supply with its dissolved solids and gases may not have serious scale forming or strongly corrosive characteristics. However, the water which evaporates from the tower in normal operation is pure water. The mineral impurities remain behind and increase in concentration, thus changing the characteristics of the water. It is possible, through evaporation, for the tower water to contain twenty times as much dissolved solids as the make-up water supply. The number of times the amount of dissolved solids in the tower water is increased over the amount of dissolved solids in the make-up water is called the Cycles of Concentration. The most basic and simplest step in controlling scale or corrosion is to bleed a portion of the concentrated tower water to a drain and dilute the remainder with fresh make-up water. The amount of bleed needed to provide various cycles of concentration is given in the following table:

Cycles of Concentration to be Maintained	Bleed-off Rate, gal. per hr. per ton of refrig. cap.
2	1.80
3	.90
4	.60
5	.45
6	.33
7	.30
8	.26
9	.22
10	.20

Scale Control

7.03 If the municipal water supply is hard, as the concentration builds up, the water becomes harder, and the solids tend to precipitate out as scale on the high temperature surfaces of the circulating system, the water side of the condenser tubes. The scale retards the transfer of heat from the refrigerant gas to the cooling tower water, thus decreasing condenser efficiency and causing high compressor head pressure.

7.04 Several methods of controlling scale formation are possible. With moderately hard water, by bleeding to provide two to three cycles of concentration, a thin protective scale may be built up on the condenser tubes without seriously impairing condenser efficiency. However, with this method, the pH control and the bleed rate adjustments are very critical to prevent the scale from continuing to build up. Generally, scale formation is more easily controlled by adding polyphosphates in concentrations of three to five ppm. To prevent possible corrosion by this method eight to ten ppm of chromate are added with the polyphosphate. The bleed rate should be adjusted to provide from three to five cycles of concentration and the pH value adjusted to 6.5 to 7.5 for wooden towers, or 6.5 to 8.5 for metal towers.

7.05 If the water supply is very hard (over 180 ppm calcium carbonate) it will probably be necessary to neutralize some of the alkalinity in the water with sulphuric acid to adjust the pH value to the recommended range. The three to five ppm polyphosphate and eight to ten ppm chromate should also be added. With this method of treatment, the number of cycles of concentration allowable is generally five to eight.

7.06 As an alternative to the treatment suggested in Paragraph 7.04, the make-up water supply or some portion of it may be fed through a Zeolite exchange softener which reduces the hardness content of the water.

Corrosion Control

7.07 Corrosion or rusting is the loss of metal in the water circulating system, due either to chemical or electrochemical action. It may be in the form of broad, generally corroded areas, or in the form of severe localized pitting. Corrosion is accelerated by dissolved oxygen in the cooling water and by water having pH values below seven. The oxygen content and the acidity of the water tend to build up because of the oxygen and acid forming gases present in the air drawn through the tower.

7.08 Chromate concentrations of 300 to 500 ppm afford acceptable corrosion protection within a pH range of 7 to 8.5 for cooling tower circulating systems. The wooden portions of the tower are least susceptible to deterioration at a pH value of 7.2. An effective and less expensive method of protecting both wood and metal in contact with the tower water is to use a mixture of ten ppm polyphosphate, and 160 ppm chromate maintaining a pH value of 6.5 to 7.5. Bleed-off should be adjusted to maintain five to eight cycles of concentrations. The pH value, which normally tends toward the acid side, may be adjusted by addition of caustic soda or soda ash. If the tower is not constructed of wood, the same chemical treatment may be used with a pH range of 6.5 to 8.5.

Algae and Slime

7.09 Algae is a form of plant life, greenish in color, which multiplies rapidly in water exposed to light. Slime is a form of organic life which flourishes in dark portions of the water circuit. Both growths will impede water circulation and insulate heat exchange surfaces if allowed to grow.

7.10 Algae and slime may be removed by scrubbing manually, by hosing down with a high pressure hose, or by poisoning with chemicals. Since the use of chemicals does not require shutting down the system, it is the preferred means of control.

7.11 Sodium pentachlorophenate seems best suited for use as an algaecide. It is highly toxic to algae and slime life and has no corrosive effect on the tower or circulating system in the concentrations recommended. Sodium pentachlorophenate may be used in the slowly soluble block form for continuous treatment, or in powdered form for shock treatment. Experience will determine which treatment is more effective. For continuous treatment, a concentration of 20 to 30 ppm of sodium pentachlorophenate is maintained in the circulating water. If this does not turn the algae from a green to a brown color after a few days, shock treatment in the order of 100 ppm should be used about once a week.

7.12 Other commonly used algaecides are copper sulphate and chlorine. Copper sulphate may cause serious corrosion of steel in the circulating system if improperly used. Chlorine as a hypochlorite is very effective, but losses of the chemical are high when the water is aerated in passing through the tower. This results in high costs and difficulties in maintaining proper proportions.

Wood Preservation

7.13 Deterioration of the wood in cooling towers may be caused by any of three forms of attack: chemical action, biological action and mechanical disintegration.

7.14 One form of chemical attack removes lignin, the binder that holds the wood fibres together. Wood subject to this attack forms long, whitish, loosely bonded fibres on the surface. This form of attack occurs in alkaline waters which have either strong concentrations of sodium carbonate or high chlorine content. It is controlled by keeping the pH of the water below 7.5, proper bleed to limit the sodium carbonate concentration, and by keeping the chlorine content below one ppm.

7.15 A rarer form of chemical attack removes cellulose, a substance similar to lignin from the wood, resulting in a surface condition of long reddish brown fibres. It is caused by the acid in water with a pH value below 5. Maintaining the pH of the water within the limits of 6.5 to 7.5 will prevent this form of attack.

7.16 Biological attack is caused by various microscopic organisms such as bacteria and fungi. Redwood normally contains certain extractives toxic to these organisms and resists biological attack unless these protective extractives are leached out by chemical attack. If the leaching action has occurred, the wood should be protected from biological attack by treating the water with an algaecide.

7.17 Biological attack may reveal itself in three different conditions of the tower wood. Delamination of the wood may occur in which the softer grain of the wood erodes and the hard grain stands out in ridges. Another form of biological attack causes a soft, punky center under a sound exterior. A third form of attack does not change the appearance of the wood, but weakens the fibres so that the wood breaks cleanly across the grain instead of with a normal splintering action.

7.18 Mechanical disintegration sometimes occurs in the section of the tower exposed to alternate wetting and drying action. The wood absorbs water with its dissolved salts when wet, and is ruptured by the crystallization of the salts as the wood dries out. Damage to the wood from this action may be minimized by proper bleed to limit the concentrations of salts, and by periodically scraping or hosing down salts which form on the surface of the alternately wet and dry wood sections.

7.19 More complete information on water treatment will be found in BSP H51.370 "Fundamental Principles of Water Conditioning" and BSP H51.371 "Water Treatment, Air Conditioning Systems." The latter section describes water analysis, types of treatment and procedures for evaluating the effectiveness of the treatment program.

Precautions

7.20 The chromate compounds used for water treatment are poisonous. Hands must be washed well after contact with this chemical.

7.21 Sodium pentachlorophenate also is poisonous and care must be exercised in handling it. Dust from the chemical is irritating to mucous membranes and both the dust and water solution may be irritating to the skin if exposure lasts longer than five minutes.

8. PREVENTIVE MAINTENANCE

8.01 The preventive maintenance procedures outlined in this practice apply generally to all cooling towers. For more specific information, refer to maintenance manuals published by the tower manufacturer or by the supplier of the materials used for maintenance, e.g., packing materials, oils, greases, etc. Characteristics of various lubricants are covered in BSP A710.012, "Materials - Greases, Oils and Cleaning Fluids." Details of fan and bearing maintenance are covered in BSP H51.317, "Inspection and Maintenance of Ventilating Fans."

8.02 A daily visual check may be made to detect abnormal operating conditions or incipient troubles. The daily check would cover:

(a) Unusual noise.

(b) Circulating pump gauge pressures.

(c) Inlet and outlet water temperatures.

(d) Electric motor temperatures. (Hand test)

(e) Proper flow and distribution of water.

(f) Float valve functioning.

(g) V-belt and coupling appearance.

(h) Water treatment facilities.

(i) Condition of suction screen.

8.03 Periodic maintenance routines are listed in the following chart.

8.04 Maintenance Schedule for Cooling Towers

Item	Routine	Minimum Frequency	Materials Used
Ball bearings in fans, pumps and electric motors.	Lubricate as per instructions in BSP H51.317 or manufacturer's instructions.	Every 3 to 6 months	Short fiber medium consistency all purpose soda soap basegrease or manufacturer's recommendations.
	Flush out, check for roughness or excessive play. Relubricate.	Every 3 years	Flush with mineral spirits. Relubricate, filling bearing 1/3 full of grease as above.
Sleeve type bearings in fans, pumps and electric motors.	Check oil cup level. Add oil if necessary. See BSP H51.317 for instruction.	Monthly	SAE 20 oil for ambient air temperatures of 30° to 90°F or manufacturer's recommendations.
	Drain and flush bearings. Check for wear, scoring, excessive play, oil slinger ring operation, seals. Refill with oil.	Every 3 years	Flush with mineral spirits. Refill with oil as above.
Fan drive reducing gear box.	Stop fan, and after several minutes check for proper gear box oil level. Add oil & check for leaks if low. Drain completely and refill if high. (Water contamination raises oil level.)	Weekly	Use oil as specified by manufacturer. The oil type is generally found on the name plate of the gear box, and is a waterproof oil with a specific gravity higher than water.
	Drain sample of gear box oil and check for water droplets or white or yellow streaks indicating moisture contamination. Drain and refill if moisture is found.	Monthly	Manufacturer's recommendation as above.
	Change gear box oil.	Every 3 months of operation	Manufacturer's recommendation as above.
	Check coupling tightness.	Every 3 months	
	Drain and disassemble gear box, checking shaft play, worn areas on gear teeth, corrosion. If found satisfactory reassemble and fill completely with oil to prevent corrosion during idle period. Cover with tarpaulin.	At annual shutdown	Manufacturer's recommended oil.
	Drain gear box oil and refill to proper level.	Annual start-up	Manufacturer's recommended oil.
Tower Basin	Check pump intake screen for breaks, clogging.	Weekly	
	Check for silt or debris in basin and clean if necessary.	Monthly	High pressure hose, stiff brush. If a wet pick-up vacuum cleaner is available, tower need not be drained to clean silt and debris.
	Test water treatment concentration, pH value, bleed rate.	Weekly	pH measuring kit, chromate comparator kit. Chloride test kit.

Item	Routine	Minimum Frequency	Materials Used
	Drain, clean thoroughly, check for deterioration or corrosion. Make replacements, or repairs found necessary on inspection. Paint where necessary.	At annual shutdown	High pressure hose, stiff brush for cleaning or vacuum pick-up.
	Close drains, refill to swell wood.	Two weeks before annual start-up.	
	Tighten basin bolts, caulk where necessary to stop leaks.	At annual start-up	Oakum and pitch, or caulking compound.
Tower distribution basins, troughs, nozzles, fill louvers and eliminators.	Check for proper, even break-up and distribution of water flow over fill. Clean if necessary.	Monthly	High pressure hose, stiff brush.
	Clean thoroughly, check for deterioration or corrosion, replace, repair or repaint as necessary.	At annual shutdown	High pressure hose, wire brush, scraper.
Fan	Visually check for fan blade damage. Check weep holes in hollow blades for clogging. Check while in operation for vibration or tower sway indicating unbalance.	Weekly	
	Check mounting bolt tightness, pulley set screws.	Monthly	
	Check belt alignment, tightness, and condition.	Monthly	
	Clean blades, paint if necessary. Check fan balance.	At annual shutdown	
	Remove belts and store in protected location. Paint pulley sheaves to prevent corrosion.	At annual shutdown	Rust preventive paint.
	Replace belts.	At annual start-up	
Pump	Check stuffing box for proper leakage.	Monthly	
	Repack pump. Be sure to remove packing behind metal lantern seal ring. Be sure lantern seal ring is replaced in proper position. Install rings with joints staggered.	At annual shutdown	Square graphited asbestos packing cut in rings with diagonal joints. Pump packing tool.
	Check coupling alignment, coupling tightness, bushing condition.	At annual shutdown	

Item	Routine	Minimum Frequency	Materials Used
	Drain water from pump, leaving drain plug out.	At annual shutdown	
	Replace pump drain plug.	At annual start-up	
	Overhaul pump, inspect shaft, impeller and wearing seal rings.	Every 3 years	New pump gaskets.
Electric motors	Clean windings by removing end bells.	Every 3 years	Vacuum cleaner or blower, soft brush.
Controls for electric motors. Caution: Be sure power is OFF before performing routines.	Check condition of contacts. Replace when silver thickness is reduced to 1/3 of original size. File large projections. Surface conditions similar to rough sandpaper are satisfactory. Do not file smooth.	Monthly	
	Check braided shunts to moving contacts for broken or burnt strands. Replace if damaged.	Monthly	
	Operate moving contacts by hand to check for binding or improper meeting of contact surfaces.	Monthly	
	Check tightness of all electrical connections. Check fuse clips and switch contacts for tightness or discoloration of copper indicating poor contact.	Annually	
	Wipe magnet sealing surfaces in starter box.	Monthly	Lint free cloth, slightly moistened with oil.

9. TROUBLES

9.01 Since the function of a cooling tower is to cool water used by the condenser in a refrigeration system, any trouble in a tower generally results in warmer water being supplied to the condenser. With warmer water in the condenser, the discharge pressure gauge of the compressor will rise. Thus the discharge pressure gauge of the compressor indicates the relative efficiency of the cooling tower.

9.02 Trouble Chart for Cooling Tower

Symptom	Trouble	Possible Cause	Remedy
High head pressure. Liquid refrigerant in bottom of condenser or receiver very warm. Compressor may cut out on high head pressure.	1. Insufficient air through tower. (Less than 300 to 400 cfm/ton of capacity.)	a. Blown fuses, tripped overload relays, or tripped vibration switch	a. Find cause of failure, repair, and replace fuses or reset overload relay or vibration switch.
		b. Motor and fan running backwards.	b. Reverse motor leads. If not a new installation, check for recent power changes. If a single phase capacitor start motor, check for stuck centrifugal starting switch in the motor.

Symptom	Trouble	Possible Cause	Remedy
		c. Low voltage to fan motor. (Over 10% difference in actual and rated voltage is bad for motor.)	c. Increase wire size. Consult Power Co. Change taps on owned transformers.
		d. Fan drive shaft or fan drive coupling broken.	d. Replace drive shaft or coupling.
		e. Gear box frozen or binding.	e. Repair gear box.
		f. Loose motor pulley or fan pulley.	f. Align pulleys and tighten set screws.
		g. Fan belts slipping or broken.	g. Adjust belt tension or replace belts with matched set.
		h. Pitch setting on fan blades changed due to loose set screws.	h. Reset pitch on blades to proper angle and tighten set screws. Check motor current afterwards to stay within motor current rating.
		i. Obstructions in fill, louvers or eliminators.	i. Clean fill, louvers and eliminators.
	2. Insufficient water circulation.	a. Clogged strainers in circulation piping.	a. Clean strainers.
		b. Clogged pump intake screen.	b. Clean screen. If algae, see Sec. 7.
		c. Clogged spray nozzles.	c. Clean nozzles.
		d. Scale in lines or condensers.	d. Chemically remove scale, treat water to prevent recurrence.
		e. Pump coupling loose or broken.	e. Repair or replace coupling, check alignment.
		f. Eroded pump impeller.	f. Replace impeller.
		g. Pump packing too tight or binding on shaft.	g. Loosen or replace packing. Check for damage to shaft.
		h. Low voltage to pump motor.	h. Increase wire size; consult Power Co.
		i. Blown fuses or tripped overload relay.	i. Find cause and replace fuses or reset relay.
		j. Pump motor running backwards.	j. Change power leads. If not a new installation, check recent power change-over.
		k. Float valve stuck closed.	k. Repair float valve.
	3. Insufficient water breakup.	a. Spray nozzles, distribution nozzles or distribution troughs clogged with algae or debris.	a. Clean, treat water for algae if necessary. See Paragraphs 7.07 through 7.12.
		b. Collapsed, broken, missing or warped fill.	b. Replace or repair fill.

Symptom	Trouble	Possible Cause	Remedy
	1. Tower discharge air recirculating into tower intake.	a. Intake and discharge of tower too close.	a. Install baffle or duct work to separate intake and discharge areas.
		b. Discharge air leaves at too low velocity.	b. Increase fan speed or fan blade pitch; do not overload fan motor in making change.
Noisy opereration.	1. Complaint of building occupants or neighbors.	a. Gear box or fan drive shaft worn or out of alignment.	a. Repair or realign.
		b. Pump, fan or drive motor bearings worn.	b. Replace bearings.
		c. Fan unbalanced.	c. Balance fan.
		d. Pump or fan coupling worn or broken.	d. Repair coupling.
		e. Fan belts loose.	e. Adjust belt tension.
		f. Three phase motor operating on single phase due to faulty wiring or blown fuse.	f. Repair wiring or replace fuse.

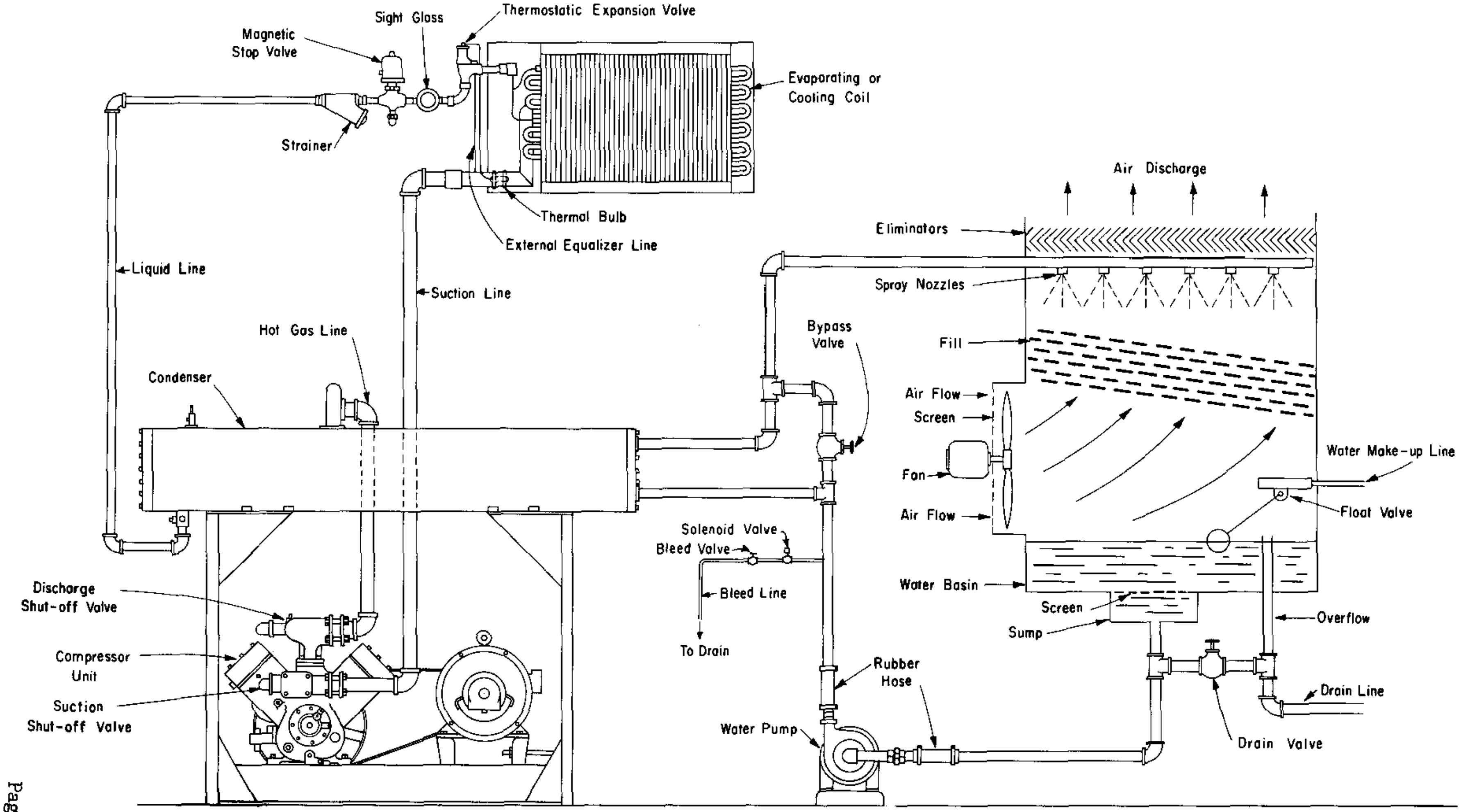


Fig. 1 - Forces Draft Cooling Tower Serving Refrigeration System

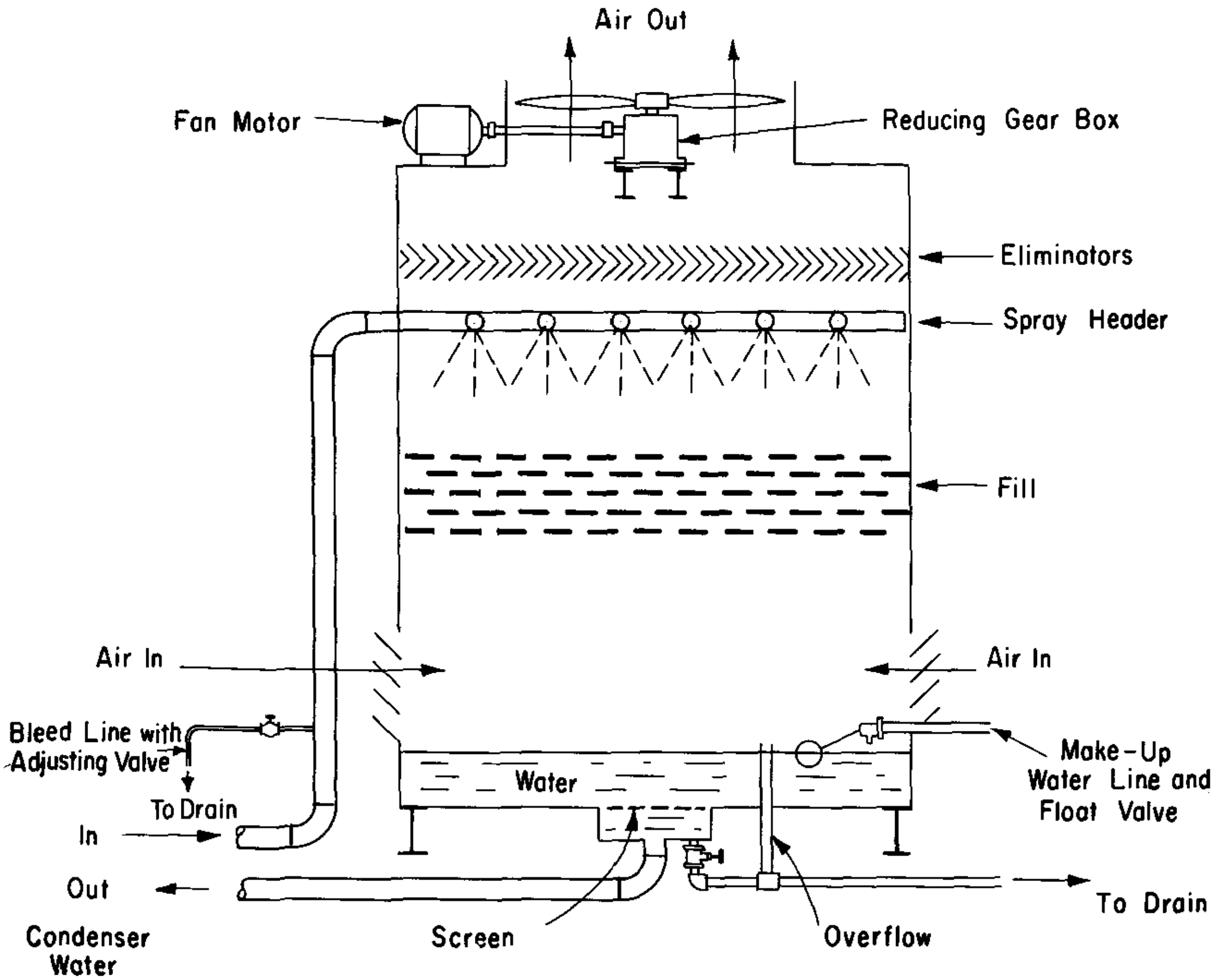


Fig. 2 - Induced Draft Counter-Flow Cooling Tower

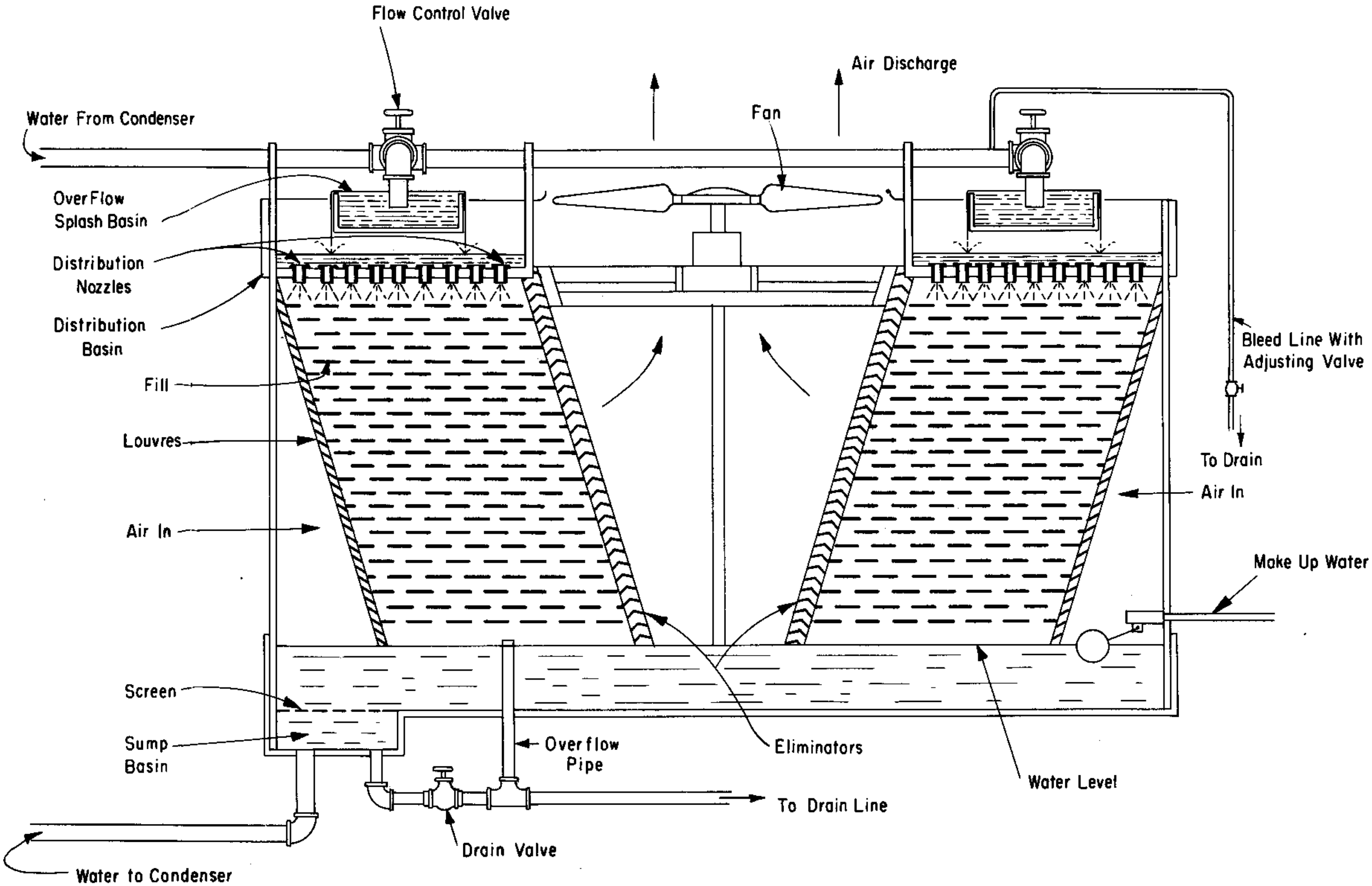


Fig. 3 - Induced Draft Double Flow Cooling Tower

WATER TREATMENT

OPEN AND CLOSED HEAT EXCHANGER SYSTEMS

1. GENERAL

1.01 This section outlines some conditions to be considered in planning equipment and water piping for water treatment of heat exchanger systems. Included in such systems are hot water heating systems, water chiller systems and water-cooled condensing systems used in air conditioning installations.

1.02 The control of corrosion, scale, algae, fungi, and sludge is essential to obtain maximum life and performance of the equipment used in these systems. The water to be used in a system should be analyzed by a reliable water testing laboratory or water treatment company to determine the need for a water treatment program. In addition, consideration should be given to the nature and extent of air-borne pollution to which an evaporative condenser or cooling tower may be exposed. The location of equipment of this nature should be guided by the location of building chimney, the type of fuel used and the prevailing wind direction.

1.03 The Engineering Department through the Building Engineer should:

(a) Make the decision after consultation with the Plant Department whether treatment is to be provided.

(b) Reach an agreement with the Plant Department on the method of treatment to be used.

(c) Provide the equipment required as part of the mechanical equipment of the building.

(d) Provide the initial supply of chemicals.

(e) Check for satisfactory installation and operation before turnover to the Plant Department.

(f) See that adequate operating instructions are provided for Plant Department use.

1.04 The Plant Department through its Superintendent of Buildings has the responsibility of administering the water treatment program.

2. REFERENCES

2.01 The following BSPs contain information on related subjects:

H34.280 Evaporative Condensers
H34.281 Cooling Towers
H51.370 Fundamental Principles of Water Conditioning
H51.371 Water Treatment — Air Conditioning Systems (to be issued)

2.02 The sentences defining corrosion and scale and the entire paragraph defining sludge have been reprinted by permission from HEATING — VENTILATING — AIR CONDITIONING GUIDE — 1956, Chapter 43.

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3. DEFINITIONS

3.01 *Corrosion* is destruction of a metal by chemical or electrochemical reaction with its environment.

3.02 *Scale* is a deposit formed from solution directly in place upon a confining surface. In general, hard water tends to form scale, especially when subjected to successive heating and cooling. In most cases, scale is the insoluble carbonates of calcium and magnesium.

3.03 *Sludge* is a water-formed sedimentary deposit. It usually does not cohere sufficiently to retain its physical shape when mechanical means are used to remove it from the surface upon which it deposits. Sludge is not always found at the place where it is formed. It may at times be hard and adherent and baked to the surface on which it has deposited.

3.04 *Algae and fungi* are types of plant life which may grow in circulating systems. They tend to form slime on the surfaces of the system.

3.05 The *pH-value* is a term used to describe the degree to which a water is acid or alkaline. Neutral water has a pH of 7. The pH-values range from 0 to 14, those less than 7 being acidic and those above 7 being alkaline. However, the pH-value is a logarithmic function, not a straight line function. Thus a pH of 4 indicates a solution ten times more acidic than one having a pH of 5, and 100 times more acidic than one having a pH of 6. A pH of 9 would indicate a solution ten times more alkaline than one having a pH of 8.

3.06 *Once Through System* — The condenser water passes through a heat exchanger absorbing heat and increasing in temperature before being discharged to waste.

3.07 *Closed Recirculating System* — The water circulates through a heat exchanger where it absorbs heat, rises in temperature, then circulates through another heat exchanger where its temperature is lowered.

3.08 *Open Circulating System — Cooling Towers* — The condenser water passes through a heat exchanger absorbing heat and increasing in temperature. The water then flows to water cooling equipment such as atmospheric (natural draft) towers or mechanical draft towers. As water passes through the tower, a portion of it evaporates thereby cooling the remainder. Loss of water through evaporation tends to concentrate the salts, since the salts do not evaporate. In addition, a small amount of water is lost through drift. Automatically fed make-up water replaces that lost for these reasons.

3.09 *Open Circulating System — Evaporative Condenser* — The water, recirculated from a sump, is sprayed over hot refrigerant piping where it absorbs heat and increases in temperature before returning to the sump. As this water is again sprayed over the piping, it is cooled by evaporation, aided by an induced air movement. Water losses occur in evaporative condensers for the same reasons as in cooling towers.

4. ECONOMIC CONSIDERATIONS

4.01 Chemical feeding and control devices, as well as the chemicals used in a program, are expensive. The cost of such devices and the chemicals may influence the design of the condenser water system for smaller installations. Closed systems usually require less costly feeding devices and fewer chemicals than the open systems.

4.02 Where serious water problems occur, consideration should be given to the use of air-cooled condensers. Not only is this consideration recommended for small systems, but also for large ones, particularly where there are serious water problems. Air-cooled condensers have been used satisfactorily for systems as large as 200 tons. They have two disadvantages — the amount of power required to handle the necessary air volumes and the fact that their capacity is at its lowest on the hottest days. The choice between installation of a water treatment system and the use of air-cooled condensers should be governed by the result of a cost comparison, with due consideration for the fact that personnel must be available to administer a water treatment system.

5. SPECIFYING THE WATER TREATMENT PROGRAM

5.01 The following items are considered as essential in any water treatment program specified by a water treatment company:

(a) A written report of the water analysis, which should include the determinations, usually in parts per million, of calcium, magnesium, silica, iron, bicarbonate, sulfate, chloride, total hardness as calcium carbonate, total solids, and pH.

(b) The chemical names of the water treatment compounds recommended for use.

(c) The concentration of chemical and pH to be maintained in the water.

(d) That chemicals recommended and the apparatus used to feed these chemicals comply with municipal and state health codes.

(e) That chemicals recommended will have no detrimental effect on nonmetallic materials such as rubber, plastic, etc, often used in water systems.

(f) That chemicals recommended will not cause delignification of wooden parts sometimes used in cooling towers.

(g) The amount of continuous bleed-off, water run to waste, from open circulating water systems required to limit scale formations.

6. SUMMARY OF WATER TREATMENT CONTROLS

6.01 Table 1 is a summary of water treatment controls for various types of heat exchanger water systems. This table is condensed from "Carrier Document 2D-7." It may be necessary to use one or several of the treatments listed depending on what a water analysis shows to be the most economical. Certain of the listed items may prove to be too costly in some cases.

7. CHEMICAL FEEDING

7.01 The preferred way to add chemicals to large open recirculating systems is by means of an electric driven, positive displacement mechanical feeder. This type feeder should be connected so as to operate only when the recirculating water pump is running. Such a feeder should be considered for systems larger than 100 tons. Other factors may make it desirable to use this type pump on systems smaller than 100 tons. For example, where it is desirable to locate the chemical treatment equipment in a basement equipment room for easy access by maintenance personnel, this type of pump may be used advantageously.

7.02 Bypass feeders can be used for adding chemicals to closed systems. In this case the chemicals are added manually and in one shot. Bypass feeders usually are not used on open systems due to the lack of good control. Fig. 1 shows one type of bypass feeder.

TABLE I

Summary of Water Treatment Controls

WATER PROBLEM	SYSTEM		
	CLOSED RECIRCULATING	ONCE THROUGH	OPEN RECIRCULATING
Scale Control	No Control Required	1. Pretreatment a. Sequestering Agent b. pH Adjustment	1. Bleed-off 2. Pretreatment a. Sequestering Agent b. pH Adjustment c. Ion Exchange
Corrosion Control	1. Deaeration 2. Corrosion Inhibitors	1. Corrosion Inhibitors 2. pH Control	1. pH Control 2. Corrosion Inhibitors
Algae Control	No Control Required	No Control Usually Required	1. Manual Cleaning 2. Chemical Algaecides

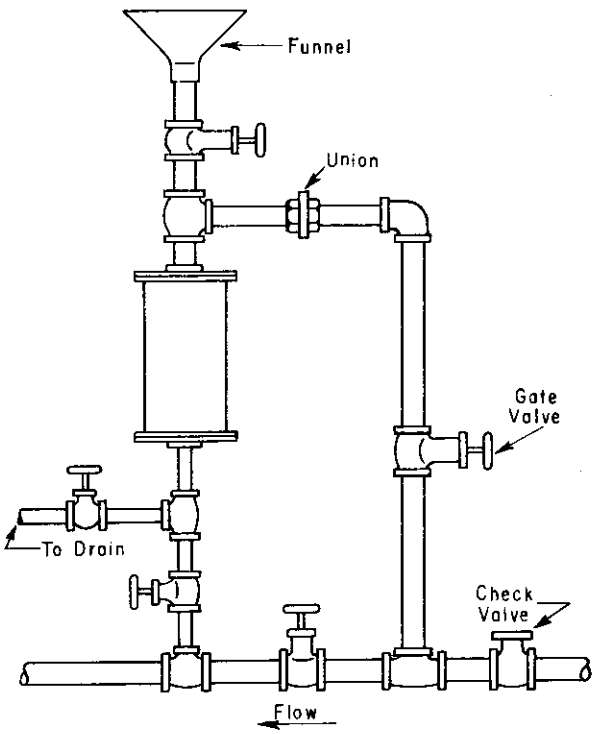


Fig. 1 – Bypass Feeder

7.03 On small open-type systems where the cooling tower or evaporative condenser is accessible, the chemicals may be fed by gravity to the sump from a tank mounted above the sump. Because a continuous drip of the chemical solution would be too small for proper adjustment, a timer and solenoid valve may be used to allow chemicals to be fed for two minutes or so during each hour of tower operation. The chemicals must be in solution in the tank in order to be fed into the system. The rate of flow of the solution will depend on the amount of water used as the solvent. Since the solution will flow for only two minutes each hour, the flow will be great enough to be regulated satisfactorily by means of a globe valve. Fig. 2 shows this arrangement. A second solenoid valve regulates bleed-off. If the tank can not be elevated above the sump of the tower, then a small pump may be installed as shown in Fig. 3 to feed the chemical solution into the system. This pump would not be as expensive as the type mentioned in Paragraph 7.01.

7.04 Fig. 4 shows one type of feeder which can be purchased commercially. This type unit can be used singly or in groups. It is to be placed in the bottom of the cooling tower or evaporative condenser and arranged so that the top cup is always full of water when the circulating pump is running. The proper rate of flow is obtained by using the proper size of orifice. The chemical is replaced by removing the empty can and placing a new can of chemical in its place.

7.05 There are certain devices on the market today which claim to control scaling and corrosion by electric current or magnetism. These are not recommended. They should not be confused with those devices which are based on scientific principles, such as the magnesium rod placed in hot water storage tanks for the control of rust.

7.06 The most accurate way to add acid for pH control to assist in scale control is to use an electric driven, positive displacement mechanical feeder controlled by an electronic pH controller. However, this equipment is quite expensive and its use should be limited only to the extremely large systems requiring the addition of acid. Intermittent dosages by manual feeding or excess concentrations from the use of inexpensive feeders can be harmful to the system.

7.07 Hot water heating systems as a general rule do not need chemical treatment. These systems tend to have a small amount of scale formed in the piping and this helps protect it against possible corrosion. Chilled water systems should have some provisions made for treatment against corrosion. There is a tendency for all the dissolved oxygen in the water to unite with the metal in the pipe over a period of time. In this case, it would probably be more economical to provide a chemical feeder than a deaerator. It should be remembered that for a closed system the best policy is to prevent as little change of water as possible. For this reason, unnecessary leaks should be detected as early as possible and eliminated.

8. PIPING

8.01 In open-type circulating systems it is necessary to allow a small percentage of the water to discharge to a drain in order to pre-

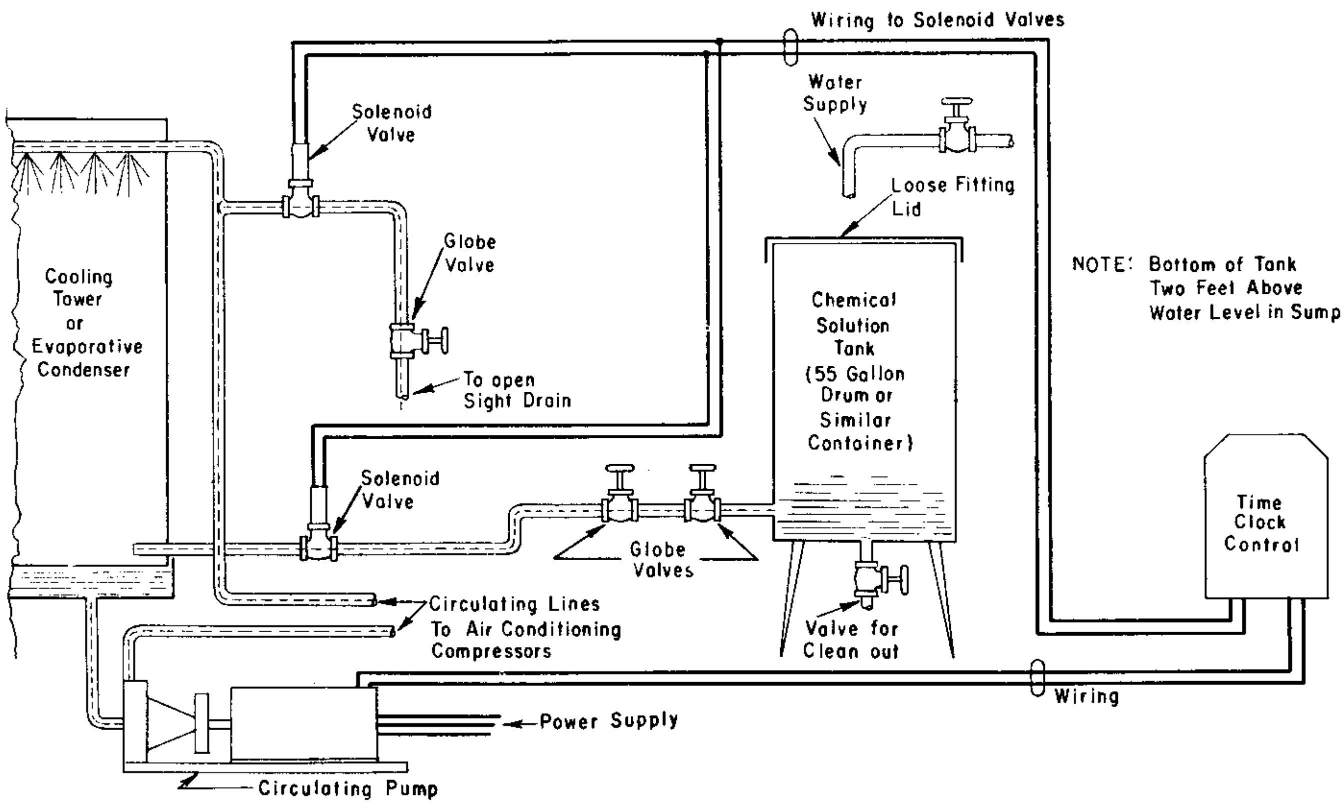


Fig. 2 – Timer – Solenoid Valve Gravity Chemical Feed System

vent the build-up of minerals in the water. This is known as bleed-off. For easy control on small systems this can be done by installing a funnel or pan with a rectangular sliding cover and with a line running to a drain. This pan should be installed in the path of the spray. The amount of bleed-off can then be regulated by opening or closing the cover. A means of diverting the bleed-off water into a separate container should be provided so that the amount of bleed-off can be measured. In general, where bleed-off is to be continuous, facilities sized to bleed-off one per cent of the water circulated should be provided. The actual bleed-off can then be regulated as required. There may be cases where the chemical content of the water or the temperature drop through the water-cooling device may require a larger bleed-off than one per cent. A bleed-off line taken directly off the circulating pipe is not recommended where the bleed-off is less than ½ gallon per minute because of the likelihood that the valve regulating the amount of bleed-off will become clogged. In these cases, and in other cases where an intermittent bleed-off is desirable, the solenoid valve and timer arrangement, mentioned in Paragraph 7.03, is recommended. This must be sized as required by the frequency of solenoid operation and volume of bleed-off necessary.

8.02 When a positive displacement pump is used to add water treatment chemicals in solution to a cooling tower, the pump discharge line should be connected to the condenser water line to the tower. The connection should be made at a point in the condenser water line after the water has passed through the condenser water pump and the condenser.

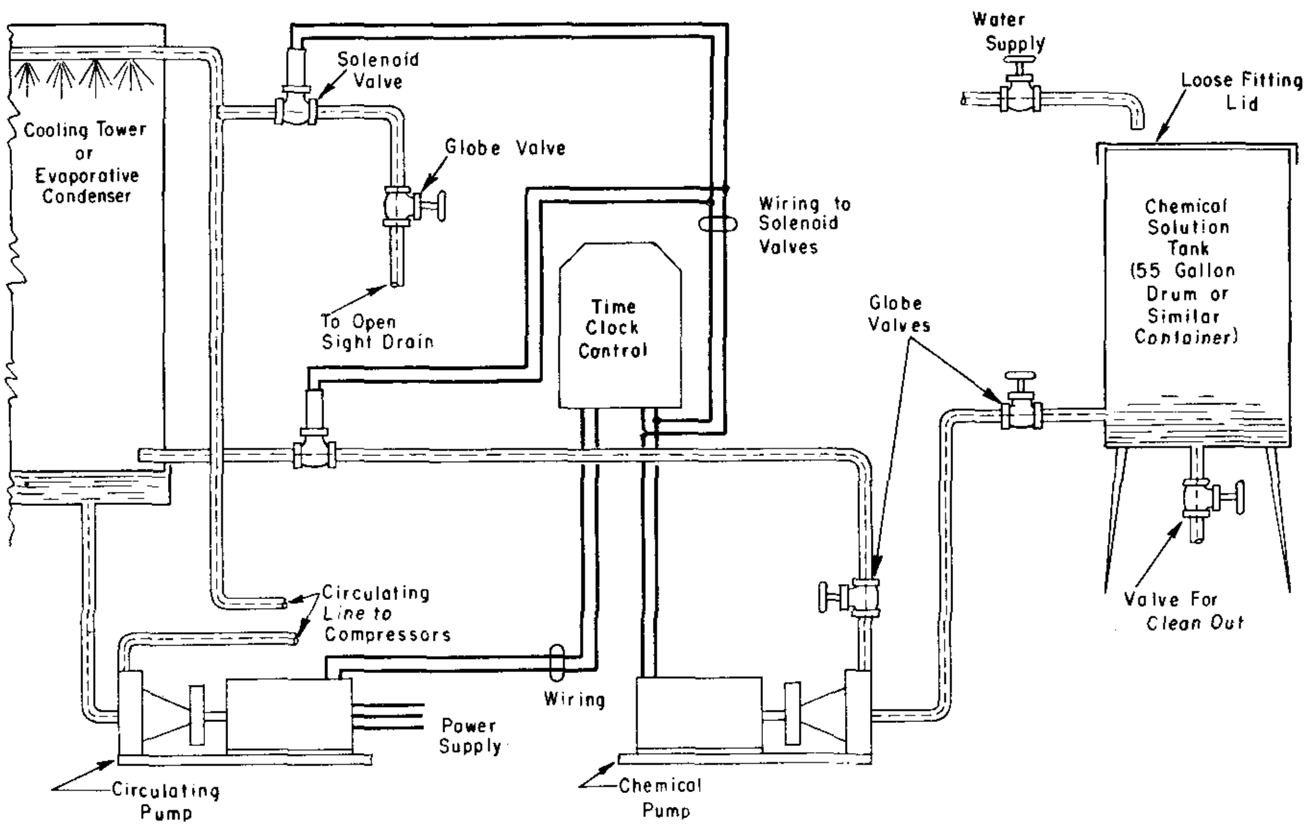


Fig. 3 – Timer – Solenoid Valve Pumped Chemical Feed System

8.03 Fig. 5 shows a commercially manufactured device for regulating the amount of bleed-off. This type device is located in the bottom of the cooling tower or evaporative condenser. Water should overflow the top cup whenever the circulating pump is running. The orifice can then be changed to give the desired rate of bleed-off. This method would be used where the bleed-off rate is less than ½ gallon per minute. Depending upon the condition of the water, this would be used for systems of about 70 tons or less.

8.04 On open-type systems provide an air gap between the system and the water supply. Closed systems which have the water supply connected directly to them should be treated with chemicals in such concentration that the resulting solution is not poisonous. The use of chemicals in poisonous concentrations in boiler water or chilled water systems may require the use of expensive make-up water controls to prevent the possibility of the treated water from backing up into the potable water supply.

8.05 A fouling factor is usually applied in designing equipment. This fouling factor is the allowance made for a small amount of deposits on the piping and equipment which slows down the rate of heat transfer. Table 2 is taken from "Carrier Document 2D-7" and lists suggested fouling factors for industrial equipment operated 24 hours a day and cleaned every 6 to 12 months. This table should be used only as a guide to help select the correct fouling factor. Equipment manufacturers usually give a fouling factor when listing the performance data of their equipment.

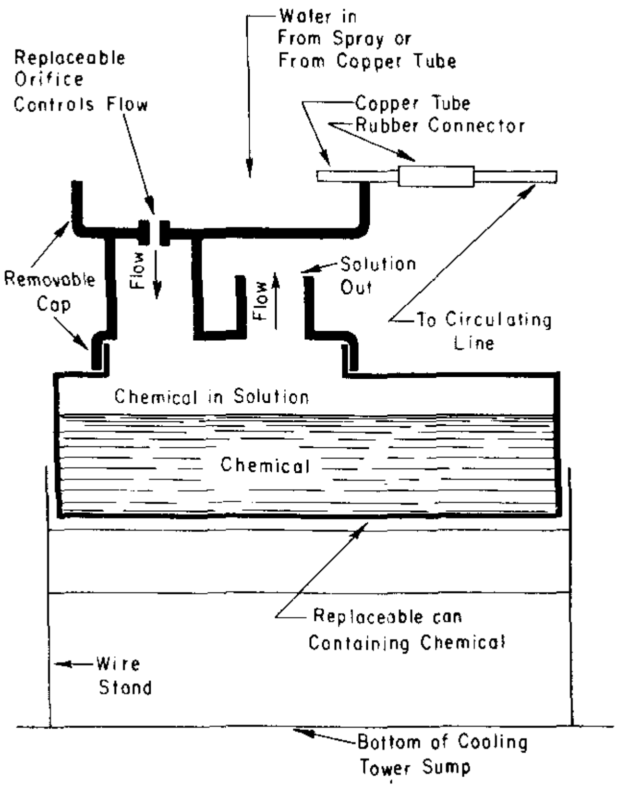


Fig. 4 – Cross Section of a Simple Manufactured Feeder

9. EQUIPMENT SELECTION AND DESIGN

9.01 When designing condenser water systems select equipment and a design criteria which will minimize or be less susceptible to the damaging effects due to failure or lack of water treatment. Included in the following paragraphs are suggestions for the selection of some of these items of equipment.

9.02 *Equipment to Minimize Scaling*

(a) Avoid the use of finned coils for evaporative condensers. It is difficult to remove the scale between the closely spaced fins. Acid cleaning damages the fins.

(b) Select slightly oversized condensing coils in hard water areas to permit operation at lower condensing and water temperatures. Lower water temperatures are less conducive to scaling.

(c) Select shell and tube condensers with removable water boxes to facilitate inspection and scale removal from the coils by mechanical means. Avoid the use of heat exchangers which pass the water through the shell rather than through the coils, since this type is usually difficult to descale and clean.

(d) When evaporative condensers are used, design so the condenser fan is cycled, not the spray pump. Continuous operation of the sprays will eliminate successive wetting and drying of the coils and decrease scale deposit.

9.03 *Equipment to Minimize Corrosion* — Aluminum is susceptible to corrosion and is effectively protected by chemical water treatment only if the treated water washes all of the aluminum surfaces. Avoid the use of aluminum tube coils when recirculated water is pumped through the coils. Aluminum cooling towers will require a protective coating of paint to prev*r* the pitting type of corrosion.

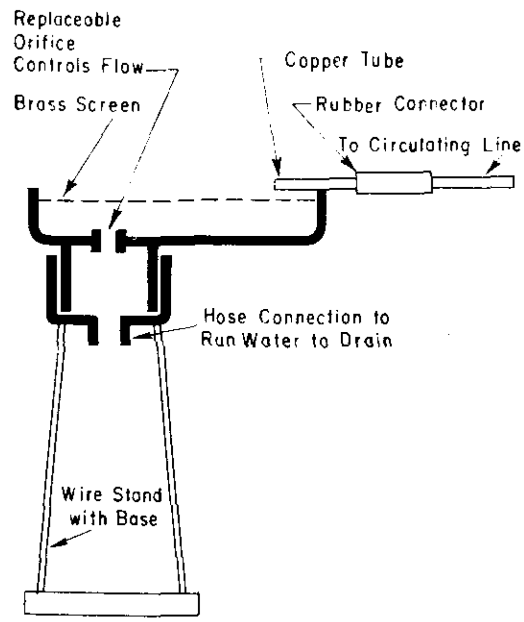


Fig. 5 – Cross Section of a Simple Manufactured Bleed-off Regulator

TABLE II

Suggested Fouling Factors for Selecting Equipment

Temperature of heating medium Temperature of water	0 to 240°F 125°F or less	
WATER SOURCE	WATER VELOCITY FT./SEC.	
	3 feet or less	over 3 feet
Sea Water	.0005	.0005
Brackish Water	.002	.001
Cooling Tower and Spray Pond Treated Make-up	.001	.001
Untreated Make-up	.003	.003
City (Great Lakes)	.001	.001
River Water	.002	.001
Minimum	.003	.002
Mississippi	.003	.002
Delaware, Schuylkill	.003	.002
East River and New York Bay	.003	.002
Chicago Sanitary Canal	.008	.006
Muddy or Silty	.003	.002
Hard Water (over 260 parts per million)	.003	.003
Hard Well Water (over 260 parts per million)	.003	.003
Well Water (less than 260 parts per million)	.002	.001

9.04 ***Equipment to Minimize Algae*** — When spray coil dehumidifiers are used in locations where algae is expected to be a problem, avoid the use of six- or eight-row coils. It is difficult to clean algae growth from between the fins on the inner rows of coils. Four-row coils would be preferred for such an installation.

9.05 ***Miscellaneous Equipment and Design Considerations***

(a) The location of a cooling tower or evaporative condenser with relation to sources of atmospheric pollution is important. Combustion products from stacks close to the tower or condenser may react with the water to make it corrosive. Vegetation products may be carried into such equipment, especially when it is located at ground level, and clog strainers, causing operating difficulties.

(b) Provide adequate drains so that draining the system will not take excessive time. Drain from bottom of pan permits easy removal of dirt and debris. Provide a hose bib for hosing down the cooling tower or evaporative condenser after they have been drained.

(c) Provide nonclogging spray nozzles located so they can be easily removed and cleaned. Arrange spray nozzles to provide adequate water distribution over tubes or slots.

(d) Provide easily opened access doors at locations which are accessible to maintenance personnel and yet provide access to the equipment needing maintenance. Also provide drift eliminators which can be easily removed for maintenance. Eliminators should be provided where excessive windage losses are likely to occur. This is especially true where chromates are used, since they have staining characteristics.

(e) When the size of the installation requires chemical feeding apparatus, provide a type that is easy to service.

(f) Provide a plugged tee in the condenser water lines to package units at the units. This will make chemical (acid) cleaning of the condensers easier if it becomes necessary.

10. SUMMARY

10.01 The need for a water treatment program should be determined by an analysis of the water made by a competent laboratory or water treatment company. When the need is established, recommendations for the treatment program should be obtained from one or more competent water treatment companies. Such recommendations should include the result to be attained, the name and quantity of each chemical to be used and the method of adding them.

10.02 When all parties concerned with the design and operation of the system have knowledge of the potential water problems during the planning stages of a job, adequate chemical feeding devices for treatment can be built into the system when it is installed.

10.03 The problem of controlling corrosion, scale, and biological deposits can be reduced through the proper selection of equipment used in the condenser water system.

10.04 Local ordinances should be investigated to see if chemical treatment is restricted or whether any restrictions might govern the installation of chemical feeders.

HEATING EQUIPMENT

FIRE PROTECTION

1. GENERAL

1.01 This section covers practices recommended for the safe installation of appliances used exclusively for the heating of buildings. The following recommendations are based on provisions of the Building Code Recommended by the National Board of Fire Underwriters, 1949 Edition. For further details, reference should be made to Article XI of the above Code. Where local or state regulations require higher degrees of protection than those covered in this practice, the local or state regulations should be followed.

1.02 This section is reissued to refer to the latest edition of the "National Building Code" as recommended by the National Board of Fire Underwriters and other Bell System Practices relating to the same general subject. For operation and maintenance application, the section is dually numbered with this issue and the same issue is assigned for uniformity. Arrows are used to indicate changes throughout the text.

1.03 Heating plants for buildings, except in small structures such as community dial offices, are usually located in fire resistive rooms as covered in double numbered section BSP H41.230, H54.345.

1.04 The construction of chimneys, smokestacks, and flues is covered by BSP Section H41.260. Periodic cleaning of flues helps to prevent fires.

1.05 Gas, oil, and coal fired plants should be installed and maintained in accordance with current standards of the National Board of Fire Underwriters. Periodic inspection of safety devices should be made to insure that they function properly to prevent the possibility of creating fires.

1.06 The danger of fires originating in coal bins will be slight if the precautions described in double numbered BSP Section H34.284, H51.353 are followed. Coal fires should be combated as described in P.O.L. 1055.

2. HEATING FURNACES AND BOILERS DEFINED

2.01 Heating furnaces and boilers are intended to include floor mounted direct fired warm air furnaces, hot water boilers and low pressure steam boilers used for the heating of buildings.

3. FURNACES AND BOILERS BURNING OIL

3.01 Mounting: Furnaces and boilers burning oil should, where possible, be mounted on floors of fireproof construction having incombustible flooring or surface finish. Where it is not possible to mount furnaces or boilers on other than wood joist floors or other combustible construction, the floor under the appliance should be protected by two courses of 4-inch hollow clay tile laid at right angles with cells matched so as to preserve free circulation of air through each tile course. The entire tile base should extend at least 12 inches beyond the appliance on all sides and be covered with 3/16-inch thick metal plate.

3.02 Clearances: The clear distance from the appliance to woodwork or other combustible material whether plastered or unplastered should be not less than 18 inches above, at sides and rear, and 48 inches at front. Where it is not possible to obtain the above minimum clearances all exposed combustible surfaces should be protected with 28-gauge sheet metal set one inch clear of the protected surface with incombustible spacers. In no case should the clearances be reduced to less than 9 inches above, 6 inches at sides and rear and 48 inches in front. All protection should extend beyond the appliance not less than 18 inches, both vertically and laterally.

3.03 Installation: The installation should be made in accordance with the provisions contained in "Regulations of the National Board of Fire Underwriters for the Installation of Oil Burning Equipments," current edition.

4. FURNACES AND BOILERS BURNING COAL

4.01 Furnaces and boilers burning coal should have the same mounting and clearances as described for appliances burning oil, except where mounting is on a combustible floor 1/4-inch asbestos mill board covered with 24-gauge sheet metal should be placed to cover the floor area not less than 18 inches beyond the front of the appliance or the side where ashes are removed.

5. FURNACES AND BOILERS BURNING GAS

5.01 Furnaces and boilers burning gas should have the same mounting and clearances as described for appliances burning oil.

6. STOVES

6.01 Mounting: Stoves for heating purposes, where placed on combustible floors, should be mounted on iron legs providing an open space of not less than 4 inches below the bottom of the stove. The floor should be protected with 24-gauge sheet metal extending at least 6 inches beyond the appliance on sides and rear, and 18 inches at the front.

6.02 Clearance: Stoves should be installed to provide a minimum clearance of 24 inches to combustible surfaces whether plastered or unplastered, unless protected with a 28-gauge sheet metal shield set one inch clear of the protected surface with incombustible spacers. With this protection the clearance may be reduced to not less than 12 inches. Metal shielding should extend from the floor to 18 inches above and 12 inches beyond sides of the stove.

7. GAS-STEAM RADIATORS AND PORTABLE HEATERS

7.01 General: Gas-steam radiators equipped with pilot lights should be so located as to avoid the possibility of the pilot flame being extinguished by air currents. They should be connected to the gas supply with rigid piping. Portable heaters such as oil stoves should be located where they will not be subject to accidental overturning, and they should not be filled while lighted.

8. SMOKE PIPES

8.01 Smoke pipes should be connected with smoke flues as described in Bell System Practice H41.260 - Chimneys, Smokestacks and Flues. Two or more smoke pipes may be joined for a single flue connection, including junctions of smoke pipes from oil burning appliances with those from appliances burning solid fuel, provided the several smoke pipes are constructed to comply with the severest requirements for any one of those connected. Connections of vents from appliances burning gas to chimney flues are covered in Section H41.260 of these practices.

8.02 Smoke pipes should not pass through a floor, roof or exterior wall unless such floor, roof or wall is of fireproof construction.

8.03 Passing Through Partitions: Smoke pipes from heating furnaces or boilers should not pass through combustible partitions. Where necessary, smoke pipes from ordinary stoves may do so if they are guarded by double metal ventilated thimbles not less than 12 inches larger in diameter than the pipe, or by steel or tile sleeves built into brickwork or other approved fireproof materials extending not less than 8 inches beyond all sides of the sleeve.

8.04 Clearances for Smoke Pipes: The clear distance between a smoke pipe or metal breeching and combustible material, including plaster on a combustible base should be not less than 18 inches. This clear distance may be reduced to not less than 9 inches if the combustible material or construction is protected by sheet metal no thinner than 28 gauge placed one inch from the combustible surface and extending full length of the smoke pipe and not less than 12 inches beyond it on both sides.

9. WARM AIR DUCTS

9.01 Installation: Warm air heating ducts should be installed in accordance with Standards of the National Board of Fire Underwriters Pamphlet No. 90.

9.02 Protection: Warm air ducts extending from the furnace to vertical wall ducts should, for their initial 6 feet of horizontal run, be placed not less than 18 inches from woodwork. This clearance may be reduced to 9 inches if the woodwork is protected with 28-gauge sheet metal placed one inch from its surface and extending 12 inches beyond the duct on both sides. Elsewhere the horizontal warm air ducts should be placed not less than one inch from woodwork unless such woodwork is covered with asbestos paper overlaid with sheet metal.

9.03 Ducts and duct fittings and connections installed in combustible partitions, walls or concealed ceiling spaces should be covered with at least one thickness of asbestos paper weighing not less than 12 pounds per 100 square feet. An air space of not less than 5/16 inch should be provided on all sides of such ducts.

9.04 No warm air duct should be placed in a partition, wall or other enclosure of combustible construction unless it is at least 6 feet distant in a horizontal direction from the nearest surface of the furnace.

10. WARM AIR SUPPLY REGISTERS

10.01 Setting: Where registers are placed in floors or walls of combustible construction the register boxes should be covered with 12-pound asbestos paper and a clear space of at least 5/16 inch maintained between the sides of the box and the combustible material.

10.02 Register Over Furnace: When a register is placed in a floor of combustible construction over the furnace, the register box should be constructed with double sides spaced 4 inches apart, except where the warm air passage is entirely surrounded by a cold air return passage.

10.03 Fixed Register: Each warm air furnace system should have at least one register installed without valves or louvers.

11. STEAM AND HOT WATER HEATING PIPES

11.01 Protection: Where steam or hot water heating pipes pass through combustible floors, partitions or other combustible construction, an open space of at least one inch should be provided at all sides of the pipe. This space should be closed at ends with metal collars or escutcheons. Steam and hot water heating pipes should be kept not less than one inch from any combustible construction except where they are covered with at least one inch of approved insulation.

11.02 Wood casings or enclosures for steam or hot water heating pipes, or wood covers for wall recesses in which such pipes are placed should be lined with sheet metal.

11.03 Pipe Coverings: Coverings used on all steam or hot water heating pipes should be of incombustible material.

12. ASH PITS

12.01 Pits or receptacles for the storage of ashes should be of brick, iron or other incombustible material. The walls of such pits should be of approved masonry not less than 8 inches thick. The floor, and the roof if covered, should be of fireproof construction. If the ash pit is not covered, the ceiling of the room in which it is located should be of fireproof construction.

HEATING EQUIPMENT

3. STOVES

3.03 Stoves on combustible floors shall have iron stove legs at least 4" high which shall rest on a sheet of heavy galvanized iron on the floor extending 1'-6" in front of the stove and at least 8" on each side of it. Where appearance is important, a standard "stove board" such as can be obtained from a hardware or stove dealer may be used instead of the galvanized iron.

4. HOT PLATES

4.01 Wooden table or bench tops supporting hot plates (gas, oil, or electric) shall be covered with 1/4" asbestos faced with sheet metal not thinner than #24 gauge.

4.02 Shelves for supporting hot plates shall be of asbestos "transite," slate, metal, or other approved incombustible material, on sturdy metal brackets securely attached to the wall.

4.03 Walls or partitions of combustible material such as wood or wood lath and plaster on studding shall be protected where a hot plate or oil stove or gas stove is within 1'-6" of them. Such protection consists of a sheet of asbestos transite 1/4" thick, or sheet metal not thinner than #24 gauge with 3/16" of asbestos next to the wall. Protection shall extend at least 1'6" each side of and above the burner.

6. PROTECTION - WALLS - WOODWORK

6.02 Steam or hot water pipes where passing through a combustible floor or partition shall be protected by a sheet metal sleeve with a close fitting collar at the floor line or on one side of the partition, so made as to insure clearance not less than 1" between pipe and combustible material.

6.04 Stove pipes or smoke pipes shall be at least 18" from any unprotected wood or other combustible material, and shall be at least three feet below any unprotected combustible ceiling or joist. These clearances may be reduced by one-half if protection is provided by 1/2" asbestos covered by #24 gauge sheet metal extending at least 18" each side of smoke pipe.

INSTALLATION AND MAINTENANCE OF V-BELTS

1. GENERAL

1.01 This section outlines the methods and procedure for installing, removing and maintaining V-belts used for driving mechanical equipment in telephone buildings.

1.02 The useful service life of V-belts is mainly determined by the drive construction and the quality of regularly scheduled maintenance attention they receive.

1.03 A V-belt derives its driving ability from the wedging contact between the sides of the V-shaped belt and the walls of the V-shaped groove of the sheaves. This wedging contact is, in addition, augmented by the inherent bulging of the belt straight sides as it enters and maintains contact with sheave groove.

1.04 V-belts are manufactured in standard cross-sections "A to E," inclusive, Fig. 1, and in a varied assortment of lengths.

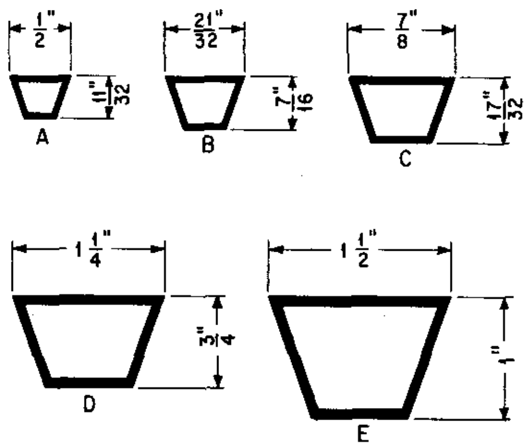


Fig. 1 - Standard V-Belt Cross-Sections

1.05 The size of a V-belt is determined by two measurements:

(a) The outside circumference - Fig. 2.

(b) The top width - Fig. 3.

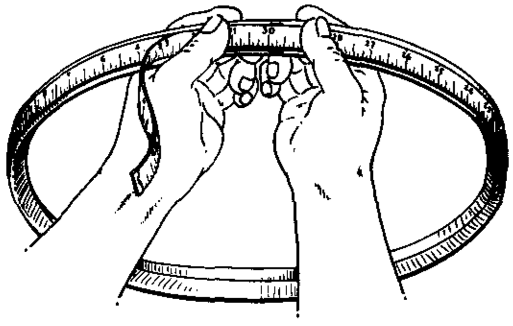


Fig. 2 - Measuring the Outside Circumference

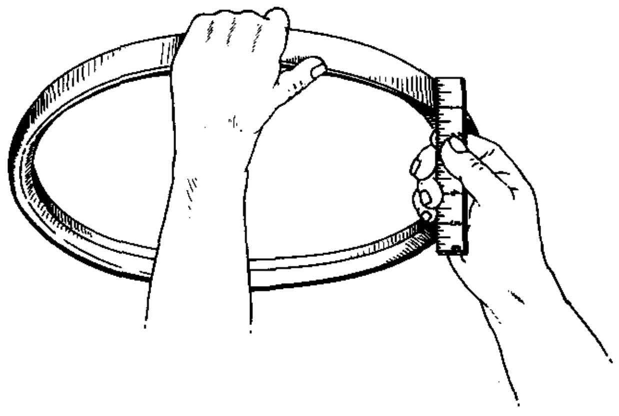


Fig. 3 - Measuring the Top Width

2. SAFETY

2.01 A belt drive is always dangerous to work on or around unless the following safety precautions are observed:

(a) Be sure the motor disconnect switch is in the open position before starting to work on the belts. Consider the necessity for removing the fuses to assure the motor is not started while work is in progress.

(b) If the motor disconnect switch is located at some distance from the drive assembly it is also advisable to place a tag on the switch stating that it is in the open position because men are working on the equipment.

(c) Never operate a machine unless the belt guard is in its proper place. Open the motor disconnect switch if the belt guard must be removed to perform certain repairs. After making the necessary repairs, adjustments and tests, replace the guard prior to restoring the machine to service.

3. INSTALLATION OF V-BELTS

3.01 The recommended procedure for installing a new set of belts is as follows:

(a) Comply with the safety precautions listed in Part 2 before proceeding with the installation.

(b) Move the motor far enough toward the driven machine to allow for the installation of the belts without forcing.

(c) Install the belts on the inside sheaves first. Lay all belts evenly in the grooves with all the slack on either the top or bottom side. Do not have the slack of some belts on the top and others on the bottom.

(d) Never attempt to pry the belts on to the sheaves as this may damage the inner cords of the belt.

(e) To tighten the belts move motor away from driven machine by turning the motor aligning and adjusting bolts. Turn the bolts, alternately, a few turns at a time to maintain the motor in alignment.

(f) Tighten belts sufficiently to prevent belt slip, squeal, or whip. Belts should not be tightened excessively. See Paragraph 5.02 (a) for method of proper tensioning.

(g) With the belts properly tensioned and the motor aligned, tighten the motor hold down bolts.

(h) Give the drive a trial run until the belts have become seated in place. Again adjust the drive until the belts are taut.

(i) Replace belt guard and securely tighten all bolts.

4. REMOVAL OF V-BELTS

4.01 The recommended procedure when removing V-belts is as follows:

(a) Comply with the safety precautions listed in Part 2 before starting to remove belts.

(b) Remove the bolts that hold the belt guard in position and remove guard.

(c) Loosen the motor hold down bolts.

(d) To move the motor towards the driven machine, turn the adjusting bolts. These bolts will turn freely and not bind if alternately turned a few threads at a time. To maintain the motor in alignment, turn each bolt the same number of threads. Move the motor far enough towards driven machine to allow easy removal of the belts from the sheaves.

(e) When removing belts, never attempt to pry or force the belts from the sheaves.

5. MAINTENANCE OF V-BELTS

5.01 The life and performance of a belt drive will be extended and improved through attention to the following maintenance items.

5.02 Tension: The proper tensioning of belts is very important. When the belts are applied with too little or too much tension, the efficiency of the belts, motor and driven machine is adversely affected.

(a) To obtain approximately the proper tension, put a measuring tape around the outside circumference of the belt before any tension has been applied. Then tension the belt on the drive until the outside circumference increases 1/4" to 3/8" per 100" of belt length.

(b) V-belts must be tensioned to avoid slip. When a belt is pulling a load, as in Fig. 4, the pulling leg of the belt will be tighter than the returning leg of the belt. As the belt goes around the sheave from the "loose" side to the "tight" side the belt will naturally stretch slightly. This causes a creep or slight slipping of the belt on each sheave. The normal expected slip due to this creep results in a total slip of approximately one per cent to two per cent at normal loads on the belts. Therefore, the output rpm of a V-belt drive will be about one per cent to two per cent less than if it were a chain drive at the same pitch diameter.

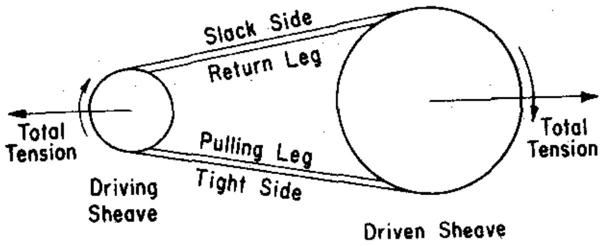


Fig. 4 - V-Belt Drive

(c) A V-belt drive operating with insufficient tension is subjected to a snapping action which will usually occur at peak loads or when starting the motor. This snapping action occurs when the excess slack is suddenly taken up and the belt is whipped taut. When this happens, see Fig. 5, a force far greater than that for which the drive was designed to transmit is imposed upon the belt. By reason of the above, a belt operating with insufficient tension will stretch more in service than one properly tensioned.

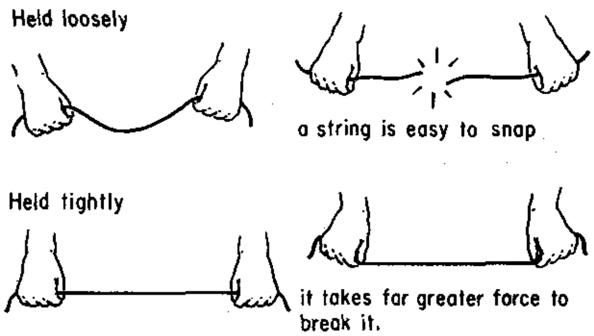


Fig. 5 - Simulating Belt Snapping Action

(d) A belt drive operating with too much tension will result in increased power consumption, overheating and accelerated wear of the motor and driven machine bearings.

(e) A slack belt feels dead when struck with the hand; a properly taut belt has an alive springiness.

5.03 Matched Sets: When installing belts, always use a complete set of new matched belts. Never use a mixed set of new and old belts. The use of a mixed set, because of the working stretch present in the old belts, will impose abnormal stress and strain on the new belts.

5.04 Initial Stretching: All new belts will have some stretch and tend to settle down in the grooves during the first few hours of operation causing a loss in belt tension. Therefore, the tension of the belts should be checked and adjusted after the first few hours of operation and scheduled for recheck at least twice a month for three months and no less than once a month thereafter.

5.05 Belt Wear: A belt which has worn until it rides on the bottom of the sheave groove instead of riding on the groove sides will slip excessively unless it is adjusted to abnormal tension. Belts should be replaced before they ride the bottom of the sheave grooves.

(a) Belts which are too loose result in a loss of rpm, reduced belt life due to heat and premature wearing of shoulders or rings in the sheave grooves. Excessive slip due to insufficient tension may be indicated by premature wear on the belt side walls. This may be recognized by the appearance of spots where the ply or layer of belt jacket has been worn through to the ply or layer underneath. Belts that slip excessively will wear rapidly.

5.06 Sheave Alignment: The alignment of the sheaves should be checked at least twice a year. The motor and driven machine shafts must be kept parallel and the sheaves aligned so a straightedge or a taut cord will touch across the entire flank of each sheave. Fig. 6

(a) Poor alignment of sheaves will also produce premature wear on belt side walls by causing the sides of the belt to chafe against the sheave flange at entry and leaving points. Rough or worn grooves in either or both sheaves will cause rapid wear of the belt sides. If alignment and condition of the sheaves are good, premature side wall wear is a sure sign of excessive slip.

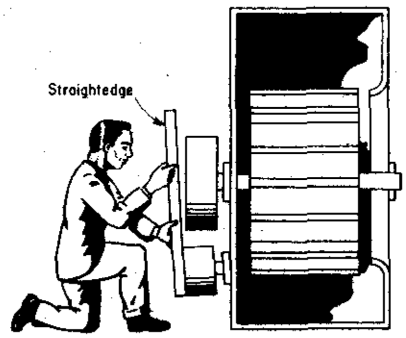


Fig. 6 - Checking Sheave Alignment

5.07 Belt Cross-Sections: Belts of the various cross-sections have a minimum diameter sheave, as indicated in the following table, on which they will operate satisfactorily. When used on sheaves of smaller diameter, the resulting internal friction, due to the increased cord flexing, will shorten the belt life.

Minimum Diameter Sheaves

Sheaves	"A"	"B"	"C"	"D"	"E"
Minimum Recommended Pitch Diameters	3.0"	5.4"	9.0"	13.0"	21.6"
Outside Diameters	3.25"	5.75"	9.4"	13.6"	22.4"

5.08 The pitch diameter and outside diameter of a typical V-belt sheave is illustrated by Fig. 7.

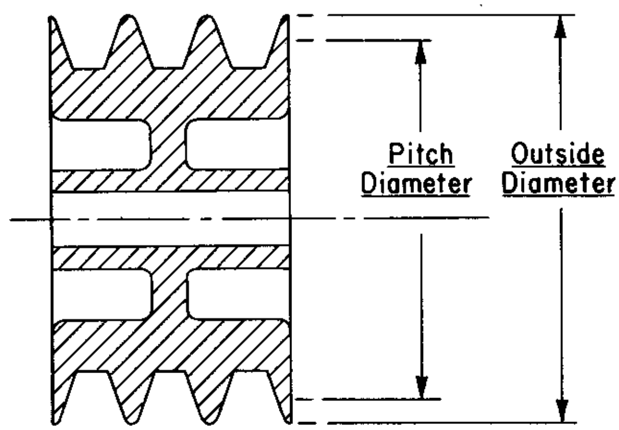


Fig. 7 - Sheave Cross-Section

5.09 Belt Dressing, etc.: Belt dressing should not be used and belts should be kept free of foreign materials such as oils and grease.

5.10 Records: In order to expedite maintenance and repairs, a record of the correct belt size for all equipment involved should be maintained in conjunction with Bell System Practice H51.350, "Building Mechanical Equipment Scheduling Routine Maintenance."

REPLACEMENT PARTS AND PROCEDURES

FOR

DAY-BRITE FLUORESCENT UNITS FOR

FRAME AND AISLE LIGHTING

1. GENERAL

1.01 This section covers replacement parts for Day-Brite Lighting, Inc., fluorescent lighting units. Data on complete units is given on the Power Data sheets.

1.02 It is reissued to dually number in the H series, to add two-lamp units without reflectors and one-lamp units with directional reflectors. Units which have no standard applications are deleted. This section covers a general revision, therefore arrows to indicate changes are omitted.

1.03 Part 2 of this section is called "Replacement Parts". Associated Figs. 1 to 3 and Tables A and B cover the different parts with manufacturer's part numbers and corresponding names.

1.04 Part 3 of this section is called "Replacement Procedures" and covers procedures for replacing those parts most likely to need replacement.

2. REPLACEMENT PARTS

2.01 The Associated Figures 1 to 3 show the various replacement parts in their proper relation to other parts of the apparatus with their corresponding names.

2.02 If a part's identifying number is given, the order should give name of part, name of manufacturer, and identifying part number.

Example: 10 mounting straps,
Day-Brite Lighting, Inc.,
part T-703

2.03 Where part's identifying numbers are not given, they are commercial and should be obtained locally.

3. REPLACEMENT PROCEDURES

3.001 List of tools (Equivalents may be substituted).

Screwdriver, 4" regular
Wrench, adjustable, single end, 6", R-1542
Pliers, P-side-cutting, 8"

3.01 Ballast: The ballast is mounted in the center with respect to the lamps. On the 2-foot and 4-foot units, this is on center with respect to the complete unit. The two used on the 8-foot units are located 2 feet from each end.

3.02 Lampholders: Each lamp has a lampholder at one end and a combination lampholder and starter socket at the other end. The starters are located at opposite ends of adjacent lamps.

3.03 Lamps: In a two-lamp unit, to remove a lamp, rotate the two lamp guards to a position parallel with the lamps, rotate the lamp 90 degrees so that the pins at each end of the lamp will slide out of the slot in the lampholder. To insert a lamp, slide the pins at each end of the lamp into the slot in the lampholder and rotate 90 degrees to lock the lamp in position and return the lamp guards to their original position at right angles to the lamps. In a one-lamp unit, to remove a lamp, swing one of the lamp guards towards end of unit, rotate the lamp 90 degrees so that the pins at each end of the lamp will slide out of the slot in the lampholder. To insert a lamp, slide the pins at each end of the lamp into the slot in the lampholder and rotate 90 degrees to lock the lamp in position and release the lamp guard.

Caution: The material on the inside of fluorescent lamps is harmful if introduced into open cuts. Report even minor accidents to the medical department.

3.04 Starters: When a lamp fails, the starter automatically cuts out and must be reset by pushing the exposed button before replacing the lamp.

Bell Telephone Laboratories, Inc.

Attached:
Pages 101 to 106 inclusive

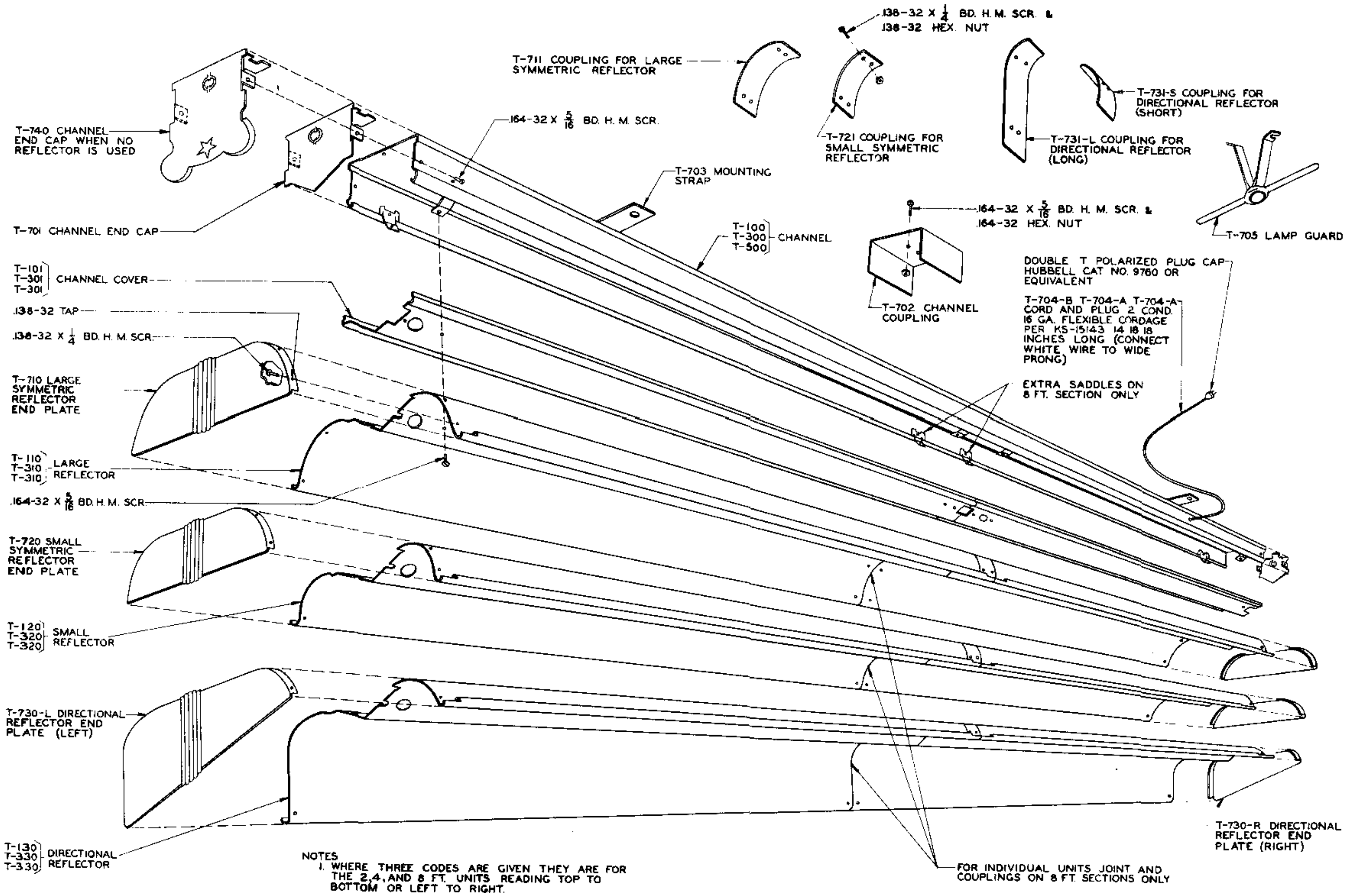


Fig. 1 - Fluorescent Lighting Fixtures Details for Two-lamp Units

TABLE A

PART NUMBERS, NAMES AND QUANTITIES
TWO-LAMP UNITS

NAME OF ASSEMBLY →		UNITS WITH LARGE SYMMETRIC REFLECTORS			UNITS WITH SMALL SYMMETRIC REFLECTORS					UNITS WITH DIRECTIONAL REFLECTORS			UNITS WITHOUT REFLECTORS		
CATALOG NO. OF ASSEMBLY →		T-213	T-413	T-813	T-220	T-420	T-223	T-423	T-823	T-233	T-433	T-833	T-243	T-443	T-843
LENGTH OF ASSEMBLY IN FEET →		2	4	8	2	4	2	4	8	2	4	8	2	4	8
PART CAT. NO.	DESCRIPTION OF PART	NUMBER OF PARTS PER ASSEMBLY			NUMBER OF PARTS PER ASSEMBLY					NUMBER OF PARTS PER ASSEMBLY			NUMBER OF PARTS PER ASSEMBLY		
T-100	Channel	1			1		1			1			1		
T-101	Channel Cover	1			1		1			1			1		
T-110	Reflector (Lg. Sym.)	1													
T-120	Reflector (Sm. Sym.)				1		1								
T-130	Reflector (Dir.)									1					
T-300	Channel		1			1		1			1			1	
T-301	Channel Cover		1	2		1		1	2		1	2		1	2
T-310	Reflector (Lg. Sym.)		1	2											
T-320	Reflector (Sm. Sym.)					1		1	2						
T-330	Reflector (Dir.)										1	2			
T-500	Channel			1					1			1			1
T-701	Channel End Cap				2	2									
T-702	Channel Coupling	1	1	1			1	1	1	1	1	1	1	1	1
T-703	Mounting Strap				2	2									
T-704A	Cord and Plug					1									
T-704B	Cord and Plug				1										
T-705	Lamp Guard	2	2	4	2	2	2	2	4	2	2	4	2	2	4
T-706	Saddle	4	4	8	4	4	4	4	8	4	4	8	4	4	8
T-710	Reflector End Plate (Lg. Sym.)														
T-711	Reflector Coupling (Lg. Sym.)	2	2	4											
T-720	Reflector End Plate (Sm. Sym.)				2	2									
T-721	Reflector Coupling (Sm. Sym.)						2	2	4						
T-730R	Reflector End Plate, Right (Dir.)														
T-730L	Reflector End Plate, Left, (Dir.)														
T-731L	Reflector Coupling, Long (Dir.)									1	1	2			
T-731S	Reflector Coupling, Short (Dir.)									1	1	2			
T-740	Channel End Cap														
G.E.Co. 58G679	Ballast	1			1		1			1			1		
G.E.Co. 58G983	Ballast		1	2		1		1	2		1	2		1	2
G.E.Co. 78X491	Lampholder	2	2	4	2	2	2	2	4	2	2	4	2	2	4
G.E.Co. 78X736	Lampholder and Starter Socket	2	2	4	2	2	2	2	4	2	2	4	2	2	4
G.E.Co. FS-20	Starter	2			2		2			2			2		
G.E.Co. FS-40	Starter		2	4		2		2	4		2	4		2	4
	Jump Wire	1	1	2	1	1	1	1	2	1	1	2	1	1	2

TABLE A (Continued)

PART NUMBERS, NAMES AND QUANTITIES
TWO-LAMP UNITS

NAME OF ASSEMBLY →		UNITS WITH LARGE SYMMETRIC REFLECTORS			UNITS WITH SMALL SYMMETRIC REFLECTORS					UNITS WITH DIRECTIONAL REFLECTORS			UNITS WITHOUT REFLECTORS		
CATALOG NO. OF ASSEMBLY →		T-213	T-413	T-813	T-220	T-420	T-223	T-423	T-823	T-233	T-433	T-833	T-243	T-443	T-843
LENGTH OF ASSEMBLY IN FEET →		2	4	8	2	4	2	4	8	2	4	8	2	4	8
PART CAT. NO.	DESCRIPTION OF PART	NUMBER OF PARTS PER ASSEMBLY			NUMBER OF PARTS PER ASSEMBLY					NUMBER OF PARTS PER ASSEMBLY			NUMBER OF PARTS PER ASSEMBLY		
	2'-0" Line Leads (2) #14 Delabeston Wire	1	1	1			1	1	1	1	1	1	1	1	1
	.164-32x5/16" Bd. H.M. Screw for Mtg. Reflector to Channel	4	4	8	4	4	4	4	8	4	4	8	4	4	8
	.138-32x1/4" Bd H.M. Screw, Fastening Reflector End Plates to Reflector				8	8									
	.138-32x1/4" Bd. H.M. Screw, Fastening Couplings to Reflector	8	8	16			8	8	16	6	6	12			
	.138-32 Hex Nut, Fastening Couplings to Reflectors	8	8	16			8	8	16	6	6	12			
	.164-32x5/16" Bd. H.M. Screw, Fastening Coupling to Channel	2	2	2			2	2	2	2	2	2	2	2	2
	.164-32 Hex Nut, Fastening Coupling to channel	2	2	2			2	2	2	2	2	2	2	2	2
	.164-32x5/16" Bd. H.M. Screw, Fastening End Caps to Channel				6	6									
	.216-24x3/8" F.H.M. Screw, Fastening Mtg. Strap to Channel				4	4									
	.216-24 Hex Nut, Fastening Mtg. Strap to Channel				4	4									
	.164-32x5/16" Bd. H.M. Screw, Fastening Ballast to Channel	2	2	4	2	2	2	2	4	2	2	4	2	2	4
	.164-32 Hex Nut, Fastening Ballast to Channel	2	2	4	2	2	2	2	4	2	2	4	2	2	4
	Connector for Cord and Plug				1	1									
	Wire Nut (Size as Req'd.)	As Required			As Required					As Required			As Required		

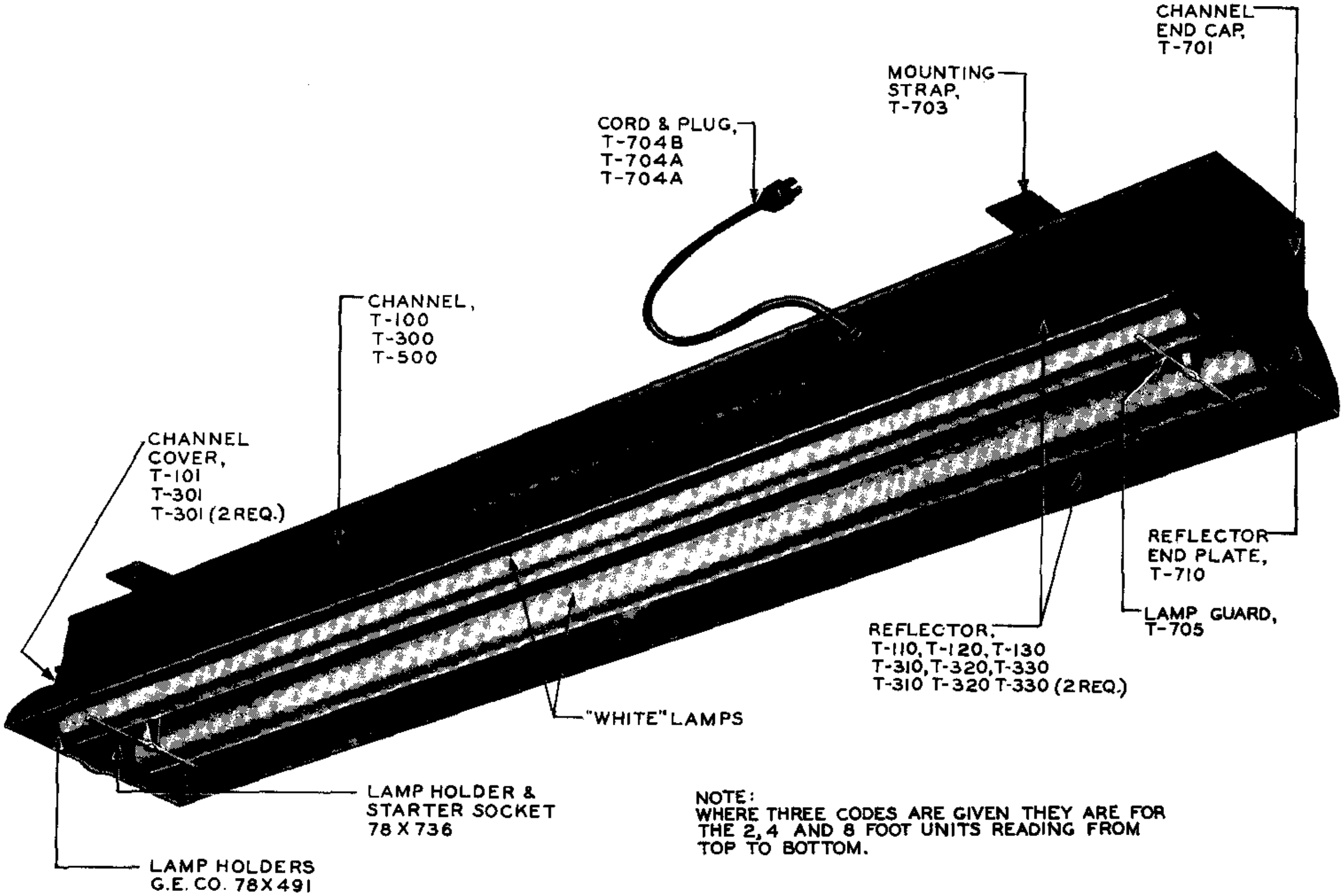
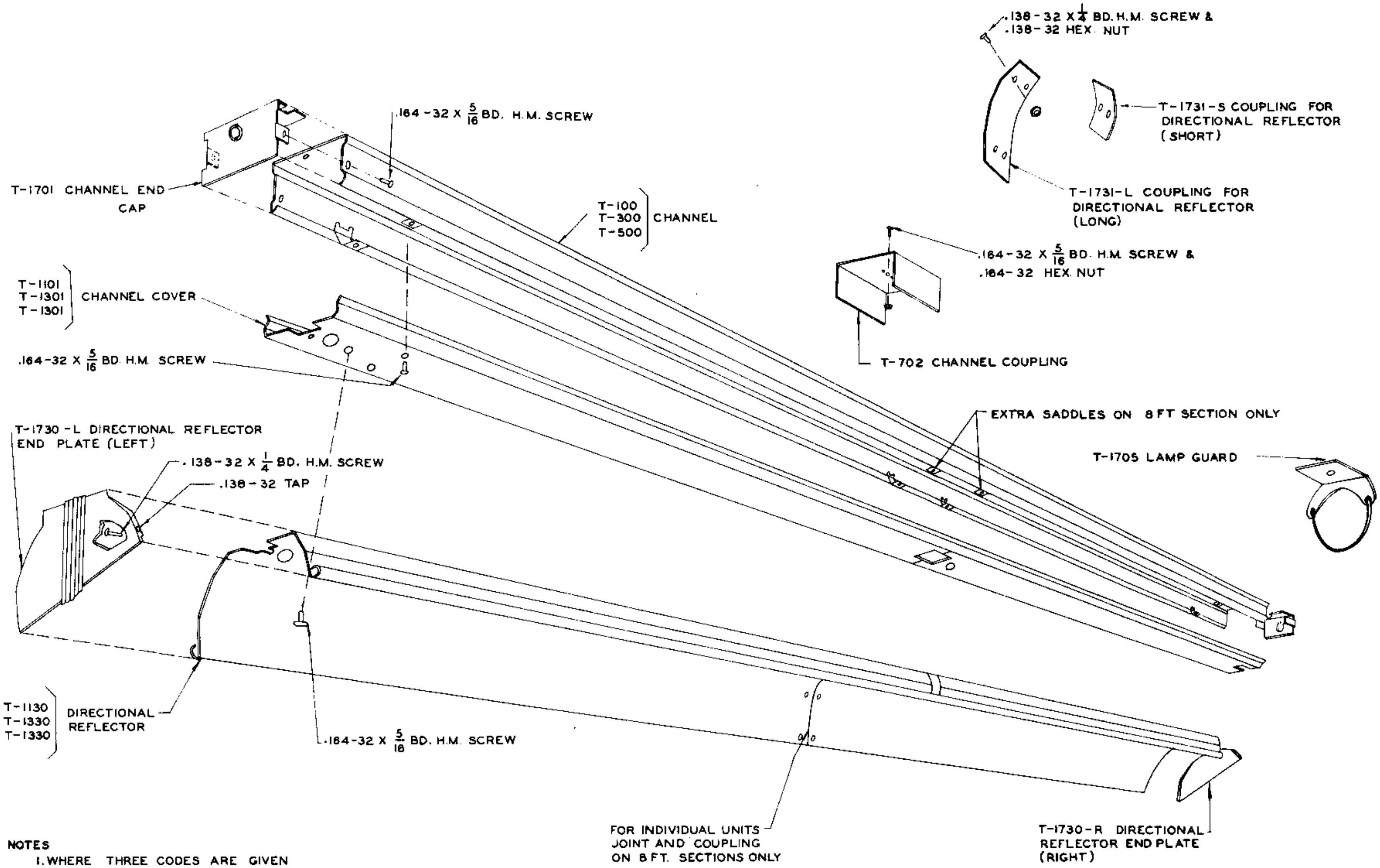


Fig. 2 - Assembly



NOTES

1. WHERE THREE CODES ARE GIVEN THEY ARE FOR THE 2, 4 AND 8 FT. UNITS READING TOP TO BOTTOM OR LEFT TO RIGHT.

Fig. 3 - Fluorescent Lighting Fixtures Details for One-lamp Units

TABLE B

PART NUMBERS, NAMES AND QUANTITIES
ONE-LAMP UNITS

NAME OF ASSEMBLY →		UNITS WITH DIRECTIONAL REFLECTORS		
CATALOG NO. OF ASSEMBLY →		T-1233	T-1433	T-1833
LENGTH OF ASSEMBLY IN FEET →		2	4	8
PART CAT. NO.	DESCRIPTION OF PART	NUMBER OF PARTS PER ASSEMBLY		
T-100	Channel	1		
T-300	Channel		1	
T-500	Channel			1
T-702	Channel Coupling	1	1	1
T-1101	Channel Cover	1		
T-1130	Reflector (Dir.)	1		
T-1301	Channel Cover		1	2
T-1330	Reflector (Dir.)		1	2
T-1705	Lamp Guard	2	2	4
T-1706	Saddle	4	4	8
T-1701	Channel End Cap			
T-1730R	Reflector End Plate, Right (Dir.)			
T-1730L	Reflector End Plate, Left (Dir.)			
T-1731L	Reflector Coupling, Long (Dir.)	1	1	2
T-1731S	Reflector Coupling, Short (Dir.)	1	1	2
G.E. Co. 58G679	Ballast	1		
G.E. Co. 58G983	Ballast		1	2
G.E. Co. 78X491	Lampholder	2	2	4
G.E. Co. 78X736	Lampholder and Starter Socket	2	2	4
G.E. Co. F.S-20	Starter	2		
G.E. Co. FS-40	Starter		2	4
	Jump Wire	1	1	2
	2'-0" Line Leads (2) #14 Delabeston Wire	1	1	1
	.164-32x5/16" Bd. H.M. Screw For Mtg. Channel Cover to Channel	4	4	8
	.164-32x5/16" Bd. H.M. Screw For Mtg. Reflector to Channel Cover	2	2	4
	.138-32x1/4" Bd. H.M. Screw Fastening Reflector End Plates to Reflector			
	.138-32x1/4" Bd. H.M. Screw } Fastening Coupling to Reflectors	6	6	12
	.138-32 Hex Nut } Fastening Coupling to Reflectors	6	6	12
	.164-32x5/16" Bd. H.M. Screw } Fastening Coupling to Channel	2	2	2
	.164-32 Hex Nut } Fastening Coupling to Channel	2	2	2
	.164-32x5/16" Bd. H.M. Screw Fastening End Caps to Channel			
	.164-32x5/16" Bd. H.M. Screw } Fastening Ballast to Channel	2	2	4
	.164-32 Hex Nut } Fastening Ballast to Channel	2	2	4
	Wire Nut (Size as Required)	As Required		

PIECE-PART DATA AND REPLACEMENT PROCEDURES

KS-15673 FLUORESCENT LIGHTING FIXTURES

FRAME AND AISLE LIGHTING

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the KS-15673 fluorescent lighting fixtures for frame and aisle lighting. It also covers approved procedures for replacing these parts.

1.02 Part 2 of this section covers the piece-part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of the above apparatus. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Piece-part Data.

1.03 Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

2. PIECE-PART DATA

2.01 The figures included in this part show the replaceable parts in their proper relation to the other parts of the apparatus. The part numbers of the various parts are given together with the names listed by the Western Electric Company Merchandise Department. When these names differ from those in general use in the field, the latter names, in some instances, are shown in parentheses.

2.02 When ordering parts for replacement purposes, give the part number, the name of the part, and the manufacturer, and state that the part is for the KS-15673 fluorescent lighting fixture. For example: "C551.03 Channel, Day-Brite Lighting, Inc., for the KS-15673 Fluorescent Lighting Fixture." The part numbers and names specified in this section, are names of parts assigned by the manufacturer. Do not refer to the BSP number or to any information shown in parentheses.

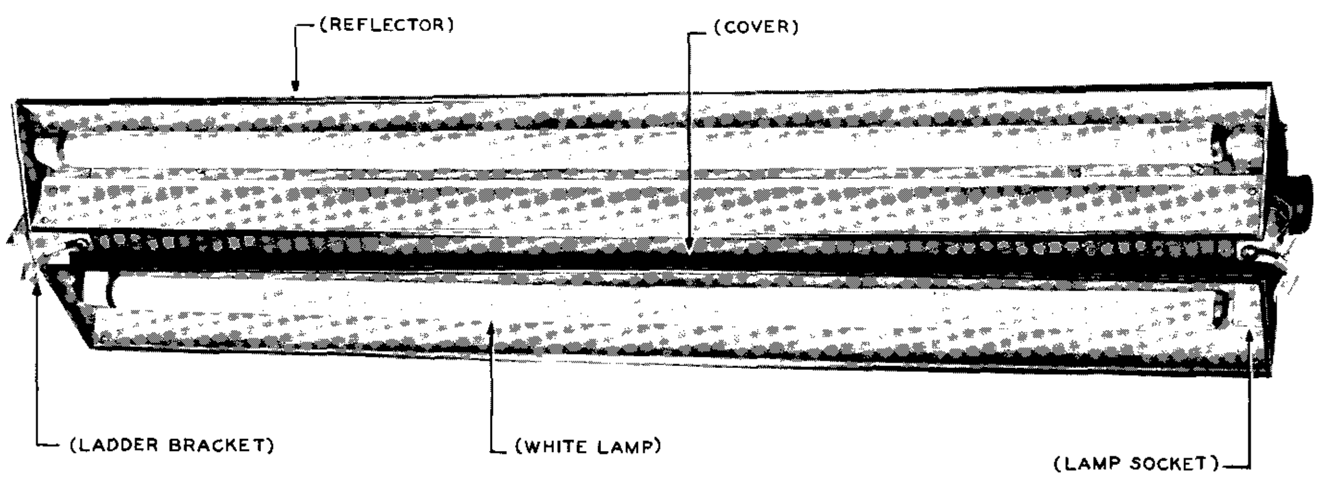


Fig. 1 — KS-15673 Assembly

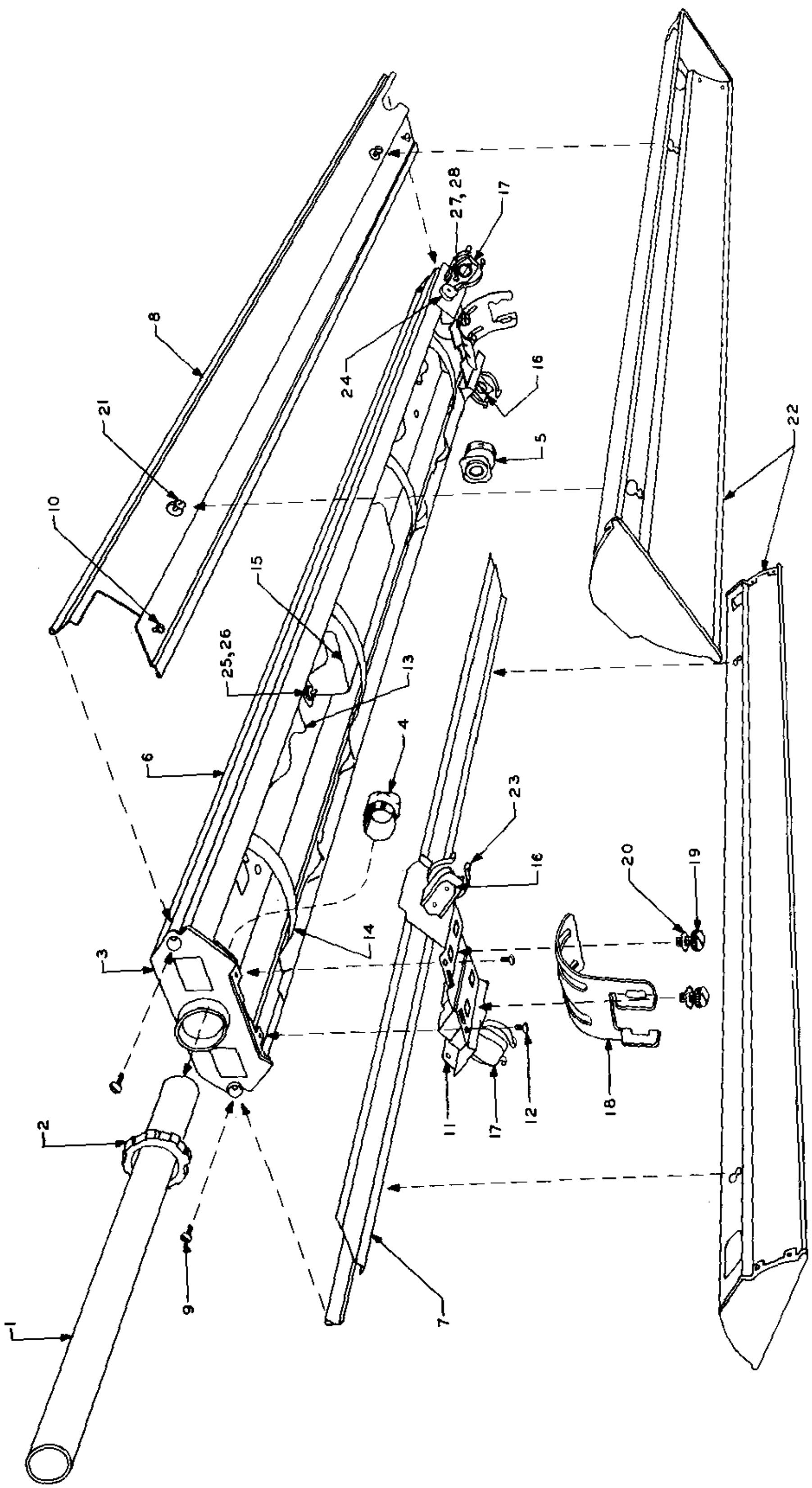


Fig. 2 — KS-15673, List 1 Fixture

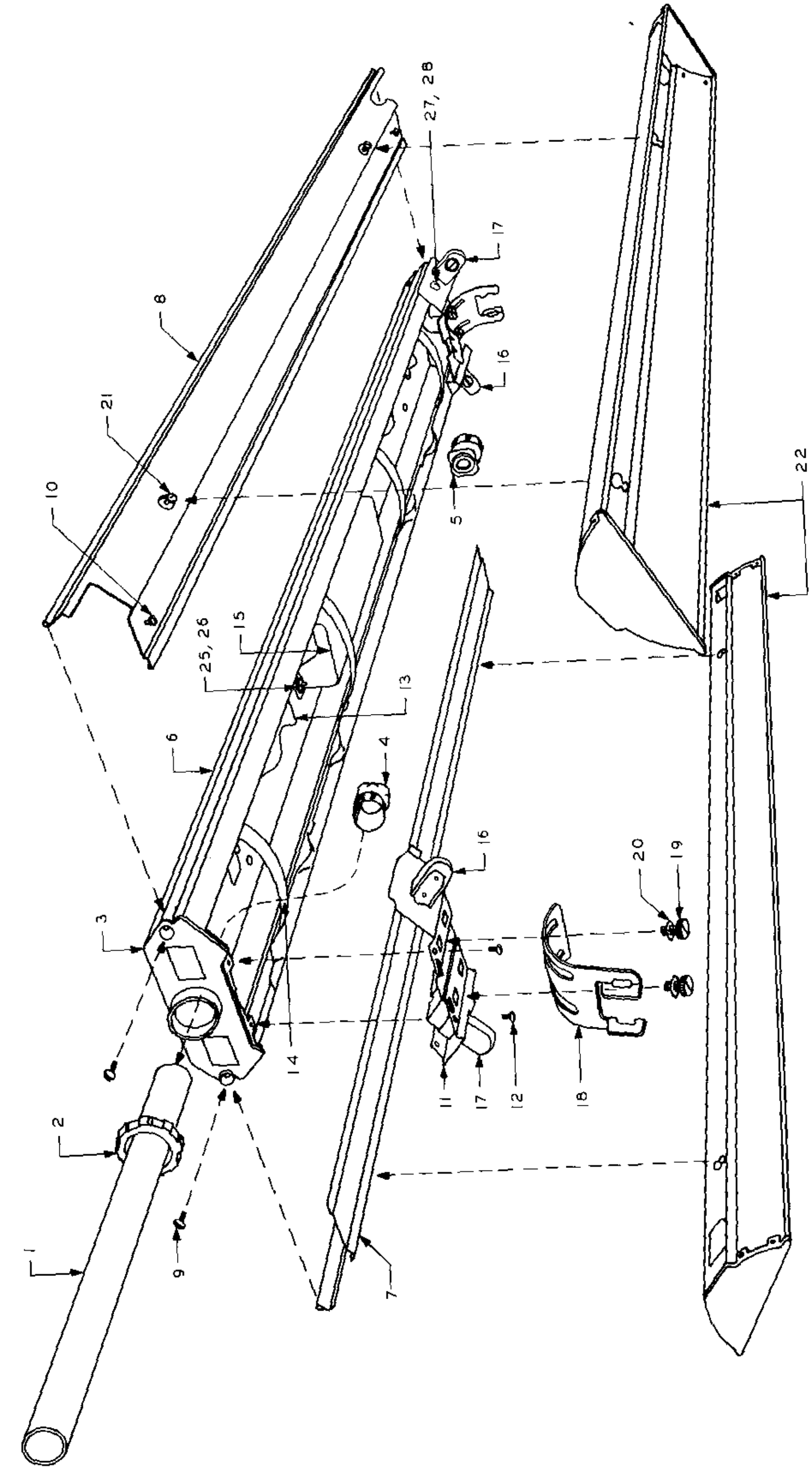


Fig. 3 — KS-15673, List 3 Fixture

TABLE A — ITEM NUMBERS, NAMES, AND CATALOG NUMBERS — 4-FOOT UNITS

ITEM	CURTIS LIGHTING, INC.			DAY-BRITE LIGHTING, INC			DESCRIPTION
	KS-15673			KS-15673			
No.	L1	L3	Cat. No.	L1	L3	Cat. No.	
1	√	√	53116	√	√	UM209	Connector
2	√	√	53132	√	√	UM205	Locknut
3	√	√	53117	√	√	UM204	Channel End
4	√	√	53134	√	√	UM206X	Fitting
5	√	√	53133	√	√	UM206Y	Fitting
6	√	√	53103	√	√	C551.03	Channel
7	√	√	53110A	√	√	C550.09	Cover, Plain
8	√	√	53105A	√	√	C550.13	Cover, Latch
9	√	√	B580	√	√	ZS276	Screw, Pivot
10	√	√	X53123	√	√	ZT243	Screw, Latch
11	√	—	53106	√	—	S550.09	Socket, Saddle
	—	√	53794	—	√	S550.13	
12	√	√	B587	√	√	ZS222	Screw
13	√	√	53115	√	√	S554.07	Stop Bracket
14	√	√	53118	√	√	UM203	Wire Retainer
15	√	—	8747	√	—	GE Co 6G1000	Ballast
	—	√	8796	—	√	GE Co 89G545	
16	√	—	10693	√	—	GE Co 78X491N	Socket
	—	√	10645	—	√	GE Co 505X85	
17	√	—	10694	√	—	GE Co 78X736N	Socket
	—	√	10644	—	√	GE Co 505X84	
18	√	√	53113	√	√	B551.11	Bracket, Fixture
19	√	√	X53122	√	√	ZT242	Screw, Thumb
20	√	√	B1341	√	√	ZW228	Lockwasher
21	√	√	B585	√	√	ZS4	Screw
22	√	√	53108	√	√	R551.19	Reflector
23	√	—	53119	√	—	UM197	Lamp Guard
24	√	—	10887	√	—	GE Co FS400	Starter
25	√	√	B872	√	√	ZN216	Nut
26	√	√	B121	√	√	ZB221	Bolt
27	√	—	B584	√	√	ZS157	Screw
	—	√	B640				
28	√	—	B815	√	√	ZN212	Nut
	—	√	B817				

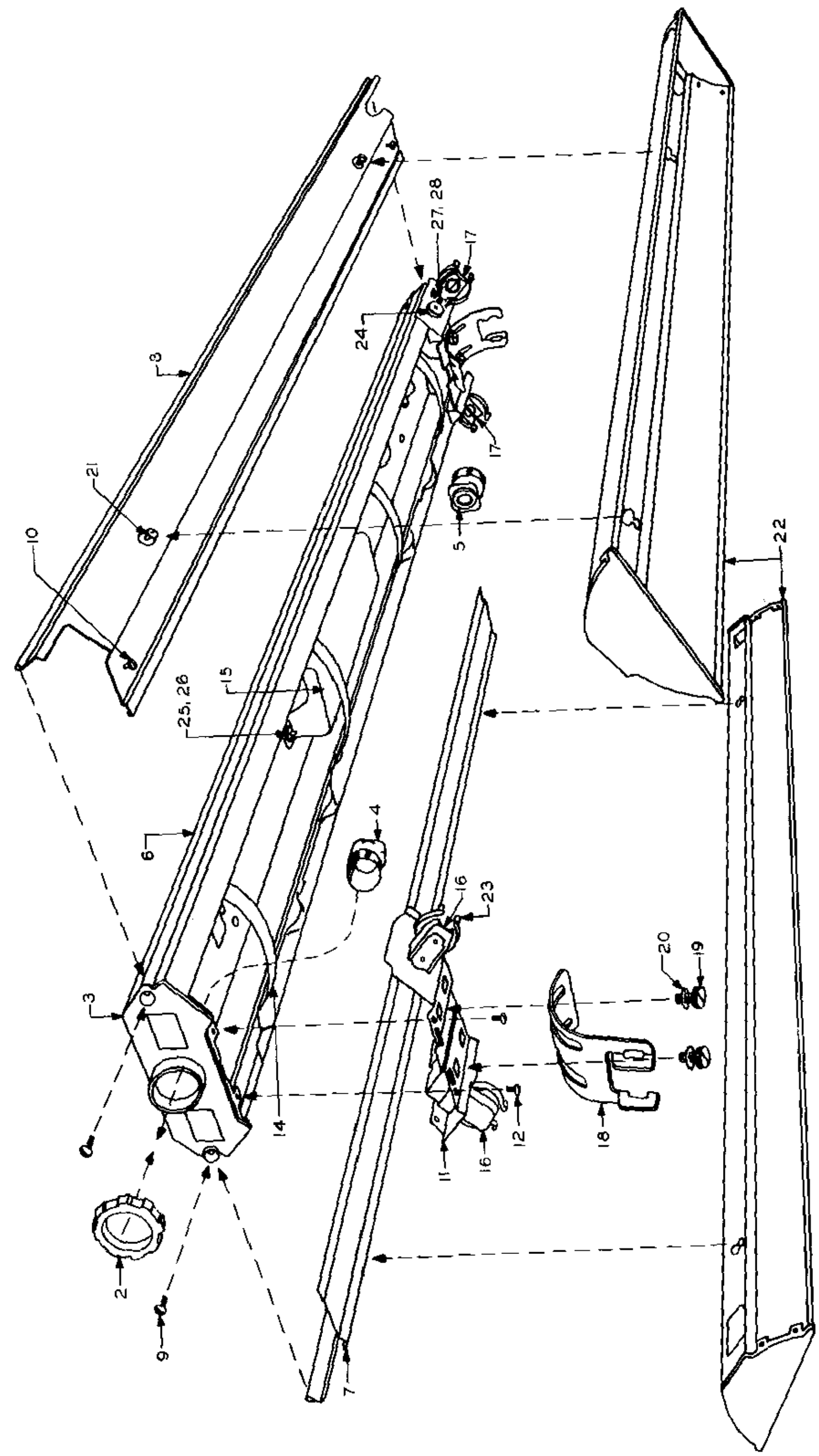


Fig. 4 — KS-15573, List 2 Fixture

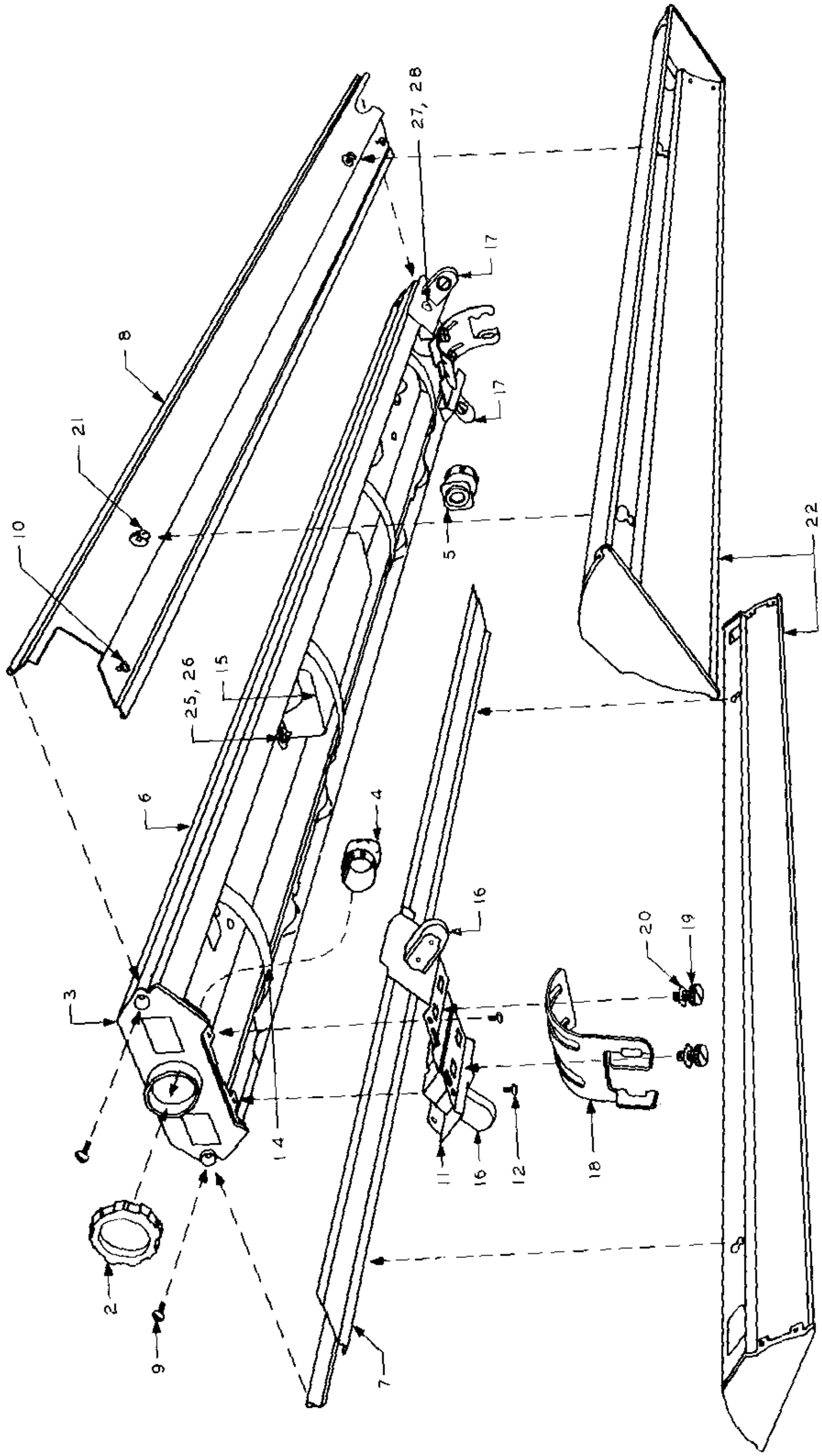


Fig. 5 — KS-15673, List 4 Fixture

TABLE B—ITEM NUMBERS, NAMES, AND CATALOG NUMBERS—2-FOOT UNITS

ITEM	CURTIS LIGHTING, INC.			DAY-BRITE LIGHTING, INC			DESCRIPTION
	KS-15673			KS-15673			
No.	L2	L4	Cat. No.	L2	L4	Cat. No.	
1	—	—	—	—	—	—	—
2	√	√	53132	√	√	UM205	Locknut
3	√	√	53117	√	√	UM204	Channel End
4	√	√	53133	√	√	UM206Y	Fitting
5	√	√	53133	√	√	UM206Y	Fitting
6	√	√	53102	√	√	C551.01	Channel
7	√	√	53109A	√	√	C550.07	Cover, Plain
8	√	√	53104A	√	√	C550.11	Cover, Latch
9	√	√	B580	√	√	ZS276	Screw, Pivot
10	√	√	X53123	√	√	ZT243	Screw, Latch
11	√ —	— √	53106 53794	√ —	— √	S550.09 S550.13	Socket, Saddle
12	√	√	B-587	√	√	ZS222	Screw
13	—	—	—	—	—	—	—
14	√	√	53118	√	√	UM203	Wire Retainer
15	√ —	— √	8721 8850	√ —	— √	GE Co 89G429 GE Co 89G667	Ballast
16	√ —	— √	10693 10645	√ —	— √	GE Co 78X491N GE Co 505X85	Socket
17	√ —	— √	10694 10644	√ —	— √	GE Co 78X736N GE Co 505X84	Socket
18	√	√	53113	√	√	B551.11	Bracket, Fixture
19	√	√	X53122	√	√	ZT242	Screw, Thumb
20	√	√	B1341	√	√	ZW228	Lockwasher
21	√	√	B585	√	√	ZS4	Screw
22	√	√	53107	√	√	R551.17	Reflector
23	√	—	53119	√	—	UM197	Lamp Guard
24	√	—	10622	√	—	GE Co FS20 Bryant FS20	Starter
25	√	√	B872	√	√	ZN216	Nut
26	√	√	B121	√	√	ZB221	Bolt
27	√ —	— √	B584 B640	√	√	ZS157	Screw
28	√ —	— √	B815 B817	√	√	ZN212	Nut

3. REPLACEMENT PROCEDURES

3.01 *List of Tools*

CODE OR SPEC. NO.	DESCRIPTION
TOOLS	
102	3/8-inch Hex. Single-end Socket Wrench
R-1542	6-inch Adjustable Wrench
R-1539	Pipe Wrench
—	8-inch P-side-cutting Pliers
—	4-inch Regular Screwdriver

3.02 Before making any replacements except the lamps or starters, disconnect the unit from the source of power.

3.03 No replacement procedures are specified for screws or other parts where the procedure consists of a simple operation.

3.04 *Lamps*

(1) ***Caution: The material coating the inside of fluorescent lamps manufactured prior to 1949 contained beryllium which is harmful if introduced into open cuts. Report even minor accidents involving fluorescent lamps containing beryllium to the medical department. However, the following safety precautions should be taken when replacing any fluorescent lamps.***

(a) Protect fluorescent lamps against accidental breakage at all times. Danger to personnel exists in:

1. Cuts from flying or broken glass.

2. Beryllium poisoning from the coating used to line the interior of some fluorescent lamps.

3. Mercury vapor poisoning.

(b) Store new fluorescent lamps in protective cartons.

(c) Should a fluorescent lamp be broken leave the area until dust has settled. Do ***not*** attempt to pick up broken parts with the bare fingers. Wear protective goggles and gloves, keep debris wet while gathering it up and disposing of it. Mop surrounding area and dispose of cloths used. Wash hands and gloves thoroughly upon completion of operation.

(d) Do not dispose of fluorescent lamps in incinerators, with other rubbish where they may be accidently broken, or in places where unsuspecting persons (especially children) may have access to them.

(2) To remove a lamp from a list 1 or a list 2 fixture, rotate the lamp 90 degrees so that the pins at each end of the lamp will slide out of the lampholder. To insert a lamp in a list 1 or a list 2 fixture, slide the pins at each end of the lamp into the slot in the lamp holder and rotate 90 degrees to lock the lamp in position. To remove a lamp from a list 3 or a list 4 fixture, remove the lamp by pressing in the telescoping fixture. To insert a lamp in a list 3 or a list 4 fixture, place the pins in the telescoping socket and press in sufficiently to permit the pins at the other end to enter the socket.

(3) After replacing a lamp on list 1 and list 2 fixtures, the starter must be reset by pushing the exposed button. List 3 and list 4 fixtures are not equipped with starters.

Other Parts

3.05 *Ballast:* The ballast is mounted in the center of the channel. To replace a ballast remove the lamps, loosen the reflector screws using the 4-inch regular screwdriver, and remove the reflectors. Loosen the latch screw attached to the latch cover using the 4-inch regular screwdriver, and open the covers. Remove the ballast retaining nuts using the No. 102 socket wrench. Substitute a new ballast and remount the parts in the reverse order.

3.06 *Lamp Holders:* List 1 and list 2 fixtures have a lamp holder at one end and a combination lamp holder and starter socket at the other end. List 3 and list 4 fixtures have plain sockets at one end and telescoping sockets at the other end.

3.07 *Starters:* When a lamp fails on list 1 or list 2 fixtures, the starter automatically cuts out and must be reset by pushing the exposed button before replacing the lamp. List 3 and list 4 fixtures do not require starters.

KS-15912, L1 FLUORESCENT LIGHTING FIXTURES PIECE-PART DATA AND REPLACEMENT PROCEDURES

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the KS-15912, L1 fluorescent lighting fixtures for power and engine room lighting. It also covers approved procedures for replacing these parts.

1.02 The KS-15912 fluorescent lighting fixtures are equipped with "V" slot twist-type lampholders and employ ballasts to utilize rapid start lamps. No starters are required.

1.03 Part 2 of this section covers the piece-part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of the above apparatus. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Piece-part Data.

1.04 Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

2. PIECE-PART DATA

2.01 The figures included in this part show the replaceable parts in their proper relation to the other parts of the apparatus. The part numbers of the various parts are given together with the names listed by the Western Electric Company Merchandise Department. When these names differ from those in general use in the field, the latter names, in some instances, are shown in parentheses.

2.02 Information enclosed by parentheses ( ) is not ordering information. This information may be references to notes, parts referred to in other portions of the section and not considered replaceable, or part names in general use in the field if these names differ from those assigned by the manufacturer.

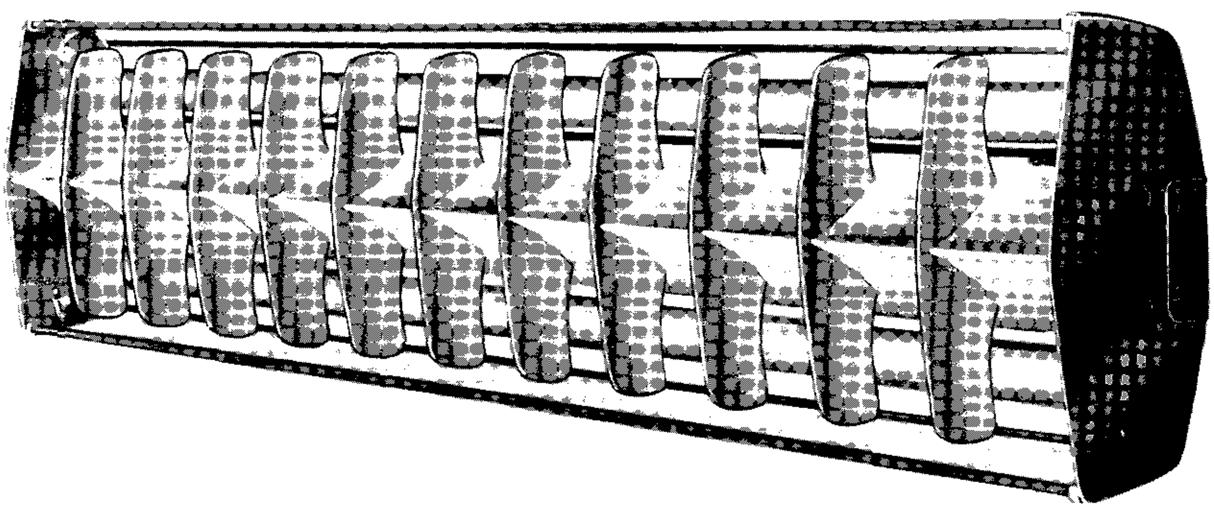
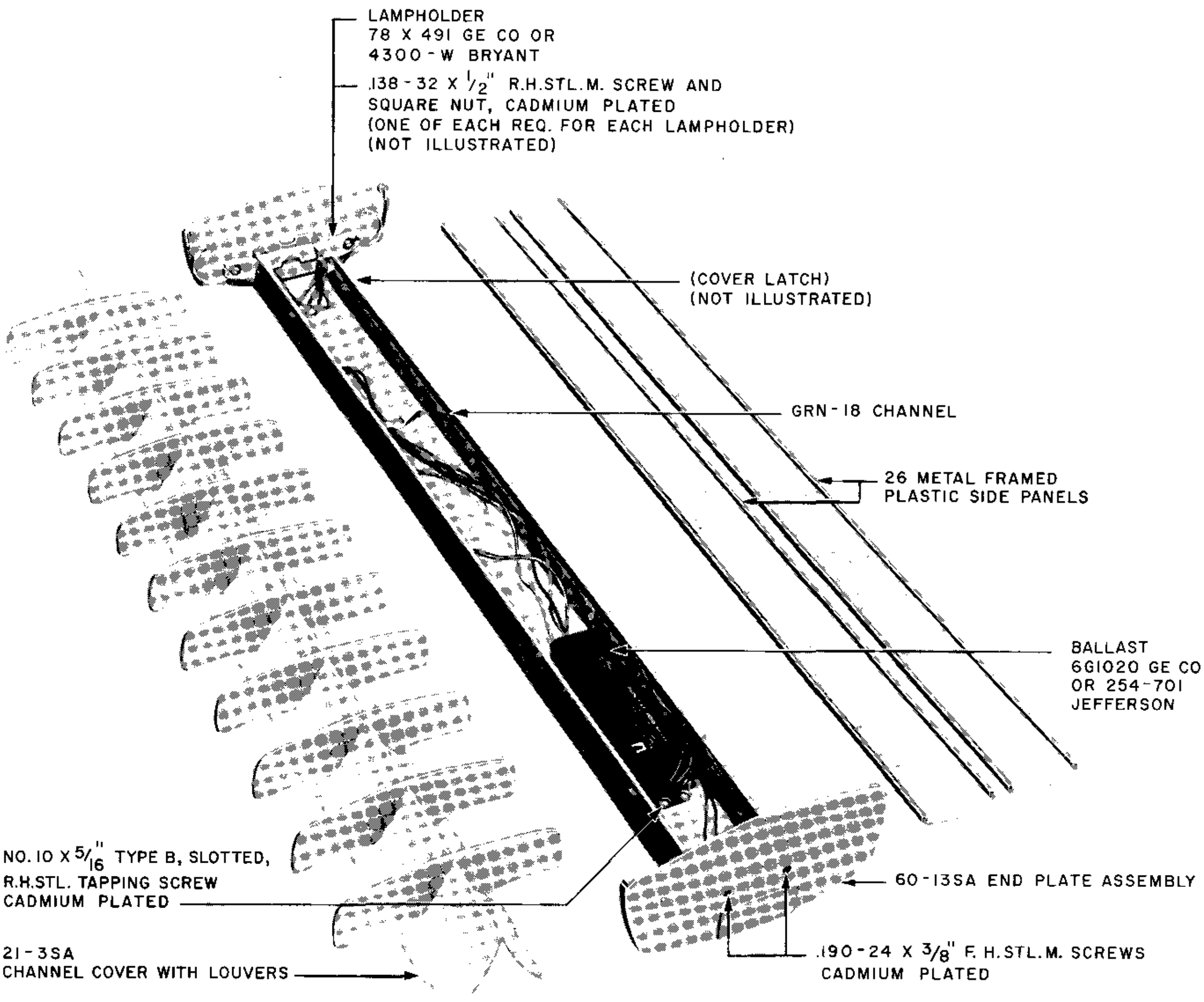


Fig. 1 – KS-15912 Fluorescent Fixture — View Showing Fixture Assembled With Lamps in Place

2.03 When ordering parts for replacement purposes, give the part number, the name of the part, and the manufacturer, and state that the part is for the KS-15912 fluorescent lighting fixture. For example: "GRN-18 Channel, The Wakefield Company, for the KS-15912 Fluorescent Lighting Fixture." The part numbers and names specified in this section, are names of parts assigned by the manufacturer. Do not refer to the BSP number or to any information shown in parentheses.

2.04 Where the identifying number of a part is not given, it is commercial and should be obtained locally.



NOTE: UNLESS OTHERWISE SPECIFIED, ALL PART NUMBERS ARE THE WAKEFIELD COMPANY PARTS.

Fig. 2 – KS-15912, L1 Fluorescent Fixture — Partially Disassembled — Lamps Not Shown

3. REPLACEMENT PROCEDURES

3.01 *List of Tools*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	8-inch B Side Cutting Pliers
—	4-inch E Screwdriver

3.02 Before making any replacements except the lamps, disconnect the unit from the source of power.

3.03 No replacement procedures are specified for screws or other parts where the procedure consists of a simple operation.

3.04 *Lamps*

Caution: The material coating the inside of fluorescent lamps manufactured prior to 1949 contained beryllium which is harmful if introduced into open cuts. Report even minor accidents involving fluorescent lamps containing beryllium to the medical department. However, the following safety precautions should be taken when replacing any fluorescent lamps.

(1) Protect fluorescent lamps against accidental breakage at all times. Danger to personnel exists in:

(a) Cuts from flying or broken glass.

(b) Beryllium poisoning from the coating used to line the interior of some fluorescent lamps.

(c) Mercury vapor poisoning.

(2) Store new fluorescent lamps in protective cartons.

(3) Should a fluorescent lamp be broken leave the area until dust has settled. Do ***not*** attempt to pick up broken parts with the bare fingers. Wear protective goggles and gloves. Keep debris wet while gathering it up and disposing of it. Mop surrounding area and dispose of cloths used. Wash hands and gloves thoroughly upon completion of operation.

(4) Do not dispose of fluorescent lamps in incinerators with other rubbish where they may be accidentally broken, or in places where unsuspecting persons (especially children) may have access to them.

(5) Lamps can be changed from above the fixture without removing either the side panels or the channel cover. To remove a lamp from a fixture, rotate the lamp 90 degrees so that the pins at each end of the lamp will slide out of the lampholders. To place a lamp in a fixture, slide the pins at each end of the lamp into the slots in the lampholders and rotate the lamp 90 degrees to lock it in position.

Caution: When placing a lamp in a fixture, make sure that it is properly seated in the lampholders at each end of the fixture.

3.05 *Lampholders*

(1) To remove a lampholder from a fixture, it will be necessary to remove the louvered channel cover and the side panel covering the side of the channel on which the lampholder is mounted. To do this proceed as follows.

(a) Release the cover latches located on one side of the channel and adjacent to the end plates to free the cover. Then release the cover from the projections on the opposite side of the channel and remove it.

(b) To remove a side panel, withdraw it from the top side of the fixture.

(c) Using the 4-inch E screwdriver, remove the lampholder mounting screw and remove the lampholder from the inside of the channel. Substitute a new lampholder and connect and remount the parts in the reverse order.

3.06 *Ballasts*

Note: When installing a ballast, the wiring diagram appearing on the casing of the new ballast should be followed for connection in the fixture circuit.

(1) To replace a ballast, remove the channel cover as outlined in 3.05. Using the 4-inch E screwdriver, remove the ballast fastening screws. Substitute a new ballast and connect and remount the parts in the reverse order.

CARE OF LAWNS AND SHRUBBERY

CONTENTS PAGE

1. GENERAL

1.01 This section deals with the description and culture of lawns, trees, and shrubs employed in landscaping Telephone Company properties. In general, the trees and shrubs which are set out on central office grounds have been confined to species readily grown in the locality. In those instances where unusual plants are to be dealt with, additional information should be obtained from well informed sources before proceeding with their treatment.

1.02 Inasmuch as the planting of shrubs and trees on Company properties is generally entrusted to experienced landscapers or nurserymen, there will be little occasion for Company forces to handle this class of work; accordingly, the details of this phase of the work has not been included.

1.03 The landscaping around Telephone Company buildings should be of the simplest practicable design to be in keeping with the surrounding properties and should be of the type requiring the minimum amount of maintenance. Seeded areas around the buildings should be kept small if provided at all. In most cases shrubbery will not be provided but where it is considered necessary, it should be confined generally to the front of the buildings.

1.04 Some Companies may consider it desirable to modify this section by a supplement outlining practices that will conform to conditions in their territories more closely than do those outlined herein.

2. SOILS

(A) Description

2.01 The three principal types of soil generally encountered in grading work are sand, clay, and loam.

2.02 Sandy soils are usually made up of comparatively large particles of disintegrated rock of the harder type. They are well drained which results in their being rather lacking in plant food because such elements as are found naturally within the sand are soon washed away by water.

2.03 Clay soils are made up of very fine particles of disintegrated rock of the softer types, and hold great quantities of water. They are inclined to contain more plant food than sandy soils.

2.04 Loam is a mixture of sand and clay which contains a considerable amount of organic matter like decayed vegetation. It has enough clay to retain some moisture and possesses sufficient food content to sustain plant life. It has enough sand to give the soil the right texture and porosity and it contains bacteria from decayed vegetation suitable to promote plant growth. Soil bacteria are necessary because they have the ability to manufacture the substances which plants take from the soil for growth. Inorganic soil particles do not have this property.

3. SOIL CHEMISTRY AND FERTILIZERS

(A) Soil Chemistry

3.01 General: Although there are many elements which are considered actually essential for plant growth, the three most important are nitrogen, phosphorus, and potash. Other essentials are hydrogen, oxygen, carbon, calcium, magnesium, sulphur, iron, and manganese. In human food, proteins, fats, and vitamins are essential to good health. In a similar manner nitrogen is likened to protein, phosphorus to fats, and potash to the vitamins.

3.02 Nitrogen is associated with leaf and stem growth and its deficiency is manifested by the stunting of plants and the yellowing of foliage which, however, hangs tenaciously on to the plant. Nitrogen is obtainable in the form of chemical compounds such as nitrate of soda, ammonium sulphate, calcium nitrate, and such strictly organic substances as blood, tankage (dried organic matter), cotton seed oil and soot. Pulverized cattle and sheep manures are also advocated for the same purpose. The strictly chemical compounds are quickly available for plant food and should be applied lightly or in liquid form. The others are more slowly soluble and may be used in heavier doses.

3.03 Phosphorus produces greater root development, strength of stems, and is associated with early maturity which means early flowering. Phosphorus is found principally in tankage, bone meal and other slaughter house by-products. The usual rate of phosphorus application is five pounds per hundred square feet.

3.04 Potassium, like a vitamin, acts as a conditioner and occasionally is helpful in warding off diseases of the plant. It also plays its part in root development, its growth and coloration of flowers. Potash comes in three general forms, potassium sulphate, potassium chloride, and wood ashes. The first two are extremely valuable and should be used when the plant is in a vigorous state of growth. The ordinary amounts recommended are two pounds per hundred square feet. Wood ashes if unleached are safer to use, but fully four or five times the above amount are necessary to equal the action of the chemical ingredients. Potash is frequently lacking in light soils and applications of the material are necessary in addition to the balance of plant food which may have been used.

(B) Fertilizers - Natural

3.05 The principal natural fertilizers are manures from various sources, peat moss, humus, and leaf mold. Fertilizers containing animal blood have been introduced more recently. The use of manures is not as prevalent as formerly due to their scarcity. Such materials have little actual plant food value because they carry such minute quantities of available nutrients. A ton of manure is apt to provide a lesser quantity of plant food than a hundred pounds of scientifically prepared fertilizer. Furthermore, manures are likely to introduce enormous quantities of objectionable weed seeds. The real benefit from manures and similar substances results from the humus they add to the soil, improving the physical rather than the chemical conditions.

3.06 Peat moss comes in alkaline as well as in acid forms, although the acid is most common. It may be well to ascertain the type being obtained, especially if it is being used for rhododendrons or other acid soil plants. It makes an unusually good summer mulch. A layer of 1/2 to 1-inch thick should be placed over all newly planted shrubs. A standard bale of peat moss when spread 1/2-inch thick will cover about 720 square feet.

(C) Top Dressing

3.07 In these instructions the term "top dressing" has reference to a compost containing loam and fertilizers for the purpose of spreading over lawns. In order to maintain a lawn in good condition, a top dressing should be applied in the early spring.

3.08 It should consist of two parts of light loam and one part comprised of peat moss, humus, or leaf mold. Sand should be added in the case of a heavy clay soil. The top dressing should be mixed thoroughly and screened before it is applied to the lawn.

3.09 A cubic yard of this mixture should be sufficient to top dress from 3,000 to 5,000 square feet of lawn.

3.10 In addition to the use of the top dressing during the early spring it may sometimes be well to make another application in late August or early September.

3.11 It should be raked in lightly with a bamboo rake and given a thorough watering to settle the particles about the roots of the grass.

3.12 In case the above practice is followed, it is not necessary to spread manure over the lawn in the fall or early spring. The use of ordinary manure has a tendency to scatter weed seeds which may kill out the grass in spots. However, heat treated manure in which the seeds have been killed, may be safely mixed with the top dressing.

4. LAWNS

(A) General

4.01 Success in cultivating lawns depends largely on the preparation of the soil, drainage, selection and sowing of the seed, and care and attention during the early stages of development. If there is reason to believe that the condition of the soil is faulty, a soil analysis should be made to determine the special treatment required.

(B) Seeding

4.02 New Lawns: Probably no lawn should give less trouble than one planted in late summer and maintained by regular feeding. After a summer of baking sun, shriveling drought and destructive insects, nature affords an ideal season to repair the damage and build a lawn that will not retreat the following year. Grass started in the fall develops a more spreading and deeply anchored root system.

4.03 Fall weather is nearly ideal for quick germination and the subsequent development of grass. The seeds lodge in the warm soil, there is a helpful temperature variation in the warm days and cool nights and further, there is usually adequate rainfall. Autumn rains are gentle and the soil is able to absorb them so that there is less washing and drowning of seedlings. These favorable conditions offer every encouragement to a deep and sturdy root development. The advantages to be obtained should not be neglected in the weeks from mid-August to late October.

4.04 Old Lawns: Fall is the best time to renovate old lawns. If an established lawn is so poor that reconstruction seems necessary, the first step is to find out the cause of failure and guard against a repetition of the experience.

4.05 Even a good lawn will be better the next year if it is seeded and fed in the fall. A good turf will not need drastic treatment but it is advisable to rake vigorously to scratch the surface soil and to mow closely. This permits the seed to reach the soil.

4.06 If the lawn turf is uneven it is well to level it with a top dressing of compost or good top soil. Depressions in the lawn should be corrected in this way and not by heavy rolling.

4.07 Seeding in two directions assures even covering. A light raking and rolling afterwards will form the soil around all sides of the seeds.

4.08 If an old lawn has been treated in the fall, it should be cut regularly and rather closely through September to give the new grass a chance to receive sunlight. There is not much danger of injuring young grass blades unless the soil is very wet at the time of mowing. After the end of September raise the height of cut to a minimum of two inches so there will be fairly long growth in event of a sudden cold snap.

4.09 Occasionally good lawns are sure to suffer some injury over the winter months caused by warmth during unseasonable days when the ground thaws. Then at night the soil which is usually well saturated in moisture is apt to freeze again. During the next thaw the ice melts and the soil settles back leaving the roots partly out of the ground. After this process has been repeated a few times many grass roots will be heaved to such an extent that they are broken off and exposed to the drying sun and wind. Plants need moisture even in winter and they are soon destroyed if they can not take it from the soil. Because of this lifting or heaving, an open winter may be more damaging to grass than the so-called old fashioned winters. Good grass is better off if it remains frozen all winter especially if it lies buried under a protecting blanket of snow.

(C) Grass Seeds

4.10 General: To provide a first class seed bed in the most approved manner would be wasted effort if the proper seed of the right varieties were not secured. For the average lawn, Kentucky Bluegrass should predominate. This seed, together with other either desirable or at least acceptable varieties that may be included, are discussed below. The use of Lespedeza is suggested for areas adjacent to auxiliary and other unattended buildings that will receive care at infrequent intervals.

4.11 Above all, seed should be pure. The total weed content should not exceed 1/4 of one per cent and still cleaner seed is obtainable. A high-grade lawn mixture composed of well chosen grasses that are free from weeds and chaff should weigh about 13 to 14 ounces to the quart; this constitutes a rather good test of quality provided Bluegrass is known to predominate. Such seed should be sown 4 pounds per 1000 square feet, or roughly, one pound to a space 15 by 16 feet. One-fourth to one-half of this amount is sufficient for seeding old lawns. Seeding should be done on a calm day, from two directions so as to insure uniform coverage. Following seed, the ground should be sprinkled with a fine spray and lightly rolled.

4.12 Varieties: Brief descriptions of the common varieties of grass are given in the following paragraphs.

(a) Kentucky Bluegrass (Poa prantensis, meaning meadow grass): The standard of grasses. Slow in germinating but makes strong permanent turf. Does not attain proper development until third year. Succeeds in any but an acid soil. Apt to become brown in mid-summer. Strong growing and will crowd out other grasses in a few years.

4.13 Kentucky Bluegrass requires 21 days to germinate and constant moisture is required for this period to get satisfactory germination. The lawn should be watered so that it is moist from three to four inches deep the first time. When the new lawn shows a shade of green, sprinkle more water on it at one time but not as often.

(b) Canada Bluegrass (Poa Compressa): Distinguished from Kentucky Bluegrass by its compressed stems, blue green color of blade, and its prominent root stocks. Its use is confined to very poor clay soils and gravel knolls, or as a soil binder on silt or slopes. Mixed with Chewings fescue it makes a fair turf.

(c) Fescues: Have fine round and bristle-like blades; useful in forming dense sod mat; will stand drought; are included in mixtures to give quick effect; somewhat superior to Rhode Island bent in partly shaded areas; very low growing and bunchy; thrive on poor sandy soils.

(1) Sheeps Fescue (Festuca Ovina): Leaves are blue green and very bristly, producing stools or tussocks from four to eight inches in diameter.

(2) Various Leaved Fescue (Festuca Leterophylla): Gives a very fair but bunchy turf if used under shade on soil rich in humus. The color is very dark green.

(3) Chewings Fescue: A creeping variety; does not form tufts or bunches, but a mat-like turf brownish green in color; is long wearing even under hard usage.

(d) Ryes (Lolium Perenne, meaning Perennial): Is biennial; germinates almost immediately and grows rapidly, giving good appearance first year; will remain in lawn about two years; stands hard wear; does not have fine foliage and if used too freely will result in coarse looking lawn; narrow flat blades of glossy dark green color; favored for athletic fields.

(e) Meadow Grass (Poa Trivialis): Good for moist and shady places and a heavy soil.

(f) Red Top (Agrostis Palustris, meaning Swamp Field): Succeeds on slightly acid soil; forms dense mat; used to secure a stand in places where soil is too acid for Bluegrass.

(g) White Dutch Clover (Trifolium Repens): Useful for mixtures; forms dense ground cover; does well in shade; will grow more abundantly on infertile soils where other grasses fail; will not stand rough use; grows below level of lawn mower cutting height as generally set; does not interfere with growth of permanent grasses; affords green ground cover in dry weather.

(h) Crested Dogs Tail (Cynosurus Cristatus): Tough grass which makes early low dense growth and stands hard wear; good for shady areas.

(i) Rhode Island Bent (Agrostis Capillaris, meaning hair-like): Closely related to Red Top from which it differs in being lower and more delicate. It does not produce root stocks as does Bluegrass but the stems are creeping at the base.

(j) Creeping Bent (Agrostis Maritima): Is the type to which the best of the fine-lawn bent grasses belong. Both it and Rhode Island bent withstand close cutting well.

(k) Bent Stolons: A stolon is a creeping stem which has a number of joints, or nodes, from which new shoots and roots are developed, each shoot being able to produce an independent plant. The closeness of the nodes determines the texture of the resultant turf and usually indicates the rapidity with which the plant will spread.

4.14 The price of stolons for a lawn is about four times that of seed for the same area.

4.15 The preparation of the lawn for stolons is the same as that for seeding. Just previous to planting, the lawn area should be raked, but need not be left in as smooth condition as for seeding. In fact, the ridges formed by the rake teeth make an excellent planting surface. Stock from a nursery comes in bags already chopped into pieces one to one-and-half inches long; it may be planted at once or stored in a cool dry place.

4.16 The stolons should be dropped evenly over the measured lawn area and immediately covered with a 1/4 inch of sifted loam, also dropped, as spreading the loam with a shovel will push the stolons into rows and result in an uneven planting and covering. The loam top dressing is for the purpose of holding the stolons in place and to help keep them from drying out.

4.17 Following the covering, the stolons should be rolled and sprinkled in such a manner that there is no washing of the top-dressing. Should washing occur, the washed area should be top-dressed. It is not necessary to water the stolons every day after planting but a light sprinkling twice a week for the first four weeks should be done.

4.18 Two days after planting, young shoots will appear, and at the end of a week the areas will have the appearance of a very thin lawn.

4.19 Many weeds will have started by this time but these need not cause concern as they will quickly disappear under clipping and the aggressiveness of stolons. Usually at the end of one week there will be many shoots two or three inches tall. If so the lawn should be mowed and again top-dressed in order that the nodes from the clippings may take roots. The lawn should be clipped and top-dressed each time there are a number of tall shoots, as this treatment strongly promotes the vegetative propagation.

4.20 A spring-planted bent grass lawn should be fully developed by June 1, and a fall-planted lawn by May 10 or 15 of the following year.

(L) Range Grasses: The grasses of the Great Plains section are numerous, but three species, Buffalo grass, Grama grass and Curly mesquite stand out as being especially important. These are all popularly known on the plains as short grasses in which the foliage is short and curly, forming a close covering to the soil.

(1) Buffalo Grass (Bulbilis Dactyloides): Light or grayish green creeping grass that forms a strong firm sod. The flowers are of two sorts, the male being produced on short erect stems 3 to 6 inches tall, with 2 or 3 short pale spikes not over 1/2-inch long, near the top. The female or seed bearing flowers are in little green clusters or heads hidden among the leaves.

(2) Grama Grass (Boutelona Gracilis): Is not creeping, either by stolons or root stocks, but where the grass is abundant, the bunches are so close together that they form a continuous covering. Grama resembles Buffalo grass in its foliage, but may be readily distinguished by the flower stalks.

(m) Lespedeza (L. Striata): Bush Clover or Japan Clover.

4.21 Mixtures: The following are recommended grass mixtures (expressed in percentages) for the various soils and surfaces indicated:

	Sand	Clay	General	Sunny	Shady	Terrace	Bottom Land	Hill Tops
Kentucky Blue	20	15	50	75	40	10	30	40
Rhode Island Bent	35		15					25
Creeping Bent	35	35				40		20
Sheeps Fescue	10							10
Crested Dogs Tail		30			15	25		
Canada Blue		20				25		
Rye			15				20	
Red Top			20	25				
Meadow Grass					40		30	
Various Leaved Fescue					5		20	
White Clover								5
	100	100	100	100	100	100	100	100

4.22 Seed for Use in South: The establishment and maintenance of lawns in the South present very special problems. Bluegrass which is the chief ingredient of most lawn grass mixtures in the North will not thrive under conditions of extreme heat or drought. Bermuda grass meets the requirements of these conditions more completely than any other.

(D) Watering

4.23 The brilliant green lawns of the British Isles owe their beauty mainly to ideal moisture conditions. Gentle rains fall so frequently and atmospheric conditions are so favorable there is no critical drying.

4.24 In the United States most sections east of the Rockies have an annual rainfall almost six per cent greater than that in England, yet the watering problem is more difficult. About the same amount of moisture falls each month throughout the year. June, July, and August even have a slight excess over the other months. Unfortunately, evaporation during the summer is highest, and many of the rains come in heavy dashing storms. They do the grass little good because much of the water runs off the surface before it can be absorbed. There may be such rains during the summer with severe drought in between. To offset this fluctuation and provide a more even moisture supply a careful watering program is needed.

4.25 On loam and clay soils a good turf can withstand severe and protracted drought. It may turn quite brown, but unless cut too short it will be revived by the slow drizzling rains of fall. This is not true of sandy soils. They dry so completely that even weeds may be killed in dry weather.

4.26 Some soils have a greater moisture retaining capacity than others. If there is an abundance of organic matter this acts as a sponge in retaining moisture and releases it to the grass if needed. Because of their finer particles, loam and clay soils hold more water than sandy and gravel soils. Evaporation is reduced by cutting the grass 1-1/2" and 2" high because the longer growth shades the ground. As pointed out under the paragraph "Mowing," high cutting promotes deeper rooting so grass can reach to a greater depth for moisture.

4.27 Steep slopes receive fewer benefits from rainfall and watering because there is more surface run off. Those facing the south are subject to greater loss of moisture by evaporation.

4.28 The amount and type of natural rainfall are the main factors affecting the timing of the watering program. A slow soaking rain of 1/2" will do more good than a driving downpour of several times that amount. When rains have been missing for a week or two, the soil should be examined for dryness. Sometimes this condition develops much earlier in the spring than is realized. A bright sun and crisp winds can evaporate considerable soil moisture within a few days, even in April. Therefore, it is important to start watering early enough in the season. A good lawn watering program can not be scheduled by the calendar. A good plan for determining the dryness of soil is to cut a small plug 2" or 3" deep with a knife or trowel. If the upper inch or so reveals any kind of dryness, it is time to water.

4.29 As the soil dries out it should be necessary to replace only as much water as was lost during the interval by evaporations from it and transpiration from grass leaves. From an average loam soil this loss on a warm summer day would be 50 gallons per thousand square feet. In six days that would be three hundred gallons or the equivalent of about 1/2" of rain. The length of time needed to replace that would depend upon the sprinkler and the water pressure. A good type at 20 pounds pressure would need to run two or three hours.

4.30 In the case of a sandy soil the moisture lost should be replaced long before it amounts to as much as 1/2" of rain. Even though such soils absorb water quickly they actually hold less moisture and lose it more readily. They need to be watered more frequently but in smaller quantities.

4.31 The delivery of a sprinkler over any given time may be checked by placing coffee cans or similar receptacles under the spray and measuring the depth of water collected. To be sure of complete coverage it is necessary to overlap the border to the area covered by the sprinkler.

4.32 The belief that grass plants absorb water through their blades and stems is erroneous. Actually grass can make use of moisture only by taking it from the soil through the root system. Merely wetting the grass and soil surface does no good. The water must be put into the ground where it becomes available to the roots.

4.33 If water is suitable for human consumption or even for laundry purposes it is not likely to hurt grass. It is doubtful if enough of such water would ever be put on a turf to cause an appreciable concentration of chemicals. The lime in some water may tend to alkalinize soils but never harmfully so. The quantity of chlorine and other chemicals used for purifying city water will not be harmful to grass.

4.34 Careful tests have shown that cold well water, or warm tank water is not detrimental to grass.

(E) Mowing

4.35 The principal purpose of mowing a lawn is to improve its appearance. Unless properly done, however, this improvement will only be temporary. The continued removal of its foliage will eventually starve any plant. Close mowing has the same strangling effect on grass. Yet if mowing is neglected the grass becomes tall and spindly in an effort to reach the light. It forms a thin, weak covering instead of a thick sod.

4.36 Somewhere between these two extremes lies the happy medium where mowing causes the least possible injury and gives the desired appearance.

4.37 This medium is attained by cutting 1-1/2" to 2" high. At this length the turf will not suffer even from frequent cutting and the grass tips can be kept uniformly trimmed so that the lawn has a decent well groomed appearance. Taller grass minimizes the presence of weeds by shading the surface soil and so prohibiting the germination of many weed seeds. It also prevents weeds from overgrowing the desirable grass and smothering everything beneath them. Obviously, high grass forces weeds into an upright position where the mower blades can sever their seed heads and much of their foliage.

4.38 Aside from appearances, proper cutting has a lasting effect on the general health of the grass. There is a definite relation between grass growth above ground and that below ground, a longer top growth resulting in a more extensive root system. Such a root system is much to be desired because it is capable of reaching more moisture and absorbing more food. Taller growth also provides shade and so reduces evaporation of soil moisture. In periods of drought these factors may mean the difference between saving and losing the lawn. In cases of shaded lawns, higher cutting is especially important because of the reduced volume of sunlight and the competition of tree roots.

4.39 The first spring cutting should be delayed until the grass has had an opportunity to grow. A large portion of the root system is regenerated every spring. Consequently by allowing more growth before mowing the roots have more time to develop. This condition influences the grass for the rest of the entire season.

4.40 Cutting the grass every few days does no harm provided the height of cut is correct. Nevertheless, it is better to adopt a mowing schedule regulated by the amount of growth made, rather than by the calendar. Instead of mowing at fixed periods, mow whenever the length is one inch taller than when cut last. This will be more often during the growing season, and less often during hot dry weather.

4.41 At no time should grass be cut with a dull mower which chews off the blades instead of shearing them cleanly; the resulting bruise gives a brownish cast to the lawn. In the fall the last mowing should be done at such a time that further growth will take place before winter. A length of two or three inches is desirable and is all the winter protection the lawn needs.

4.42 An exception to the above is applied in the case of creeping bent which is composed of an unusual type of grass, the nature of which is to make an extensive lateral growth. Because of this it tolerates and even thrives under close clipping.

4.43 In cutting the crown of a terrace, mow up and down the slope. Trying to cut crosswise will invariably leave the ridge scalped by the bed knife. Then it is only a question of time until the grass turns brown and is burned out. Grass on terraces is often exposed to the direct rays of the sun. Soil washes easily from around the grass crowns, exposing the surface roots. Here high cutting is doubly important. Taller grass will reduce the soil washing and the evaporation of moisture.

4.44 The combined length of clippings removed from a single blade of grass during the year may add up to a total of 36 inches. Considering how closely together grass blades grow, the immensity of this crop is more apparent. To produce such a harvest there is a continual flow of food from the soil through the grass roots to the blades which are then removed in mowing. No soil can long continue to yield so bountifully without replacing some of the facilities through the use of complete grass foods.

4.45 Contributing some small part of this replacement are the grass clippings left on the lawn. They work down to the ground and at least partially decay, thus liberating a portion of their food. The greatest benefit of clippings, however, derives from the protection they afford. Acting as a mulch they reduce evaporation to the soil surface keeping it cooler and more moist.

4.46 But clippings are detrimental, too, in that if wet, they will mass cake, smothering the grass underneath them. If much over an inch long they do not readily work down through the grass. As they dry out their brownish color dulls the lawn.

4.47 Although proper mowing can not be considered a cure all for straggly turf, much can be accomplished by following these simple rules:

(a) Delay the first spring mowing until the grass has made some new growth.

(b) Cut the grass at a minimum height of 1-1/2" to 2", using a sharp mower.

(c) Remove the clippings during wet weather whenever they are heavy enough to mat.

(d) Stop mowing early enough in the fall to insure a growth of 2 or 3 inches before winter.

4.48 New grass should be cut when it reaches between 2-1/2 to 4 inches, using a mower set at 1-1/2 inches high. Cut up and down the lawn, or, if cut round and round, reverse the direction each round; in this way the grass matted down by the driving wheel will be picked up by the cutting blade on the reverse trip. Since young grass, particularly when wet, bruises and tears up easily, it should be dry when cut, using a grass catcher for the first few cuttings.

(F) Adjustment of Mower

4.49 Place the mower on a flat surface, such as a walk or concrete driveway, then loosen the side brackets at the end of the wooden roller. As the roller bracket is extended downward, the roller is lowered and the bed knife in front is tilted up. Measure 1-1/2 to 2 inches from the cutting edge of this bed knife to the floor and tighten the bracket bolts. Many mowers can not be set to cut high enough so it is necessary to obtain longer roller brackets from the manufacturer or have them made at a local machine shop. Another solution is to wrap a 1/2" rope around the roller or replace it with one having a larger diameter.

(G) Rolling

4.50 It is damaging to soil to roll a lawn while it is soaking wet and just as damaging to use a roller so heavy that it actually mashes into the ground. The soil should be moderately moist and a roller of water or sand ballast type used, so the weight can be adjusted to the soil conditions. Some lawns newly planted in late fall or during the winter have only a short growth of seedlings by rolling time in the spring. Even so, if the ground is badly heaved it should be rolled. No harm is done to the young tender grass unless the soil is so wet and sticky it makes the roller pull out the plants. Care should, of course, be exercised in making turns with the roller so as not to disturb the soil too much.

4.51 The heavier and wetter the soil, the lighter the roller should be. A sandy soil can withstand more weight than a clay soil. As a general rule a ballast roller should be less than one-half full so the weight is around 75 to 100 pounds per foot in width. If in doubt use a very light roller or none at all. There is a mistaken idea that the function of the rolling is to level out or iron out high and low spots in the lawn. A severe rolling will puddle and compact the soil so the grass roots are suffocated. To correct extreme high and low spots, lift the sod and adjust the undersoil to the proper grade and then replace the sod. Moderately low places may be gradually built up by top dressing them with 1/4" of good screened soil at frequent intervals until the proper level is reached.

(H) Lawn Insect and Fungas Diseases

4.52 Lawns are subject to insect and fungas diseases. These at times become serious and prompt action is required to control them.

4.53 Japanese Beetle grubs during late May and June feed on the grass roots just below the surface of the ground. With the first dry weather in June and July, the grass begins to die in large patches as if killed by the drought. Grass injured by grubs will peel off in layers as if cut below the surface by a knife, and may be so distinguished from grass killed by drought.

4.54 The beetle grub may be controlled readily by arsenate of lead dusted on the lawn at the rate of 10 lbs. per 1000 sq. ft. It will remain in the soil for three or four years and will also retard the development of some weeds and stop the invasion of the lawn by moles.

4.55 Chinch bugs are very small, active and difficult to see even though the lawn is badly infested. They are about 1/6 inch long. They are red when young becoming black and white when mature. They suck the juices out of the grass and seem to have a toxic effect on grass, killing out large areas which appear to have been killed by drought. They can be killed by spraying or dusting with rotenone or nicotine; or by spreading 1/2 lb. per 1000 sq. ft. of 5 per cent chlordane dust mixed with any convenient quantity of soil, sandy compost, or sand to enable ease of distribution. When dusting or spraying, give two treatments, on the same day a few hours apart, as many of the bugs are missed by the first.

4.56 Snow Mold, Dollar Spot and Brown Patch are the most common lawn diseases with which to contend. All of these can be controlled by one of the mercurial compounds. P.M.A.S. - phenyl-mercuric-acetate-soluble is effective and is sprayed at the rate of 1-1/4 fluid ounces of 10 per cent P.M.A.S. to 2-1/2 gallons of water over an area of 500 sq. ft. As many as nine treatments in a season may be given when used to prevent disease.

(I) Lawn Weed Control

4.57 The best weed control is a good fertilizer program. A good lawn requires deep, mellow and well-drained soil.

4.58 The best way to eliminate weeds is to dig them out. Chemicals are necessary when weeds are too numerous or the lawn is large.

4.59 Manufacturers' instructions in the use of any of the selective chemical controls must be followed precisely to accomplish weed eradication.

4.60 Broad-leaved weeds such as dandelion, plantain, buckhorn, thistle and ground ivy, are easily destroyed by 2,4-D. A convenient formulation of 2,4-D is Tufor, prepared by the U. S. Rubber Company. Add one ounce of Tufor to four gallons of water and spray onto each 800 sq. ft. Other good preparations containing 2,4-D are Weeder 64, Weedone 48, Weed-no-more, and Barweed.

4.61 Spring, when the weeds are young and tender, is the best period for chemical weed killing; early autumn is next best. Spraying should be done on a calm day as a light drifting spray is very liable to kill near-by shrubbery or trees. Spraying equipment used for 2,4-D should never be used for shrubbery or tree spraying until the tank, hoses, and spray nozzle have been thoroughly cleaned with a sal-soda solution.

4.62 Crabgrass which infests many lawns, makes active growth starting with the hot weather in June and continuing throughout the summer. Keeping a thick, healthy turf and mowing at regular intervals, with the machine set to leave the turf long, are the best means of keeping it out. Elimination of beetle grubs and avoiding turf diseases also helps. Early recognition and early weeding are important. If these fail, spraying with P.M.A.S. is an effective control. Several applications, of the same strength and rate as in Paragraph 4.56, must be used for it to be effective and the effect is not immediately observed. It is quite safe to use, is beneficial as a fungicide, and there is an obvious reduction in Crabgrass the year after it has been used.

4.63 Potassium cyanate will kill Crabgrass, but will not destroy its seeds, and must be used with caution or it will burn the grass. It is particularly efficient in getting rid of chicken weed.

4.64 Caution: All insecticides, herbicides and fungicides mentioned in this section are deadly poison as are practically all others. Care should, therefore, be used in their handling and storing.

5. TREES AND SHRUBS

(A) General Classification

5.01 Trees are generally grouped into two classifications:

(a) Deciduous - those from which the foliage falls after the growing season.

(b) Evergreens - those on which the foliage remains verdant throughout the year.

5.02 Due to the more general use of evergreens for central office grounds, the major portion of these instructions has been limited to this class of tree.

(B) Evergreens

5.03 Evergreens fall into two principal groups:

(a) Conifers - those bearing cones, include pines, spruces, yews, firs, hemlocks, and arborvitae.

(E) Transplanting

5.17 Any tree with a trunk larger than six inches in diameter should be transplanted with ball and burlap. Small sizes of the following trees should also be transplanted by this method:

Japanese Maple
Sugar Maple
Hickory
Beech
Walnut
Tulip Tree
Birch
Magnolia
Dogwood
Oaks (nearly all)
Evergreens

5.18 Most trees and shrubs transplant best in the fall season when resting, for the following reasons:

(1) Transpiration or evaporation from leaves is negligible.

(2) Soil is warm and easily worked.

(3) Plenty of moisture is available but soil is not as soggy as in the spring.

(4) Long season of planting; spring comes with a rush; autumn lingers into winter. Transplanting can be done after leaves have had a hard frost and growth has been checked or made dormant.

(5) Shrubs are established and ready to grow when spring arrives.

(F) Pruning

5.19 Pruning is the removal of surplus or undesirable growth at the proper time of the year. Chopping back trees and shrubs indiscriminately, regardless of their needs or habits of growth, is not the proper procedure for pruning.

5.20 The following are reasons for pruning:

(1) To remove diseased, dead, broken or crossed branches.

(2) To renew and rejuvenate old plants.

(3) To shape a plant for some special purpose, such as a hedge or sheared specimen.

5.21 Nearly all ornamental shrubs renew their top growth by new shoots which develop each year from the ground around the older stems. Unless some of these shoots are thinned out, the plant is likely to be choked, thus becoming scraggly. By gradually replacing the older stems with new, the plant may be rejuvenated in a cycle of from 4 to 10 years. The natural shape of the plant can be maintained during this time by having the older stems form the framework as the newer growth fills the gaps.

5.22 Shrubs which mature quickly, such as most of the species Roses, the shrubs Dogwoods, Deutzias, Forsythias and Nine Bark, may be renewed every 4 to 6 years; very slow growing kinds, like Azaleas, Flowering Quince, Summer Sweet and Witchhazels may take as long as ten years. In between these there are numerous popular shrubs Barberries, Cotoneasters, Honeysuckles, Lilacs, Mock Oranges, Privets and Viburnums.

5.23 There are several principles of pruning which have been developed:

(1) When heading back twigs cut just above a healthy bud pointing in the desired direction. (See Fig. 8.)

(2) Heavy top pruning causes more leaves and branches. (See Fig. 9.)

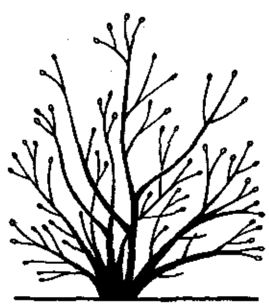


Fig. 7 - Unpruned

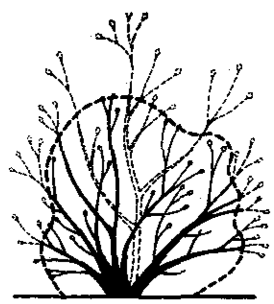


Fig. 8 - Properly Pruned

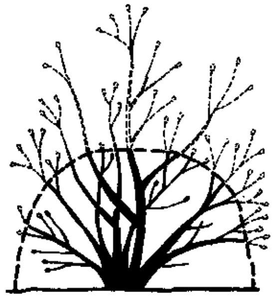


Fig. 9 - Improperly Pruned

(3) Heavy root pruning during transplanting lessens vegetative growth but increases production of flowers.

(4) A pruned plant always tends to resume its natural habit.

(5) The uppermost buds of plant grow first.

(6) Heading back of young growth forces development of side buds.

5.24 Following are several accepted pruning operations illustrated by Fig. 10:

(1) Make all wounds clean.

(2) Make all cuts parallel and close to branch that is left.

(3) Never leave a stub if it is possible to avoid it.

(4) In removing large branches, first undercut until saw binds, then cut down from top until branch snaps off. Wounds should be painted with an antiseptic dressing, particularly those over 2" across.

(5) Wounds made in spring heal faster than those during summer.

(6) Privet hedges should not be trimmed late in the year since the new growth freezes in the winter. Hedges becoming bare at the base should be cut down to the soil and allowed to sprout anew.

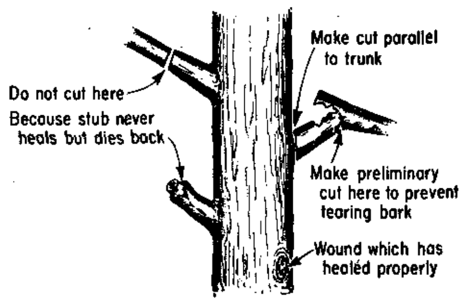


Fig. 10 - Pruning Cuts

5.25 A general pruning rule to be observed is that shrubs blossoming early, bloom on last year's growth, and should be pruned, if at all, just after this bloom. If trimmed in the fall or spring, buds will be destroyed. Forsythias, Spirea Van Houttei and Lilacs are examples of early blooming shrubs.

5.26 Shrubs that blossom late in the summer or in the fall, bloom on twig growth of that summer and should be trimmed, if at all, in late winter or early spring before any growth starts. Anthony Waterer Spirea and Althras are examples of late blooming shrubs.

5.27 Another rule to observe is that any late summer pruning of shrubs is unsafe, because it induces a new growth of wood that rarely becomes hardened enough to withstand severe winter. In such cases tips of branches and sometimes all the wood that grows after the pruning will be winterkilled or weakened.

5.28 The following comments pertain to pruning of some of the more common shrubs:

Barberry: Except when used as formal hedge, do not prune at all unless there is dead wood.

Butterfly Bush: Dies back nearly to ground in winter. In the spring, cut all branches back to live wood.

Cranberry, High Bush: Should be pruned very little as pruning destroys either flowers or berries, or both.

Forsythia: Trim as desired directly after blooming.

Honeysuckle, Tartarian: Prune sparingly and as desired. Both blossoms and berries should be preserved.

Hydrangea P.G.: The tree form should be pruned sparingly and the main branch, or trunk, not at all, to permit its development into a larger tree form. Pruning should be done in March before any growth starts.

Lilac: Do what little pruning is necessary just after blooming.

Privet: It should be sheared in the spring, again in June or July and again later as desired. When used as a hedge and allowed to grow to a height of around three feet, it should be sheared only enough to keep it symmetrical and regular. It may then be squared at the top or sheared to a conical form.

BUILDING ADMITTANCE AND SERVICE PROTECTION PRACTICES WHERE WATCHMEN ARE NOT PROVIDED

1. GENERAL

1.01 This section is issued to provide instructions relative to building admittance and protection of property where watchmen are not provided.

1.02 Each employee shall be encouraged to cooperate in the administration of the procedures placed in effect and to be constantly alert to conditions which might impair telephone service.

1.03 Non-employees are admitted to restricted quarters only when accompanied by a telephone employee except that at exchanges designated by the General Plant Manager, certain non-employees may be furnished admittance permit badges.

1.04 Each individual admitted to restricted quarters shall be known to be an employee, shall be accompanied by a known employee or shall wear a building admittance badge clearly visible to others. Each employee shall be encouraged to question anyone found in restricted quarters who is not clearly identified as indicated and to require proof of authorized admittance or departure from the building. Each such case shall be referred to the supervisor in charge of the building.

2. OPEN HOUSE ACTIVITIES

2.01 Open house activities, central office visits and family nights provide a most effective means of developing public understanding. These activities may be carried on in all exchanges except those or portions of those central offices which are designated "closed" to the public by the Vice President and General Manager. #

2.02 Plans for admitting visitors to quarters which are defined as restricted in paragraph 3.01, but not specifically "closed" to the public by the Vice President and General Manager, shall be approved by the District Heads to ensure that proper steps are taken to protect telephone buildings and equipment. ##

3. RESTRICTED QUARTERS

3.01 Restricted quarters are defined as:

a. Equipment rooms (all rooms containing telephone, telegraph, teletypewriter, program and power equipment).

NOTE: Where the space housing the central office equipment and business office space used by the public is located in a common room, the latter space is not considered as being "restricted quarters".

b. Cable vaults.

c. Rooms containing building equipment items such as heating and ventilating plants, pumps, and elevator equipment.

4. IDENTIFICATION CARDS

4.01 Identification cards are furnished to employees requiring them for admission to telephone buildings and where required for admission to certain customers' premises. Current identification cards are printed on blue safety paper and sealed in a transparent cover. Any others presented for admission to telephone buildings shall be taken up by the supervisor and returned through lines of organization to the Area Department Head.

5. BUILDING ADMITTANCE BADGES

5.01 At exchanges designated by the General Plant Manager, outside workmen such as contractors' employees, plumbers, and electricians who are required to work for long periods (1 hour or more) may be furnished building admittance badges which shall be worn in a clearly visible location by the non-employee while in the building. Non-employees wearing admittance badges need not be accompanied by an employee.

5.02 Before furnishing a non-employee a building admittance badge, the supervisor in charge of the building shall satisfy himself of the non-employee's need for admittance, have the non-employee sign Form 3108, Record of Admittance Permits, and indicate the reason for admittance. The supervisor shall then post the badge number and the "time in". When leaving the building, the badge shall be returned to the supervisor and the "time out" posted.

5.03 All building admittance badges shall be fully accounted for at all times. Should a badge be removed from the premises, steps shall be taken immediately to recover it. If a badge is not recovered within 24 hours, complete information shall be passed along lines of organization to the Plant Operations Supervisor so that the badge may be voided throughout the Company. If the badge is subsequently recovered, the Plant Operations Supervisor shall be notified.

6. BUILDING ADMITTANCE

6.01 Employees of this Company, the Western Electric Company and Long Lines Department may be admitted upon recognition or positive identification.

6.02 Deliveries of merchandise and supplies shall generally be accepted at the entrance but if the assistance of the delivery men is required, they shall be accompanied by an employee while in the building.

6.03 Except where the use of the building admittance badges is authorized, non-employees who have occasion to enter restricted quarters in connection with services performed for the Telephone Company shall be accompanied by an employee while in such quarters.

6.04 Non-employees (except those performing services for the Company, applicants for employment and others known personally by the employee) seeking admission to restricted quarters shall be required to furnish identification and reason for the visit. No admission shall be granted until all facts have been submitted to the District Office and approval obtained.

> NOTE: Applicants for employment shall be admitted to restricted quarters only when accompanied by the employing supervisor.

7. PRECAUTIONS

7.01 All doors, except as indicated in paragraph 7.03, through which entrance can be gained to buildings housing telephone equipment shall be locked at all times. This includes interior doors connecting rooms regularly open to the public and restricted quarters.

7.02 Where agreed upon by the Department Heads involved, outside doors used for employee entrance shall be equipped with electrically operated locks. The locks shall be controlled by a key in the central office manually operated on signal from a buzzer button on the outside door casing.

7.03 Doors serving as entrances to rooms regularly open to the public shall be kept locked during other than normal business hours.

7.04 All windows at basement and first floor levels shall be kept closed and latched except when it is necessary that they be opened for ventilation.

7.05 The supervisor in charge of the building, or delegated employee shall check for the proper locking of all entrances and closure of windows at the close of the business day, when the last employee leaves the building and at such other times as seem desirable.

7.06 The District Office shall be promptly informed of any condition or occurrence of an unusual or suspicious nature.

8. USE OF ADMITTANCE BUZZERS

8.01 Buzzer codes shall be established by the Chief Operator. They shall be changed at frequent intervals - three to four months, as a general rule. Employees shall be cautioned not to divulge the codes to others, and not to press the button in such a way as to make the code obvious to non-employees.

8.02 An employee who does not possess the code but requires admittance, may go to a nearby telephone and make arrangements with the employee in charge for admittance. If the employee cannot conveniently make arrangement by telephone and instead pushes the buzzer for attention, the employee's presence shall be verified at the door. In no case shall the Chief Operator release the lock on a ring other than the established code without verification. After all employees who are normally on duty for the night are in, the lock shall not be released even on the established code without verification.

8.03 Employees leaving or entering the building shall make sure the door is closed and locked. They shall be cautioned on both entering and leaving to make sure that no loiterers are waiting for an opportunity to enter when the door is unlocked for an employee.

8.04 In offices where electric locks are not provided, the same principles as to protection of property and of the employees shall be observed, that is, the employee in charge shall always make sure that a request for admittance is proper and necessary before the door is opened.

9. SPECIAL ARRANGEMENTS

9.01 In multi-office exchanges where only one Plant man is on duty, arrangements may be made, as directed by the District Plant Superintendent, for such employees to make periodic reports by telephone to a designated location.

9.02 Other special arrangements shall be carried out in accordance with local instructions or as directed by the Plant Superintendent.

CONSERVATION OF FUEL

1. GENERAL

1.01 This section discusses the general aspects of fuel conservation for efficient operation.

1.02 Reference shall be made to appropriate Bell System Practices, manufacturers' instructions or the assistance of experienced personnel shall be obtained if difficulties are encountered in the operation of heating and ventilating systems.

1.03 Recommendations shall be prepared to cover any contemplated additions or changes to buildings and heating equipment and these forwarded through the lines of organization to the General Plant Manager. No work shall be done until required approvals have been obtained.

2. ROOM CONDITIONS

2.01 Reduce temperatures to the minimum generally accepted as desirable for health and comfort It is estimated by some authorities that each degree drop in average temperature above 70° F. saves about 3% in fuel.

2.02 Avoid variations in temperature in different rooms, e.g. operating room, locker room and rest room in so far as practical. Maintenance of the same temperature level throughout quarters occupied by a particular force is conducive to greater comfort.

2.03 Proper air conditions are considered to be more dependent on slow air movement sufficient to dispel dead air pockets than upon the number of changes of air and can be effected with less expenditure of fuel.

2.04 Open windows only the minimum necessary for satisfactory ventilation. When room temperatures are excessive, it is preferable to turn off one or more radiators.

2.05 Turn off radiators in rooms during unoccupied periods with due regard to avoiding freezing temperatures.

2.06 Pull down shades or venetian blinds at night to reduce heat losses through windows.

2.07 Solicit employee cooperation in effecting fuel conservation by the means enumerated above and to ensure their comfort encourage employees to wear warm clothing.

3. HOT WATER

3.01 Maintain temperature of hot water in storage tanks when used for toilet purposes and housekeeping requirements at not more than 130 degrees F.

3.02 When hot water temperatures are reduced, it is necessary to notify the employees of the fact by appropriately placed posters in wash rooms, or otherwise, so that water will not be allowed to run in order to get expected higher temperatures. Request employees to use hot water sparingly.

4. BOILER OPERATION

4.01 Keep internal heating surfaces of the boiler clean to assure maximum heat absorption. Soot and fly ash on boiler heating surfaces may waste as much as 5% of the fuel burned.

4.02 Inspect oil burners and combustion chambers frequently to make certain that the burners are in good operating condition and that the combustion chamber walls are not cracked, disintegrating or covered with soot.

4.03 Adhere strictly to proper practices for firing, cleaning and banking coal fires. (Covered by other sections of the "H" series of Bell System Practices).

4.04 Blow down and flush boiler to clean interior surfaces and to remove sludge as provided for in Division 18 of Section H51.303.

4.05 Check the boiler setting to ensure that it is tight and there is no infiltration of air into the combustion chamber.

4.06 Normally, buildings equipped with low pressure boilers can be satisfactorily heated with one pound or less of steam pressure even in severe weather. Avoid steam pressure in excess of actual heating requirements. Vacuum heating systems should be operated with as high a vacuum in the return lines as practical.

NOTE: In Iowa refer to Sec. H51.390.

5. HEATING SYSTEMS

5.01 Radiators should be cleaned between and under sections to ensure maximum air circulation. Where blackout curtains or draperies are used on windows over radiators inspect to see that the heat from the radiators is not pocketed by the curtains or draperies.

5.02 Check condition of insulation on steam lines, hot water tanks, etc.

5.03 Inspect the heating system as a whole to see that there are no leaks and that traps, radiator shut-off valves, air vent valves, etc., are operating properly.

5.04 The air valve in hot water radiators should be opened periodically to assure hot-water circulation to full capacity of the radiator.

5.05 Hammering or erratic circulation in steam distribution and return lines can be corrected by a competent heating contractor with advantages in fuel saving.

5.06 If it is evident that the thermostats are out of adjustment they shall be checked and readjusted by a competent service mechanic. However, in small exchanges where only one thermostat is involved and it can not be readily adjusted, it should be replaced.

5.07 Room thermostats should be protected from drafts and relocation or shielding may be justified in some instances.

5.08 There may be cases where it would be desirable to modify a thermostat to prevent unauthorized persons from changing the setting.

6. VENTILATING SYSTEMS

6.01 Inspect ventilating equipment as to cleanliness of air filters and operation of the dampers.

6.02 Adjust ventilating equipment to hold to a minimum the percentage of outside air taken in.

7. INSULATION

7.01 Review the advisability of installing weather-stripping on windows where air leakage is excessive.

7.02 Review the advisability of installing storm sash on the windows of small buildings particularly on the prevailing wind side and where air leakage is excessive. Due regard should be given to the availability of space for summer storage and to the problems of hanging, removal and cleaning.

8. MISCELLANEOUS

8.01 Reduce the cleaning of windows to a minimum during the winter months.

DISPOSAL OF DISCARDED FLUORESCENT LAMPS

1. GENERAL

1.01 This section covers approved methods for disposal of discarded fluorescent lamps.

1.02 Since the coating on the inside of fluorescent lamps usually contains materials which are poisonous when taken into the human system, care shall be exercised to avoid breakage, (except as outlined below) being cut or scratched by broken particles, or breathing dust particles resulting from breakage.

1.03 Discarded lamps shall be disposed of as outlined in Division 2.

2. DISPOSAL OF USED LAMPS

2.01 Discarded fluorescent lamps shall be disposed of as follows:

a. Place discarded lamps in cartons in which received. Wrap the carton in several thicknesses of newspaper or wrapping paper, tie securely with cord, take out of doors and break into a waste container, care being exercised to avoid tearing or breaking the wrapping. During the breaking operation, the employee shall wear protective goggles and gloves and avoid breathing dust or vapor from the broken lamp.

NOTE: The foregoing precautions shall, of course, be observed in the event lamps in service are accidentally broken.

KS-16153 DEHYDRATOR AND ASSOCIATED WAVEGUIDE ALARMS

1. GENERAL

1.01 This section covers the operation of the KS-16153 dehydrator and associated waveguide alarms for use in the TD-2/TH radio systems utilizing a maximum of four horn reflector antennas.

KS-16153 Dehydrator

1.02 The dehydrator is used to furnish a source of dry air for pressurizing the antenna and waveguide runs. The unit is designed to deliver dry air continuously at flow rates not greater than 100 cubic feet per hour at a delivered pressure of between 0.2 and 0.3 pounds per square inch. In operation, ambient air is drawn in through a filter arrangement to a centrifugal blower and passed through one of two drying towers, each of which contains approximately 25 pounds of a drying agent, where the moisture vapor in the air is removed. After drying, the air is delivered to a common outlet where it is distributed through the necessary piping and manifolds to the waveguide and antenna system.

1.03 The dehydrator operates on a humidity controlled drying cycle. Air to be dried is passed through one drying tower until the relative humidity reaches approximately 4 per cent at 70°F at which time the air to be dried is automatically routed through the second tower and the first tower is then reactivated. Reactivation consists of heating the drying agent for 4 hours by internal nichrome heating coils which are embedded in the drying agent. Proper reactivation temperatures are maintained in the bed through the use of internal thermostats in series with the heating coils. During the 4-hour heating period, a small flow of ambient air purges the moisture released by the drying agent from the system. Control of air flow through the reactivating tower is achieved through a solenoid valve which diverts the required purge flow.

1.04 Alarm facilities are provided which operate on either low pressure or high humidity. These alarms are connected in parallel and appear on a terminal strip as the alarm pair. A low-pressure switch is connected to the delivered air stream and will operate the alarm when the delivered air pressure falls below approximately 1.4 inches of water. A humidity sensing element, which is mounted in the air outlet, will cause the alarm to operate when the relative humidity in the air exceeds approximately 4 per cent relative humidity.

1.05 A measurement of pressure at the waveguide pressure manifold will indicate whether low pressure or high humidity has developed in the dehydrator. If the pressure on the gauge is greater than 1.4 inches of water, the trouble may be due to high humidity. If the pressure on the gauge is less than 1.4 inches of water, the trouble is probably due to low pressure.

1.06 The instructions for the KS-16153 dehydrator are based on drawing SD-59742-01. For detailed description of the operation, see the corresponding circuit description.

Waveguide Alarms

1.07 An individual pressure switch is connected by a length of copper tubing to each antenna system at the waveguide pressure window. The switches are electrically connected in parallel to the station alarm circuit and will register an alarm in the event that antenna pressure drops below 1.4 inches of water.

1.08 The instructions for the waveguide alarms are based on drawing SD-59812-01. For detailed description of the operation, see the corresponding circuit description.

General

1.09 For more detailed information on the operation and maintenance of the apparatus, refer to the following sections. All apparatus should be adjusted in accordance with these sections and with the circuit requirements table or circuit description associated with the circuit drawing.

A401.921 / H51.348 — KS-16153 Dehydrator

A501.921 / H51.347 — KS-16153 Dehydrator

2. List of Tools, Gauges, and Test Apparatus

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
R-2652	9-inch Adjustable Wrench (for new design sensing element) or
—	Spanner Wrench, American Instrument Co., Catalog No. 4-4896A
—	B Pressure Hose
—	3-inch Cabinet Screwdriver
GAUGES	
KS-14510, L1	Volt-ohm Milliammeter
—	Gauge, U. S. Gauge Company, No. 633S, 0-15 inches of water, 1/4-inch N. P. T.
TEST APPARATUS	
—	Set Plug, American Instrument Co., No. 15-6220

3. OPERATION

Preparation for Starting Dehydrator

3.01 *Caution: Before starting, check that the dust cap on the reactivation air outlet is removed. This outlet is located on the back of the bottom 4-way valve. Do not remove any restriction plate found in this outlet.*

3.02 Operate the START-STOP switch to ON. The blower motor should operate.

3.03 Absence of an alarm indicates that the dehydrator is operating properly and that the pressure in the system is satisfactory.

3.04 The manifold pressure gauge should read at least 5 inches of water.

Timer

3.05 The timer is set to terminate the heating period in approximately 4 hours, at which time the heater is shut off and the solenoid valve in the reactivation exhaust is closed. The tower is cooled for the balance of the cycle until reversal again occurs. The adsorption, reactivation, and cooling cycle will be continued until the starter switch is moved to the OFF position.

Waveguide and Antenna Alarm System

3.06 The pressure switch in each antenna system should close its contacts and cause an alarm when the pressure within the system drops to approximately 1.4 inches of water.

4. ROUTINE CHECK

Dehydrator

4.01 *Caution: Where a reset of the 5-hour timer is specified in the following routine checks, do not attempt to reset the 5-hour timer during a timing period, otherwise damage to the timer will result. At the conclusion of the test reset the timer to 4 hours. Failure to reset the timer will disable the dehydrator.*

4.02 *Routine Intervals:* The following are suggested maintenance intervals for making routine checks. These intervals may be changed depending on local conditions.

	INTERVAL	PARAGRAPH
Pressure Switch	3 Months	4.03
Sensing Element	3 Months	4.04
Humistat	3 Months	4.05
Tower Heater	As Required	4.06
Waveguide and Antenna Alarm Pressure Switch	3 Months	4.07

4.03 *Pressure Switch:* To check the operation of the pressure switch make sure that both towers are cold, then turn the timer (black hand) to 0 to prevent the 4-hour heating cycle from starting. Operate the starter switch to OFF. The alarm should sound within a few minutes. Operate the switch to ON. The alarm should stop after a short interval.

> ***Caution: Reset the 5-hour timer (black hand) for 4-hour operation.***

4.04 *Humidity Sensing Element:* Remove the cover of the Humistat using the 3-inch cabinet screwdriver. Disconnect the lead to the sequence relay from terminal 1 on the Humistat using the screwdriver. With the KS-14510, L1 voltmeter set to read 300 volts ac, connect it to terminals 1 and L1 on the Humistat. Remove the nut from tne hexagonal fitting using the spanner wrench or the adjustable wrench as required. Then slowly remove the sensing element from the fitting. Breathe on the sensing element. This should cause the Humistat to operate as indicated by the meter reading of 115 volts ac. If the Humistat does not operate, make sure that the plug on the cable from the sensing element is firmly plugged into the receptacle in the Humistat case and examine the cable for a broken conductor. If the Humistat still does not operate, adjust the setting as covered in 4.05. Remount the sensing element, but do not connect the lead from the sequence relay to terminal 1 on the Humistat until the meter reads zero. Disconnect the meter.

> ***Caution: Do not use an ohmmeter to measure the resistance of the sensing element or in any manner apply a dc voltage to the sensing element as this will damage it.***

4.05 *Humistat:* To check the operation of the Humistat, remove the cover using the 3-inch cabinet screwdriver. Disconnect the lead to the sequence relay from terminal 1 on the Humistat using the screwdriver. With the KS-14510, L1 voltmeter set to read 300 volts ac, connect it to terminals 1 and L1 on the Humistat. Insert the set plug furnished with the Humistat in the jack of the Humistat case. This should cause the Humistat to operate as indicated by the meter reading of 115 volts ac. If the Humistat does not operate, turn the slotted potentiometer shaft clockwise with the screwdriver until the relay in the Humistat operates as indicated by the meter reading of 115 volts ac. Note the position of the potentiometer shaft. Then turn the shaft counterclockwise until the meter reads 115 volts ac. Again note the position of the potentiometer shaft. Finally, turn the shaft clockwise to a point midway between the two positions described above.

> ***Caution: When the setting is complete, remove the set plug from the jack but do not connect the lead from the sequence relay to terminal 1 on the Humistat until the meter reads zero.***

Disconnect the meter. Replace the cover.

4.06 *Operation of the Tower Heater Circuit:* To check the operation of the heater circuit, proceed as follows. The check should be made when both towers are at approximately room temperature to avoid circulation of hot moist air in the antenna system. Set the 5-hour timer (black hand) to 30 minutes before removing the sensing element. Remove the ring nut from the hexagonal fitting using the spanner wrench or the adjustable wrench as required. Then slowly remove the sensing element from the fitting. If the removal of the sensing element into ambient room humidity does not cause the towers to shift, breathe on it. This should cause the towers to shift, and start the 5-hour timer through a 30-minute time cycle. Insert the sensing element into the fitting. Allow 30 minutes to elapse and check by feeling the towers to make sure that one of the towers is heating. Completion of the 30-minute heating period as set by the timer is indicated by observation of the heater contactors. Observe that the spring coils of the contactor associated with the reactivating tower are in the down position during the 30-minute heating period. At the end of this period the spring coils will be in the up position. Again set the 5-hour timer (black hand) for 30-minute operation. Remove the sensing element and blow on it as covered above. This should cause the towers to shift. Insert the element into the fitting. Again allow 30 minutes to elapse and check the second tower for heating as covered above. The switch of the towers the second time should restore the original tower to the antenna system.

Caution: Reset the 5-hour timer for 4-hour operation.

Waveguide and Antenna Alarm Pressure Switch

4.07 To check the operation of the individual waveguide pressure switch, remove the valve cap from the pressure testing valve at the pressure switch. Attach the No. 633S gauge equipped with the snap-on chuck to its testing valve. Stop the air flow into the pressure window (single air supply to a single antenna) or pressure windows (dual air supplies for waveguides connected to a common antenna) by disconnecting the tubing at the pressure window or windows. Record the pressure reading on the gauge at the time the alarm sounds. The reading should be approximately 1.4 inches of water. If the alarm does not sound or if it sounds at a pressure other than above, proceed as covered in 5.07. Repeat the test on each pressure switch.

5. CORRECTING TROUBLE

Dehydrator Alarm Operating

5.01 Check the manifold pressure using the No. 633S pressure gauge. If low pressure exists, proceed as covered in 5.04. If not, remove connection 71 from the terminal strip inside the pressure switch. If the alarm stops, the trouble is in the pressure switch. Replace the switch. If removing the connection from the terminal strip does not cause the alarm to stop, the trouble is in the sensing element, in the Humistat, or the humidity is too high. Disconnect the sensing element cable from the Humistat. If the alarm continues with the sensing element cable disconnected, the trouble is in the Humistat. Remove the cover from the Humistat using the 3-inch cabinet screwdriver. Disconnect the lead to the sequence relay from terminal 1 on the Humistat using the screwdriver. With the KS-14510, L1 voltmeter set to read 300 volts ac, connect it to terminals 1 and L1 on the Humistat. Insert the set plug furnished with the Humistat into the jack inside the Humistat case. Turn the adjacent slotted potentiometer shaft clockwise with the screwdriver until the relay in the Humistat operates as indicated by the meter reading of 115 volts ac. Note the position of the potentiometer shaft. Then turn the potentiometer shaft slightly counterclockwise until the meter reads 115 volts ac. Again note the position of the potentiometer shaft. Finally, turn the shaft clockwise to a point midway between the two positions of the potentiometer shaft described above.

Caution: When the setting is completed, remove the set plug from the jack but do not connect the lead from the sequence relay to terminal 1 on the Humistat until the meter reads zero.

Disconnect the meter. If this does not clear the trouble, change the tube and recheck the potentiometer as covered above. If trouble still exists, check the Humistat for defective components, or replace the unit. If the alarm stops when the sensing element is disconnected, the cause is either high humidity or a defective sensing element. Turn the 5-hour timer (black hand) to zero. Install a new sensing element and reconnect, towers will shift. Wait a few minutes; if alarm clears, the cause was due to a defective sensing element.

Caution: Reset the 5-hour timer for 4-hour operation.

If the alarm continues with a new element installed, check the humidity in the dehydrator as covered in 5.02.

5.02 Determine which tower is delivering air to the waveguide system by observing the arrows, if present, on the 4-way valve at the bottom of the dehydrator. The arrow pointing toward the front indicates the tower supplying air; the arrow to the rear indicates the tower in which reactivation is taking place. For those 4-way valves not equipped with arrows, the tower which is delivering air to the waveguide system can be determined by observing the position of the limit switch arm on the 4-way valve drive shaft. Tower No. 2 is supplying air to the system if the limit switch arm is in contact with the rear limit switch. Tower No. 1 is supplying air to the system if the limit switch arm is in contact with the front limit switch. Shift the air supply to the other tower as covered in 4.06. Allow up to 30 minutes for the sensing element to clear. If the alarm stops, the released tower is high in humidity, in which case proceed as follows.

5.03 Determine if the heater in the released tower is operating and observe if the spring coils on the heater contactor are down. If so, allow up to 30 minutes for the heater to rise in temperature. Check for operation by feeling the outside of the tower and also check that the air is being purged as covered in 5.05. Failure of the tower to heat or the heater contactor to operate indicates circuit trouble.

(a) If the heater contactor operates but the tower does not heat, the cause may be due to an open heater or to blown associated 6-ampere fuses on the fuse block. If the fuse is blown, replace it. If the fuse is satisfactory, check the resistance of the heater which is approximately 63 ohms. To check the resistance, disconnect the commercial power at the service panel. Connect a voltohmmeter across terminals 12 and 26 on the heater contactor for the resistance of the heater in tower No. 1, and across terminals 14 and 28 on the heater contactor for the resistance of the heater in tower No. 2.

(b) If the heater contactor does not operate, see if the associated 6-ampere fuse on the fuse block is blown or if an open circuit exists through the thermostat limit switch, or timer.

(c) Failure of the tower to shift may be caused by the valve drive motor, valve drive motor starter, limit switch, sequence relay, sensing element, Humistat, or associated fuses.

(d) Push the right overload reset button on the front of the control panel. If this clears the fault, the trouble was due to an overload condition. Possible cause for an overload condition might be binding in the motor, gear train, or 4-way valve.

(e) If restoration of the overload switch does not clear the trouble, check whether the associated fuses on the fuse block are blown or if the trouble is in the START-STOP switch or the circuit through the timer or limit switch.

5.04 ***Checking Low Dehydrator Pressure:*** To determine the cause of low pressure, check the blower. If the blower is not operating, push the left overload reset button on the front of the control panel. If the motor starts and the pressure returns, the trouble was due to an overload condition. The cause of an overload condition could be binding of the motor or the blower impellers. If the motor does not start after resetting the overload reset button, check whether the associated fuses on the control panel are blown or whether the blower motor starter is faulty.

5.05 ***Checking Tower Purge:*** To determine if the tower is purging during the heating cycle, check by feel to determine whether air is being expelled at the reactivation air outlet at the rear of the lower 4-way valve. Failure of the tower to purge may be due to a faulty solenoid valve or the circuit through the timer. The electrical circuit (to the solenoid valve) should be closed during the 4-hour heating cycle for either tower.

Checking the Humistat

5.06 If the Humistat does not operate, check the adjustment of the potentiometer as covered in 4.05, change the tube, and readjust the potentiometer. If trouble still exists, check the Humistat for defective components.

Checking Waveguide and Antenna Pressure Switch

5.07 If the alarm does not sound, as covered in 4.07, loosen the two screws which secure the cover of the pressure switch in place and remove the cover. Turn the large knurled adjusting screw until the contacts just close on 1.4 inches of pressure. If the contacts are open when the pressure is 1.4 inches, the adjusting screw should be turned clockwise until the "just close" point is reached on decreasing pressure. If the contacts are closed with a pressure of 1.4 inches, turn the adjusting screw counterclockwise until the "just open" point is reached.

PAINTING - INTERIOR

SWITCHING EQUIPMENT PROTECTION

1. GENERAL

1.01 This section covers procedures intended to prevent possible unfavorable equipment reactions resulting from building painting operation in switch rooms of central offices.

2. PROCEDURES

2.01 It is assumed that the usual procedures for maintaining painted surfaces, as covered in Section H51.117, of Bell System Practices entitled "Washing Painted Walls" will be followed to obtain the maximum interval between painting operations.

2.02 Equipment, furniture and floors in the vicinity of actual painting operations are protected against paint spattering by completely covering with drop cloths of such lint-free material as described in Specification KS-8031 and treated so as to be flame-proof in accordance with Section H40.201 of Bell System Practices. The cloths may be suspended from the superstructure or cable racks keeping the maximum possible separation between the cloths and the equipment. Cloths should not be attached to or allowed to rest upon equipment on the frames.

2.03 The following suggestions are intended to prevent possible equipment reactions caused by the deposit on relay or switch contacts of gummy residue from paint thinner fumes:-

(a) Paints containing mineral spirits and thinned with mineral spirits are used in place of those containing or thinned with turpentine.

(b) In order to minimize the amount of thinner fumes released during a given period, large scale applications of paint are avoided wherever practicable. It is suggested that but one painter be permitted to apply paint in very small equipment rooms such as those in community dial offices; for switch rooms of moderate size up to eight bays, - two painters; and for larger rooms, one additional painter for each unit of six bays. The application of paint is usually limited to eight hours in every twenty-four. These procedures would, of course, prolong the over-all painting operations but should result in a corresponding reduction in fume concentration.

(c) Restricting painting operations in switching equipment rooms to warm weather months usually simplifies the ventilating problem; also, it is desirable that the painting work be scheduled to be complete shortly prior to a routine pressure cleaning of the equipment. Painting operations are avoided or discontinued during periods of high humidity or prolonged rains, or under unusually dusty conditions. Considerably more than normal ventilation is required in switch rooms during the painting period; - 10 to 15 air changes per hour are recommended during and for about three hours subsequent to each daily painting operation. The movement of such volumes of air generally requires induced ventilation by means of large circulator fans or other similar units temporarily placed to exhaust through open windows. In order that air drawn into the room may be kept reasonably clean from an equipment standpoint, the open intake windows may, if considered necessary, be fitted with single thickness spun glass or similar filter units. It is desirable, of course, that intake windows be as remote as possible from exhaust windows; also that any existing ventilating plant serving the involved switch room be used to capacity, exclusive of recirculation, to supplement the temporary exhaust units.

HARDENING AND DUST-PROOFING CONCRETE FLOORS

1. GENERAL

1.01 This section covers the application of a chemical hardener to finished concrete floors to minimize or eliminate excessive dusting under traffic. The hardener may also be used as a priming treatment preliminary to painting.

1.02 The recommended floor hardener is a water solution of magnesium fluosilicate. This material overcomes dusting by chemical reaction with the free lime in the concrete thereby sealing the voids and producing a hard dense surface. The chemical reaction takes place quickly and the floor is ready for use as soon as the final application is dry. The resulting dense surface reduces paint absorption and the treatment also neutralizes any free alkali in the concrete that would be detrimental to paint. Hardeners may be used on exterior concrete and for terrazzo floors that are porous and show signs of disintegration.

1.03 Magnesium fluosilicate is a white crystalline powder which is readily soluble in cold water. While the solution is harmless to the normal skin it is advisable to avoid prolonged contact. As a hardening treatment it is preferable to oil, wax and varnish sealers. Sodium silicate (water glass) should not be used as a hardener since it leaves an alkaline residue which is harmful to paint and linoleum.

1.04 Magnesium fluosilicate hardening treatment slightly lightens the appearance of the floor. The lightening effect may produce a faded appearance on integrally colored concrete but the effect will gradually wear away. Treated floors develop a sheen under foot traffic.

1.05 Magnesium fluosilicate, also known as magnesium silicofluoride, may be purchased under this name in powder form from chemical supply firms. It is also available under various brand names in both liquid and powder forms. One of these contains a wetting agent which is intended to improve penetration. The latter is considerably more expensive and of questionable advantage under usual conditions.

2. EQUIPMENT AND MATERIALS

2.01 For preparation of floors:

- Pails and mop wringers of small mopping units
- Mop
- Desk scrub brush or floor scrubbing machine
- Floor squeegee
- Pyrophosphate cleaner or garage floor cleaner for heavily soiled floors
- Sol Speedi Dri, if needed
- Hose, for garages and basements if applicable.

2.02 For application of hardener:

- Pail and mop wringer or small mopping unit
- Vessel for mixing the hardener such as a clean garbage can or drum
- Mops
- Palmyra floor brushes
- Magnesium fluosilicate at the rate of approximately 2 lbs. per 100 sq. ft. for 2 coats.

3. PREPARATION OF THE FLOOR

3.01 The floor to be treated must be thoroughly clean before application of the hardener. New floors should be thoroughly cured and dry (preferably ten days or longer) before applying hardeners.

3.02 Mortar droppings, plaster and paint, are removed with an ice scraper, putty knife or floor machine equipped with steel wire brushes. Smooth new floors are hosed or swept or if necessary mopped with a pyrophosphate solution. Floors which have been in use for some time are mopped, or scrubbed with pyrophosphate solution. Garage floors soiled with oil deposits are scrubbed with garage floor cleaner. Oil absorbent powder (Sol Speedi Dri) sprinkled over the oil deposits some hours before scrubbing aids in absorbing the oil and expedites scrubbing in those areas. Thorough rinsing should follow mopping or scrubbing. The floor should be thoroughly dry before application of the hardener solution. This usually requires 24 hours or longer following mopping or scrubbing. B.S.P. H51.107 Floor Mopping and B.S.P. H51.108 Floor Scrubbing provides details regarding these procedures.

4. PREPARATION OF THE HARDENER

4.01 Powdered magnesium fluosilicate is dissolved in water in the following proportions.

(a) For initial application
One-half pound magnesium fluosilicate per gallon of water. One gallon will treat about 60 to 80 sq. ft.

(b) For second application
Two pounds magnesium fluosilicate per gallon of water. One gallon will treat about 120 to 140 sq. ft.

The magnesium fluosilicate is added to cold water in a pail, drum or mop tank and stirred with a paddle or stick until thoroughly dissolved, which requires only one or two minutes. The solution is then ready for use. The magnesium fluosilicate solution is slightly acid and consequently should not be stored for periods of more than a few days in metal containers.

4.02 If one of the prepared brands is used it is mixed with water according to the directions of the manufacturer.

5. APPLICATION OF THE HARDENER

5.01 The first application of magnesium fluosilicate solution consists of the half pound per gallon concentration and is applied by flushing a pail full at a time on the clean dry floor starting near one end of the room. The solution is immediately spread and respread over the area as it soaks in using the floor brush. This procedure is continued progressively until the entire floor has been treated. The solution is usually absorbed into the floor in irregular patches because of the varying porosity of concrete floors. Care must be taken so that the solution does not splash on equipment or trim as it may cause damage and is very difficult to remove when dry.

5.02 Where puddles form, they are respread from time to time for a period of one-half to one hour when any puddles still remaining are mopped up and the floor permitted to dry. It is preferable to permit the first application to dry for 24 hours especially in damp weather but in dry weather, if time for completion of the job is limited, the second application may be applied in about eight hours.

5.03 The second application consisting of the two pounds per gallon solution is applied as above. The coverage per gallon of solution in this application is about twice that of the first application. Again the solution is spread with the floor brush and when puddles form they are respread for a period of one-half to one hour. After final respreading any remaining puddles are removed with a mop and the floor permitted to dry. The floor can be used as soon as it appears to be thoroughly dry, which is usually a matter of two or three hours.

5.04 If the floor continues to show appreciable dust on sweeping, a third application may be made using a concentration of 2 lbs. of magnesium fluosilicate to the gallon but the need for a third treatment is an exception.

6. CARE OF TOOLS

6.01 Wash the pails, wringers, mops and brushes promptly to remove the magnesium fluosilicate solution. Avoid leaving any solution of magnesium fluosilicate in metal pails as it tends to rust the pails and the solution may deteriorate.

FIRE PROTECTION DURING CONSTRUCTION

1. GENERAL

1.01 This section outlines certain precautionary measures intended to minimize the possibility of fire as well as the hazards due to fire in buildings under construction, and is offered as a guide in arranging for such protection.

1.02 The recommendations in this practice are based in general on the National Fire Codes of the National Fire Protection Association, Volume III - Building Construction and Equipment, and the National Building Code recommended by the National Board of Fire Underwriters. These recommendations cover a broad range of building operations, and it is therefore expected that each project will be considered individually to determine which measures are applicable thereto. In general, projects involving alterations or enlargements to buildings in service are considered to be of prime importance from the standpoint of providing thorough fire protection.

1.03 This issue includes a general revision and expansion of the practice to conform to present recommendations. Marginal arrows, indicating changes in the text, are omitted in this issue because of the extensive general revision of the text. For operation and maintenance application, this section is double numbered with this issue and the same issue number is assigned for uniformity.

1.04 Buildings in course of construction are inherently more hazardous, regardless of the type of construction employed, than when completed. Building alteration and demolition hazards are also more severe. Fires which are not discovered and extinguished in the incipient stage during construction operations are likely to spread more rapidly in the absence of provisions for the limitation or extinguishment of fire in the completed structure and can involve heavy losses in revenue from delayed completion of the project. Construction operations can be made reasonably safe from destructive fire by planning for fire protection in the project estimates in advance of the work, providing the necessary facilities and project responsibility when the work is started and throughout the construction period.

1.05 Where the following procedures conflict with or are exceeded by corresponding requirements of local or state legislation, the legislated requirements should, of course, apply.

2. SITE PREPARATION

2.01 Brush, trees, tall grass, debris and rubbish are removed from the site prior to the start of construction operations.

2.02 Site preparation includes the safe location of temporary buildings and storage areas in relation to their hazards and the probability of damage to the building under construction.

3. FIRE LINES

3.01 Where the provision of fire lines or standpipes is included in new buildings, additions, extensions or major alterations, it is important that they be completed promptly as the work progresses and made available for use, including the installation of fire hoses. Standpipes should be installed as the construction progresses, in such a manner that they are always ready for fire department use to the topmost floor that construction has been installed. For buildings four stories and higher, except as otherwise indicated in BSP Section H43.210 - Standpipe and Hose Systems, standpipes are provided with a siamese fire department connection on the outside of the building at the street level, are conspicuously marked and are equipped with at least one standard hose outlet at each floor. All standpipe connections are designed to fit the local fire department equipment. This procedure may, in some cases, require the temporary placement of certain piping and accessories.

4. ACCESS TO FIRE EXTINGUISHING EQUIPMENT AND EXITS

4.01 It is important that free access be provided and maintained at all times from the street to fire hydrants and to outside connections for standpipes or other fire extinguishing equipment, whether permanent or temporary. No material or construction equipment should be placed within ten feet of such hydrants or connections nor between them and the center line of the street.

4.02 Free access should also be maintained at all times to control valves and hose on fire lines within the building, and to all portable extinguishers.

4.03 Signs designating the location of fire extinguishing equipment and standpipe connections are conspicuously displayed.

4.04 For projects involving alterations or enlargements to existing buildings in service it is essential that all necessary measures be taken to maintain full exit facilities at all times. For example, the removal of a fire escape should not be undertaken until equivalent exit facilities are provided elsewhere. Also, present means of egress should be kept free from all materials, equipment or other obstructions.

5. PORTABLE FIRE EXTINGUISHERS

5.01 A liberal distribution of portable fire extinguishers throughout the areas under construction is desirable from the standpoint of controlling incipient fires promptly. It is important that at least one extinguisher be provided at each tool house, temporary office, storage room, dressing room or workshop on the premises.

5.02 The description, use, mounting, operation and maintenance of types of extinguishers approved for the protection of telephone buildings and equipment are covered in Sections H43.110 to H43.140, inclusive, of Bell System Practices. The general procedure to be followed in distributing fire protection apparatus throughout telephone buildings upon completion of construction is outlined in Section H43.010 of Bell System Practices. Where the location of certain types of extinguishers is subject to low temperatures suitable precautions should be taken to prevent their freezing.

5.03 The instruction of workmen in the proper use of fire extinguishing equipment is desirable.

6. WATCHMAN'S SERVICES

6.01 For major new building projects or for extensions, additions or important alterations to existing telephone buildings where the service could be seriously impaired by a fire, the services of a watchman to cover all periods when workmen are not on the premises is usually given favorable consideration. A thorough inspection of the entire project is suggested at the close of each day's work by a person instructed for that purpose, and he should report conditions to the watchman on duty. Periods when the construction operations are shut down, such as week ends, holidays and lunch periods require better coverage and at more frequent intervals than during working hours.

7. FIRE WARDEN

7.01 A qualified person should be appointed as a fire warden and vested with authority to supervise the installation and maintenance of the recommended fire protection equipment and fire prevention measures, the removal of all unnecessary combustible material and waste, and the supervision of adequate watchman and supervisory service. The contractor's superintendent or assistant superintendent ordinarily is appointed and acts as the fire warden except in large building projects when the appointment of a full time fire warden or a combination safety engineer and fire warden is warranted.

7.02 During working hours operations of workmen should be checked frequently to determine whether appliances, soldering coppers, extension lights, flammable liquids, torches, welding and metal cutting apparatus, wax pots, etc., are being used safely and such corrective measures as are necessary from time to time are taken promptly.

7.03 Alterations carried forward during use of the structure warrant even greater supervision and care on the part of the Telephone Company, their architects and contractors, for safety of life and property, due to the inherently hazardous nature of construction operations.

8. HEATING DEVICES

8.01 The permanent heating equipment should be installed and put in operation as soon as practicable.

8.02 The use of stoves, salamanders, tar pots, etc., inside the building is generally prohibited.

8.03 If, through necessity, the use of such devices is required within the structure, special precautions are taken to minimize the additional hazard.

8.04 When salamanders or other temporary heating devices are used, if a temporary heating plant is impracticable and until a permanent plant is installed, they are substantially constructed, stable, not readily overturned, and restricted to the use of coal, coke or kerosene oil as fuel. They should be under the constant supervision of an attendant on every floor where they are in use, and for so long as they are in use.

8.05 Such devices are so located that there is a clearance of not less than 6 feet above, nor less than 2-1/2 feet on all sides between such device and unprotected woodwork or combustible material, equipment or construction, nor are they placed within 10 feet of tarpaulins or canvas covers.

8.06 Salamanders or other temporary heating devices should not be set on combustible flooring or platforms unless thoroughly insulated therefrom by a bed of sand or cold ashes not less than 4 inches thick, or by other efficient protection, extending at least 2 feet horizontally beyond such devices on all sides. The legs of such devices, which should be at least 12 inches long, should rest on the insulation and should not extend through it.

8.07 Requirements for the construction and mounting of salamanders and heaters are outlined in National Fire Codes, Volume III, Building Construction and Equipment, of the National Fire Protection Association, Page 556, Paragraph 6.

8.08 Where practicable, gas or electric space heaters, steam heat, or Underwriters Laboratories labeled oil heaters are preferable to salamanders.

9. PROTECTION OF STRUCTURAL MEMBERS

9.01 It is important that all structural steel members of fire resistive buildings be encased in fireproofing material as rapidly as structural conditions will permit. No such structural members should be left exposed for unduly long periods.

9.02 No part of the building is used for the storage of combustible material until such fireproofing of that part has been installed.

9.03 In every building of reinforced concrete construction, as soon as practicable after the elapse of the required setting time of the concrete, forms of combustible material are stripped from the concrete and promptly removed from the building.

9.04 No part of a reinforced concrete building is used for the storage of combustible materials until combustible forms have been removed in that part of the building.

10. SCAFFOLDING AND FORM WORK

10.01 Wood scaffolding is a potential fire hazard which may cause extremely heavy fire damage if accidentally ignited. Consideration should be given on projects of appreciable size or of valuable construction and content, to the use of scaffolding constructed of fire-resistive materials, and any lumber used may be given a flameproof treatment.

10.02 The use of structural steel shapes or steel piping for scaffolding, and metal forms for concrete work has the advantage of eliminating fire hazards from these sources.

10.03 It is particularly desirable to use suspended scaffolding, made of noncombustible supports and flameproofed planking, wherever possible, in order to minimize the amount of scaffolding that may be exposed in case of fire.

10.04 Wood forms for concrete work are usually removed from the premises as soon as they are taken down, with the exception of such members as are suitable and intended for reuse. Rigid requirements and supervision for the processes of form installation and removal so as to avoid any accumulation of forms on the floors between shores when being moved from floor to floor and especially the prompt removal of all broken forms, etc., from floors occupied by shores and forms in place, are most important.

10.05 No part of a building where forms are in place should be used for the storage of flammable materials of any kind.

11. RUBBISH REMOVAL

11.01 It is important that any accumulations of rubbish, debris, waste lumber or other flammable materials be removed promptly from the premises. If such removal is unavoidably delayed, the hazard may be reduced by frequently and thoroughly wetting down. Disposal of materials by burning on or near the premises should not be permitted. Combustible waste and rubbish should be removed at least daily.

11.02 Rubbish chutes are considered undesirable because of their potent flue action in spreading fire. Rubbish is preferably removed via material hoist or elevator.

11.03 Particular attention is directed to the immediate disposal of flammable materials used in packing, such as excelsior, sawdust, wood shavings, straw, etc., and of empty paint containers.

12. WELDING AND CUTTING

12.01 Where electric or gas welding or cutting work is done above or within ten feet of combustible material or above space that may be occupied by persons, interposed shields of

FIRE PROTECTION DURING CONSTRUCTION

1. GENERAL

1.01 This addendum outlines procedures to be followed by Telephone Company exchange forces in connection with building, or building equipment repairs, or building additions, when work is performed by outside workmen.

Note 1: Some projects may be executed on an informal request basis by the local Plant forces, while others may be executed per contract according to specifications under the supervision of the Chief Engineer.

Note 2: For procedures involving Western Electric Company workmen see Bell System Practices, Section A309.302 and Addendum.

1.02 References in this practice to the "Foreman" should be interpreted to mean the foreman or other individual in charge of the work for the contracting firm, and references to the "Wire Chief" means the Exchange Wire Chief, Chief Switchman, Chief Toll or Local Tester, or other Telephone Company supervisors delegated with the responsibility for the building or building equipment involved.

1.03 The following practices point out specific safety measures which should be observed when work of this nature is under way. The Wire Chief should review those practices which are appropriate in connection with any proposed work and be guided accordingly.

Section No.	Title
H34.284	Ventilation of Basement Spaces.
H36.148	Cable Openings.
H40.010	Fire Protection Practices.
H40.050	Garages.
H40.101	Fire Protection Practices.
H40.201	Flame Proof Treatment.
H41.215	Fire Protection Exterior Openings.
H41.510	Fire Protection Cable Vaults, etc.
H42.110	Fire Protection Heating Equipment.
H42.120	Fire Protection Kitchen Ventilation.
H42.140	Fire Protection Solder and Wax Pots.
H42.250	Fire Protection Storage of Inflammable Materials.
H43.001	Protection Apparatus.
H43.010	Distribution of Fire Protective Apparatus.

2. PROCEDURE PRIOR TO START OF WORK

2.01 Prior to the start of each job, the Wire Chief will confer with the Foreman (and also a representative of the Building and Equipment Engineer's force when desirable) and review the scope of the work to be done. The Foreman will outline his plan for the conduct of the work and a joint agreement reached as to the detailed procedures to be followed in executing informal requests and executing contract work in compliance with specifications under the direction of the Chief Engineer. The development of these plans will usually involve such items as:

a. A careful review of the work to be done to determine at what points our commercial power supply and the Telephone Company's battery and signaling power supply wiring and equipment may be involved.

b. Particular consideration given to fire preventive measures, such as the safe storage of inflammable materials such as oils, paints, and thinners, emphasis being placed on the hazards in connection with the use of torches, plumbers' furnaces, and other open flame devices, heaters, etc. See Section H42.250, Storage of Inflammable Materials.

c. Analysis of all other possible service hazard conditions which could within reason be considered as hazards to the building, equipment, or telephone service.

d. An agreement as to necessary precautions and protective measures required at points considered hazardous and specific plans to employ them when required.

e. An agreement as to which phases of the job should be performed during light load periods, if any.

2.01 If the work is extensive, the Wire Chief will prepare in duplicate a brief outline of the plans agreed to and furnish one copy to the Foreman, retaining the duplicate copy for his files.

2.02 Should more than one contractor be engaged at the same time in the same building, similar arrangements may be required with each.

2.03 In instances where the Wire Chief is unable to reach a mutually satisfactory agreement with the Foreman on job procedure, he should seek advice from his immediate supervisor.

3. PROCEDURE SUBSEQUENT TO START OF WORK

3.01 Subsequent to the starting of the job, the Wire Chief shall be constantly alert to determine that the plans, as previously agreed to, are carefully followed by the Foreman and Telephone Company employees alike, making such changes as may be currently required.

4. INFORMING TRAFFIC AND COMMERCIAL DEPARTMENTS

4.01 The Wire Chief is responsible for informing the local Traffic and Commercial Department supervisory personnel regarding the nature, scope, and schedule of such work to be performed in the quarters occupied by these departments and handle all negotiations between these departmental heads and the Foreman to effect the best possible arrangements.

HOUSE SERVICE INSPECTION

1. GENERAL

1.01 This section outlines a procedure for inspecting house service in telephone buildings. It is intended to aid the supervisory forces in maintaining a clean, attractive and safe environment in and about the buildings.

1.02 The reason for reissue is to advance the classification from "Provisional" to "Standard" and to improve the arrangement of the text in Paragraphs 4 to 13.

1.03 House service inspections under the plan are made in a particular building to:

(1) Determine the quality of the house service job as a whole and whether its various phases are in good balance.

(2) Determine that the work is being performed according to approved practices.

(3) Institute corrective measures if the quality of the job, the methods employed or work frequencies require them.

1.04 For purposes of inspection, house service is divided into ten classifications, as follows:

Exterior and Grounds	Windows, Shades and Venetian Blinds
Floors	Lighting Fixtures and Fans
Walls, Doors and Partitions	Supplies and Tools
Washrooms	Service Quarters
Furniture, Lockers and Files	Miscellaneous

1.05 An inspection report form (E-3024) is used for guidance in making the inspection. A copy of this form, filled out as for a typical inspection, is shown in Exhibit A. The form provides two lists; one indicating the items to be inspected under each classification and a second giving typical conditions to be observed. Notes in reference to listed items that require attention are made on the back of the form. The notes should be numbered and the number written after the item in the checking list for identification.

1.06 The form also includes a table for evaluating house service results. Numerical values are established for each of the ten classifications that are broadly proportional to the importance each classification bears to the job as a whole. The inspection plan thus indicates whether a balanced job is being done and if not, where attention is necessary to bring all classifications up to the desired level. This may be accomplished by additional or redirected effort, more supervisory attention, further training or other action.

1.07 The conditions observed under each classification are initially considered in terms of "excellent, good, fair or poor." For example, thoroughly clean, properly waxed and polished linoleum floors are rated as "excellent," i.e., theoretically 100 per cent. and, therefore, the figure 20 would be placed in the "quality value" column for floors. If the floors do not rate as "excellent" but better than "good" the figure 17, 18 or 19 would apply depending upon whether they were closer to a "good" job, midway between "good" and "excellent," or nearly "excellent." If they only rate "fair" the figure 12 would be used, etc. The other classes of work are treated similarly.

1.08 Quality values are assigned on the basis of the conditions observed at the time of inspection regardless of the imminence of floor or furniture conditioning, wall washing, etc. However, consideration is given to the elapsed time since the last scheduled day-to-day operation. For instance, a linoleum floor could not be expected to be entirely free from dust at 4 P.M. when it was last swept at 9 P.M. on the previous evening. Inspection is omitted in space undergoing painting, alterations or other construction activities.

1.09 Appearance is a factor to be considered in the assigning of quality values. Generally a good house service job and good appearance go hand in hand, but occasionally walls or floors, for example, may look poorly because of the need for repainting or for the replacement of linoleum. Although such conditions may not be the direct result of inadequate house service, they affect appearance and it is obviously contradictory to assign high values in the face of poor appearance. Report should be made of all such cases.

1.10 A single form serves for one building. In the case of a large multi-story building, a number of floors may be selected by the inspector as representative of the building as a whole and on subsequent inspections other floors can be chosen. The selected floors should be noted on the form. A quality result for the entire building is determined from the conditions observed on the selected floors. If a more detailed report is desired or the size of the building warrants, each floor may be entered on separate forms. These can be averaged and consolidated on a single form to establish an overall quality index for the building.

1.11 During the inspection any observed conditions requiring maintenance treatment such as building hardware, door checks, lighting switches, dispensers, etc., that are not in proper working condition should be reported.

IMMEDIATE ATTENTION SHOULD BE GIVEN TO ANY CONDITIONS THAT MAY CONSTITUTE ACCIDENT OR FIRE HAZARDS.

2. PRELIMINARY PROCEDURE

2.01 Before starting the actual inspection, fill in the data on the inspection form i.e., the name of the locality in which the building is situated, the name of the building, year built, number of floors, the gross area of the building, area of the grounds, number of occupants, tenancy, etc., in the spaces provided on the face of the form.

2.02 The number of occupants includes all Telephone Company employees regularly housed in the building and includes the house service forces. The number of tenants in any space rented to outsiders is also included.

2.03 The following basis is employed for entering data regarding tenancy on the inspection form:

Traffic quarters - operating rooms, service observing rooms, rest, quiet and locker rooms and dining service.

Plant space - switch and terminal rooms, test centers, power and emergency power rooms, battery rooms, cable vaults and plant storerooms.

Office space - all separately partitioned space used for general or private office purposes.

Vacant space - if this space is more than 10 per cent. of the assignable space (excluding basement) place the approximate proportion on the form. If it is less than 10 per cent. use the abbreviation "neg." i.e., negligible.

The proportions of the different occupancies need to be only roughly approximated, on the form, as for example, Traffic 30 per cent., Plant 45 per cent., Office 25 per cent. Vacant negligible.

2.04 In noting the cleaning force data the number of persons of each sex together with hours per normal work week should be entered - example "Clng. Force M. 2 @ 40, Fe. 2 @ 20."

2.05 Where the operations of window cleaning, wall washing, and care of grounds are done by the cleaning employees regularly assigned to the building, the abbreviation "emp" is placed in the space following each designation. Where these operations are done by outside contractors "cont" is used or if the work is done by Telephone Company traveling crews the letters "tc" are entered.

2.06 The cleaning hours used as a basis for computing the hours per thousand square feet per week consist of the regularly assigned time for all housekeeping work done by the normal building force including the time of working foremen and group leaders. The range of duties covered include dusting, sweeping, mopping, waxing, washing of windows and other glass, cleaning lighting fixtures, wall washing, cleaning and polishing office furniture and fixtures, cleaning screens, blinds and window shades, cleaning and servicing toilet rooms, collecting and disposing of waste paper and rubbish, displaying flags, replacing electric light bulbs, caring for lawns and shrubbery, polishing metal hardware and trim, cleaning of elevator cars, etc.

2.07 The cleaning hours per thousand square feet per week need only be approximated as this figure is simply a further index to aid in judging the overall effectiveness of the job being performed. For simplicity the house service work done by contractors or traveling crews need not be included.

The computation should exclude the time devoted by the regular cleaning force to other tasks such as elevator reliefs, watch service, attending heating plants, etc., when of significant amount.

2.08 In calculating the population density per thousand square feet, the gross area of the building is used.

3. INSPECTION - GENERAL

3.01 Inspection is done by observation of all of the items listed in the checking list, and of any others observed while walking around the building or through the building from the roof to the basement. It is preferable to begin with the exterior and grounds. The exterior is viewed from as many points as practicable.

3.02 The items listed in subsequent paragraphs under headings corresponding to the subdivisions on the inspection form are those points that should be considered in judging the condition of the building. Also any other factors affecting the quality of the job are to be observed.

4. EXTERIOR AND GROUNDS

Building Exterior

4.01 Entrances - dusty, dirty, stained masonry, worn paint, chipped, loose or broken steps or landings.

4.02 Building Sign - dusty, dirty - requires polishing.

4.03 Base course - soiled, stained, marked with crayon.

4.04 Bronze trim - dusty, dirty, uneven weathering - requires oil treatment.

4.05 Shutters - dusty, dirty, worn paint.

4.06 Fire escapes - debris, dirty, stained, rusty, worn paint.

4.07 Roofs - debris, clogged drains, blisters, tar base not uniformly covered with gravel, loose or cracked slate.

4.08 Flag - soiled, torn, worn paint on staff, halyard worn.

Grounds

4.09 Sidewalks - require sweeping, removal of gum, washing - note if there are broken slabs, raised edges or uneven edges that might cause tripping.

4.10 Driveways, areaways - require sweeping, raking.

4.11 Parking lot - debris, washed out sections - requires sweeping, raking, realignment of parking barriers or markers.

4.12 Lawns, Shrubbery - debris, grass requires cutting, hedges require trimming - note if reseeding is required or shrubbery requires pruning or replacement.

4.13 Trees - general appearance, broken or dead limbs - note if spraying or pruning is needed.

4.14 Fences - dirty, rusted, worn paint, loose posts, not in true alignment, gates sagging, hinges or latches not in working order - note if repairing or repainting is necessary.

4.15 Drains - not clear, strainers defective or missing.

Accident Hazards

4.16 IN ADDITION TO THOSE LISTED ABOVE NOTE ANY BROKEN CURBS, OBJECTS LEFT WHERE THEY MAY BE TRIPPED OVER, BROKEN GLASS, PROTRUDING NAILS, SAGGING SIDEWALK DOORS, ETC.

5. FLOORS

Smooth Finished

5.01 Dusty - Is dust accumulated on the finger tips when rubbed over the surface or does the surface appear dusty when viewed toward light?

5.02 Streaked - residues of scouring powder or soap because not properly cleaned or rinsed.

5.03 Dirty areas - in paths of traffic under desk wells, at bases of furniture and equipment, along baseboards - note if spot cleaning is required.

5.04 Dirty, overall - general darkening or discoloration - note if overall cleaning and rewaxing are required.

5.05 Waxing - Is the floor adequately waxed, worn thin in spots, or on overall basis? - note if spot or overall waxing is required.

5.06 Polishing - surface dull in traffic lanes or generally - note if spot or overall polishing is needed.

5.07 Wet areas - (Slip Hazard) look for causes of wet areas such as dripping pipes, condensation or spattering from drinking fountains, failure to provide umbrella racks, failure to use storm mats, etc.

Carpets and Rugs

5.08 Dusty - surfaces appear dusty, show evidence of cigarette ashes or other debris.

5.09 Dirty - embedded dirt indicating insufficient sweeping or vacuuming in paths of traffic or overall.

5.10 Stained - spotty stains or general dullness or discoloration - note if it should be sent out for cleaning.

Wear or Damage

5.11 NOTE IF ANY OF THE FLOOR COVERINGS, I.E. LINOLEUM, ASPHALT TILE, RUBBER TILE, OR CARPETING NEEDS REPAIR OR REPLACEMENT.

6. WALLS, DOORS AND PARTITIONS

Walls, Partitions

6.01 Dusty - adjacent to ventilators, windows, especially observe interior surfaces of outside walls.

6.02 Fingermarked - adjacent to doors, windows, lighting switches, on columns and doors - review spot washing frequencies.

6.03 Dirty - in specific areas or overall.

6.04 Marble Walls - stained, discolored - note if poulticing is required.

6.05 Baseboards - dusty ledges, dirty, stained from unclean mops.

Doors

6.06 General - dusty, fingermarked, marred by foot contact, metalware tarnished, generally dirty - note if repolishing, refinishing, or kick plates are required.

6.07 Door Hardware - look for loose or projecting screws which may create an accident hazard, checks drip oil, checks, knobs, latches operate properly - note if replating or painting is needed.

Glass

6.08 General - smeared, dirty - note if door, transom or partition glass is cracked.

7. WASHROOMS

Sanitation

7.01 General - All parts of washrooms including wash basins, toilets, urinals, dispensers and receptacles, walls, partitions and doors should be immaculately clean and all facilities should be in good operating condition at all times. The use of disinfectants or deodorants are not necessary where an adequate cleaning job is being done.

Facilities

7.02 Dispensers - soap dispensers and valves not clean, glass bowls dirty on insides, soap cloudy or contains sediment, hardened soap deposits at outlets - note if they leak or do not operate properly.

- toilet paper and paper towel dispensers, sanitary napkin vending machines, dusty, dirty stained, have paint droppings on them - note if enamel, paint or plating is worn, chipped or rusted.

7.03 Mirrors and Shelves - glass, frames or brackets dusty, dirty, smeared, tarnished - note if fastenings are loose or refinishing is needed.

7.04 Toilets - seats are dull, not of clean appearance, discolored, hinges dirty, tarnished, loose, bowls, stained, chipped, scratched - note if seats require refinishing or replacement; if hinges or flushometers require replating.

7.05 Urinals - dirty, stained, have odor because of deposits in traps of floor type or accumulations underneath the edges of the fixtures or because of the use of disinfectants or deodorants - note if flushometer fittings require replating.

7.06 Wash basins - streaked, dirty, have ring around inside of bowl, rust stained, adjacent walls stained from spattered soap - note if basin is cracked, checked or chipped.

Stall Partitions

7.07 Cleanliness - is determined by viewing them at an angle facing the source of light - note if the brackets of stall partitions are loose or the slabs cracked.

8. FURNITURE, LOCKERS, FILES

8.01 Dusty - on tops and side surfaces, between chair back slats, underneath objects such as clocks on desks, bookcases, etc.

8.02 Fingermarked - at handles of desk drawers, filing cabinets, lockers, chair arms, at point where occupant sits at desk - note if spot cleaning is required.

8.03 Dirty - generally dirty requiring overall washing and polishing - note if refinishing or repairing is necessary.

8.04 Footings - of desks, chairs, tables, lockers, office machines, etc. not proper type, are indenting or scratching floors - note floor damaging conditions for immediate correction.

9. WINDOWS, SHADES AND VENETIAN BLINDS

Windows

9.01 Glass - dirty, rainspotted, fogged on inside surfaces - note if glass is cracked or broken.

9.02 Frames - dusty, dirty, rusty - note if paint is checking, flaking or worn requiring repainting.

9.03 Sills - dusty, dirty, scratched as by window washer's feet, has paint droppings.

9.04 Deflectors - dusty, fingermarked, dirty - note if glass is chipped or cracked or holders require tightening or refinishing.

9.05 Unit Ventilators - dusty, dirty, filters require cleaning or replacement.

Shades

9.06 General - dusty, fingermarked, stained, dirty especially at the meeting rail point. Inspect especially the side facing the window - note if they are torn, frayed, or if cord is not properly attached.

Venetian Blinds

9.07 General - dusty, dirty, tapes stained, worn or faded - note if tapes or cords require replacement or the slats require refinishing.

Awnings

9.08 General - dirty, stained - note if they are torn or do not operate freely.

Drapes

9.09 General - dusty, dirty, stained, badly wrinkled - note if they should be cleaned.

Screens

9.10 General - dusty, dirty - note if mesh is torn or frames require repainting.

10. LIGHTING FIXTURES AND FANS

Fixtures

10.01 Ceiling and Wall Types - dusty, dirty, glass globes or lamps dusty, dirty, try emergency gas lights for proper operation - note if fixtures require refinishing, globes are cracked.

10.02 Portable Types - dusty, dirty - note if shades are discolored, torn or loose or if cords are frayed or are a tripping hazard.

Fans

10.03 All Types - dusty, dirty, dripping oil, blades dirty or tarnished - note if electric cords are frayed or are a tripping hazard.

11. SUPPLIES AND TOOLS

Cleaning Supplies

11.01 General - not stored in an orderly manner, quantities are excessive, include non-recommended or hazardous materials, e.g., disinfectants or uncolored sodium fluoride or materials of unknown compositions.

Cleaning Tools

11.02 General - not properly stored, not in clean or good condition, polishing machines are dusty, dirty, drip oil, cords defective, vacuum cleaners not clean, bag or dust receptacle contains dirt, cords defective.

Sanitary Supplies

11.03 General - not stored in a clean and orderly manner, quantities are excessive.

12. SERVICE QUARTERS

Service Sink Rooms

12.01 General - floors, walls, shelves, sinks are dusty, dirty, supplies and tools not in an orderly condition, room has musty odor - note if floors or walls require repainting.

Basement

12.02 General - Observe corners and closets for debris and vermin and particularly for fire hazards such as excelsior, papers, packing cases, flammable oils, paints, etc., try sump pumps to determine whether they operate properly, check infrequently used floor drains to determine whether traps have liquid in them.

12.03 Boiler Room - boilers and auxiliary equipment are dusty, dirty, ash and trash accumulations not stored orderly or safely.

12.04 Cable Vault - floors and walls are dusty, dirty, debris on floor.

12.05 Emergency Engine Room - floors and walls are dusty, dirty. There should be no equipment or supplies stored in these rooms.

12.06 Piping - pipes and coverings are dusty, dirty, stained, identification obscure - note if valves drip or there are other leaks.

13. MISCELLANEOUS

13.01 Stairs - dusty, dirty - note if treads are broken, loose or are worn or slippery.

13.02 Hand Rails - dusty, dirty, require polishing - note if they are loose or require refinishing.

13.03 Radiators - dusty, especially between sections - note if valves leak or if refinishing is needed.

13.04 Fire Extinguishers - dusty, check date of last inspection on tags - note if they are obscured or made inaccessible by equipment or lockers placed subsequent to their installation.

13.05 Building Fuse Panels - inspect to see that they are clean and also free from foreign materials.

13.06 Utility Shafts - not clean, or have cleaning tools, supplies or miscellaneous articles stored in them.

13.07 Elevator Shafts - dusty, dirty, have debris at bottom.

13.08 High Dusting - check all points that are dusted on a periodic basis such as pipes, transom and partition ledges, picture mouldings, tops of lockers, switchboards.

13.09 Drinking Fountains - not clean, strainers clogged - is drinking water refrigerated properly, i.e., approximately 50°F.

13.10 Hot Water - is it of the proper temperature, for general use, i.e., approximately 120-125°F. - not too hot for direct contact with the hands?

13.11 Heat - does the building appear to be properly heated, i.e., a proper health temperature and windows not open excessively during heating season, suggesting overheating?

13.12 Elevators - is service adequate, are attendants neat and courteous, are cabs and doors dusty, dirty, require polishing with furniture or metal polish.

13.13 Electricity - do there appear to be fans running or electric lights burning unnecessarily?

13.14 Bell System Practices - are they in the building, readily available and being followed?

13.15 Work Schedules - are they used and if so, are they up to date, are the assignments well balanced as to order and frequency?

Attached:
Exhibit A.

Exhibit A

FORM E 3024 (6-45)

B.S.P. HS4.301

HOUSE SERVICE INSPECTION

City Alphatown Date 6-6-45

Bldg. Alphatown C.O. Yr. Blt. 1930

Bldg. 28,130 ◫ Grds. 4500 ◫

No. Flrs. 2 + B Pop. 83

Occupancy
Traf. 30 % Plt. 45 % Off. 25 % Vacant neg. %

Clng. Force M 1 @ 40 hrs. Fe. 2 @ 25 hrs.

CLASSIFICATION	Poor	Fair	Good	Excel-lent	Quality Value
	Range of Quality				
Floors	8	12	16	20	17
Walls, Doors & Partitions	8	12	16	20	19
Washrooms	6	9	12	15	10
Furniture, Lockers & Files	4	6	8	10	10
Exterior & Grounds	4	6	8	10	10
Windows, Shades & V. Blinds	2	3	4	5	4
Lighting Fixtures & Fans	2	3	4	5	5
Supplies & Tools	2	3	4	5	5
Service Quarters	2	3	4	5	3
Miscellaneous	2	3	4	5	5

Wind Clng. cont.
Wall Wash cont.
Grounds Imp.

Quality Index	88
Clng. Hrs. per M ◫ per Wk.	2.8
Pop. Density per M ◫	2.9

PRINTED IN U.S.A.

CHECKING LIST

EXTERIOR & GROUNDS
EXTERIOR
Entrances ✓
Flags ✓
Fire Escapes
Metalwork ✓
Roofs ✓
Shutters
Signs ✓
Steps
Wall Bases ✓
GROUNDS
Awnings ✓
Fences
Lawns ✓
Parking Lot
Shrubbery ✓
Sidewalks ✓
Trees

FLOORS
Asphalt
Carpet - Rugs
Concrete
Linoleum 1 2
Marble
Rubber
Terrazzo ✓
Tile
Others

WALLS, DOORS & PARTITIONS
DOORS ✓
Checks
Finish
Frames
Hardware
Kickplates
PARTITIONS ✓
Frames
Glass
WALLS
Bases ✓
Ceilings ✓
Dado ✓
Marble
Painted 3
Papered
Tile
Others

WASHROOMS
Dispensers
Paper Towel ✓
Sanitary Napkin ✓
Soap 4
Toilet Paper ✓
Floors 5
Hardware ✓
Mirrors ✓
Partitions 6
Piping ✓
Shelves ✓
Toilets ✓
Towel Baskets ✓
Urinals ✓
Walls ✓
Wash Basins ✓

FURNITURE, LOCKERS & FILES
FILES ✓
FURNITURE ✓
Cabinets
Chairs ✓
Desks ✓
Footings
Tables ✓
LOCKERS 7

WINDOWS, SHADES & VENETIAN BLINDS
SHADES 8
VENETIAN BLINDS
WINDOWS ✓
Awnings
Frames ✓
Glass ✓
Screens
Ventilators ✓

LIGHTING FIXTURES & FANS ✓
FANS
LIGHTING FIXTURES ✓

SUPPLIES & TOOLS
Cleaning Supplies ✓
Cleaning Tools ✓
Sanitary Supplies ✓

SERVICE QUARTERS
Basement ✓
Boiler Room ✓
Mechanical Equipment
Service Sink Rooms 9

MISCELLANEOUS
Bell System Practices ✓
Cleaning Procedures -?
Drinking Fountains ✓
Elevators
Cabs
Doors
Shafts
Fire Extinguishers ✓
Radiators ✓
Stairs ✓
Utility Shafts
Work Frequencies - Schedules none

CONDITIONS TO OBSERVE
Appearance, General
Broken or Loose
Clogged
Cracked
Debris
Dirty, spots-overall
Dusty
Fingermarked
Frayed
Hazards, Accident-Fire
Indenting Floor
Leaks
Marred
Odor
Operation of Facilities
Stained
Streaked
Supplies, approved storage quantities
Tarnished
Torn
Unsightly Grounds
Wax, spot-oiled-polish
Worn out

When notes are made, number them and write number after item for reference.

NOTES

1. Linoleum in 204 needs spot cleaning and waxing in traffic paths.
2. Linoleum in women's locker room has been badly indented by locker footings. Replacement recommended.
3. Walls in women's locker room and men's smoking room need spot cleaning.
4. Two soap dispensers in men's washroom are dirty on insides of globes and do not operate freely because of soap incrustations.
5. Floors in both washrooms should be thoroughly cleaned, especially in corners and about toilet bowls.
6. Toilet partitions streaky, review washing procedure.
7. Place proper footings on lockers in women's locker room. See 2
8. Window shades generally dusty. Those in locker and rest rooms require spot cleaning.
9. Service sink rooms untidy. Floors require repainting.

Floors, walls and furniture other than mentioned above present excellent appearance.

CABLE OPENINGS

1. GENERAL

1.01 This section covers the requirements for openings associated with standard cable holes in floors and walls or partitions, cable shafts, cable sleeves, and cable slots under distributing frames and between columns.

1.02 This section is reissued for the following reasons:

(a) To include information contained in addendum of previous issue of the section.

(b) To revise certain parts of the text to include a brief description of all drawings referring to cable openings listed in Paragraph 2.01.

(c) To increase the clearance between floor opening and the outside of sheet metal type cable hole sheathing.

(d) To provide tapered floor openings for cable sleeves.

(e) To require openings for future use to be packed with canvas bags of mineral wool.

(f) To include reference to cable vault walls.

(g) To describe a method for providing temporary closures for cable openings in floors.

Arrows are used to indicate changes throughout the text.

1.03 A cable opening is required where a cable run passes through a floor, wall or partition in a telephone building. The openings consist of cable holes in floors and walls or partitions, cable slots in floors, cable shafts, cable sleeves in floors, and floor openings in cable ducts.

1.04 The providing or cutting of openings is arranged for by the Telephone Company, unless otherwise specified. In case of walls or partitions, where it may not be practicable to determine the location or size of the cable opening at the time the locations and sizes of floor openings are determined, the wall or partition openings may be cut at the time of equipment installation. Any unused cable opening in the floor is provided with a cover plate flush with the floor. (See Paragraph 1.07.)

1.05 Except for cable holes using sheet metal type sheathing, openings for cable holes are provided or cut to the exact dimensions shown on the floor plan and floor plan data sheets. In the case of cable holes using sheet metal type sheathing, usually holes of less than one square foot in area in floor, the actual opening is provided or cut 3/16 inch larger all around than the finished hole shown on the floor plan drawings.

1.06 Fascia angles required for cable hole and slot openings in fire resistive floors and cable hole openings in fire resistive walls or partitions are furnished and installed by the Telephone Company. The outer faces of the legs of these angles are flush with sides of opening and floor, ceiling or wall surface. The legs flush with floor, ceiling, wall or partition are drilled and tapped by the Telephone Company, as indicated on the drawings referred to in Paragraph 2.01, to facilitate installation of sheathing and covers. The tapped holes are protected by inserting temporary screws prior to placing the concrete and floor material.

1.07 Flush cover plates required for the unused portions of cable openings in the floor together with the necessary support angles fastened to the vertical legs of the top fascia angles are furnished and installed by the Telephone Company.

1.08 Design requirements for standard cable hole sheathings are covered in a section of Division AA380 of the Bell System Practices.

1.09 Installation requirements for cable hole and cable slot sheathing, closing details and cable sleeves together with power cable supports in shaftways are covered in Section AA614.003, Sheathing for Cable Openings - Installation.

1.10 A method of forming cable openings in reinforced concrete floors under main distributing frames by use of removable aluminum cores is described in Section H36.149, Core Method of Forming Main Frame Cable Holes. This method is both economical and practicable, and is offered for consideration when arranging for cable openings under main distributing frames.

9.02 A tapered opening is provided in the floor for this sleeve.

9.03 This sleeve is limited to a maximum 4-inch inside diameter in a 5-inch hole.

10. ENCLOSURE FOR VERTICAL CABLE RUN ADJACENT TO COLUMN

10.01 Drawing ED-90579-01 covers the enclosure of vertical runs located adjacent to a column, such as where a cable run passes through non-equipment space. Such enclosures are provided with an opening on both sides of the cable racks to facilitate the work of the installer. The fire resistive construction and finish of the enclosure are governed by the local conditions. Such enclosures are provided by the Telephone Company.

11. FIRE PROTECTION FOR CABLE OPENINGS

11.01 In closing cable openings in floors, walls or partitions of fire resistive telephone buildings, canvas bags containing mineral wool are packed around the cables to prevent drafts from carrying smoke, flames or heat through the openings in case of fire except in the case of the slots beneath the M.D.F. and protector frame (see Paragraph 11.05), cable openings in enclosed shafts and cable sleeves. Cable openings through combustible type floors, with the exceptions stated above, also are packed with bags of mineral wool, but in holes through combustible walls and partitions this protection is not required. The bags are of eight-ounce canvas and are filled about three-quarters full with mineral wool so as to be about 12" x 12" x 1" in size per Specification KS-5048.

11.02 Cable holes in fire resistive floors are packed tightly with canvas bags of mineral wool to a depth of approximately 8" above the bottom cover plate. Cable holes in combustible floors are packed to a depth of 4". In fire resistive walls and partitions, all available space around the cable runs is packed with canvas bags from cover to cover of the cable hole.

11.03 When installing the bags of mineral wool each horizontal layer of bags is arranged so as to overlap the space between the bags in the layer beneath and to fit tightly against the cable runs and sides of the cable hole. It will not be practicable to close completely all small openings by this method but the arrangement will effectively cut off drafts and will be satisfactory from a fire protection standpoint. In the case of small cable holes, the bags are folded as necessary to permit them to be fitted in the limited space provided.

11.04 The closing of cable holes in floors, walls or partitions and cable slots in floors provided for future use is done by the Telephone Company. Such openings are packed tightly with canvas bags of mineral wool in accordance with Paragraphs 11.01 to 11.03.

11.05 In central office buildings where outside underground cables require cable racking, a cable vault separated from other parts of basement by a fire resistive wall is provided. In general this is based on the following:

(a) Protects cables from possible fire originating in general basement.

(b) In locations where M.D.F. is in first story directly above the cable racking in basement, provides a fire barrier between general basement and equipment space in which M.D.F. is located. From a fire protection standpoint, this makes the cable vault a part of the frame room.

Fire resistive ratings and protection of vertical openings in cable vault walls are covered in Section H41.230, Interior Construction to Restrict Spread of Fire.

12. TEMPORARY COVERS FOR CABLE OPENINGS IN FLOORS

12.01 It is good practice for the Telephone Company to place all permanent top and bottom cover plates and canvas bags of mineral wool in cable holes and slots at the earliest possible time in the construction of buildings to provide adequate fire and accident protection at these locations during the construction and equipment installation periods.

12.02 Temporary covers for cable openings are furnished and installed by the Telephone Company during the construction of a building where such openings are not provided with permanent covers in this period. During the equipment installation as cables are added, the installer modifies these temporary covers as necessary until the regular closing details are installed. These temporary closures may be constructed of materials such as cement-asbestos boards, treated wood, wire baskets with canvas bags of mineral wool, and pine boards.

12.03 In order to be sufficiently fire resistive, all temporary closures are comparable in fire resistive rating to a cement-asbestos and pine board cover over a basket containing bags of mineral wool. For example, if pine boards are used, a cement-asbestos board of at least 1/8" thickness, or its equivalent in fire protection, is attached to the underside of the pine boards. Cement-asbestos boards are available which can be nailed to wood and cut easily so that sections of the cover can be removed when cables are being installed. Board covers are usually secured to cleats so that the cover can not be accidentally moved on the opening.

12.04 In addition to the temporary cover, bags of mineral wool as described in Paragraphs 11.01 to 11.03 are packed tightly to a depth of at least 6" into wire or metal lath baskets under the cover. The baskets are not to be dependent upon wood portions of the closure for support in case the wood is removed or destroyed.

12.05 All covers are to be of adequate strength and securely fastened in place. They should not be unfastened or removed except when it is necessary to work in the cable holes or slots, or to place the permanent sheathing or cover plates.

12.06 The closures should always be replaced at night if workmen are not on the job. Western Electric Company installation practices cover the use of temporary guard rails around the cable holes through which cables are to be run, and its practice is to use temporary closures during the progress of its work in placing the cables.

BUILDING MAINTENANCE INSPECTIONS

EXTERIOR AND GROUNDS

1. GENERAL

1.01 This section outlines a plan for making and reporting periodic, scheduled inspections of building exteriors and grounds. It also suggests procedures for administering the corrective measures indicated by the inspections.

1.02 It is the purpose of the inspections to disclose conditions requiring repairs and to classify them according to their urgency as follows:

(a) Conditions requiring immediate repair attention with emphasis on those involving safety of personnel or property.

(b) Conditions requiring repairs which will be scheduled for completion prior to the next inspection.

(c) Conditions of a deteriorated nature not requiring repairs before the next inspection but which should be given special attention on subsequent inspections.

1.03 It is intended that the inspections will be made by personnel qualified to recognize and evaluate the physical condition of the buildings. The plan for inspections outlined herein does not supersede day-to-day supervisory observation and reporting of defective structural and grounds conditions.

2. SAFETY PRECAUTIONS

2.01 THE INSPECTOR SHALL AT NO TIME EXPOSE HIMSELF TO PERSONAL INJURY. Where circumstances require the examination of items in hazardous locations, a qualified contractor with proper equipment for making such examination in a safe manner should be employed.

3. FREQUENCY OF INSPECTIONS

3.01 Inspections of the exterior of building structures and surrounding ground areas should be made at least annually. It is generally preferable to schedule such inspections at a time of the year which will allow any necessary repairs to be completed during weather favorable to outside work.

3.02 Special inspections should be made on buildings following severe storms or other disturbances which might affect the buildings structurally.

4. CHECKING LIST

4.01 Form E-3922, Checking List, Building Exterior and Grounds Inspection, is used for guidance in making the inspection. The form lists items to be inspected and principal conditions to be observed. A copy of this form filled out for a typical inspection is shown in Exhibit 1.

4.02 The checking list includes items typical of those to be examined on the inspection of building exteriors and grounds. Space is provided for writing in items not specifically mentioned.

4.03 The principal conditions to be observed are described or illustrated in Part 5. These are intended to aid the inspector in recognizing defects commonly found on building exterior and ground inspections.

5. PRINCIPAL CONDITIONS TO BE OBSERVED

Sidewalks and Paving

5.01 Fig. 1 illustrates defective conditions commonly found on sidewalks or paved areas, such as spalled surfaces, uneven surfaces, cracks and deteriorated joints. Sidewalks and paving should also be inspected for loose expansion joints and poor drainage.

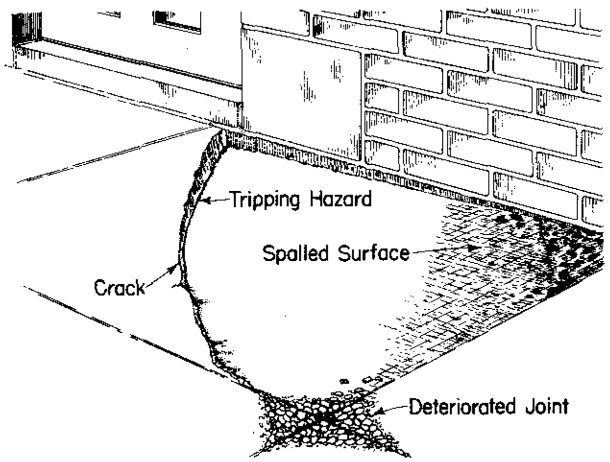


Fig. 1 - Common defects in paving and sidewalks

Landscaping

5.02 Ground areas should be examined for evidence of erosion, poor drainage and grading. Dead or diseased trees and shrubs should be reported. Trees and shrubs should be checked for proper pruning. Cases where limbs interfere or rub on wires or buildings should be noted. Because of potential damage to exterior surfaces, vines on buildings should be observed. Lawn areas should be inspected and conditions indicating the need for repairs such as resodding, regrading, etc., reported.

Masonry

5.03 Illustrated in Fig. 2 is an example of open joints in brickwork. This defect is frequently found in masonry construction of all types. The head (vertical) joints are especially susceptible and should be carefully examined. Open joints if not corrected usually result in leaks and deterioration of the wall and possible damage to interior walls.

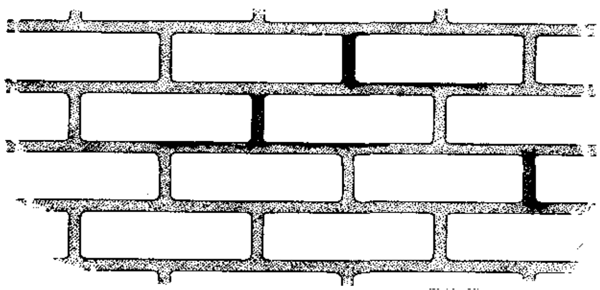


Fig. 2 - Open joints in masonry wall

5.04 Fig. 3 illustrates a structural crack in a brick wall. These are usually caused by settlement and are generally found on corners of the building and around doors and windows. Cracks such as this should be repaired promptly to avoid leakage and further deterioration. Stonework, terra cotta and other types of masonry construction should also be observed for evidence of structural cracks.

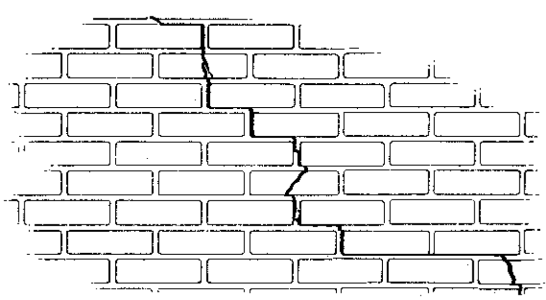


Fig. 3 - Structural crack in masonry wall

5.05 Spalling of the surface of a brick wall is illustrated in Fig. 4. This is generally found on surfaces which have been painted or sealed and usually results from moisture being trapped in the brick or stone. The adjacent area should be examined for cracks or openings permitting water penetration.

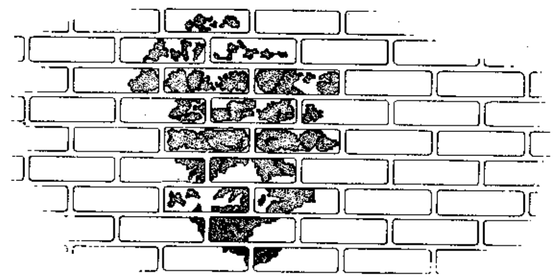


Fig. 4 - Spalling on brickwork

5.06 Masonry should also be observed for loose bricks, stone or terra cotta. Caulking around windows, coping joints, grills, etc., should be examined and dried or loose conditions reported.

5.07 Efflorescence usually results from moisture in the wall. Surrounding areas should be examined carefully for leaks, cracks or open joints.

5.08 Painted masonry surfaces should be inspected for signs of deterioration of the paint.

Woodwork

5.09 Woodwork should be examined for damaged or loose portions, dried or loose caulking, nail rust stains, cracked and rotted areas and deteriorated paint. Woodwork should also be inspected for evidence of termite damage in areas where these insects are prevalent.

Windows and Doors

5.10 In Fig. 5 are shown some of the common defects found on windows and doors. Metal doors and windows should be examined for evidence of rust and corrosion. Other defective conditions on windows and doors to be observed are: damaged frames or sash, broken or cracked glass, defective or missing hardware and improper operation. Screens and grills should be inspected for corrosion, damaged screen or frames, deteriorated paint and improper operation.

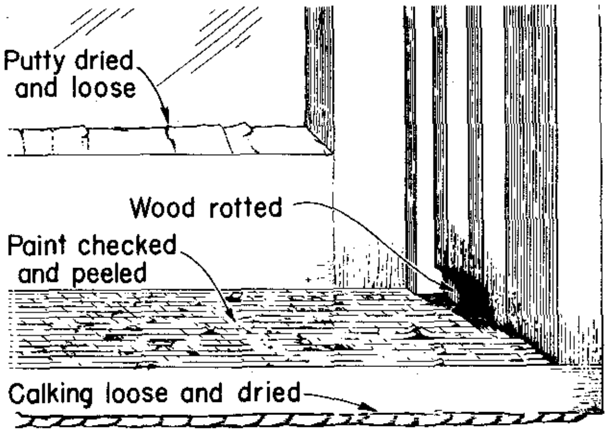


Fig. 5 - Common defects on windows and doors

Metal Work

5.11 Exterior metal work such as fire escapes, manhole covers, fences, gratings, fill pipe caps, grills, louvres, access doors, etc., should be examined for deteriorated paint, rust or corrosion, damaged or bent metal, loose fastenings, defective operation and loose or dried caulking. Metal work adjacent to driveways or parking areas should be observed for adequacy of protection against damage by vehicles.

Roofing

5.12 Figs. 6, 7 and 8 illustrate some of the defects found on flat roofs and flashing. Cracks, breaks and open joints should be observed and reported. Blisters and alligatoring do not necessarily indicate trouble but these areas should be examined carefully for dried felts or cracking. A check should be made for exposed or dried felts which deteriorate rapidly. Flashings should be examined for evidence of damage, breaks, looseness, dried out membranes and open joints.

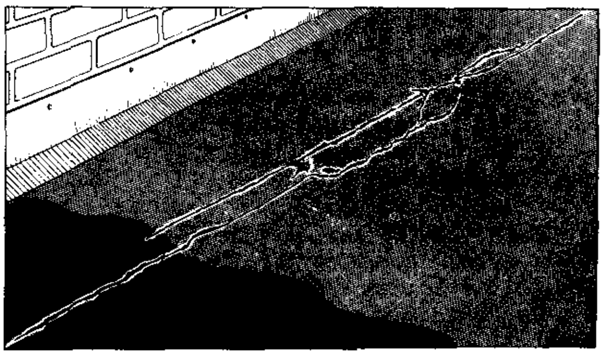


Fig. 6 - Cracks in smooth surfaced roof

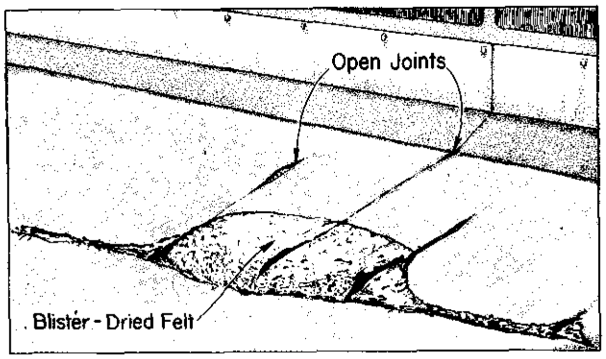


Fig. 7 - Defects on pitch and gravel roof

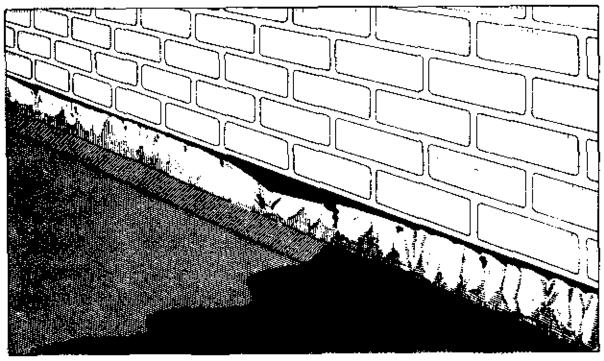


Fig. 8 - Loose and damaged flashing.

5.13 Flat roofs should also be checked for miscellaneous objects stored or lying about as these may cause damage. Debris around sumps and leaders may cause water to stand on the roof. Damaged or missing strainers on drains should be reported.

5.14 Shingle roofs should be inspected for loose, damaged or missing shingles. Ridge rows and valleys should also be examined for defective flashings.

5.15 Slate roofs should be examined for broken or missing slates and for damaged or missing snow stops.

6. INSPECTION PROCEDURE

6.01 The checking list Form E-3922 is used as a guide in making the inspection and notes on the inspection are made on Form E-3923, Notes on Inspection. Notes should be numbered and the number shown opposite the item on the checking list. Notes should describe in detail the conditions found and include recommendations as to nature of correction. Space is provided for indicating the urgency and estimated cost. Minor items need not be estimated but should be marked "Minor". Form E-3923 is shown in Exhibit 2 filled in for a typical inspection.

6.02 In making the inspections, the following procedure is suggested.

(a) Inspect the exterior and grounds with the supervisor in charge of the building and check defects and leaks known to him.

(b) Refer to previous inspections and check on the completion of items reported. Special attention is given to those items reported as requiring attention at a future date. Recent House Service Quality Inspections (B.S.P. H54.201) and Building Maintenance Interior Inspections (B.S.P. H54.311) should also be referred to and attention given those items within the scope of this inspection.

(c) Inspect ground areas.

(d) Inspect exterior wall surfaces from the ground. The use of binoculars is helpful in examining high areas. Note any vantage points on the building such as windows, fire escapes or offsets from which closer examination of the wall areas may be made.

(e) Proceed to the roof and examine the roof, parapets, flashings, copings and other items on the roof as indicated on the checking list.

(f) From the roof go down through the building and examine the interior surfaces of exterior walls and ceilings for evidence of wall or roof leaks. Further investigation of such conditions should be made as necessary.

(g) While going through the building examine exterior wall surfaces and appendages from vantage points such as windows, fire escapes or building offsets. Defects noted in the inspection from the ground should be reexamined at close quarters.

(h) Where possible defects on exterior surfaces are in such locations that close examination from safe vantage points is not possible, consideration should be given to employing a qualified contractor to make the examination from drop scaffolds or other proper equipment.

(i) On multi-story buildings of such height that examination of the exterior wall surfaces can not be made satisfactorily from the ground or vantage points on the building, and when the general condition of the accessible portions of the walls indicate that a complete inspection is advisable, the employment of a qualified contractor to examine the walls from drop scaffolds or other proper equipment should be considered. When such inspections are made, any necessary minor repairs are generally made concurrently with the inspection.

7. BUILDING MAINTENANCE INSPECTION REPORT FORM E-3924

7.01 The field notes on the inspection which were made on Form E-3923 are reviewed and conditions requiring attention are summarized on Form E-3924. Exhibit 3 shows a sample of Form E-3924 filled out for a typical inspection.

7.02 The report is addressed to the supervisor responsible for maintenance in the building, district or area as local practice may require. Copies of the report may be sent to other supervisors for their information as necessary.

7.03 The heading on Form E-3924 is completed by filling in the inspector's name, date of inspection, city and building as indicated. The items are numbered for reference. The conditions requiring attention are fully described and recommendations for repairs made in the space headed "Recommendations." Items of a similar nature are grouped together on the form.

7.04 The urgency with which corrective measures are required is to be designated in the column headed "Urgency" by the letters A, B or C as follows:

A - Requires immediate repairs.

B - Repairs are required but will be scheduled for completion prior to the next inspection.

C - Condition is deteriorated but repairs are not required prior to the next inspection when item is to be reexamined.

7.05 The estimated cost of the recommended repairs as shown on Form E-3923 is entered in the column headed "Est. Cost." The estimate need only be approximate as it is not intended to be a basis for contract negotiation.

7.06 Form E-3924 provides a means for checking progress in correcting conditions requiring attention. The date that it is desired to have the form returned for review should be shown in the space provided at the bottom of the form. This date should be set sufficiently in the future to allow adequate time for completing repairs indicated as urgent or for scheduling those to be completed prior to the next inspection.

7.07 On or before the return date indicated on Form E-3924, the supervisor responsible for completing the repair work should indicate the action taken in regard to each item and return a copy of the form through lines of organization to the supervisor who originally signed the summary. Order numbers, contract references, costs or other pertinent information may be shown if available. The date of completion of the work on each item should be shown in the last column. If the work is uncompleted, explanatory remarks in regard to uncompleted items should be shown in the "Action Taken" space. Arrangements should be made for further tracing on uncompleted items as necessary.

Attached:
Exhibits 1 through 3, inclusive.

EXHIBIT #1

E-3922
(1-52)

CHECKING LIST
BUILDING EXTERIOR AND GROUNDS INSPECTION

INSPECTED BY a. Jones CITY Alphatown
DATE 9-18-51 BUILDING Alphatown C.O.

GROUNDS	WALLS	ROOF
AREA WAYS	AWNINGS	ANTENNAS
CURBING	BRICKWORK 2	CATWALKS
DRAINS	CORNICES	CHIMNEYS
DRIVEWAYS	DOORS & FRAMES	COLUMN STUBS
FENCES & GATES	FIRE ESCAPES	COPINGS
GRATINGS	FIRE SHUTTERS	DRAINS
LAWNS & SHRUBBERY	FLAGPOLES	FLAGPOLES
PARKING AREAS	GUTTERS & DOWN SPOUTS	FLASHINGS
PAVEMENTS	HOSE BIBS	HATCHES
RAILINGS	INTERIOR WALLS	HOIST BEAMS
RETAINING WALLS	LIGHT FIXTURES 3	LADDERS
SIDEWALKS 1	LINTELS	LEADERS
SIDEWALK OPENINGS	METAL TRIM	PARAPETS
SPRINKLER SYSTEMS	SCREENS	PENTHOUSES
STEPS	SIAMESE CONNECTIONS	ROOFING 4
	SIGNS	SKYLIGHTS
	STONEWORK	VENTS & STACKS
	STUCCO	
	TERRA COTTA	
	VENT OPENINGS	
	WINDOWS & FRAMES	
	WOOD SIDING	
	WOOD TRIM	

NUMBER NOTES MADE ON THE INSPECTION AND PLACE THE NUMBER OPPOSITE THE ITEM ABOVE FOR REFERENCE. ITEMS NOT NUMBERED INDICATES CONDITION IS SATISFACTORY. USE BLANK SPACES FOR WRITING IN ITEMS NOT LISTED.

PRINCIPAL CONDITIONS TO BE OBSERVED

LANDSCAPING
DRAINAGE OR GRADING POOR
TREES OR SHRUBS DISEASED
PRUNING REQUIRED

SIDEWALKS & PAVING
CRACKS
SPALLED SURFACES
POOR DRAINAGE
UNEVEN
LOOSE EXP. JOINTS

WOODWORK
PAINT DETERIORATED
ROTTED
CRACKED OR BROKEN
CAULKING LOOSE

MASONRY
OPEN JOINTS
CRACKS
SPALLED SURFACES
LOOSE
CAULKING DRIED OR LOOSE
EFFLORESCENCE
PAINT DETERIORATED

WINDOWS & DOORS
PAINT DETERIORATED
FRAMES OR SASH DAMAGED
GLASS BROKEN
CORRODED OR ROTTED
PUTTY OR CAULKING LOOSE
HARDWARE DEFECTIVE
DEFECTIVE OPERATION
SCREEN DAMAGED

ROOFING
CRACKS OR BREAKS
BLISTERS
EXPOSED OR DRY FELTS
OPEN JOINTS
LOOSE OR DAMAGED FLASHING
LOOSE OR DAMAGED SHINGLES
DEBRIS

METAL WORK
PAINT DETERIORATED
CORRODED
LOOSE
DAMAGED
DEFECTIVE OPERATION
CAULKING LOOSE

E-3923
(1-52)

NOTES ON INSPECTION

INSPECTED BY A. Jones CITY Alphatown

DATE 9-18-51 BUILDING Alphatown C.O.

NO.	NOTES	URGENCY* EST. COST
1	Sidewalk to front steps is cracked and slab is sunken. Immediate repairs recommended to remove tripping hazard.	A 55.00
2	Structural crack has developed in brickwork on northeast corner of building at 2nd. story level. Should be repaired and pointed before freezing weather.	B 150.00
3	Light globe above rear exit doorway is cracked. Recommend immediate replacement before it breaks and falls.	A Minor
4	Several large blisters have formed on roofing. No action is recommended at this time	C

* INDICATE URGENCY BY LETTER
A - REQUIRES IMMEDIATE REPAIR
B - REPAIRS TO BE SCHEDULED
C - RE-EXAMINE ON NEXT INSPECTION

* MINOR ITEMS NEED NOT BE ESTIMATED - MARK "MINOR."

E-3924
(1-52)

BUILDING MAINTENANCE INSPECTION REPORT

To H. Smith
Div.Supv. of Bldgs. & Suppls.
TITLE

INSPECTED BY A. Jones
DATE 9/18/51

CITY Alphatown
BUILDING Alphatown C.O.

ITEM NO.	RECOMMENDATIONS	URGENCY*	ESTIMATED COST	ACTION TAKEN	DATE COMPLETED
1	Repair sidewalk to front steps. Slab is cracked and sunken. It is a tripping hazard.	A	55.00	Repaired on W. O. # 6942 Contract with Apex Const. Co. Cost $50.00	10.2.51
2	Repair structural crack in brickwork on northeast corner of building at 2nd story level. Pointing recommended before freezing weather.	B	150.00	Work approved on W.O. #7016 Scheduled for Completion 12.31.51	
3	Replace light globe above rear exit doorway. Globe is cracked.	A	Minor	Replaced by building mechanic	9.24.51
4	Several large blisters have formed on roofing. No action is recommended at this time.	C	-	None necessary at this time.	

RETURN ONE COPY OF THIS REPORT BY 12/18/51
SHOW ACTION TAKEN AND COMPLETION DATES.
INDICATE STATUS OF UNCOMPLETED ITEMS.

* INDICATE URGENCY BY LETTER
A - REQUIRES IMMEDIATE REPAIRS.
B - REPAIRS TO BE SCHEDULED.
C - RE-EXAMINE ON NEXT INSPECTION.

S. Brown
Supt. of Bldgs.
TITLE

EXHIBIT #3

BUILDING MAINTENANCE INSPECTIONS

INTERIOR

1. GENERAL

1.01 This section outlines a plan for making and reporting periodic, scheduled inspections of building interiors. It also suggests procedures for administering the corrective measures indicated by the inspections.

1.02 Unsatisfactory conditions requiring painting or repairing are classified according to their urgency as follows:

(a) Conditions requiring immediate repair attention with emphasis on those involving safety of personnel or property.

(b) Conditions requiring painting or repairs that will be scheduled for completion prior to the next inspection.

(c) Conditions of a deteriorated nature not requiring repairs before the next inspection but which should be given special attention on subsequent inspections.

1.03 It is intended that inspections will be made by personnel qualified to recognize and evaluate the physical condition of the buildings. The plan for inspection outlined herein does not supersede day-to-day supervisory observation and reporting of defective interior conditions.

2. SAFETY PRECAUTIONS

2.01 THE INSPECTOR SHALL AT NO TIME EXPOSE HIMSELF TO PERSONAL INJURY. Where circumstances require the examination of items in hazardous locations he should take necessary precautionary measures to insure his personal safety or a qualified contractor who has the proper equipment for making such examinations in a safe manner should be employed.

3. FREQUENCY OF INSPECTIONS

3.01 Inspections of building interiors are scheduled at such intervals as local conditions may require. These inspections may be made concurrently with the exterior and grounds inspection (B.S.P. Section H54.310). It is recommended, however, that all building interiors be inspected at least once each year. Special inspections may be scheduled at any time to deal with new problems or to follow up current projects.

4. CHECK LIST, FORM E-3928

4.01 For purposes of this inspection the maintenance of building interiors is divided into six categories, as follows:

Paint
Walls, Partitions and Ceilings
Doors and Windows
Floors and Floor Covering
Stairways
Electrical and Plumbing Fixtures

4.02 To assist in making the inspection a Check List, Form E-3928, is used. A copy of this form, filled out for a typical inspection is shown in Exhibit 1.

4.03 Form E-3928 includes two lists, one indicating items to be examined under each category and a second showing principal conditions to observe. Space is provided for adding items not specifically listed.

4.04 The principal conditions to observe are described in Part 5. These are intended to aid the inspector in recognizing defects commonly found in building interior inspections.

5. PRINCIPAL CONDITIONS TO OBSERVE

Paint

5.01 Painted surfaces are inspected for conditions indicating deterioration. Peeling, checking, chalking, spots worn thin by washing, stains and discolored areas are conditions indicating that painting is desirable. Surfaces that are soiled but sound otherwise and require washing only are noted.

5.02 Particular attention is given lower wall areas subject to damage by furniture and waste receptacles.

Walls, Partitions and Ceilings

5.03 Plastered surfaces are examined for cracks, loose segments and water penetration. The source of moisture or leaks resulting in spalling, efflorescence and staining should be located. Ceilings are thoroughly inspected for evidence of water penetration. Loose sections of acoustical tile should be reported.

5.04 Inspect movable partitions for loose, cracked or broken panel sections.

5.05 Marble, tile, travertine and other masonry finishes are examined for cracks, loose sections or tiles and joints that require repointing. Inspect joints of tile walls and partitions for loose mortar.

5.06 Examine seals and adjoining wall areas around piping entering the building through basement walls, particularly gas lines below grade, for cracks and openings.

Doors and Windows

5.07 Doors, windows and frames are examined for deteriorated finish. Observe worn spots resulting from handling and washing.

5.08 Inspect venetian blind finish for peeling, checking, chalking and worn spots. Also examine for cracked, bent or broken slats and defective tapes, ropes and hardware.

5.09 Window shades are examined for tears, stains and defective roller operation. Examine drapes for fading, worn or torn areas and loose hangers.

5.10 Examine doors and windows for cracked, loose or broken glass and loose, defective or missing hardware. Inspect wind deflectors for cracks. Wind deflector support brackets should be examined for loose mounting screws. Spot check windows for ease of operation.

Floors and Floor Covering

5.11 Floors and floor covering are observed for indications of wear, damage and tripping hazards. Inspect masonry floors for cracks, open joints, spalling and raised or settled sections. Wood floors are examined for sagging, settling and rotting. Woodwork should also be inspected for evidence of termite damage in areas where these insects are prevalent.

5.12 Check for indentations of floor covering caused by chairs, desks, tables, lockers, file cabinets and ladders. Floor covering deteriorated by age and wear will be indicated by checks, cracks and dull areas that do not respond to normal waxing.

Stairways

5.13 Stairway safety treads and landings are examined for worn, loose or damaged sections.

5.14 Handrails, balustrades, newels and brackets are checked for loose connections and anchorages.

5.15 Open and close stair doors to observe self-closing features.

5.16 Check for adequate illumination and signs indicating the way of egress.

Electrical and Plumbing Fixtures

5.17 Inspect light fixtures for cracked or broken reflectors and deteriorated finish. Give special attention to fixtures not securely attached to ceiling or wall.

5.18 Observe wall, pedestal and floor fans for dripping oil, frayed or damaged electric cords and condition of safety guards. Pedestal fans should be set with the center line of the motor about 8'6" above the floor so that the clearance to the guard will be well over 6 feet.

5.19 Inspect switches and electrical outlets for loose, broken or missing cover plates and screws.

5.20 Inspect washbasins, service sinks, toilets and urinals for drainage and for chipped, cracked or broken porcelain. Observe condition of stoppers in washbasins and sinks. Examine faucets, soap dispensers and flush valves for leaks, improper operation, corrosion and necessity of replating or replacing.

6. INSPECTION PROCEDURE

6.01 The Check List, Form E-3928, is used as a guide in making the inspection and notes on the inspection are made on Form E-3923, Notes on Inspection. Notes are numbered on the latter form and may be numbered after the appropriate item on the Check List for identification. When the note concerns painting, the number is written in the column headed "Paint" even though the item in question may appear elsewhere on the Check List.

6.02 Unsatisfactory conditions found are described in adequate detail on Form E-3923 and recommendations for corrective action should be included. Space is provided for indicating the urgency and estimated cost of completing the work. Minor items need not be estimated but should be marked "Minor." Form E-3923 is shown in Exhibit 2 filled in for a typical inspection.

6.03 In making the inspections, the following procedure is suggested:

(a) Inspect the building interior with the supervisor in charge of the building and check deteriorated or damaged conditions known to him.

(b) The status of items reported as a result of previous building interior inspections and scheduled for completion prior to the current inspection should be checked. Special attention is given to those items reported as requiring attention at a future date.

(c) Check status of interior maintenance items reported in the most recent House Service Inspection Report (B.S.P. Section H54.201).

(d) Inspections may be started either on the uppermost floor or in the basement; however, one floor should be completely inspected before continuing to another. Reference to the Check List will assist in assuring that all items will be inspected.

(e) Special attention is given ceilings directly below the roof, washrooms, service rooms or kitchens for indications of water penetration and leaks. Examine interior surfaces of exterior walls for water penetration, particularly areas adjacent to windows and doors.

(f) Electrical and plumbing fixtures, including associated outlets and plumbing should be spot checked during the course of the inspection. While these items are normally repaired on a routine basis when required, this inspection provides a supervisory check and record of maintenance conditions.

(g) Fire protection equipment tests and inspections are made in accordance with the Bell System Practices covering those procedures and are therefore not included in this section; however, it may be desirable to schedule such tests and inspections to coincide with this inspection.

7. BUILDING MAINTENANCE INSPECTION REPORT, FORM E-3924

7.01 Recommendations for interior painting and maintenance work are made by reviewing notes taken during the inspection on Form E-3923 and summarizing them on the Building Maintenance Inspection Report, Form E-3924. A copy of this form filled out for a typical inspection is shown in Exhibit 3.

7.02 Address the report in the space provided and forward to the building, district, division or area supervisor responsible for maintenance of building interiors as required by local practice. Copies of the report may be sent to other interested supervisors for their information.

7.03 Complete the heading of the form by filling in the name of the person making the inspection, date of inspection, city and building.

7.04 Describe briefly but adequately the condition of each item requiring attention and indicate the repairs required in the space headed "Recommendations." Items referring to the same type of work are grouped together. Consult with the appropriate supervisor before recommending painting or repairs to determine whether alterations, moves or other projects are scheduled for the quarters under review.

7.05 This report is prepared on the basis that the condition of each item inspected is satisfactory unless indicated otherwise.

7.06 The urgency for corrective action is indicated by the letter A, B or C entered in the column headed "Urgency." Classification is made according to the following:

A - Requires immediate repairs.

B - Repairs are required but will be scheduled for completion prior to the next inspection.

C - Condition is deteriorated but repairs are not required prior to the next inspection when the item is to be reexamined.

The interval between scheduled inspections should be considered when classifying conditions recognized as unsatisfactory but not requiring repairs before the next inspection.

7.07 Enter the estimated cost of making the repairs recommended for each item in the column headed "Est. Cost." Minor repairs need not be estimated but are marked "Minor" in the estimated cost column.

7.08 The data thus accumulated will assist in preparing a budget and schedule of interior maintenance for the following period.

7.09 The remainder of the Inspection Report form provides a means of checking the progress of recommended repairs. The supervisor whose signature appears in the lower right-hand corner of the form should indicate in the space provided the date desired to have the form returned to him for review. This date should be set sufficiently in the future to allow adequate time for completing the recommended repairs or to conform to scheduled completion dates.

7.10 On or before the return date indicated, the supervisor responsible for completing the repair work should indicate the action taken on each item and return a copy of the form to the originator.

7.11 Information of interest, i.e., order numbers, contract references, costs or other pertinent data should be included. Indicate the date of completion where applicable. The status of uncompleted items should be shown.

7.12 Arrangements to follow up uncompleted items should be made as necessary.

7.13 It is suggested that a folder be provided for each building for filing the periodic interior building inspection reports and the inspection reports on exterior and grounds (B.S.P. Section H54.310). Correspondence associated with recommendations resulting from the inspections may be included together with copies of routine orders, work requests, contractors' bills and major invoices for completed jobs.

Attached:
Exhibits 1 through 3, inclusive.

Exhibit #1

E-3928
(3-52)

CHECK LIST
BUILDING INTERIOR INSPECTION

INSPECTED BY a. Jones

CITY Alphatown

DATE 9-18-51

BUILDING Alphatown C.O.

* WALLS	FLOORS	FIXTURES
BASEBOARDS	ASPHALT TILE	FANS
CEILING	CARPET	FAUCETS
COLUMNS	CERAMIC TILE	FLUSH VALVES 5
MARBLE 1	CONCRETE	FUSE PANELS
MOULDINGS	LINOLEUM 2	GRILLS
PARTITIONS	MARBLE	LIGHTS
PLASTER	RUBBER TILE	RADIATORS
TILE	RUG	SERVICE SINKS
TRAVERTINE	TERRAZZO	SWITCHES
WALLS	TRAVERTINE	TOILETS
	WOOD	URINALS
		WASH BASINS
PAINT	*** DOORS & WINDOWS**	*** STAIRWAYS**
PAINT 3 4	DOORS	ANCHORAGES
	DOOR CLOSERS	BALUSTRADES
	DRAPES	BRACKETS
	FRAMES	HANDRAILS 7
	HARDWARE	ILLUMINATION
	SHADES	LANDINGS
	VENETIAN BLINDS 6	NEWELS
	WINDOWS	SAFETY TREADS
		SIGNS

NUMBER NOTES MADE ON THE INSPECTION AND PLACE THE NUMBER OPPOSITE THE ITEM ABOVE FOR REFERENCE. ITEMS NOT NUMBERED INDICATES CONDITION IS SATISFACTORY. USE BLANK SPACES FOR WRITING IN ITEMS NOT LISTED.

* LIST PAINTING NOTES UNDER "PAINT".

PRINCIPAL CONDITIONS TO OBSERVE

WALLS

CRACKS
EFFLORESCENCE
LOOSE PLASTER
LOOSE TILE
OPEN JOINTS
POINTING LOOSE
ROTTED WOOD
SPALLING
WATER MARKS

FLOORS

BREAKS OR CRACKS
INDENTED
LOOSE EDGES & SEAMS
ROTTED
SPALLED SURFACE
TERMITES
UNEVEN
WORN

FIXTURES

CORRODED
CRACKED OR BROKEN
DEFECTIVE OPERATION
DETERIORATED FINISH
LEAKING
LOOSE
PARTS MISSING

PAINT

BLISTERED
CHALKY
CHECKED
DETERIORATED
PEELING
SOILED
WORN

DOORS & WINDOWS

BENT
CORRODED
CRACKED OR BROKEN
DEFECTIVE HARDWARE
IMPROPER OPERATION
LOOSE
ROTTED
TORN

STAIRWAYS

BALUSTRADES LOOSE
BROKEN OR CRACKED STEPS
DAMAGED HANDRAILS
HANDRAILS LOOSE
INSUFFICIENT SIGNS
WORN OR DAMAGED TREADS

E-3923
(1-52)

NOTES ON INSPECTION

INSPECTED BY a. Jones CITY Alphatown

DATE 9-18-51 BUILDING Alphatown C.O.

NO.	NOTES	URGENCY* EST. COST
1	Marble trim above public entrance in business office is cracked. Immediate replacement of cracked section recommended to remove accident hazard.	A 75.00
2	Linoleum along main frame is indented and cracked in same location.	C
3	Walls of equipment room will require painting when current installation job is completed about 12.15.51	B 450.00
4	Paint on walls in D S A operating room is faded and deteriorated with age and washing. Painting recommended.	B 150.00
5	Flush valves in women's washroom are beyond economical repair and should be replaced.	B 50.00
6	Venetian blind pulled loose from window at south end of room 201. Reinstall	A Minor
7	Handrail of rear stairway between 1st. and 2nd. floor is pulled loose from wall. Should be remounted as soon as possible.	A Minor

* INDICATE URGENCY BY LETTER
A - REQUIRES IMMEDIATE REPAIR
B - REPAIRS TO BE SCHEDULED
C - RE-EXAMINE ON NEXT INSPECTION

* MINOR ITEMS NEED NOT BE ESTIMATED - MARK "MINOR."

E-3924
(1-52)

BUILDING MAINTENANCE INSPECTION REPORT

TO H. Smith
Div. Supv. of Bldgs. & Suppls.
TITLE

INSPECTED BY A. Jones
DATE 9-18-51

CITY Alphatown
BUILDING Alphatown, C.O.

ITEM NO.	RECOMMENDATIONS	URGENCY*	ESTIMATED COST	ACTION TAKEN	DATE COMPLETED
1.	Replace cracked section of marble trim above public entrance, business office.	A	75.00	Replaced on W.O. #5827, contract with Acme Marble Co., Cost $75.00	9-26-51
2.	Reinstall venetian blind pulled loose from window at south end of Room 201.	A	Minor	Completed by building mechanic.	9-24-51
3.	Remount handrail pulled loose between 1st and 2nd floor, rear stairway.	A	Minor	Completed by building mechanic.	9-24-51
4.	Paint walls, D.S.A. operating room.	B	150.00	Work approved on W.O. # 5960 now in progress. Contract with A.B. Smith Co. Scheduled for completion 12-14-51	
5.	Paint walls, 2nd floor equipment room.	B	450.00	See 4 above.	
6.	Replace flush valves, women's washroom.	B	50.00	Replaced valves on W.O. # 5928 completed by building mechanic. Cost $46.00	11-21-51
7.	Linoleum along M.D.F. indented and cracked.	C	-	None at this time.	

RETURN ONE COPY OF THIS REPORT BY 12/18/51
SHOW ACTION TAKEN AND COMPLETION DATES.
INDICATE STATUS OF UNCOMPLETED ITEMS.

* INDICATE URGENCY BY LETTER
A - REQUIRES IMMEDIATE REPAIRS.
B - REPAIRS TO BE SCHEDULED.
C - RE-EXAMINE ON NEXT INSPECTION.

S. Brown
Supt. of Bldgs.
TITLE

Exhibit #3

MAINTENANCE OF ANTENNA SUPPORTING STRUCTURES

1. GENERAL

1.01 This addendum is issued to provide definite inspection intervals for the various guyed and self-supporting tower components. It supersedes the intervals mentioned in Sections 4 and 5 of the Bell System Practice.

1.02 Federal Communication Commission rules and regulations require that all inspections shall be recorded in the station record.

1.03 Tables A and B of this addendum specify the required initial and subsequent inspection intervals.

TABLE A

INSPECTION AND MAINTENANCE STEEL TOWERS

SELF-SUPPORTING

Inspection Item	Initial Check 6 Mos. to 1 Yr. After Installation	2nd Check 2 Yrs. After Initial Check	Routine Check Intervals Every 3 Months	Every Year After Initial	Every Four Years After 2nd Check	Special After High Winds of Hurricane Force Or Other Unusual Loading
Tower						
1. Bolted Connections	X	X(Note B)				X(Note B)
2. Protection Against Corrosion	X			X(Note A)	X	
3. Air Navigation Obstruction Painting	X			X(Note A)	X	
4. Concrete Base	X			X		
Waveguide and Other Transmission Lines						
1. Bolted Flanges	X				X	
2. Rigid Waveguide	X				X	
3. Flexible Waveguide	X				X	
4. Waveguide Supports	X				X	
5. Pressure Windows	X				X	
6. Coaxial and Concentric Runs	X				X	
7. Tower Ground Connections	X				X	
Obstruction Lights						
1. Operation - Alarms			X			

Note A - This check should be a visual examination from the ground by telephone forces. Evidence of deterioration such as streaks of rust, peeling of paint, etc., should be used to judge whether further detailed inspection is necessary.

Note B - Spot Checks should be made. Further work to depend upon results of this check.

TABLE B

INSPECTION AND MAINTENANCE STEEL TOWERS

GUYED TYPE

Inspection Item	Initial Check 6 Mos. to 1 Yr. After Installation	2nd Check 2 Yrs. After Initial Check	Routine Check Intervals: Every 3 Months	Routine Check Intervals: Every Year After Initial	Routine Check Intervals: Every Four Years After 2nd Check	Special After High Winds of Hurricane Force Or Other Unusual Loading
Tower						
1. Bolted Connections	X	X(Note B)				X (Note B)
2. Protection Against Corrosion	X			X(Note A)	X	
3. Air Navigation Obstruction Painting	X			X(Note A)	X	
4. Concrete Base	X			X(Note A)	X	
5. Tower Alignment	X	X			X	X
6. Guy Tension						
Visual			X			
Tension Measurement By Gauges or Tension By Oscillation (See Section 6)	X	X			X	X
Waveguide and Other Transmission Lines						
1. Bolted Flanges	X				X	
2. Rigid Waveguides	X				X	
3. Flexible Waveguide	X				X	
4. Waveguide Supports	X				X	
5. Pressure Windows	X				X	
6. Coaxial and Concentric Runs	X				X	
Obstruction Lights						
1. Operation - Alarms			X			

Note A - This check should be a visual examination from the ground by telephone forces. Evidence of deterioration such as streaks of rust, peeling of paint, etc., should be used to judge whether further detailed inspection is necessary.

Note B - Spot checks should be made. Further work to depend upon results of this work.

INSPECTING AND TESTING

OF FIRE SHUTTERS

1. GENERAL

1.01 This section outlines the procedures to be followed for inspecting, testing and maintaining fire shutters provided on certain telephone buildings as a fire protective measure.

1.02 The two types of fire shutters used on telephone buildings are the "Automatic Rolling Fire Shutters" and "Manually Operated Fire Shutters."

1.03 Fire shutters are mounted on the exterior of certain telephone buildings while on others, where appearance is a factor, they are mounted on the interior.

1.04 The purpose of inspecting and testing fire shutters is to assure their unfailing operation in the event of exposure to fire in nearby property.

1.05 Every fire shutter should be inspected and tested at least once a year.

2. AUTOMATIC ROLLING FIRE SHUTTERS

Description

2.01 This type fire shutter, see Figs. 1 and 2, consists of an interlocking steel curtain which coils on a steel tube in a housing above the window opening. The shutter when raised or dropped, travels in vertical steel guides which may be secured to the window frame or the face of the window opening.

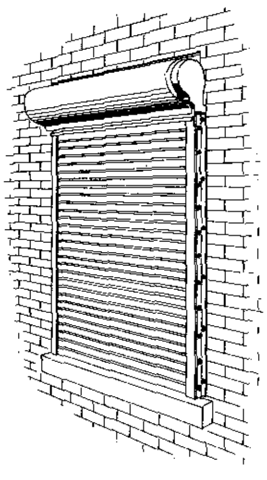


Fig. 1 - Exterior Mounted Automatic Rolling Fire Shutter

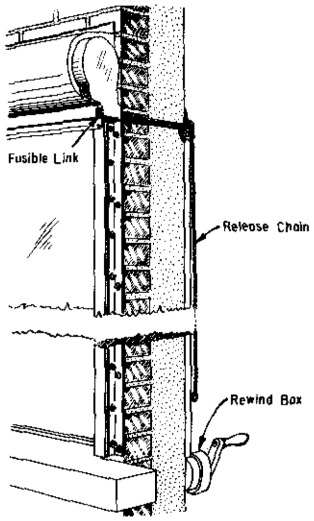


Fig. 2 - Cross Section of Exterior Mounted Automatic Rolling Fire Shutter

Operation

2.02 The fire shutter is held in the open position by a locking device controlled by a fusible link. This fusible link melts at a comparatively low temperature, thereby, automatically releasing the lock and dropping the shutter to close the window opening.

Testing

2.03 To test this type fire shutter, it may be manually dropped to the closed position by tripping the release chain located within reach on the inside of the window. When operating properly the entire window opening will be covered by the shutter when in the closed or dropped position. In the event the shutter does not operate properly, repairs should be made promptly.

Inspection

2.04 An inspection of fire shutters is required to disclose the accumulation of dirt and/or other obstructions which would impede their proper functioning. This inspection should ascertain the following:

(a) That the working mechanism, where exposed, is free from accumulations of dirt and other foreign material. The material deposited by the nesting of birds in the space between the interlocking curtain and the housing is a frequent cause of obstruction in the working mechanism.

(b) That the fusible link is properly connected and is not covered with paint or other material which would prevent its functioning at design temperature. Fusible links which are found covered with paint should be thoroughly cleaned or replaced with a new link. The use of a fusible link having a melting point of 165°F. is considered normal practice.

(c) That the vertical steel guides in which the fire shutters travel, are free from accumulations of paint or dirt which would impede their proper functioning.

3. MANUALLY OPERATED FIRE SHUTTERS

Description

3.01 Manually operated fire shutters, see Figs. 3 and 4, sometimes known as the swinging type, are of metal construction. Each shutter is equipped with hinges and a suitable latch arrangement to secure it in the closed position.

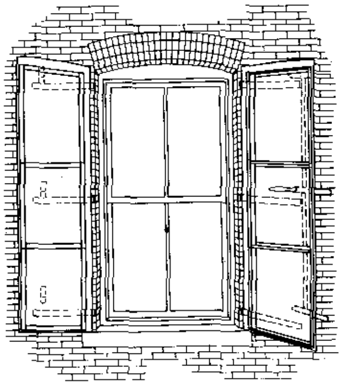


Fig. 3 - Manually Operated Fire Shutter - In Open Position

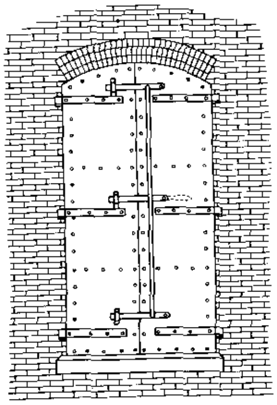


Fig. 4 - Manually Operated Fire Shutter - In Closed Position

Operation

3.02 For normal operation of this type shutter, in the event of fire, manually place the shutter in fully closed position and set the latch arrangement.

Testing

3.03 To test this type of shutter manually close and lock the shutter as in the event of fire.

Inspecting

3.04 When inspecting this type of shutter, the following items should be checked:

(a) Openings are clear to permit a free and complete closing of the shutters.

(b) All exposed parts are free of dirt or other accumulations.

(c) Latch arrangement and hinges are properly lubricated, operate freely and hold the shutters securely against the opening when closed.

(d) All parts are free from corrosion.

4. REPAIRS AND MAINTENANCE

4.01 Defective fire shutters should be repaired promptly so that the exposed window opening will not be left unprotected in the event of fire.

4.02 Care should be exercised during building exterior maintenance painting, to avoid applying excess paint on the working parts of the fire shutter.

4.03 In the case of automatic rolling fire shutters, special attention should be given to the following:

(a) The fusible link should not be painted as a coating of paint prevents the link from parting at the temperature for which it was designed.

(b) Excess paint should not be applied to the vertical guides in which the fire shutters travel. A too heavy coat of paint on the guides will impede the automatic closing of the shutters.

(c) The interlocking steel curtain is usually protected from the elements when the fire shutter is in the open position and does not require repainting as often as the exposed metal parts.

(d) When interlocking steel curtains are painted only a thin coat should be applied. The paint should be thoroughly dry before the shutter is restored to the open position.

(e) After each painting the shutter should be tested as outlined in Paragraph 2.03.

4.04 On the manual type fire shutters, the latch arrangement and hinges should be lubricated twice a year to insure their proper operation.

4.05 A record should be maintained of all fire shutter locations in each building. Space on this record should be provided for posting the date each shutter is inspected and tested.

TARPAULINS

1. GENERAL

1.01 Tarpaulins of the portable type are used to protect telephone equipment and in some cases other important apparatus or records from possible damage from water due to roof or plumbing leaks or other emergency conditions. They should not be used in an effort to smother incipient fires.

1.02 This section is reissued to specify the use of an improved type portable tarpaulin as recommended in P.E.L. 5939. The new tarpaulin can be stored in the present tarpaulin container. It is suggested that consideration be given to the replacement by the improved type tarpaulin of all tarpaulins of the KS-5143 type which have been in service ten years, or earlier where warranted.

1.03 For operation and maintenance application this section is dually numbered and the same issue number is assigned for uniformity.

1.04 Arrows are used to indicate changes in the text.

2. DESCRIPTION

2.01 The KS-15648 List 3 Portable Tarpaulin, described in P.E.L. 5939, is waterproof and flame-retardant. It is approximately 5 feet 10 inches wide by 12 feet long, and is designed for emergency use in telephone offices. The tarpaulin material consists of nylon cloth having a gray-colored coating of polymer or copolymer polyvinyl chloride resin with the hem and center seam electronically sealed. This material is reasonably pliable so that the tarpaulin may be draped over delicate apparatus without danger of damaging the apparatus. The tarpaulin is equipped with grommets in the hem so that it may be tied in position with tie cords when in use. Six tie cords 2 feet 9 inches long are furnished with each tarpaulin and they are stored between the folds when the tarpaulin is in the container.

2.02 Portable tarpaulins are not of sufficient size to protect entire pieces of large equipment (such as a switchboard) from a fire hose or major plumbing break. They are intended to temporarily cover portions of any equipment or apparatus which are threatened from leaking roofs, defective plumbing, etc.

3. MOUNTING

3.01 Portable tarpaulins should be stored two in each sheet metal container provided for the purpose, and this container should be mounted without brackets, as shown in Fig. 1.

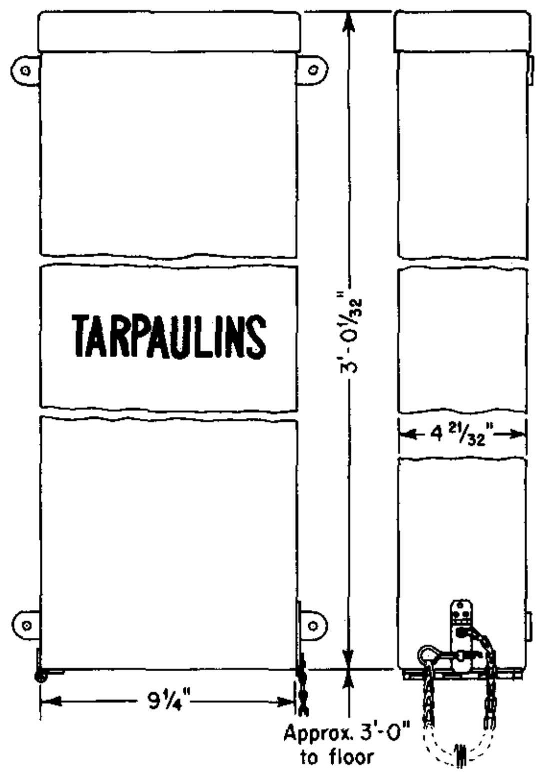


Fig. 1

4. METHOD OF USING

4.01 To use the portable tarpaulins, proceed as follows:

(1) Remove one or both tarpaulins from the container and carry to the required location.

(2) Place tarpaulin over equipment to be protected and, if necessary, secure it in place using eyelets provided in the hem and the tie cords folded with the tarpaulin.

(3) Provide arrangements for taking care of water leakage.

(4) After emergency has passed, dry tarpaulins thoroughly and return to container. Tarpaulins should not be dried over radiators or gas heaters.

5. MAINTENANCE

5.01 → Maintenance of and folding instructions for tarpaulins are covered in Section →H54.610 (H44.210).

INSPECTING AND TESTING GAS PIPING

1. GENERAL

1.01 This section outlines the methods and procedures for inspecting and testing of all piping used for the distribution of natural and manufactured gas in all owned and leased telephone buildings. This section also applies to all buildings using bottled gas.

1.02 Every employee should be mindful at all times of the potential hazards that accompany gas leaks. Any odor of gas must be reported at once. All leaks, however small, are to be repaired immediately. It is important that the local gas company be notified at once.

1.03 Particular care should be exercised by employees having occasion to enter unattended buildings, as for example Community Dial Offices, located in gas service areas.

1.04 If escaped gas is detected anywhere within a building, the area in which the odor of gas is detected should be thoroughly ventilated by opening windows, exterior doors or other means at once. DO NOT USE electric ventilating fans. Continue ventilation until the source of the leak is located and repaired. During this period, do not turn on or off any electric lights or apparatus. If illumination is required, use a flashlight which has been switched on while in a safe area.

1.05 In any area where there may be escaped gas, DO NOT SMOKE or use any OPEN FLAME.

1.06 It is recommended that where practicable the gas service should enter the building above ground level. Service entrances supplying manufactured gas, in locations where there is a possibility of freezing, should be laid below the frost line.

1.07 The inspection and tests outlined herein shall be made only by experienced (licensed) workmen. The local gas company or qualified plumbing contractors may be employed to do the work.

1.08 Because of the corrosive action of cinders, gas pipe should never be laid in such a fill. Consideration should be given to the removal of all gas piping, either inside or outside of a building, where presently laid in a cinder fill.

1.09 Initial tests of gas piping in new buildings or major additions will be made by the contractor under the supervision of the Engineering Department.

1.10 It is recommended that the inspection and testing procedures described in this section be scheduled at least once each year.

1.11 When any piping, meters or other units are dismantled from a gas piping system they should be removed from the building at once.

2. INSPECTION

2.01 All exposed gas piping shall be inspected to see that it is in good condition with particular attention to supports, joints, corrosion, foreign loads and strain.

2.02 The gas service entrance shall be inspected to assure that the seal around the pipe where it enters the building is tight. The basement walls near the gas service entrance should be checked for cracks or openings which would permit the seepage of gas into the building.

3. TESTING PRECAUTIONS

3.01 The locations in a building where the gas pipe testing is to be conducted should be properly ventilated so as to eliminate all potential hazards. Every precaution shall be taken so that no escaping gas enters a central ventilating system.

4. TESTING GAS SERVICE ENTRANCE

4.01 A gas indicator, Fig. 1, (Mine Safety Appliances Company's Explosimeter - Model 2) or its equivalent is used for detecting combustible gases such as natural gas, manufactured gas, gasoline vapors, etc. in utility service entrances, curb boxes or other confined spaces.

4.02 Ordering information for gas indicator.

For complete unit:

(Quantity) - Indicator, Gas, Explosimeter, Model 2 with 15' of hose and DN48940 carrying case.

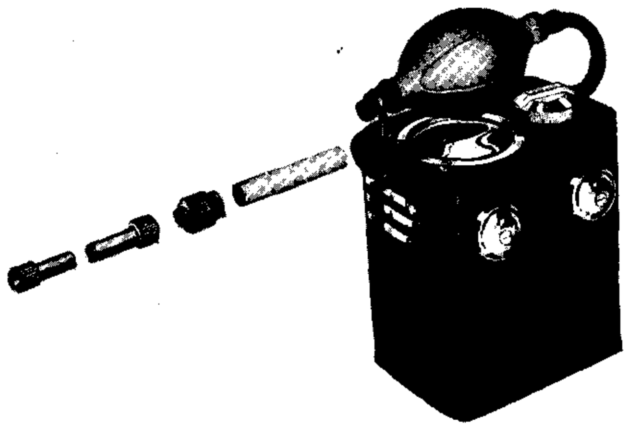


Fig. 1 - Explosimeter

4.03 The proper procedure for conducting this test is as follows:

(a) At the curb box valve, remove cover plate and lower sampling hose into the curb box. Operate instrument as outlined in manufacturers' instructions.

(b) Inside the building the "Explosimeter" should be used in testing for gas mixtures at the gas service entrance and where all underground utilities including telephone cable ducts enter the building.

4.04 If gas is found at any of the above locations, the matter should be reported to the local gas company at once.

5. TESTING GAS LINES WITHIN BUILDING

5.01 The procedure to be followed in testing all interior gas piping is as follows:

(a) Shut off pilot burners on all lights and appliances.

(b) Shut off main gas valves to the heating boiler, hot water heater, and to any other gas fired equipment.

(c) Shut-off valve to gas engine.

(d) The emergency curb valve and the building main shut-off valve remain in the open position.

5.02 With the valve settings as indicated above, watch the test hand on the gas meter for any flow of gas. One revolution of the test hand of the gas meter usually registers a flow of 1/2 to 1 cubic foot of gas. Therefore an extremely small flow of gas can be readily detected.

5.03 Observe the position of the test hand of the meter for 10 minutes. Any movement of the test hand indicates a leak which must be located and repaired.

6. REPAIRS

6.01 Leaks should be repaired immediately whether disclosed by test or when noticed at other times.

6.02 When the leak occurs in concealed piping, shut off the system at the meter.

6.03 If it appears that extensive repairs or rearrangements are necessary to eliminate a leak in concealed piping, the proper authority should be consulted as to the corrective measures to be taken.

6.04 A simple and reliable method for locating leaks in exposed piping is by the application of a soap solution on pipes and fittings. A leak is located wherever the escaping gas forms bubbles in the applied soap solution. The recommended solution for testing is ordered as (Quantity) can, Solution, Testing pressure, B, 1 quart.

7. RESTORING SYSTEM TO SERVICE

7.01 Following repairs repeat the appropriate tests to make sure repairs have been made satisfactorily.

7.02 Restore system to service in this order:

(a) Open main shut-off valve at the meter.

(b) With normal gas pressure in the piping, test all valves and connections that have been opened and closed with the soap solution referred to in Paragraph 6.04.

(c) Bleed the gas at various appliances at the far end of the system until there is no interruption to the flame because of entrapped air in the piping.

(d) Light and adjust pilot burners on equipment or appliances so equipped.

(e) Whether heat is required or not light the gas fired heating plant in accordance with instructions applying thereto. Do the same for the hot water heater and other automatically controlled gas fired equipment. This equipment need be operated only long enough to insure that it is functioning properly.

8. UNUSED PIPING

8.01 Gas piping no longer required to serve outlets or appliances, should wherever practicable, be disconnected and removed. Idle branches should be disconnected at the main line. Carefully cap all openings.

9. CERTIFICATE

9.01 When each test is completed, the inspection certificate Form E-3900 shall be signed and dated by the inspector.

9.02 The certificate shall be framed and mounted in a readily visible location, preferably in the vicinity of the gas meter.

9.03 Exhibit A is an illustration of the inspection certificate.

EXHIBIT A

Name of Building

E-3900
(3-52)

CERTIFICATE

The undersigned certifies that the gas piping system in this building has been inspected and tested and is declared safe and without leaks. The piping was tested in accordance with Bell System Practice H54.340 "Inspecting and Testing Gas Piping".

DATE	INSPECTOR'S SIGNATURE	NAME OF EMPLOYEE, GAS CO. OR CONTRACTOR

PROTECTION AGAINST EXPOSURE FIRES

1. GENERAL

1.01 This section outlines recommended standards of construction for preventing fire from entering and spreading through fire-resistive telephone buildings. Protection against exposure fires involves principally the provision of fire-resistive wall and roof surfaces and protection of the necessary openings for windows, doors, ventilation air intakes, and stairway and elevator shaft roof structures. The measures suggested for protection against exposure fires are also considered for protection against missiles and other hazards of strife.

1.02 The amount of protection to be provided is determined for each particular building depending on the character of adjacent buildings and their contents, and the distance between them and the telephone building. Any change in exposure which may occur from time to time is a matter for immediate reporting and attention and should be included for checking on inspection routine.

1.03 This section is revised and reissued to modify the requirements for the use of labeled windows in fire-resistive telephone buildings. For operation and maintenance application the section is dually numbered with this issue and the same number is assigned for uniformity.

1.04 The suggested standards of construction are based, in general, on the National Fire Codes, Volume III — Building Construction and Equipment, of the National Fire Protection Association; and the National Building Code, recommended by the National Board of Fire Underwriters.

1.05 Plans and specifications for new buildings or building additions should be submitted to Marsh and McLennan for their review as to the adequacy of fire protection and it is suggested in addition, that they be consulted whenever there is a change in the exposure of the building.

1.06 For the provision of adequate protection it is recommended that all fire doors, shutters, fire windows, and other similar protective devices for openings in exterior walls bear the label of Underwriters' Laboratories, Incorporated appropriate for the class of protection involved. Materials and devices are tested by Underwriters' Laboratories, Incorporated, for compliance with Laboratory standards of proper construction and performance with regard to their suitability for installation in accordance with regulations of the National Board of Fire Underwriters. Products tested and found to comply with the requirements are listed in Underwriters' Laboratories publications, and many listed products, inspected in current output, are labeled.

1.07 Where the following suggested measures are exceeded by the requirements of local or state codes, the legislated requirements are applicable.

2. WALL OPENINGS

2.01 Wall openings present the principal problem in protection against exposure fires and it is advisable that the openings be limited in size and number to the requirements for rapid egress from the building and for the provision of sufficient light and ventilation as proportionately suited to the various occupancies.

2.02 The avoidance of hazardous surroundings, where practicable, and as outlined in Section H21.111, Selection of Building Sites for Central Offices, is an important factor in limiting the requirements for exposure protection.

2.03 Although the standard protectives generally offer less fire resistance than the walls of which they form a part, they are designed to remain in position as an effective barrier against fire for the desired period of protection. With consideration of the degree of exposure outside the building, wall openings are classified D, E, or F, respectively, for severe, moderate or light exposure.

2.04 Telephone buildings in heavily developed commercial areas may require the protection of Class A or B labeled devices at openings exposed to buildings considered of particularly hazardous occupancy or where the nature of adjacent street or alley traffic warrants their consideration.

2.05 ***Windows***

(a) Labeled windows are provided as single retardants for the protection of Classes E and F openings and are used in combination with fire shutters in Class D openings which require double retardants.

(b) Labeled windows when required are of steel frames and sash, glazed with approved 1/4" wired glass held in place by steel clips. Their use is restricted to the moderate or light exposures because of the inherent limitations of the glass which transmits radiant heat and flows at temperatures often reached in fires. The main variation between the types of labeled windows is the limitations as to the size of individual glass lights and the total exposed areas of glass, with the larger sizes and areas permitted in the Class F openings.

(c) The use of labeled windows is governed mainly by the degree of current fire exposure or the worst possible fire exposure of the building that could exist under the present building codes. If there is any knowledge of pending changes in the Building Codes or Zoning Requirements they also should be considered. The following recommendations should be considered when planning the type of window to be used.

(d) Building exposures requiring labeled windows.

(1) The side of the exposed building located less than 15 feet from any lot line except those fronting on a street.

(2) The exposed building located 15 or more feet from an exposing building or any lot line, but requiring a single retardant under the provisions of the National Building Code, 1955 Edition, Paragraph 803, along with Standard 80-A found in NFPA's National Fire Codes, Volume III—Building Construction and Equipment.

(e) The automatic operation of windows is not generally required and is not recommended because of the accident hazard involved in the failure of the automatic device.

(f) Street front windows in first floor non-equipment space such as public offices, clerical offices and quarters may be glazed with plain glass, provided the outside exposure is separated from any equipment space by a ceiling high partition having a fire resistance rating of not less than one hour. In order to maintain the fire-resistive efficiency of this partition it is important that any view openings be protected in an approved manner. The use of wired glass as a single retardant is recommended to conform to the requirements for the use of wired glass in Class C openings in interior partitions. In the event it is considered desirable to use ordinary plate glass in the view openings it is suggested that steel shutters be provided.

(g) Where labeled windows are not required, the sash and frame are of noncombustible material, such as aluminum, steel, etc, in fire-resistive buildings.

2.06 ***Fire Shutters***

(a) Rolling steel fire shutters are used in combination with windows to provide Class D labeled protection for openings in walls under severe exposure. Their use in telephone buildings, however, is determined by the requirements of local codes pertaining to fire-resistive construction or the recommendations of Marsh and McLennan in consideration of the severity of exposure, under the procedures outlined in Section H44.015, Fire and Safety Inspection and Advisory Services Rendered by Marsh and McLennan.

(b) Considerations of the high initial cost and subsequent maintenance and testing involved, indicate for new buildings definite fire protection advantages in omitting certain windows or spacing them farther apart. Where a serious exposure hazard develops at an existing building, similar advantages may be gained where practicable, by closing the exposed opening with masonry. The practicability of these alterations, however, would depend largely upon the occupancy, and ventilation requirements of the space exposed.

(c) Where the conditions of construction and character of occupancy permit, installation of fire shutters on the interior face of the wall opening offers the advantages of protection from weather, appearance, and ease of access for operation.

(d) The automatic operation of fire shutters generally does not appear to be warranted in telephone buildings, and where required is limited to use on openings not intended for emergency exits.

(e) Rolling shutters should be provided with approved attachments for conveniently testing their operation from the inside of the building, and with approved safety attachments to prevent their operation while windows are being washed. These attachments are designed to prevent the shutters being left in an inoperative condition.

2.07 ***Doors***

(a) Door openings in exposure walls normally do not serve to provide light or ventilation to the building and are therefore more easily protected by standard fire doors.

(b) Openings in exposure walls to provide exit to outside balconies associated with smokeproof towers and the opening into the tower from the balcony are generally protected by Class E labeled doors. Class D labeled doors are used in these locations, however, where the severity of the outside exposure warrants the use of Class D labeled protection for adjacent window openings in the building wall.

(c) Doors at openings used as exits are of the swinging type where practicable, opening in the direction of exit travel and are provided with self-closing devices.

(d) Self-closing doors are normally closed and latched in the closed position, and it is important that their closing is not prevented, by wedging or tying in the open position.

(e) Latching devices are provided on self-closing doors to prevent warping of the door under severe exposure in the closed position, and it is important that the devices be maintained in sound operative condition at all times.

2.08 ***Miscellaneous Openings***

(a) Louvered or hooded openings in exposure walls for ventilation air intakes, etc, are generally equipped with automatic fire dampers or automatic rolling steel shutters.

(b) Equipment entrances, when required to be open, offer a definite fire hazard if temporary protection is not provided. Loading platforms associated with equipment installations are generally installed in a manner which prevents the use of the doors or windows normally intended to protect the exposure. It is considered advisable that temporary closures of incombustible materials be provided for protection of the openings when in use, and that loading platforms be constructed of incombustible materials for protection at the opening when in use.

2.09 ***Glass Blocks***

(a) Glass block panels are suitable for use only in exterior walls of light exposure or where there is no exposure.

(b) Where used as window protectives under light exposure the panels are limited in area to 120 square feet.

(c) Where there is no exposure the panels are limited in area to 144 square feet.

(d) Glass blocks are not used in fire walls, party walls, enclosure walls of stairs or elevator shafts, or in any wall subject to moderate or severe exposure.

3. ROOF COVERING

3.01 Approved fire-resistive roof coverings are classified A, B or C, respectively, in consideration of their effectiveness against severe, moderate or light exposure from outside fires. The properties of roof coverings which are considered in determining their classification include: (1) their flammability, (2) degree of heat insulation they afford the roof deck, (3) their stability under fire exposure, (4) absence of flying brand hazard, and (5) the frequency of repairs necessary to maintain their fire-resistive properties.

3.02 Fire-resistive telephone buildings generally require roof coverings of standard quality approved and listed by Underwriters' Laboratories as Class A or B.

3.03 Built-up roof coverings surfaced with gravel, crushed stone or slag, are generally provided on flat roofs for protection from severe or moderate exposure. Where asbestos felt is used for the built-up layers, the surfacing is not required. Other types of coverings acceptable for Class A or B installation include tin, copper or other metal; slate, clay or Portland cement tile, and asbestos shingle.

4. ROOF OPENINGS

4.01 *Skylights*

(a) Due to the considerations of high initial cost, attendant maintenance and hazard of leaks, it is desirable that the use of skylights be limited to locations where necessary equivalent light or ventilation can not be furnished by windows, or where skylights are required by local ordinances.

(b) The framework and sash of skylights are of galvanized iron, copper or monel metal, properly reinforced where span requires, securely fastened to angle irons on the roof.

(c) Skylights over stair, dumbwaiter, air or similar shafts are glazed in an approved manner with plain glass not over 3/16" thick, not over 18" wide, nor more than 720 square inches in area, protected with approved wire screens.

(d) Skylights for ventilation and other purposes which are inclined less than 80 degrees to the horizontal are glazed with 1/4" thick wired glass or 1/2" plate glass protected with approved wire screens. The panes are limited in width to 18" and in area to 1728 square inches.

(e) Where skylights inclined at an angle of 80 degrees or more to the horizontal are subject to exterior exposure, approved wired glass not less than 1/4" thick or 1/2" plate glass protected with approved wire screens are used. The unsupported surface of the glass is limited to 48" in either dimension and 720 square inches in area.

4.02 *Scuttles*

(a) Where scuttle openings are provided for access to the roof, their fascias and covers are constructed preferably with steel plates and angles. Scuttle openings are at least 2 feet by 3 feet in size.

(b) Scuttle covers are hinged and counterbalanced to facilitate operation and minimize accident hazard.

(c) Stairs or permanent ladders with handrails are provided to give ready access to the scuttles.

INTERIOR CONSTRUCTION

TO RESTRICT SPREAD OF FIRE

1. GENERAL

1.01 This section outlines standards for interior construction recommended for restricting the spread of fire in fire-resistive telephone office buildings. In designing telephone buildings to house equipment and associated personnel with greatest flexibility and economy it is essential that the safety of the occupants be assured and that interruption to service and fire losses be avoided. Although primarily for new buildings or additions of fire-resistive construction, these recommendations are considered where alterations are made to existing buildings.

1.02 The construction of floors and interior walls and partitions based upon a predetermined degree of fire resistance will prevent the spread of fire through a building. Such construction divides a building into areas in which a fire can normally be confined without endangering the structural integrity of the building. It is important, however, that proper protection be provided where the fire-resistive efficiency is impaired by the required openings in the floors, walls, and partitions.

1.03 In these recommendations, materials and construction are defined on the basis of performance standards rather than in terms of minimum dimensions and materials. "Fire Resistance Rating" is the time in hours that the material or construction will resist the standard fire exposure as determined by a fire test made in conformity with the "Standard Method of Fire Test of Building Construction and Materials" established by the American Society of Testing Materials. It is suggested that nationally recognized testing laboratories be consulted for test data on materials or construction considered for use on which fire resistance rating information is not readily available.

1.04 The use of non-combustible materials and construction is essential in restricting the spread of fire and it is assumed that the structural members not included in these recommendations are of approved non-combustible construction.

1.05 Where local or state regulations require higher degrees of protection than suggested in this practice, the legislated measures should be followed.

2. REFERENCES

2.01 The recommendations in this practice are based in general on the National Fire Codes of the National Fire Protection Association, Volume III - Building Construction and Equipment; Volume V - National Electrical Code; and the National Building Code recommended by the National Board of Fire Underwriters. National Fire Codes is a compilation of National Fire Protection Association Standards on building construction and equipment and the following standards, which have been adopted by the National Board of Fire Underwriters and pertain to this practice are available in pamphlet form.

Protection of Openings in Walls and Partitions Against Fire (N.B.F.U. No. 80) 1939

Air Conditioning, Warm Air Heating, Air Cooling and Ventilating Systems (N.B.F.U. No. 90) 1950

Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying (N.B.F.U. No. 91) 1949

Copies of the National Building Code and the pamphlets may be had on application to the offices of the National Board of Fire Underwriters, 85 John Street, New York City.

3. DEFINITIONS AND TERMS

3.01 Where reference is made to labeling in this section it refers to the label of Underwriters Laboratories, Incorporated. Materials and devices are tested by Underwriters Laboratories, Incorporated, for compliance with Laboratory standards of proper construction and performance with regard to their suitability for installation in accordance with regulations of the National Board of Fire Underwriters.

3.02 The word "approved" means acceptable to the inspection department having jurisdiction, and installed in accordance with the regulations of the National Board of Fire Underwriters, and when referring to devices, means tested by Underwriters Laboratories, Incorporated. The inspection department having jurisdiction will determine correctness of installation and use.

3.03 Openings in interior walls and partitions are classified A, B, or C in accordance with the fire-resistive requirements of the wall in which they are located, and the "labeled" or "approved" protection recommended applies to all materials and devices, and their installation, in accordance with the class of protection required. Fire doors used for protection of openings in walls and partitions are of two types, as follows:

(a) Self-closing doors are normally closed doors which close and latch when released from the open position.

(b) Automatic doors which are normally open and arranged to close when released by the action of heat.

To provide the protection for which they were designed, fire doors are maintained in reliable operating condition at all times. It is recommended that automatic doors be checked periodically as to condition and also test operated for proper closing. Self-closing doors should not be wedged or tied in open position or in other manner obstructed in closing. The use of fusible link hold-open devices for this purpose does not prevent the spread of smoke, and also may provide a source of draft to the fire. Latching devices should not be removed or made inoperative to eliminate the need of turning the knob in opening the door.

4. FLOORS

4.01 Floor construction has a fire resistance rating of not less than three hours.

4.02 Openings in floors for pipes, conduit, etc., are properly fire-stopped or enclosed with approved non-combustible construction.

4.03 Cable slots in floors are protected in accordance with the recommendations in B.S.P. Section H36.148, Cable Openings.

5. FIRE WALLS

5.01 A fire wall separates buildings or a single building into fire sections extending continuously from the foundation to the roof, and requires construction with a fire resistance rating of not less than four hours.

5.02 The importance of fire walls in preventing the spread of fire makes it essential that openings in such walls are limited in size and number and protected most efficiently. Necessary openings are protected on each side of the wall by approved fire wall, Class A labeled doors. The doors are either self-closing or automatic and when the opening serves as a required horizontal exit, one door of each type is used to protect the opening.

6. SHAFT ENCLOSURES

6.01 Series of floor openings providing communication between two or more successive stories are continuously enclosed to prevent the spread of fire vertically through the building. It is considered desirable to limit openings in shaft enclosures to those necessary for the purpose of the shaft.

6.02 When a floor opening is used for communication between only two stories, as for example, a convenience stairway, the enclosure of the stairway in one story is considered adequate, provided, (1) the stairway is not a required exit, (2) does not connect large equipment areas on the two floors, or (3) does not connect an equipment area with an area of hazardous occupancy.

6.03 Interior stairways and elevator hoistways are enclosed by construction having a fire resistance rating of not less than two hours.

6.04 Openings in stairway and elevator hoistways are provided with approved shaft doors labeled Class B. All such doors except manually operated elevator doors, are self-closing.

6.05 Recommendations on the construction of interior stairways are outlined in B.S.P. Section H32.610, Stairway Planning and Construction.

6.06 Cable openings where necessary in shaft enclosures are protected in accordance with B.S.P. Section H36.148, Cable Openings.

6.07 Shafts used for light, ventilation, dumbwaiters, conduit, etc., are enclosed by construction having a fire resistance rating of not less than two hours and the necessary openings require Class B labeled protection.

6.08 Shafts which do not extend through the roof are enclosed at the top with construction having a fire resistance rating equal to that of the walls of the shaft, and where not extending to a floor are enclosed at the lowest point with floor construction of the same type as required for the lowest floor through which it passes.

7. PARTITIONS

7.01 Partitions used for the subdivision of fire sections of telephone buildings are important in safeguarding life and in restricting the spread of fire throughout the building. By separating areas of different occupancy with adequate fire-resistive construction, telephone equipment can be protected from the more hazardous occupancies of the building.

7.02 Telephone Equipment Areas are separated from other areas by partitions having a fire resistance rating of at least one hour. In equipment areas where future equipment space is used temporarily for non-equipment purposes, it is recommended that such temporary occupancy be separated from the equipment area by a partition having a fire resistance rating of one hour. Doorways in these partitions are protected by self-closing Class C labeled fire doors.

7.03 Mechanical Plant Equipment Areas, such as boiler rooms, elevator machine rooms, ventilating equipment rooms, etc., are enclosed by partitions having a fire resistance rating of one hour and doorways are protected by self-closing Class C labeled doors.

7.04 Permanent Corridor and Room Partitions have a fire resistance rating of one hour and doorways are protected by self-closing Class C labeled doors. Partitions for private offices, quarters, conference rooms, etc., within a general office area not exceeding 5000 square feet, are not required fire-resistive construction.

7.05 Storage Areas for materials used in normal telephone operations are enclosed by partitions having a fire resistance rating of one hour and doorways are protected by Class C labeled doors. It is suggested that the storage of combustible materials in telephone office buildings be limited to the requirements for normal operation and that the storage area be designed for those requirements.

7.06 The protection required for other storage of combustible materials and for all storage areas in locations considered hazardous, is determined for each specific location by the inspection department having jurisdiction. The services of Marsh and McLennan are recommended in connection with the storage of combustible materials, in accordance with B.S.P. Section H44.015, Fire and Safety Inspection and Advisory Services Rendered by Marsh and McLennan.

7.07 Ventilation Louvers, Grills and other necessary openings in the above partitions are protected by approved automatic closing devices. Heat activated closing devices, however, do not necessarily provide protection against smoke hazard and it is considered advisable to limit the number of openings, particularly in partitions forming exit corridors.

7.08 Cable Vaults are separated from the general basement area by a partition having a fire resistance rating of not less than two hours, and doorways are protected by self-closing Class B labeled fire doors. Where practicable, it is advisable to limit the openings in this partition to the required doors. The requirement for this partition is covered in B.S.P. Section H36.148, Cable Openings.

7.09 Transformers where necessarily installed within telephone buildings, are separated from other building areas by approved vault construction designed to protect building personnel and to prevent mechanical or structural damage to the building and contents in the event of fire, escape of harmful gases or possible transformer explosion. The design requirements are based in general upon the type and capacity of the transformers, and the adequacy of the ventilation provided for heat and gas dissipation and the release of pressures resulting from a possible explosion.

7.10 Suggested procedures for the design of transformer vaults with consideration of the ventilation requirements and explosion hazard are outlined in B.S.P. Section H34.284, Ventilation-Basement Spaces. The recommendations in this section pertain to the additional protection to be considered to prevent the spread of fire originating in transformer vaults. The specific provisions for safe installations of transformers of different types and capacities are recommended to conform to the requirements of the National Electrical Code of the National Fire Protection Association.

7.11 In general, the walls and roofs of transformer vaults are of reinforced concrete or masonry having a fire resistance rating of not less than three hours. Floors are of concrete not less than 4 inches thick. Building walls and floors which meet these requirements may serve for the floor, roof or one or more walls of the vault.

7.12 In the event it is necessary to provide entrance to the vault from the building, the opening is protected by a tight fitting Class A labeled self-closing fire door. However, where added strength is indicated to reduce the possibility of explosion pressures entering the basement, as for example where oil-insulated transformers are used, it is considered advisable to provide a steel plate and angle door in metal frame firmly anchored in the wall. Doors are maintained locked and access to the vault is limited to qualified personnel. For oil-insulated transformers, a door sill or curb is provided, 4 inches high or of sufficient height to confine within the vault the oil from the largest transformer.

7.13 It is desirable wherever possible to avoid extending into or through vaults any piping or duct systems not associated with the electrical installation. If unavoidable, however, it is suggested that those sections or accessories requiring maintenance be located outside the vault. Arrangements are made where necessary to avoid possible trouble from condensation, leaks and breaks.

8. AIR DISTRIBUTION DUCTS

8.01 These recommendations are for consideration in the installation of air duct systems employing mechanical means for the movement of air and used for ventilating, heating, or cooling telephone building areas.

8.02 The protection of vertical extensions of duct through floors and of horizontal extensions where fire-resistive construction is pierced, is very important in the restriction of fire to a limited area. Automatic fan cutoff devices or alarms for the detection of fire are generally installed in air duct systems but the additional protective construction recommended in this section is necessary to prevent the communication of fire between the building areas.

8.03 Experience indicates that galvanized sheet steel with its higher melting point and strength is superior to aluminum as material for ducts and plenum chambers. It is recommended that steel be given preference to aluminum for use in duct systems up to the fire dampers protecting the branch duct work.

8.04 Where ducts pass through walls, floors or partitions, the space around the duct is sealed with rope asbestos, mineral wool or other non-combustible material to prevent the passage of flame or smoke.

8.05 Supply and return ducts in vertical extension form flues which provide a natural outlet for a fire to spread to other floors and the draft, either natural or mechanical, would increase the intensity of a fire. It is important, therefore, that such vertical ducts be enclosed by construction having a fire resistive rating of one hour. The protective construction extends from the top of the floor slab to the underside of the slab above. Duct extensions within the ventilating equipment room, however, do not require the protective construction, provided there is no open flame equipment within the room. Approved fire dampers are provided at each direct outlet or inlet and in each branch duct at its junction with the main vertical duct where the duct system serves two or more stories. Dampers are not required at room openings of the branch duct.

8.06 The passing of duct through fire walls is avoided wherever possible. Where ducts or the outlets from or inlets to them pass through fire walls they are provided with approved automatic fire doors on both sides of the wall through which they pass.

8.07 Fire doors at openings through fire walls and fire dampers at enclosures or partitions where required, are so arranged that the disruption of the duct will not cause failure to protect the opening.

8.08 An approved fire damper is provided on each opening where a duct passes through a required fire-resistive partition. Fire-resistive partitions required in telephone buildings are outlined in Paragraphs 7.01 through 7.06 above.

8.09 The passing of duct through cable vault walls is avoided wherever possible. Where ducts or the outlets from or inlets to them pass through the wall, the duct within the cable vault is enclosed by construction having a fire resistance rating of not less than two hours and each duct opening through the wall is provided with an approved fire damper.

8.10 Duct extensions through storage area walls are not generally recommended as they require protective construction in accordance with the exposure. Ducts passing through walls of storage areas housing normal amounts of combustible materials as outlined in Paragraph 7.05, are provided with approved fire dampers at each wall opening. In other storage areas as outlined in Paragraph 7.06, the duct work within the storage is enclosed by protective construction having a fire resistance rating of not less than two hours and each duct opening through the wall is provided with an approved fire damper.

8.11 It is desirable that no portion of the basement space be connected to the recirculatory system of any ventilating plant serving stories above the basement. Suggested procedures for ventilation of power rooms, cable vaults and other basement areas, are outlined in B.S.P. Section H34.284, Ventilation-Basement Spaces.

9. KITCHEN EXHAUST SYSTEMS

9.01 For the ventilation of kitchen cooking equipment an independent system is required, in no manner connected to any other ventilating system. The system is designed to lead as directly as possible to outside.

9.02 Vertical risers where necessarily located inside the building are enclosed in a shaft preferably constructed of masonry at least equivalent to four-inch hollow tile, extending from the first floor pierced and through the roof. Residue traps with provision for clean out are provided at the base of each vertical riser.

9.03 Exhaust ducts are not extended through fire walls and dampers are not installed in any portion of the system.

9.04 Openings in horizontal runs of duct for inspection or cleaning purposes are equipped with tight-fitting sliding or swinging doors and latches.

9.05 Range or grease filters, if used, are of non-combustible construction designed for the specific purpose and so proportioned as not to decrease the air velocity in the duct below the 2000 feet per minute minimum operating velocity recommended for kitchen exhaust systems.

9.06 It is suggested that periodic inspection be made to determine the amount of residue in hood, ducts, fans and related portions of the system, and cleaning should be undertaken whenever an inspection indicates the need.

9.07 Recommendations pertaining to the design and construction of kitchen exhaust systems are outlined in B.S.P. Section H42.120, Ventilation of Kitchen Cooking Equipment.

MEANS OF EGRESS

INSPECTION AND TESTING

1. GENERAL

1.01 This section outlines suggestions for routine inspections and, where appropriate, tests of the various means of egress generally common to telephone buildings, and is offered as a reference in supplementing the inspection services of Marsh & McLennan in preserving safe and effective exit facilities.

1.02 The means of egress covered include halls, corridors, passageways, interior and exterior stairs, fire towers, fire escapes, horizontal exits, doorways and windows required to furnish safe access to the street or other point of refuge in the event of fire.

1.03 This section is reissued to:

(a) Indicate the codes upon which the recommendations herein are based and which contain certain detail regarding the subject for reference use which is not covered herein.

(b) Refer to Section H32.610, "Stairway Planning and Construction" of Bell System Practices.

(c) Recommend the frequency of inspection of fire escapes and outside stairways.

(d) Include changes in certain wording and rearrangement of the text. Arrows are used to indicate changes throughout the text.

1.04 For operation and maintenance application, this section is double numbered with this issue and the same issue number is assigned for uniformity.

1.05 Codes and Ordinances: The recommendations contained in this section are based in general on the Building Exit Code of the National Fire Protection Association and the Building Code recommended by the National Board of Fire Underwriters. Where the following procedures conflict with or are exceeded by corresponding requirements of local or state legislation, the legislated requirements should, of course, apply.

1.06 It is desirable that routine inspections of all means of egress and tests of certain exit facilities be made at sufficiently frequent intervals to ensure maintaining a maximum degree of safety. The inspections and tests are preferably made by assigned employees who are specially instructed in these procedures. Any faulty conditions disclosed by the routine investigations or that become evident at any time should be corrected at once.

2. HALLS AND PASSAGEWAYS

2.01 Halls, corridors and passageways, including exitways from rooms which lead through other rooms, should be kept free from obstructions. Furniture, items of building or telephone equipment, etc., should not be placed or stored within exitway space, nor should vehicles be parked or materials located where they might interfere with free egress from the building. The amount of scaffolding placed for maintenance operations in exitways should be kept to a minimum, located so as to cause least obstruction and be removed as soon as possible.

3. STAIRWAYS AND FIRE ESCAPES

3.01 Stairs, landings and platforms of interior and exterior stairways, fire towers and fire escapes should be maintained free from all obstructions. Balustrades, hand rails, brackets and newels should be examined for loose connections and anchorages. Electric light or power wires should not be placed above or within 3 feet of outside stairs or fire escapes unless the wires are enclosed in rigid conduit.

3.02 Outside stairs and fire escapes should be inspected at least annually, and should be scraped and painted as often as necessary to maintain them in proper condition at all times. All anchorages, metal supports, brackets and other fastenings for outside stairs or fire escapes should be examined for looseness or excessive corrosion.

3.03 Where the lower flight of fire escape stairs is counterbalanced, its bearings should be kept lubricated and the entire device including its latching arrangement tested by actual operation. When lowering or raising the counterbalanced section it is desirable that care be taken to avoid excessively jarring or stressing the structure. No obstruction should be permitted at any time in the space under a counterbalanced section.

3.04 The landings, platforms, and the treads of all outside stairs and fire escapes are designed so that the accumulation of snow and ice thereon will be reduced to a minimum. The landings, platforms and the treads of outside stairs and fire escapes should be promptly cleaned of snow and ice.

3.05 Section H32.610 of Bell System Practices outlines desirable arrangements for the number and layout of stairways and stairway enclosures in telephone buildings and general features of construction.

4. DOORS AND WINDOWS

4.01 Doors and sash in openings serving as required exits should be tested for proper operation and inspected for sound physical condition. Doors should swing easily and sash move freely without undue effort on the part of the operator. Where necessary, locks, latches, hinges and closing devices should be adjusted to operate smoothly and effectively.

4.02 Revolving doors in required exits should be tested by pressure for release of the wings from each other so that each will swing independently. Where used, revolving doors should not constitute more than 50% of the required door width.

4.03 Automatic fire doors are usually tested for operation by temporarily removing the fusible link.

4.04 It is important that practices of blocking open self-closing doors with wedges, or of tying them open, be discouraged. These doors while closed prevent the passage of smoke through the opening which might otherwise render the adjoining area of refuge untenable. It is recognized that there may be certain cases in which the volume of personnel movement and the urgency of need for additional ventilation may possibly outweigh the matter of smoke protection involved to the extent that management may wish to grant specific approval permitting the doors in such cases to be held open. In this event it is recommended that such doors be equipped with and held open by an automatic door closer having a hold open device the automatic release of which is controlled by a fusible link.

5. EXIT LIGHTS AND SIGNS

5.01 Exit signs and regular and emergency lighting for the several means of egress should be kept clean and the control switches checked for proper operation. Burned out lamp bulbs should be replaced promptly with new lamps of proper wattage.

DISTRIBUTION OF FIRE PROTECTIVE APPARATUS

1. GENERAL

1.01 This section outlines the general procedure to be followed in distributing fire protective apparatus throughout telephone buildings. The recommendations are intended to apply to all new buildings.

1.02 In the case of existing buildings which do not come up to the recommendations, the question of whether to replace existing protective apparatus will have to be considered for each specific case.

1.03 This section is reissued to remove soda-acid-type fire extinguishers from the recommended list of fire protective equipment and to suggest some variations in the distribution ratio of our fire protective equipment. It also recommends the installation of carbon dioxide fire extinguishers and water-type fire extinguishers in CAMA, AMA, billing machine and other accounting areas.

1.04 The attached table has been revised to show these changes and to add unattended carrier huts in the group of small buildings requiring fire protective apparatus. Arrows are not used to indicate changes in the text due to the major revisions.

1.05 Fire protective apparatus in accordance with the attached table should be provided in completed buildings so as to be available during the period of equipment installation. Sections A310.105 and A804.415 cover the Principles of Fire Fighting and Description and Use of Equipment and Apparatus.

1.06 Where the distribution of extinguishers requires that they be placed on columns, the units, of course, are not mounted in the working aisle in equipment rooms. Since they are not visible from all sides of the columns consideration should be given to identifying the extinguisher location by painting a red band about six inches wide around the column at a level near the extinguisher center. If it should occasionally be necessary to locate a wall-mounted extinguisher where it may be obscured or partly obscured by switchboards or other obstructions, consideration should be given to providing a red painted identification marker at a suitable height for visibility.

1.07 In garages a red arrow, located above the extinguisher and higher than the vehicles, could be used to identify the location of extinguishers.

1.08 Identification bands on columns or wall location markers are usually omitted in such spaces as main entrance halls, public business offices, lounges, etc, where appearance is a controlling factor.

1.09 Vaporizing Liquid Fire Extinguishers should not be used because of the toxicity of the liquid, and handling precautions required.

1.10 Extinguishers shall ***not*** be camouflaged or painted to match the walls.

2. CARBON DIOXIDE TYPE

2.01 When the table specifies that carbon dioxide extinguishers should be located "1 per 50′ of Travel" it is expected that they will be located so that a unit can be reached by a maximum travel of 50 feet. This spacing should normally provide the total number of extinguishers required for various occupancies as outlined in the table.

2.02 ***Terminal and Switch Rooms:*** Carbon dioxide extinguishers (KS-14137) are located on walls, partitions or columns, giving preference to the wall locations where practicable. Generally, they should be placed along the walls at the ends of main cross aisles and at intervals along the walls where equipment is perpendicular to the length of the room. Additional extinguishers necessary to meet the 50-foot requirement, generally, should be mounted on columns adjacent to cross aisles.

2.03 *Mezzanine Platforms:* Extinguishers generally are not located on mezzanine platforms associated with distributing frames unless the distance between stairways leading to the main floor is more than 60 feet. Where possible, extinguishers are located so as to be readily accessible at the foot of mezzanine stairways, and not under them.

2.04 *Accounting Centers:* Carbon dioxide extinguishers are located in accounting centers in the rooms or areas containing CAMA, AMA equipment, data processing and billing machines, because of the electrical equipment involved.

2.05 *Garages:* Carbon dioxide extinguishers as well as water-filled and foam extinguishers may be used for garages as indicated in the table. Carbon dioxide type could be used in the open or carport garages as indicated in the table.

3. ASBESTOS GLOVES

3.01 Asbestos gloves are used for snuffing out glowing embers after the flames have been put out with a CO_2 extinguisher and are located as indicated in the table.

4. WATER TYPE

4.01 Water-type extinguishers are placed in accounting and equipment rooms for use on nonequipment furnishings and materials only and are located in accordance with the table. Where it is mounted adjacent to a carbon dioxide type, the carbon dioxide extinguisher should be placed between the water type and the door opening. This makes the CO_2 the first available extinguisher when someone comes through the door.

4.02 In the case of a large equipment space with only two entrance doors or possibly a dividing wall, consideration should be given to placing an additional water-type extinguisher within the floor area to reduce the distance to a water extinguisher to 100 feet.

4.03 Water-type extinguishers should never be used on live electrical equipment of any type or flammable liquids. The water-type extinguisher is for use on nonequipment furnishings and material only.

5. SODA-ACID TYPE

5.01 Soda-acid extinguishers have been superseded by the carbon dioxide and cartridge water types and are no longer recommended for telephone buildings because of the corrosive character of the water and the additional work required for maintenance.

6. FOAM TYPE

6.01 Foam-type extinguishers are located as indicated in the table.

7. SAND PAILS

7.01 Sand pails are no longer recommended.

8. PORTABLE TARPAULINS

8.01 Portable tarpaulins are provided when consideration of local conditions, such as the type of construction of the building and arrangement of the plumbing, indicates possible need for them for the protection of telephone equipment from leaking water.

8.02 In general, one holder containing two tarpaulin sections will be sufficient for a single-unit dial or manual office. In large multiunit dial offices, it will probably be found satisfactory to provide not more than one holder with two tarpaulin sections for each equipment floor. Similarly, in multiunit manual offices and in large toll offices one holder for each terminal room floor should be sufficient.

8.03 In general, the holders are located in the terminal room rather than in operating rooms and at conspicuous locations such as doorways.

8.04 Where overhead plumbing can not be avoided in equipment spaces or operating rooms, tarpaulins are preferably located near the point of possible water damage.

Attached:
Table

DISTRIBUTION OF FIRE PROTECTIVE APPARATUS

SPACE		CARBON DIOXIDE	ASBESTOS GLOVES	WATER	FOAM	LOCATION
Switch Rooms — Crossbar Terminal Rooms — Panel Operating Rooms — S x S Test Rooms — Repeater Large Manual — Toll Attended "L" Main Stations		1 Per 50′ of Travel	1 Set Per Gas Ext.	Ratio of 1 to each 4 Gas Ext. Min. of 1		On walls, partitions or columns Locate at entrance doors except for large operating rooms where the travel should not exceed 100 ft.
Power Spaces Emergency Engine Rooms Equipment Rooms in Military Installations		1 Per 50′ of Travel Min. of 2				One near entrance door
Cable Vaults (See Note A)		1 (2 for very large vaults)	1 Set Per Gas Ext.			Outside door to vault
Transformer Vaults Power Service Rooms						None — depend on Power Company
Kitchens		1 or 1 Foam (2 for very large kitchens)			1 or 1 Gas	Near entrance door
Heater Rooms (See Note B)	Oil	1 or 1 Foam			1 or 1 Gas	Near entrance door
	Gas	1 or 1 Foam			1 or 1 Gas	
	Coal			1		
Office — Clerical Spaces Locker Rooms Lounges — Dining Rooms				1 per 5,000 sq. ft. (Fire Resistive) 1 per 2,500 sq. ft. (Other Type Const.)		(a) Where 1 ext. is provided locate near door (b) Where more than 1 ext. is provided, distribute evenly throughout room
Storage Areas (Heated) * General Bldg. Space and General Basement Space				1 Per 2,500 sq. ft. Min. of 1		
AMA Accounting, Billing Machine or Data Processing Areas		Machine Area 1 per 50′ Maximum Travel		Office Area 1 per 2,500 sq. ft. 75′ Maximum Travel		On walls, partitions or columns
AMA and CAMA Perforating Areas		1 Per 50′ of Travel	1 Set Per Gas Ext.	Ratio of 1 to each 4 Gas Ext.		On walls, partitions or columns
Elevator Machine Rooms		1 (2 for very large rooms)	1 Set Per Gas Ext.			Near entrance door
Paint Storage Room		1 or 1 Foam			1 or 1 Gas	Outside door
Battery Room		Large Separate Rooms 1 per 50′ of Travel				On walls, partitions or columns
Small Manual Office		1	1 Set Per Gas Ext.			On walls, partitions or columns
Community Dial Office (See Notes C-D)	Heated *	1 Per 50′ of Travel	1 Set Per Gas Ext.	Ratio of 1 to each 4 Gas Ext.		1 gas ext. at main entrance door; distribute others on walls or columns
	Unheated	1 Per 50′ of Travel	1 Set Per Gas Ext.			
Garages	More Than 5 Cars	Ratio of 1 to each 5 Foam — Min. of 2	1 Set		1 per 2,500 sq. ft. Do not Provide in Unheated Space	Where 1 ext. is provided locate near door. Where more than 1 ext is provided distribute evenly
	5 or Less Cars	1				
Open or Carport Garages		1 Per 2,500 sq. ft. Min. of 1	1 Set Per Gas Ext.			Travel distance should not exceed 100 ft.
TV and Radio Equipment Areas Teletype Rooms (5 or More)		1 Per 50′ of Travel	1 Set Per Gas Ext.			Near entrance door
Radio Relay Buildings	Radio & Power Room	1 Per 50′ of Travel	1 Set Per Gas Ext.			Near entrance door
	Engine Room	1	1			Near entrance door
Unattended Carrier Huts	Equipment Room	1	1			Near entrance door
	Engine Room	1	1			Near entrance door

* Indicates whether or not temperature is continuously maintained above 32°F; in unheated areas substitute antifreeze units.

Note A: Where cables enter the building in areas other than through a basement cable vault, the following is recommended:
1. For basementless building or building with basement, but no cable vault. Provide fire protective measures required for space through which the cables enter the building including a minimum of 1 CO_2 Extinguisher and one set of asbestos gloves.
2. For buildings with cable vault, but no basement using an external entrance to the vault. Provide 1 CO_2 Extinguisher and one set of asbestos gloves inside the vault.

Note B: Extinguisher provided in gas fired heater rooms is ***not*** for use on gas heater unit. The storing of material or equipment other than the heater unit in heater rooms is ***not*** recommended. In the event of fire in gas heater unit, turn off gas supply. The type of extinguisher to be selected would be determined by the hazards associated with the heater room.

Note C: Less than 800 lines 1 gas extinguisher provided and 1 set of asbestos gloves.

Note D: Less than 1500 lines only 1 water extinguisher need be provided, less than 800 lines — no water extinguisher provided.

WATER-TYPE FIRE EXTINGUISHERS

CONTENTS PAGE

1. GENERAL

1.01 The water-type fire extinguisher is used on fires in telephone equipment which have made some headway and which are beyond the scope of the carbon dioxide type due to insufficient range of discharge of this extinguisher or to the lack of cooling action of the gas on deep seated masses of burning material. The water-type extinguisher is not suitable for use on fires involving flammable liquids, oils, or greases or live electrical equipment such as power boards, power plant apparatus, billing and computing machines used in accounting centers, CAMA or AMA equipment, radio and carrier equipment, or elevator machinery.

1.02 The water-type extinguisher replaces the soda-acid extinguisher in equipment space and supplements the carbon dioxide extinguisher.

1.03 This section is reissued to include the latest design of water-type extinguisher with newly designed label, and to list additional areas where this type of extinguisher should not be used.

1.04 Arrows in the margin indicate changes in the text.

2. DESCRIPTION

2.01 The extinguisher consists of a lead lined copper or brass tank of about 2-1/2 gallons capacity and uses plain water, which is expelled by the expansion of carbon dioxide from a metal cartridge located within the tank. The cartridge is attached to the underside of the extinguisher cap and is removable with the cap. A grooved puncturing pin attached to a plunger extends through the extinguisher cap and is directly above and at right angles to a disc in the top of the cartridge. The details of the latest design of extinguisher are shown in Fig. 1, and similar details of former designs in Figs. 2 and 3.

2.02 To discharge the extinguisher, the safety guard is pushed aside and the tank turned bottom up and bumped on the floor. The safety guard is omitted from the latest design, thus eliminating the first step. This causes the plunger to be forced in and the grooved pin to puncture the disc in the cartridge and releases the carbon dioxide into the extinguisher tank. The water in the tank is expelled with sufficient force to throw an effective stream some 30 to 40 feet horizontally and continues for about 60 seconds, after which gas is emitted for a few seconds. The discharge of liquid ceases when the extinguisher is turned right side up, but the gas continues to escape and can not be stopped until it is exhausted. A new pressure cartridge must be inserted and the tank refilled before the extinguisher can be used again.

2.03 On previously designed models, but omitted from the latest design, a "U" shaped hinged guard is placed over the outside end of the plunger to prevent accidental puncturing of the cartridge disc. When the extinguisher is to be discharged, this guard is pushed back and becomes fixed in the open position.

2.04 In case the guard is not pushed back when the extinguisher is to be used, the plunger will not be obstructed since the guard is of metal light enough to collapse when crushed to the floor under the weight of the extinguisher.

2.05 *Rubber Jacket:* A rubber jacket is provided over the grenade-shaped cartridge for the purpose of preventing possible electrolytic corrosion. This rubber jacket has been

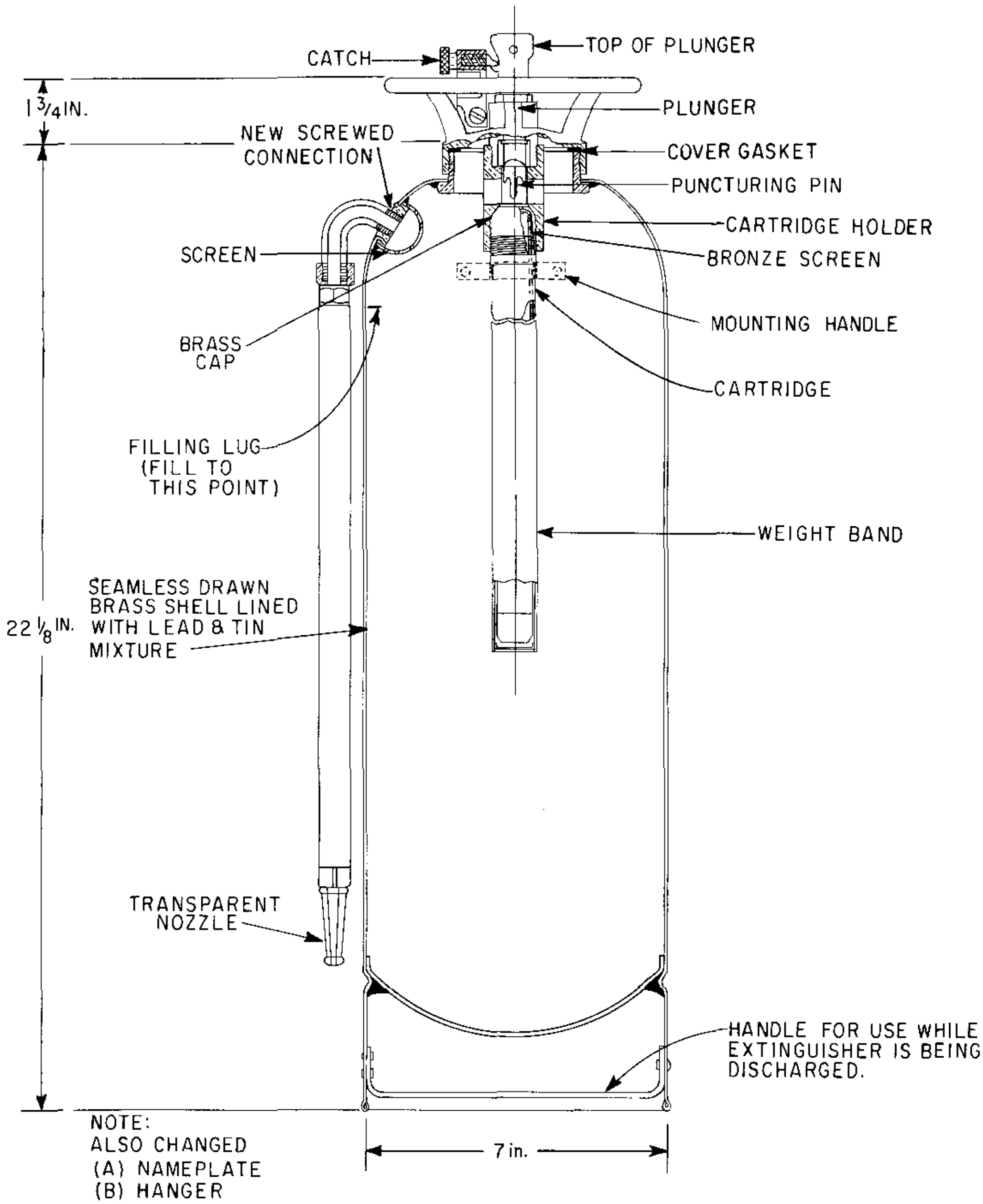


Fig. 1 — Latest Design with Cylindrical Cartridge

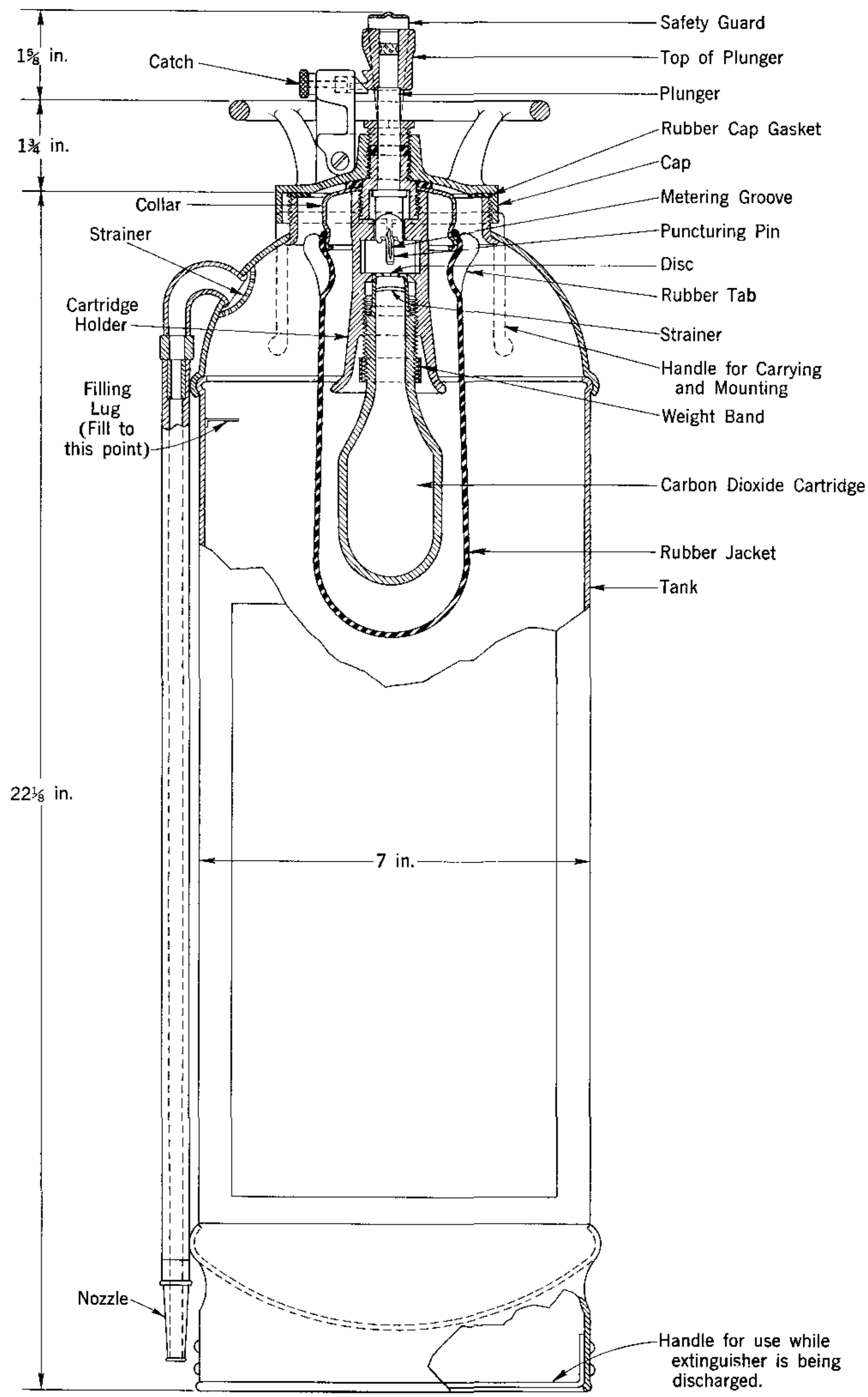


Fig. 2 — Design with Long Rubber Jacket

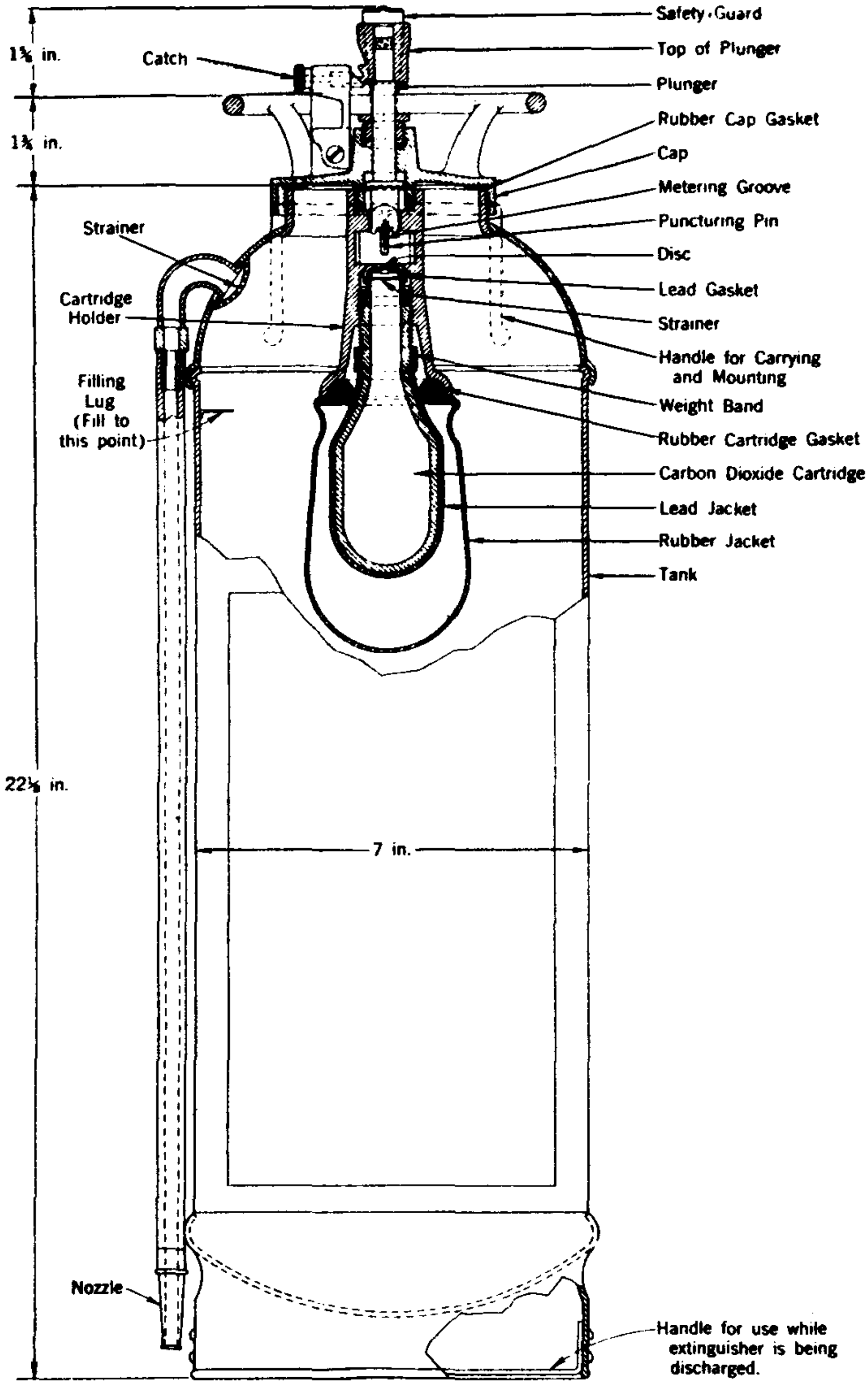


Fig. 3 – Design with Short Rubber Jacket

eliminated as unnecessary in the latest cylindrical design because the steel cartridge is enclosed in a brass jacket and then tin coated which prevents electrolytic corrosion.

2.06 *Cartridge:* A newly developed cylindrically shaped cartridge (WF75) approximately 12 inches long and 1-1/8 inches in diameter replaces the present zinc coated grenade-shaped cartridge (WF53). The new cartridge is designed without a screw-type safety cap and can be used in any Bell System standard water-type fire extinguisher.

3. LOCATION

3.01 Water-type extinguishers are subject to freezing and, therefore, should not be located in spaces where freezing temperatures may be encountered. If, however, it is considered necessary to place the water-type fire extinguisher in locations where freezing temperatures are encountered, antifreeze solutions should be added to the water. It is important in these cases to make sure that a properly labeled tank is selected and that the solutions used conform with the manufacturers' specifications. The Bell System standard extinguisher is not suitable for antifreeze solutions (not labeled properly). Water-type fire extinguishers suitable for antifreeze solutions are available only through local purchase.

3.02 The carbon dioxide which is held under pressure in the cartridge is subject to a rapid rise in pressure where temperatures above normal are experienced. It is desirable, therefore, to locate these extinguishers away from hot surfaces and out of the direct rays of the sun. In general, the clearance between extinguishers and radiators or uncovered heating pipes should be at least two feet. This distance may be reduced to six inches in the case of covered pipes.

3.03 Extinguishers should not be located where they are subject to mechanical injury from moving objects.

4. MOUNTING

4.01 Extinguishers should be mounted as shown in Fig. 4.

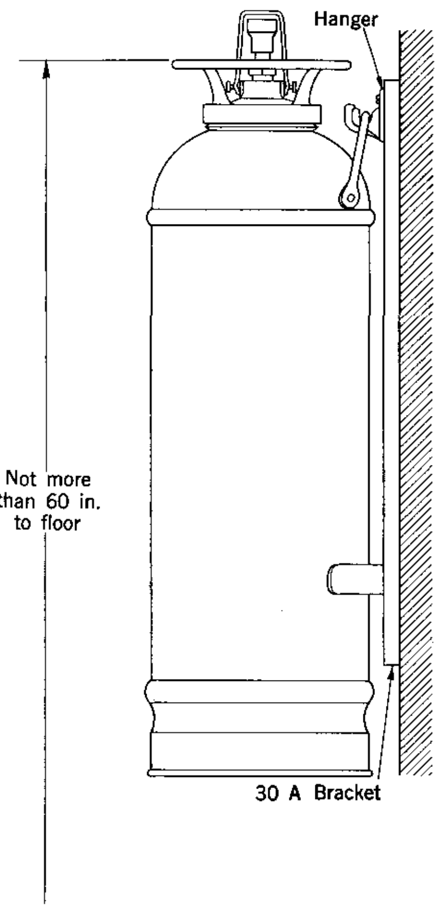


Fig. 4

4.02 Where extinguishers are placed on free standing columns, arrangements for mounting may include metal bands encircling the column or if it has been predetermined in what locations they will be required, consideration should be given to include mounting arrangements when the columns are constructed.

4.03 The extinguisher should be mounted so it will hang in a vertical position.

5. METHOD OF OPERATION

5.01 To operate the extinguisher, proceed as follows:

(1) Remove extinguisher from mounting bracket and carry to the fire in an upright position.

(2) Invert tank after pushing aside the safety guard on those extinguishers so equipped.

(3) Hold tank by handle in the bottom with hose in other hand.

(4) Bump plunger in tank cap on floor.

(5) Direct discharge at fire from a distance of about 5 feet if possible. If not possible, move away as the stream is effective up to about 30 or 40 feet horizontally.

(6) Play stream from top down with side-to-side motion. For other than equipment fires, play stream at base of flames and follow flames with stream.

(7) Stop liquid discharge by inverting tank to normal position when fire is completely extinguished.

(8) Do not use water-type extinguishers on fires involving flammable liquids, oils, or greases.

(9) Do not use water-type extinguishers on fires involving live electrical equipment such as power boards, power plant apparatus, billing and computing machines used in accounting centers, CAMA or AMA equipment, radio and carrier equipment, or elevator machinery.

(10) Do not return discharged or partially discharged extinguishers to their mounting brackets.

(11) Return plunger to normal position before unscrewing cartridge to avoid possibility of edges of metering groove picking up scrapings from cartridge disc.

6. MAINTENANCE

→**6.01** Maintenance of the water-type fire extinguisher is covered in Section H54.610 (H44.210).

SODA-ACID TYPE FIRE EXTINGUISHERS

1. GENERAL

1.01 The soda-acid type fire extinguisher is used on fires in telephone buildings which do not involve telephone equipment, flammable liquids, oils or greases, or live electrical equipment such as power boards, power plant apparatus or elevator machinery.

1.02 The soda-acid extinguisher is replaced by the water type extinguisher in equipment spaces and should be used as far as possible only in locations where the action of chemicals used on a fire will not contribute as seriously to the fire damage as is the case in equipment spaces.

1.03 This section is reissued to suggest that, if at the time of the annual refill any extinguisher caps are found without a pressure relief hole, such a hole should be provided as covered in Paragraph 6.07.

2. DESCRIPTION

2.01 The extinguisher consists of a lead lined copper tank of about 2-1/2 gallons capacity, containing water mixed with sodium bicarbonate and a bottle half full of sulphuric acid. The liquid is expelled by inverting the tank causing sulphuric acid to be mixed with the sodium bicarbonate solution resulting in a chemical action generating carbon dioxide gas, the pressure of which forces the liquid out of the hose with sufficient force to throw an effective stream some 30 feet. This discharge commences almost immediately after the tank is inverted and continues for about 50 seconds until all the liquid is gone. The discharge of liquid ceases when the extinguisher is turned right side up, but the gas continues to escape and can not be stopped until the chemical action has been completed. The extinguisher must be recharged before it can be used again. The details of a typical extinguisher are shown by Fig. 1.

3. LOCATION

3.01 Soda-acid extinguishers are subject to freezing and their action becomes sluggish at temperatures of 40°F. or lower and, therefore, are not located in spaces where the temperature may be lower than this figure.

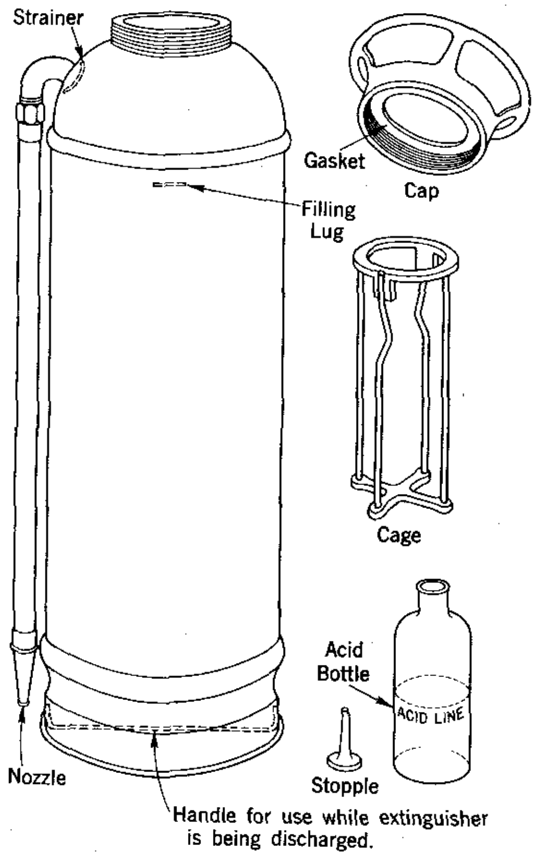


Fig. 1

3.02 Extinguishers are not located where they are subject to mechanical injury from moving objects.

4. MOUNTING

4.01 Extinguishers are mounted as shown by Fig. 2.

4.02 Where extinguishers are placed on free standing columns, arrangements for mounting may include metal bands encircling the

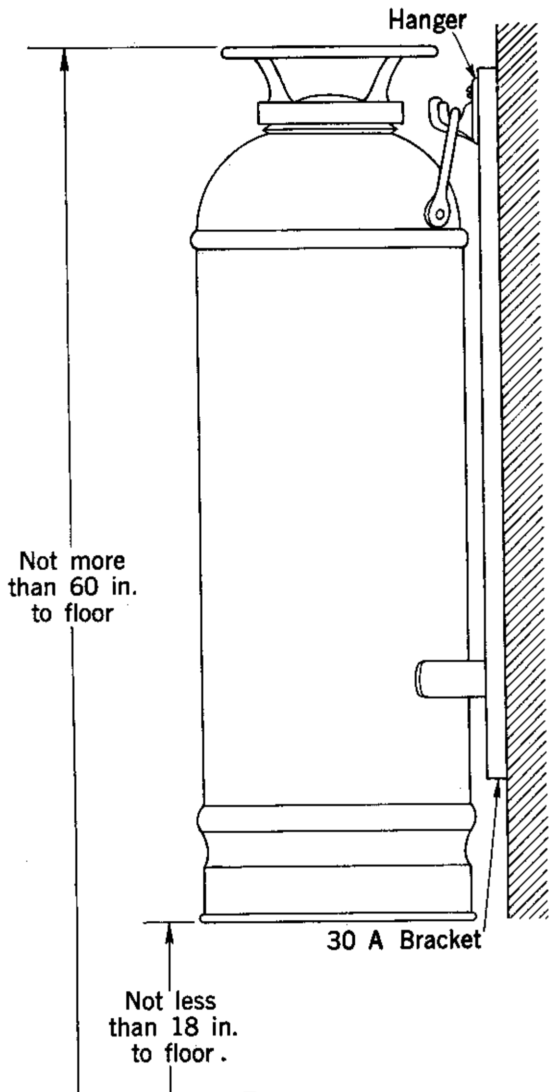


Fig. 2

column or if it has been predetermined in what locations they will be required, consideration should be given to including mounting arrangements when the columns are constructed.

4.03 The extinguisher is mounted and the lower guides are bent so that it will hang in a vertical position.

5. METHOD OF OPERATION

5.01 To operate the extinguisher, proceed as follows:

(1) Remove extinguisher from mounting bracket and carry to fire in upright position.

(2) Hold hose and extinguisher cap handle in one hand, directing the nozzle at the fire, and invert tank holding it by the handle in the bottom with other hand.

(3) Direct discharge at fire from a distance of 5 feet if possible.

(4) If impossible to stand so close, move away as the stream is effective up to about 30 feet.

(5) Play stream at base of flames and follow flames with stream.

(6) Stop liquid discharge by inverting tank to normal position when fire is completely extinguished.

(7) Do not use soda-acid type extinguishers on fires involving telephone equipment, flammable liquids, oils or greases.

(8) Do not use soda-acid type extinguishers on fires involving live electrical equipment such as power boards, power plant apparatus or elevator machinery.

(9) Do not return discharged or partially discharged extinguishers to their mounting brackets.

6. MAINTENANCE

(A) Inspection

6.01 Soda-acid type extinguishers should be inspected at intervals for the following items:

(1) Hose is in good condition.

(2) Nozzle opening is unobstructed.

(3) Hose coupling is tight at tank outlet.

(4) Dents are not evident on the extinguisher body at or near the upper or lower horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be discarded at once.

(5) Finish is in good condition.

(6) Mounting bracket is securely fastened to wall.

(7) Record tag is attached and extinguisher has been recharged within the required time.

(B) Recharging

6.02 Extinguishers are discharged and refilled at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 6.01 should also be made at this time.

Method

6.03 Remove the extinguisher from its mounting bracket and carry it to a suitable location where it can be discharged. This may be done either outside the building or inside into a service sink partly filled with water. Leaking gaskets, defective hose connections, or other irregularities are noted as the extinguisher is discharged and corrected during the recharging procedure. Only one extinguisher per floor should be taken out of service at one time.

6.04 Warning: In all the following operations where the extinguisher is to be taken apart, safety goggles and rubber gloves should be used.

6.05 Take extinguisher to a location where a new charge can be provided and where the tank can be refilled. Unscrew the cap and remove the cage and bottle from the tank.

6.06 The tank is examined on the inside for corrosion and for deposits of soda or other foreign material which should be scraped off with a suitable piece of wood. The tank should then be scrubbed with a stiff brush and rinsed thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The cap, cage and stopple should be scrubbed with a brush and carefully rinsed.

6.07 It has long been a requirement of the Underwriters Laboratories that manufacturers of this type extinguisher provide a means of pressure relief during removal of the cap. For many years it has accordingly been the practice of the manufacturers to provide a small hole through the cap threads which, as the cap is unscrewed, will release any pressure that might be present. Probably most extinguishers in the Bell System already are provided with this hole in the cap but if upon the annual refilling any are found without it, they are modified locally. The hole should be about 3/16-inch diameter with its center about 9/32 inch from the bottom edge of the cap.

6.08 The extinguisher is then carefully recharged in accordance with the following procedure irrespective of any recharging instructions that may be on the extinguisher name-plate or on the recharge package. 1-1/2 pounds of bicarbonate of soda is thoroughly mixed with about 2-1/2 gallons of lukewarm water. The temperature of the water should not exceed 100°F. The mixing is done outside the tank in order to insure that the soda is thoroughly dissolved. Undissolved soda may clog the hose or nozzle. The tank is filled to the filling lug, taking care not to pour any sediment into it. Filling the tank to levels above the filling lug reduces the air chamber volume and may result in excessive working pressure. Preservatives to prevent stagnation or solutions to lower the freezing point are not used.

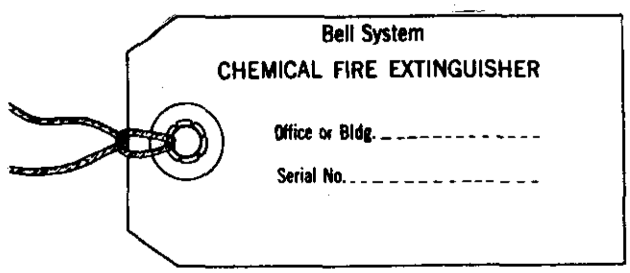
6.09 The cork or cap and label, if any, should be removed from a new bottle of acid and the bottle placed in the cage; a floating label may clog the outlet strainer. If the stopple is not a part of the cap assembly, it should next be put in place in the acid bottle. At this time, determine that the bottle is not so high, as to prevent the extinguisher cap from being screwed down properly on the tank. Also, check to see that the stopple is free to move out of the bottle for proper release of the acid and that the bottle is so held in the cage that it can not slide down on the stopple when the tank is inverted. These conditions can be checked best by placing the cage, bottle, stopple and extinguisher cap together as they are in regular assembly and determining with the fingers that the conditions mentioned are met.

6.10 Replace the rubber cap gasket with a new one. Coat the threads of cap and tank lightly with vaseline and screw the cap on the tank as tightly as possible by hand only, exercising care to insure that all threads are *properly engaged. A bar or rod should not be* used to tighten the cap. The same cap must always be replaced on the tank from which it was removed; in this connection it is suggested that all recharging operations be completed on one extinguisher before starting operations on the next.

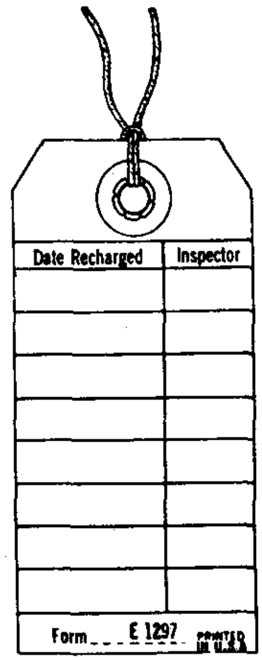
6.11 The date of recharging, etc., is recorded on the tag provided for this purpose. This tag is shown on Fig. 3.

6.12 The finish of the extinguisher is examined and polished or painted as required. The hose should not be painted. When the paint is sufficiently dry the extinguisher may be returned to its original location.

6.13 Extinguishers are emptied before shipping to other locations.



Front Side



Reverse Side

Fig. 3

CARBON DIOXIDE TYPE FIRE EXTINGUISHERS

1. GENERAL

1.01 Carbon dioxide type fire extinguishers are used for fighting incipient fires in wires, cables, racks, switchboards, power machinery and in certain locations involving flammable liquids. Since the gas is harmless to the equipment, these extinguishers should be used wherever it is possible to get the nozzle within about 2 feet of the flames.

1.02 Extinguishers of two capacities are in use, one containing about 10 pounds of carbon dioxide and the other an older model, replacement of which is recommended in Paragraph 6.12 of this practice, containing about 7-1/2 pounds. The 10-pound extinguisher supersedes the 7-1/2-pound.

1.03 Two types of 10-pound extinguishers are used, their principal difference being in the method of operation. One type releases the gas by rotating a hand wheel and the other by pressure on a trigger. The 10-pound trigger operated extinguisher supersedes the older hand wheel type. Existing hand wheel operated extinguishers should, however, be continued in service as they are considered as providing the same fire protection as the newer type. Hand wheel type extinguishers of 10-pound capacity have been furnished in two over-all weights differing by about 5 pounds. To readily identify these two extinguishers, a yellow mark is furnished on the front of the cylinder of the ligher weight extinguisher. The trigger release extinguisher is about the same weight as the lighter of the two hand wheel types.

1.04 This section is reissued to:

(a) Recommend replacement of 7-1/2-pound carbon dioxide extinguishers.

(b) Recommend periodic replacement of hose assemblies.

(c) Recommend pressure testing of cylinders at time of recharge.

(d) Refer to double numbered Section H43.010, H54.601, "Distribution of Fire Protective Apparatus" of Bell System Practices.

(e) Include changes in certain wording and rearrangement of the text. Arrows are used to indicate changes throughout the text.

1.05 For operation and maintenance application, this section is double numbered with this issue and the same issue number is assigned for uniformity.

2. DESCRIPTION

2.01 Each extinguisher consists of a steel cylinder containing carbon dioxide under pressure which is discharged as a gas through a hose and a cone shaped nozzle when released. A general view of the 10-pound extinguisher having trigger release is shown by Fig. 1, and the 10-pound hand wheel release unit is shown by Fig. 2.

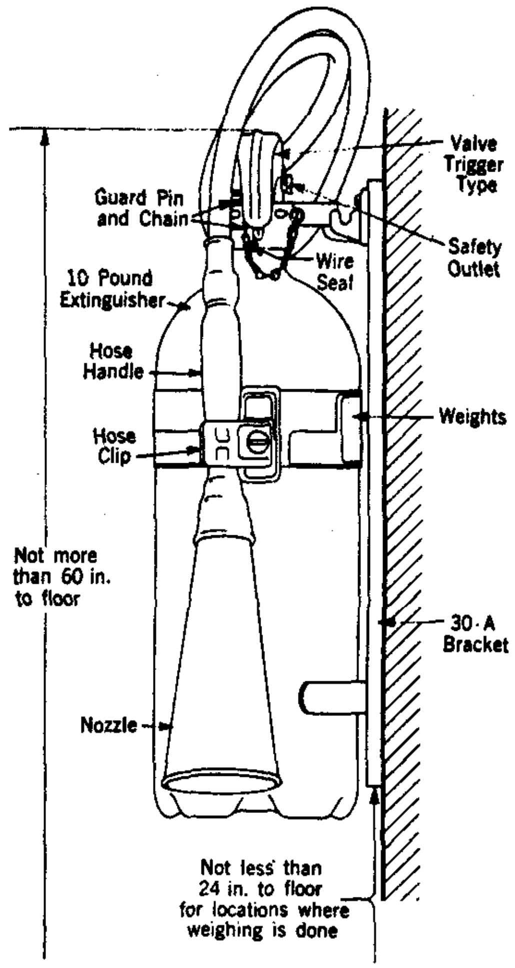


Fig. 1 - New Design with Trigger

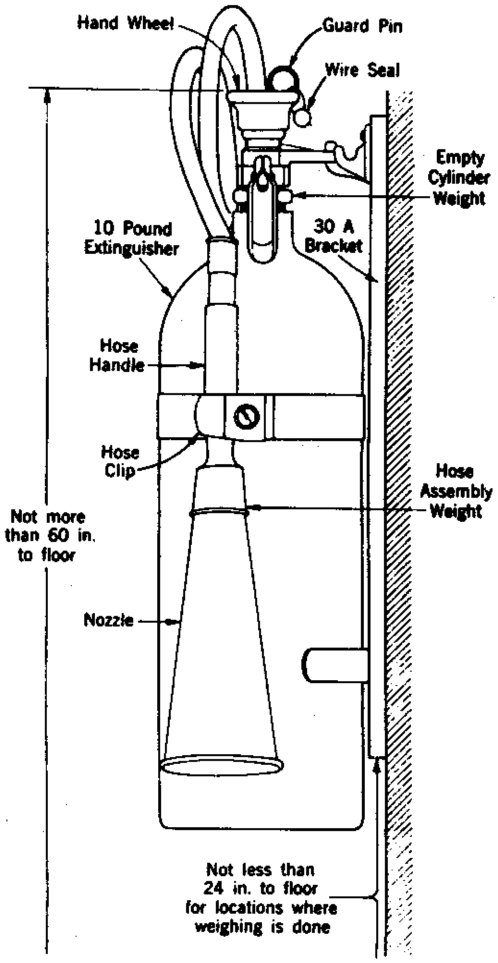


Fig. 2 - Former Design with Hand Wheel

2.02 The gas is most effective when used within about 2 feet from the fire and the discharge for both the 10-pound and the 7-1/2-pound extinguishers continues for 40 to 45 seconds. The gas has no appreciable cooling effect in fighting fires, but extinguishes the flames by its smothering action. In the case of burning fat such as in a cafeteria deep fat fryer care should be exercised that the force of the gas as it is discharged does not spatter the hot fat.

2.03 During the discharge of the extinguisher, solidified gas in the form of "snow" appears in the gas cloud and collects on the floor and other surfaces for a few moments until it evaporates. This "snow" is extremely cold and should not be handled, as frostbite may result.

2.04 Valve - 10-Pound - Trigger Release: Internally this valve has a main and an auxiliary valve seat. Operation of the trigger initially opens the auxiliary valve which admits full gas pressure to both sides of the main valve seat. Further pressure of the trigger opens the main valve with little effort. When not in use both valves are held closed not only by spring pressure but by full pressure of the gas within the cylinder. The trigger can be latched in the open position or can be released at will to stop the flow of gas, thereby permitting temporary conservation of the gas for use on any rekindling action which may occur after the fire has apparently been extinguished. To prevent inadvertent operation, the trigger is locked in the inoperative position by a pin having chain attachment to the body of the extinguisher. The pin must be withdrawn to permit operating the trigger. A wire seal is provided which is broken by operating the trigger, thus furnishing a visible means for determining whether the extinguisher has been operated.

2.05 Valve - 10-Pound Hand Wheel Release: This valve also can be closed after it has been opened, thereby permitting temporary conservation of the gas. The seal is, however, only temporary and is not sufficiently tight to retain the gas for more than a short time. The valve is provided with a guard pin which prevents accidental operation of the hand wheel by fixing it in position. A wire seal gives a visual indication of whether the guard pin and hand wheel have been tampered with. To use the extinguisher it is first necessary to withdraw the guard pin, which operation breaks the wire seal.

2.06 Valve 7-1/2-Pound: The valve on the 7-1/2-pound extinguisher cannot be closed once it has been opened. A hand wheel guard is available for this extinguisher to minimize the possibility of tampering with the hand wheel and discharging the extinguisher while on the mounting bracket. This guard is shown by Fig. 3 and should be provided only in cases where tampering might be expected.

2.07 Safety Cap - 7-1/2-Pound: A safety cap is provided on the 7-1/2-pound extinguisher for use during shipment when the hose is not in place on the extinguisher. It is important that during shipment and storage this cap be in place, since otherwise if the extinguisher is accidentally discharged there is considerable recoil; also the cap provides a

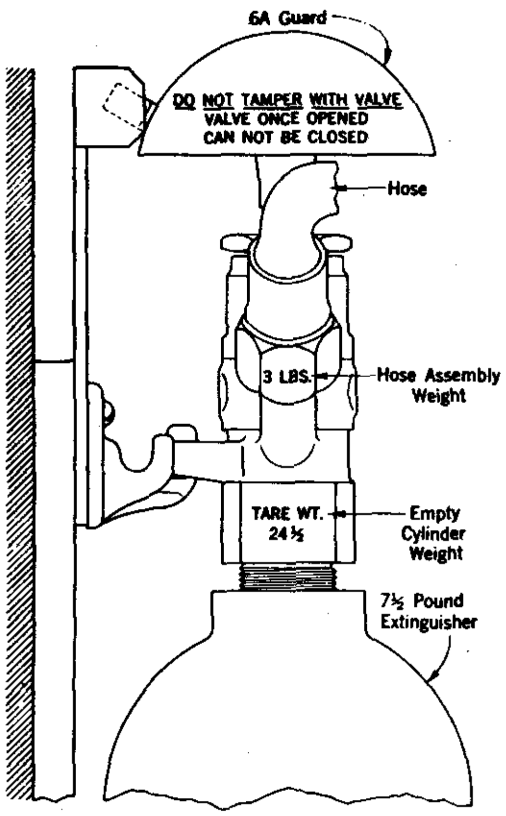


Fig. 3

desirable mechanical protection for the threads of the valve outlet. When not on the valve outlet, this cap is normally attached to a bushing on the extinguisher handle. The 10-pound extinguishers are so designed that separate safety caps are not required.

3. LOCATION

3.01 Carbon dioxide type fire extinguishers may be used in both heated and unheated spaces occupied by telephone equipment.

3.02 The carbon dioxide gas is subject to a rapid rise in pressure where temperatures above normal are experienced. It is desirable, therefore, to locate these extinguishers away from hot surfaces and out of the direct rays of the sun. In general, the clearance between extinguishers and radiators or uncovered heating pipes should be at least 2 feet. This distance may be reduced to 6 inches in the case of covered pipes.

3.03 The general procedure to be followed in distributing fire protective apparatus throughout telephone buildings is outlined in Section H43.010, H54.601 of Bell System Practices.

4. MOUNTING

4.01 10-Pound: The 10-pound extinguishers should be mounted as shown by Fig. 1 and Fig. 2 and if necessary the lower guides bent to hold the cylinder in a vertical position. If a mounting bracket for the 7-1/2-pound extinguisher only is available, it may be adapted to mount the 10-pound extinguishers by obtaining Guide P243864 and fastening it in the mounting holes for the gloves container.

4.02 7-1/2-Pound: The 7-1/2-pound extinguisher if retained in service is mounted as shown by Fig. 1 and Fig. 2 and the lower guides bent to hold the cylinder in a vertical position. Most of the 7-1/2-pound extinguishers have the long mounting brackets shown by Fig. 4 and where these are available they should be used for mounting.

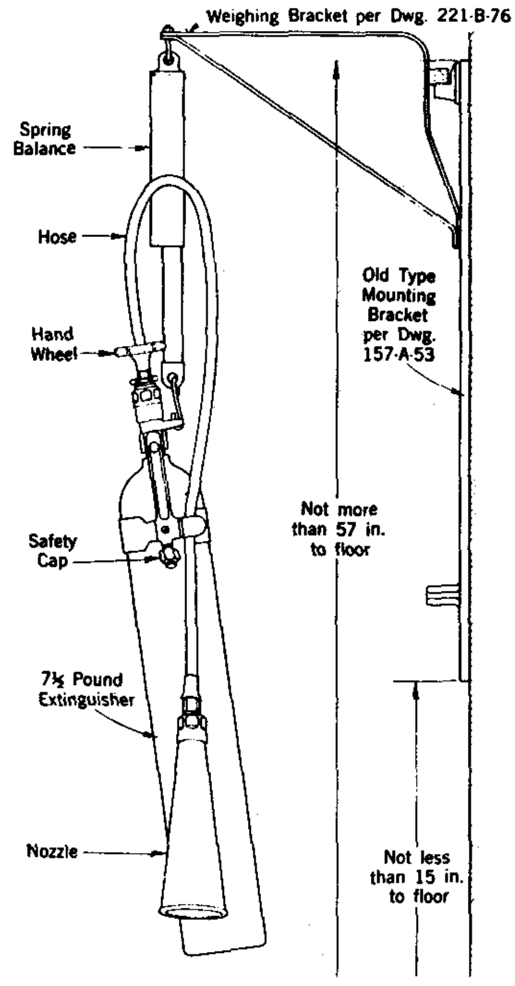


Fig. 4

4.03 Mounting Brackets: The 30A bracket shown for the 10-pound extinguishers is a universal type which is used for the 7-1/2-pound carbon dioxide type if retained in service, the water type, the soda-acid type, and the foam type extinguishers. This bracket replaces the bracket per Drawing 157-A-53 shown by Fig. 4. To insure that a hand wheel operated 10-pound extinguisher of lighter weight (yellow mark on cylinder) is returned to a given location, a yellow mark should be applied with multiple marking paint to the bracket at such location.

4.04 Where extinguishers are placed on free standing columns, arrangements for mounting may include metal bands encircling the column, or if their locations have been predetermined, consideration should be given to including mounting arrangements when the columns are constructed.

4.05 The extinguishers are shipped fully charged and completely assembled for use except that the hose is not attached to the valve. In mounting the extinguishers on the brackets the following directions should be carried out:

(a) Remove the cork or plug from the valve end of the hose which is provided during shipment to protect the inside of the hose from foreign particles.

(b) Inspect the orifice through the nozzle to see that the opening is free.

(c) 7-1/2-Pound Only: Remove the safety cap from the valve outlet and attach it to the lower end of the handle.

(d) Attach the hose securely to the valve with the aid of a wrench.

(e) The extinguisher should be weighed before placing it in service, as outlined in Paragraphs 6.02, 6.03 and 6.04.

(f) 7-1/2-Pound Only: After placing the extinguisher in position on the mounting bracket remove the safety clip around the valve stem which is provided to prevent accidental operation of the valve during shipment.

5. METHOD OF OPERATION

5.01 To operate the extinguisher, proceed as follows:

(1) Remove extinguisher from mounting bracket and carry it to the fire.

(2) 10-Pound Only: Remove the guard pin.

(3) Remove nozzle from the clip and direct at fire. Open hand wheel valve by turning hand wheel to the left. For extinguishers having trigger control, open the valve by upward pressure of the index finger on the trigger. This valve may be latched in the open position, if desired, by pulling the trigger up and forward (toward the valve body). Keep hand on top of 7-1/2-pound extinguisher to prevent its falling.

(4) Direct discharge at base of fire with nozzle about 1 foot from fire, if possible.

(5) Starting at the base of the flames, move nozzle slowly from side to side and work generally upward on the flame area but quickly return below momentarily to wipe out such rekindling as may occur so far as it may be consistent to do so with the fire conditions prevailing above.

(6) While carbon dioxide will continue to be discharged, the extinguisher is ineffective after the discharge of "snow" ceases and, if required, another extinguisher should be brought into play at this time.

(7) 10-Pound Only: If the fire is extinguished before the effective discharge is completed, the discharge may be stopped by turning the hand wheel to the right, or by releasing the trigger to its normal position, as the case may be.

(8) Any glowing embers remaining after the discharge of the gas should be snuffed out with asbestos gloves.

(9) Do not return discharged or partially discharged extinguishers to their mounting brackets. They should be forwarded for recharge in accordance with local instructions. Where recharging is accomplished by the Western Electric Company arrangements will be made for the pressure testing of the cylinders of the extinguishers in accordance with the requirement of the Interstate Commerce Commission (Bureau of Explosives). Where recharging is handled locally it is recommended that arrangements be made with the concerns doing the recharging to accomplish the retesting of cylinders as required by the Interstate Commerce Commission. The date of the last test of the cylinder is stamped on it.

6. MAINTENANCE

(A) Inspection

6.01 Carbon dioxide type extinguishers should be inspected at intervals for the following items:

(1) 7-1/2-Pound Only: That the safety clip has been removed from around the valve stem.

(2) 10-Pound Only: That the wire seal is not broken. If broken, extinguisher should be weighed.

(3) Hose is in good condition especially at couplings.

(4) Nozzle is not broken and orifice is unobstructed.

(5) Hose coupling is tight at cylinder outlet and at nozzle.

(6) Hose is looped back over valve handle and held in place by clip on side of extinguisher in such a way that lower edge of nozzle is slightly above bottom of extinguisher.

(7) Finish is in good condition.

(8) Mounting bracket is securely fastened to wall.

(9) Record tag is attached and extinguisher has been weighed within the required time.

(B) Weighing

6.02 Extinguishers should be weighed at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 6.01 should also be made at this time.

Method

6.03 Weighing of extinguishers should be done with the aid of a spring balance coded No. 120, manufactured by John Chatillon and Sons of New York. The spring balance should be supported by a weighing bracket arranged to be attached to the hook or the extinguisher mounting bracket. This arrangement is shown by Fig. 4.

6.04 Both the 10-pound hand wheel type and the 7-1/2-pound extinguishers have the weight of the empty cylinder stamped on the valve and the weight of the hose assembly stamped on the hose coupling. The 10-pound trigger type has the weight of both the empty cylinder and of the hose assembly stamped on the name plate at the rear of the hose clip. To determine if the extinguisher is in proper condition for immediate use, the following conditions should be met irrespective of any instructions that may be on the name plate:

The total weight (by spring balance) should not be less than:

STAMPED CYLINDER WEIGHT

plus

STAMPED HOSE ASSEMBLY WEIGHT

plus

5 POUNDS

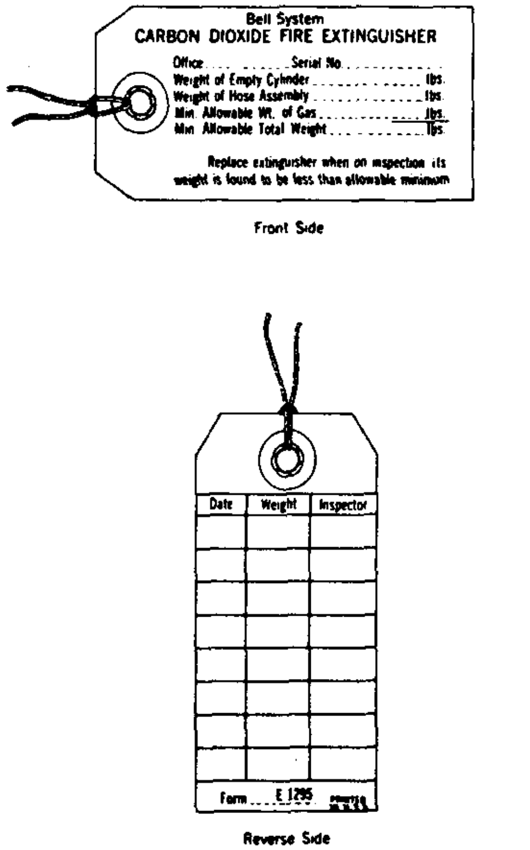


Fig. 5

Recording Weight

6.05 If the extinguisher is within the required weight limit and otherwise satisfactory, it should be returned to its mounting bracket and the weight recorded on the tag provided for this purpose. This tag is shown by Fig. 5.

6.06 Extinguishers which do not meet the requirements should be discharged, and then forwarded for recharge in accordance with local instructions.

6.07 Although the extinguishers are designed with an ample factor of safety and will withstand a reasonable amount of rough usage, care should be exercised while weighing or otherwise handling them to avoid dropping or subjecting the cylinder or valve to an excessive strain.

6.08 The finish of the extinguisher cylinder should be examined and painted as required. The hose should not be painted.

6.09 When returning discharged extinguishers the hose assembly should be disconnected from the extinguisher and in the case of the 7-1/2-pound type the safety cap should be placed over the valve opening.

6.10 The hose assemblies for the 10-pound and 7-1/2-pound extinguishers are not interchangeable. The hose assemblies for the two 10-pound hand wheel control extinguishers of different weights are interchangeable. The hose assembly for the 10-pound trigger control extinguisher is not interchangeable with those of any of the foregoing extinguishers.

(C) Replacement

6.11 The replacement of all remaining 7-1/2-pound extinguishers with the 10-pound unit per KS-14137 is recommended.

6.12 In view of the indicated approximate 10-year service life of the hose assembly and the difficulties involved in pressure testing them, it is suggested that the hose assemblies of 10-pound and larger size carbon dioxide extinguishers be replaced on a 14-year basis. To assist in this replacement the date of manufacture such as (53) is stamped into the metal couplings of hose assemblies of new extinguishers and on all replacement assemblies. For extinguishers obtained prior to the introduction of this procedure it is suggested that the earliest date appearing on the extinguisher body be considered as the date of manufacture of the hose assembly.

FIRE PROTECTION APPARATUS

ROUTINE INSPECTION AND MAINTENANCE

CONTENTS PAGE

1. GENERAL

1.01 The purpose of this section is to provide the necessary information for the house service or other forces charged with the responsibility for routine inspection and maintenance of fire protection apparatus.

1.02 It is reissued because of extensive changes and to include information regarding the following:

(a) Hydrostatic testing of water-type, foam-type and any of the soda-acid fire extinguishers remaining in use.

(b) A change in the loss of weight tolerance for carbon dioxide (CO_2) fire extinguishers to ten per cent for all sizes.

(c) To describe the procedure for inspecting and weighing the new disposable cylindrically shaped cartridge for the water-type fire extinguisher.

1.03 The newly developed disposable cartridge designated as WF-75 for the water filled cartridge-type extinguishers has been adopted as standard to replace the zinc coated grenade shaped cartridge (WF-53) which has been provided for some years. The new cartridge is approximately twelve inches long by one and one-eighth inch in diameter. To protect it from corrosion, it is brass clad and tin coated. Consequently, it does not require the use of a rubber jacket as with the grenade shaped cartridge. The new cartridge is threaded at the upper end and is screwed into the present cartridge holder the same as with the grenade shaped cartridge. When the cartridge is discharged or fails to meet weight requirements it is disposed of.

1.04 Complete descriptions of the fire protective apparatus covered in this section are given in the following sections:

H43.110, H54.602	Water-Type Fire Extinguishers
H43.120, H54.603	Soda-Acid Type Fire Extinguishers
H43.130, H54.604	Foam-Type Fire Extinguishers
H43.140, H54.605	Carbon Dioxide-Type Fire Extinguishers
H43.150, H54.606	Asbestos Gloves
H43.160, H54.333	Tarpaulins
H43.210, H54.607	Standpipe and Hose Systems

2. HYDROSTATIC TESTING

2.01 The National Board of Fire Underwriters Bulletin No. 10 dated July 1955 recommends that water extinguishers of the soda-acid and carbon dioxide (CO_2) cartridge propelled types and also foam extinguishers must be given a hydrostatic pressure test at least once every five years.

2.02 Hydrostatic tests may be made by a qualified contractor, either on the premises, in a suitably equipped truck at the building site or at the contractor's service station. All tests shall be carried on in accordance with the procedures given in Section 71 of the above-mentioned Bulletin No. 10.

2.03 If any such extinguisher upon subsequent annual inspection shows evidence of mechanical damage, corrosion, or distortion of the shell as from freezing temperatures or from any other causes it may be unsafe for use. Therefore, regardless of the date of the last hydrostatic test the extinguisher is again given a hydrostatic pressure test before being returned to service.

2.04 Each extinguisher which favorably passes the hydrostatic test shall have an orange record tag Form E-4400 attached to it on which the following will be noted:

(a) date of test

(b) test pressure

(c) name of person and concern making the test

2.05 All fire extinguishers less than five years old that are subject to periodic hydrostatic testing should have an orange record tag Form E-4400 attached. The year of installation should be posted on the tag on the first line in the "date" column and the word "installed" in the second column.

3. MAINTENANCE OF CARBON DIOXIDE FIRE EXTINGUISHERS

(A) Inspection

3.01 Carbon dioxide type extinguishers should be inspected for the following items at least once each year or when placed in service:

(1) ***10 and 15 Pound:*** That the wire seal is not broken. If broken, extinguisher should be weighed.

(2) Hose is in good condition especially at couplings, and that couplings are dated for determination of 14-year safe hose life.

(3) Nozzle is not broken and orifice is unobstructed.

(4) Hose coupling is wrench tight at cylinder outlet and at nozzle.

(5) Hose is looped back over valve handle and held in place by clip on side of extinguisher in such a way that lower edge of nozzle pointing downward is slightly above bottom of extinguisher.

(6) Finish is in good condition.

(7) Mounting bracket is securely fastened to wall.

(8) Record tag is attached and extinguisher has been weighed within the required time.

(B) Weighing

3.02 Extinguishers should be weighed at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 3.01 should also be made at this time.

Method

3.03 Weighing of extinguisher should be done with the aid of a spring balance coded No. 120 manufactured by John Chatillon and Sons of New York. The 5-pound extinguisher requires a more sensitive scale and the Chatillon No. 010 is suggested. The spring balance should be supported by a weighing bracket arranged to be attached to the extinguisher mounting bracket.

3.04 All extinguishers are marked with the cylinder weight and the horn and hose assembly weight so that the weight of gas can be checked without dismantling the parts. To determine that the extinguisher is in proper condition for immediate use, the following conditions should be met:

The total weight (by spring scale) should be not *less* than:

STAMPED CYLINDER WEIGHT
PLUS

STAMPED HOSE ASSEMBLY WEIGHT
PLUS
4½ POUNDS FOR 5-POUND EXTINGUISHER
9 POUNDS FOR 10-POUND EXTINGUISHER
13½ POUNDS FOR 15-POUND EXTINGUISHER

The above method of determining if extinguishers meet the weight requirement shall be used irrespective of any conflicting instructions that may be on the extinguisher nameplate.

Recording Weight

3.05 If the extinguisher is within the required weight limit and otherwise satisfactory, it should be returned to its mounting bracket and the weight recorded on the tag Form E-1295 provided for this purpose.

3.06 Extinguishers which do not meet weight requirements should be carried to a suitable location in building service quarters where the noise of discharge would not be distracting or outside the building, and discharged. Where feasible the discharging may be done for training. The extinguishers should then be forwarded for recharge in accordance with local instructions.

3.07 Extinguishers which develop a leak such as may be evidenced by a hissing sound or the presence of frost about the valve assembly should be immediately replaced. The leaking extinguisher should be discharged and recharged as outlined in Paragraph 3.06.

3.08 Although the extinguishers are designed with an ample factor of safety and will withstand a reasonable amount of rough usage, care should be exercised while weighing or otherwise handling them to avoid dropping or subjecting the cylinder or valve to an excessive strain.

3.09 The hose assemblies for the two 10-pound hand wheel control extinguishers of different weights are interchangeable. The hose assemblies for the 10-pound trigger control and the 15-pound extinguishers are not interchangeable with those of any of the foregoing extinguishers. When ordering hose specify model number and manufacturer.

4. MAINTENANCE OF WATER-TYPE FIRE EXTINGUISHERS

(A) Inspection

4.01 Water filled cartridge type extinguishers should be inspected for the following items at least once each year or when put into service:

(1) Safety guard is upright and plunger is not depressed.

(2) Plunger catch operates freely.

(3) Hose is in good condition.

(4) Nozzle opening is unobstructed.

(5) Hose coupling is wrench tight at tank outlet.

(6) Dents are not evident on the extinguisher body at or near the horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be emptied, removed from service and immediately replaced. Discarded extinguishers should be classified as "junk" and returned through the usual lines of organization to the Western Electric Company branch house for disposition.

(7) Finish is in good condition.

(8) Mounting bracket is securely fastened to wall.

(9) Record tag is attached and cartridge has been weighed within the required time.

(10) Bears orange hydrostatic test record tag Form E-4400 to show that extinguisher has been given the prescribed hydrostatic test within five years. If Form E-4400 shows only the date of installation, check whether hydrostatic test will be due during the current year and, if so, report to supervisor.

(B) Weighing Cartridge

4.02 Extinguisher cartridges should be weighed at least once a year, the tanks cleaned out and refilled to make sure the extinguishers are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 4.01 should also be made at this time.

Method for Grenade Shaped Cartridge

4.03 Remove the extinguisher from its mounting and carry it to a location where the cartridge can be weighed and the tank emptied, cleaned, and refilled. Only one extinguisher per floor should be taken out of service at one time, unless replacements are installed.

4.04 Care should be exercised in handling the cartridges to prevent possible damage to the disc since the rapid release of the gas will propel the cartridges with considerable force. Spare cartridges should be kept in the original container with the safety caps on them until required for use and should be stored in places where the temperatures are normal.

4.05 Unscrew the top cap and dry all parts thoroughly with a clean cloth. Remove the rubber jacket and unscrew the cartridge from the cartridge holder. In the case of extinguishers having a short rubber jacket, discard the lead gasket and replace with a new lead gasket (see Paragraph 4.14). Inspect the rubber jacket for possible defects and discard if unsuitable for reuse.

4.06 In the case of extinguishers having a short rubber jacket, remove the rubber cartridge gasket, inspect it for possible defects and discard if unsuitable for reuse. Only rubber gaskets having an extended lip can be re-used.

4.07 Dry the cartridge with a clean cloth and examine for any evidence of corrosion. Carefully remove any salts from the corrosion areas with a knife blade or suitable sharp tool. If any pitting is evident or if there is any corrosion at the cap the cartridge should be replaced. Good cartridges should now be weighed.

4.08 Scales per KS-6990 are used for weighing the cartridge. Before using the scales, the rubber tubes, provided during shipment over the four knife edges, should be removed and the balance of the scales checked. For cartridges having a stamped weight of about twenty-two ounces, a one pound and a ¼-pound weight should be placed on the beam platform and the graduations on the beam used to obtain the actual weight down to 1/16 of an ounce. For cartridges having a stamped weight of about thirty ounces, a one pound, a ½-pound, and a ¼-pound weight should be used in a similar manner.

4.09 ***Weighing:*** The weight of the completely charged cartridge is stamped on the weight band and if the actual weight is not within ½ ounce of this value, the cartridge is unsatisfactory for use.

4.10 ***Recording Weight:*** If the cartridge is within the required weight limit and otherwise satisfactory, it should be re-used and the weight recorded on the white tag Form E-1296 provided for this purpose.

4.11 Discharged cartridges should be discarded rather than returned for credit. When discharged or underweight, the grenade shaped cartridges are replaced with the disposable cartridge (WF-75). See Paragraph 1.03.

4.12 ***Refilling Tank:*** The tank should be emptied and refilled each time the cartridge is weighed. After emptying the tank, it should be examined on the inside for corrosion and any foreign matter scraped from the tank walls with a suitable piece of wood such as the wood handle of a blade-type radiator brush. The tank interior should then be scrubbed with a stiff brush such as a wood-handled toilet bowl brush, using only clean water. Rinse thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The tank should be filled to the filling lug with clean cold water. Preservatives to prevent water stagnation or solutions to lower the freezing point should not be used.

4.13 ***Assembling:*** Clean the extinguisher cap with a dry cloth. In the case of extinguishers having a short rubber jacket, thoroughly dry the seating surfaces for the lead and rubber cartridge gaskets and the threaded area between these surfaces. See that the metering groove in the puncturing pin is unobstructed and note that the plunger catch operates freely. Make sure that the plunger is in the fully unoperated position, i.e., plunger pulled all the way out before inserting the cartridge or the gas will be discharged when the cartridge is screwed in. Replace the rubber cap gasket with a new one.

4.14 In the case of extinguishers having a short rubber jacket, place a rubber cartridge gasket over the neck of the lead covered cartridge with the lip down. Any tendency of the rubber to seize the cartridge will be minimized by applying powdered talc to the gasket. Also for these extinguishers, place a new lead gasket over the cartridge top and paint the area of the top within the gasket opening with one heavy coat of black asphaltum paint. Make sure that the lead gasket stays centered on the cartridge top.

4.15 In the case of extinguishers having a long rubber jacket neither the lead nor the rubber cartridge gasket nor the painting of the cartridge top with black asphaltum paint is required.

4.16 Keeping the cartridge dry, screw it into the cap as tightly as possible by hand, as it is important that the cartridge top assemble firmly in the holder. Proper assembly can be determined by observation through the ports opposite the puncturing pin. The top of the cartridge should be visible and there be about an 1/8″ gap between the cartridge top and the puncturing pin.

4.17 In the case of extinguishers having a short rubber jacket, fit the rubber jacket over the lead covered cartridge in such a way that the bead on the jacket opening fits into the groove between the lip on the gasket and the bottom edge of the cartridge holder. Satisfactory seating is aided by pulling the rubber jacket out with the fingers at points below the gasket lip and allowing it to snap back in place. At the same time a part of the air can be exhausted by squeezing the jacket, in order that the water level in the tank will not be brought up to a higher point than originally intended.

4.18 In the case of extinguishers having a long rubber jacket, fit the rubber jacket over the cartridge in such a way that the bead on the jacket opening fits into the groove in the metal collar which projects downward from the bottom of the extinguisher cap. The rubber jacket is provided with four tabs around the neck to facilitate fitting it to the collar. Squeeze the jacket to emit entrapped air.

4.19 The threads of the cap and tank should be coated ***lightly*** with vaseline and the cap screwed on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged and that four full turns of the cap are given, engaging at least four full screw threads. Caps or tanks for water-filled type extinguishers should not be interchanged with those for soda-acid or foam extinguishers.

4.20 The finish of the extinguisher should be examined and cleaned (not painted) to restore good appearance, as required.

4.21 Extinguishers should be emptied and cartridge removed and packed separately before shipping to other locations.

Method for Disposable Cartridge

4.22 Remove the extinguisher from its mounting and carry it to the location where the cartridge can be weighed and the tank emptied and refilled. Only one extinguisher per floor should be taken out of service at one time unless replacements are installed. Inspect for the details given in Paragraph 4.01.

4.23 Unscrew the extinguisher top cap and dry all parts with a clean cloth. Unscrew the disposable cartridge from the cartridge holder. Dry the cartridge with a clean cloth and examine for possible corrosion especially at the top end.

4.24 ***Weighing:*** The weighing is done with the scales per KS-6990 as described in Paragraph 4.08. The weight of the charged cartridge is stamped on the jacket. If the actual weight is not within one half ounce of the stamped weight replace with a new cartridge.

4.25 ***Recording Weight:*** If the cartridge is within the required weight limit and otherwise satisfactory, the weight is recorded on the white tag Form E-1296 and the cartridge re-used.

4.26 After inspecting the tank both interior and exterior as described in Paragraph 4.01 and refilling the tank with water as described in Paragraph 4.12 the cylindrical cartridge is screwed hand tight into the cap.

4.27 See that the metering groove in the puncturing pin is clean and note that the puncturing pin and the plunger catch operate freely. Make sure that the plunger is in the fully unoperating position before replacing the cartridge or the gas will be discharged when the cartridge is screwed into position. The threads of the top cap and tank should be lightly coated with vaseline. The top cap is screwed on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged, and that four full turns of the cap are given, engaging at least four full screw threads. The cap should be replaced on the same tank from which it was removed.

4.28 The finish of the extinguisher should be examined and cleaned (not painted) to restore good appearance, if required.

4.29 Extinguishers should be emptied and the cartridge removed and packed separately before shipping to other locations.

5. MAINTENANCE OF SODA-ACID TYPE FIRE EXTINGUISHERS

(A) Inspection

5.01 Soda-acid type extinguishers should be inspected for the following items:

(1) Hose is in good condition.

(2) Nozzle opening is unobstructed.

(3) Hose coupling is wrench tight at tank outlet.

(4) Dents are not evident on the extinguisher body at or near the upper or lower horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be discarded at once. Discarded extinguishers should be classified as "junk" and returned through the usual lines of organization to the Western Electric Company branch house for disposition.

(5) Finish is in good condition.

(6) Mounting bracket is securely fastened to wall.

(7) Record tag is attached and extinguisher has been recharged within the required time.

(8) Bears orange hydrostatic test record tag Form E-4400 to show that extinguisher has been given the prescribed hydrostatic test within five years. If Form E-4400 shows only the date of installation, check whether hydrostatic test will be due during the current year and, if so, report to supervisor.

(B) Recharging

5.02 Extinguishers are discharged and refilled at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 5.01 should also be made at this time.

Method

5.03 Remove the extinguisher from its mounting bracket and carry it upright to a suitable location where it can be discharged. This may be done either outside the building or inside into a service sink partly filled with water. Leaking gaskets, defective hose connections, or other irregularities are noted as the extinguisher is discharged and corrected during the recharging procedure. Only one extinguisher per floor should be taken out of service at one time unless replacements are installed.

5.04 ***Warning:*** In all the following operations where the extinguisher is to be taken apart, safety goggles and rubber gloves should be used.

5.05 Take extinguisher to a location where a new charge can be provided and where the tank can be refilled. Unscrew the cap and remove the cage and bottle from the tank.

5.06 The tank is examined on the inside for corrosion and for deposits of soda or other foreign material which should be scraped off with a suitable piece of wood such as the wood handle of a blade-type radiator brush. The tank interior should then be scrubbed with a stiff brush such as a wood-handled toilet bowl brush using only clean water. Rinse thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The cap, cage, and stopple should be scrubbed with a brush and carefully rinsed.

5.07 It has long been a requirement of the Underwriters Laboratories that manufacturers of this type extinguisher provide a means of pressure relief during removal of the cap. For many years it has accordingly been the practice of the manufacturers to provide a small hole through the cap threads which, as the cap is unscrewed, will release any pressure that might be present. Probably most extinguishers in the Bell System already are provided with this hole in the cap but if upon the annual refilling any are found without it, they are modified locally. The hole should be about 3/16-inch diameter with its center about 9/32-inch from the bottom edge of the cap.

5.08 The extinguisher is then carefully recharged in accordance with the following procedure irrespective of any recharging instructions that may be on the extinguisher name plate or on the recharge package. The bicarbonate of soda in the package is thoroughly mixed with about 2½ gallons of lukewarm water. The temperature of the water should not exceed 100°F. The mixing is done outside the tank in order to insure that the soda is thoroughly dissolved as undissolved soda may clog the hose or nozzle. The tank is filled to the filling lug, taking care not to pour any sediment into it. Filling the tank to levels above the filling lug reduces the air chamber volume and may result in excessive working pressure. Preservatives to prevent stagnation or solutions to lower the freezing point are not used.

5.09 The cork or cap and label, if any, should be removed from a new bottle of acid and the bottle placed in the cage; a floating label may clog the outlet strainer. If the stopple is not a part of the cap assembly, it should next be put in place in the acid bottle. At this time determine that the bottle is not so high, as to prevent the extinguisher cap from being screwed down properly on the tank. Also, check to see that the stopple is free to move out of the bottle for proper release of the acid and that the bottle is so held in the cage that it can not slide down on the stopple when the tank is inverted. These conditions can be checked best by placing the cage, bottle, stopple, and extinguisher cap together as they are in regular assembly and determining with the fingers that the conditions mentioned are met.

5.10 Replace the rubber cap gasket with a new one. Coat the threads of cap and tank lightly with vaseline and screw the cap on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged and that four full turns of the cap are given, engaging at least four full screw threads. The same cap must always be replaced on the tank from which it was removed; in this connection it is suggested that all recharging operations be completed on one extinguisher before starting operations on the next.

5.11 The date of recharging, etc, is recorded on the white tag Form E-1297 provided for this purpose.

5.12 The finish of the extinguisher is examined and cleaned (not painted) to restore good appearance, if required.

5.13 Extinguishers are emptied before shipping to other locations.

6. MAINTENANCE OF FOAM-TYPE FIRE EXTINGUISHERS

(A) Inspection

6.01 Foam-type extinguishers should be inspected for the following items:

(1) Hose is in good condition.

(2) Nozzle opening is unobstructed.

(3) Hose coupling is wrench tight at tank outlet.

(4) Dents are not evident on the extinguisher body at or near the upper or lower horizontal seams. Such dents tend to weaken these seams, and extinguishers so damaged should be discarded at once. Discarded extinguishers should be classified as "junk" and returned through the usual lines of organization to the Western Electric Company branch house for disposition.

(5) Finish is in good condition.

(6) Mounting bracket is securely fastened to wall.

(7) Record tag Form E-1297 is attached and extinguisher has been recharged within the required time.

(8) Bears orange hydrostatic test record tag Form E-4400 to show that extinguisher has been given the prescribed hydrostatic test

within 5 years. If Form E-4400 shows only the date of installation, check whether hydrostatic test will be due during the current year and, if so, report to supervisor.

(B) Recharging

6.02 Extinguishers should be discharged (or emptied) and refilled at least once a year to make sure they are in proper condition for immediate use. An inspection of the items mentioned in Paragraph 6.01 should also be made at this time.

Method

6.03 Remove the extinguisher from its mounting bracket and carry it upright to a suitable location, preferably outside the building, for this purpose. Leaking gaskets, defective hose connections, or other irregularities should be noted as the extinguisher is discharged. Only one extinguisher per floor should be taken out of service at one time unless replacements are installed.

6.04 Take extinguisher to a location where a new charge can be provided and where the tank can be refilled. Unscrew the cap and remove the inner container from the tank.

6.05 Where it is not desirable to discharge the extinguisher, it may be emptied instead. When this is done, both the tank and the inner container should be completely drained, care being exercised in doing this not to mix the aluminum sulphate and soda solution. If emptied into a service sink, the soda solution should be poured into the sink first and thoroughly flushed down with water. The aluminum sulphate should then be emptied into the sink and flushed down with water.

6.06 The tank should be examined on the inside for corrosion and for deposits of soda or other foreign material which should be scraped off with a suitable piece of wood such as the wood handle of a blade-type radiator brush. The tank interior should then be scrubbed with a stiff brush such as a wood-handled toilet bowl brush using only clean water and rinsed thoroughly. The strainer should be cleaned and the nozzle and hose should be examined and flushed out to insure that the discharge passage is open. The cap, inner container and stopple should be scrubbed with a brush and carefully rinsed.

6.07 The extinguisher should then be recharged by carefully following the directions on the recharge packages furnished for this purpose. This generally involves thoroughly mixing the "B" solution containing bicarbonate of soda and a foam producing agent with lukewarm water. The temperature of the water should not exceed 100°F. The mixing should be done outside the tank in order to insure that the mixture is thoroughly dissolved. Undissolved soda may clog the hose or nozzle. The tank should be filled to the filling lug taking care not to pour any sediment into it. Filling the tank to levels above the filling lug reduces the air chamber volume and may result in excessive working pressures. Preservatives to prevent stagnation or solutions to lower the freezing point should not be used.

6.08 The recharge is completed by thoroughly mixing the "A" solution (aluminum sulphate) with water as directed and pouring it into the inner container which is then returned to the tank.

6.09 Replace the rubber cap gasket with a new one. Coat the threads of cap and tank lightly with vaseline and screw the cap on the tank as tightly as possible by hand only, exercising care to insure that all threads are properly engaged and that four full turns of the cap are given, engaging at least four full screw threads. The same cap, inner container and stopple must always be associated with the tank from which they were removed; in this connection it is suggested that all recharging operations be completed on one extinguisher before starting operations on the next.

6.10 The date of recharging, etc, should be recorded on the white tag Form E-1297 provided for this purpose.

6.11 The finish of the extinguisher should be examined and cleaned (not painted) to restore good appearance, if required.

6.12 Extinguishers should be emptied before being shipped to other locations.

7. MAINTENANCE OF ASBESTOS GLOVES

(A) Inspection

7.01 Gloves and container should be inspected at intervals for the following items:

(1) Container cover opens freely.

(2) Gloves should be removed from container, inspected and returned folded together, with fingers up. They should be loose enough to be easily removed.

(3) Container finish is in good condition. Container should be painted if required.

(4) Mounting bracket is securely fastened.

8. MAINTENANCE OF TARPAULINS

(A) Inspection

8.01 Portable tarpaulins and container should be inspected annually for the following items: See Fig. 1.

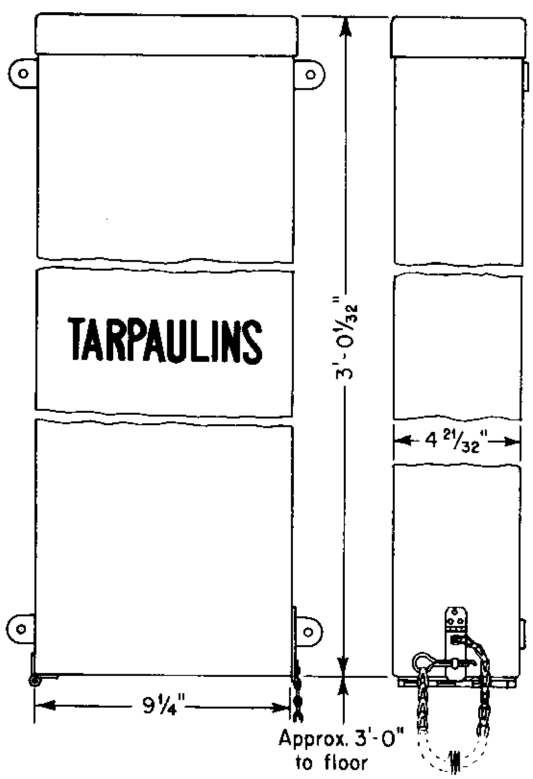


Fig. 1

(1) Bottom door of container opens freely.

(2) Tarpaulins should be removed from container and inspected for possible defects. They should then be properly folded and rolled and replaced in the container. A check should be made to insure that they are loose enough to be easily removed.

(3) Container finish is in good condition. Container should be painted if required. It should not be painted same color as background.

(4) Container is securely mounted.

(B) Folding and Rolling Portable Tarpaulins

8.02 When tarpaulins are placed in the storage container, they must be folded and rolled in the proper manner to permit them to be placed and removed easily. The proper method for folding and rolling is shown in Fig. 2.

9. MAINTENANCE OF FIRE HOSE AND STANDPIPE SYSTEMS

9.01 Tests and Inspection:

(a) While the data given herein represents current views as to procedures and recommendations it is understood that they may be altered to meet differing local fire code regulations and conditions but only when the latter are more stringent.

(b) Each standpipe station and associated equipment, whether capped or equipped with hose, valves, etc, is inspected annually. Should any defects be found in the course of the inspection or during the performance of regular duties they should be remedied. If the defects or faults can be taken care of at the time they are found, this should be done. Otherwise, the defects are reported for prompt attention.

(c) A fire hose is not to be used, under any circumstances, for other than fire fighting purposes. Violation of this rule may result in hose being missing, defective or useless in case of fire.

(d) Fire hose stations should be free of any obstacle and nothing is permitted to obscure hose racks or to block the door of a hose

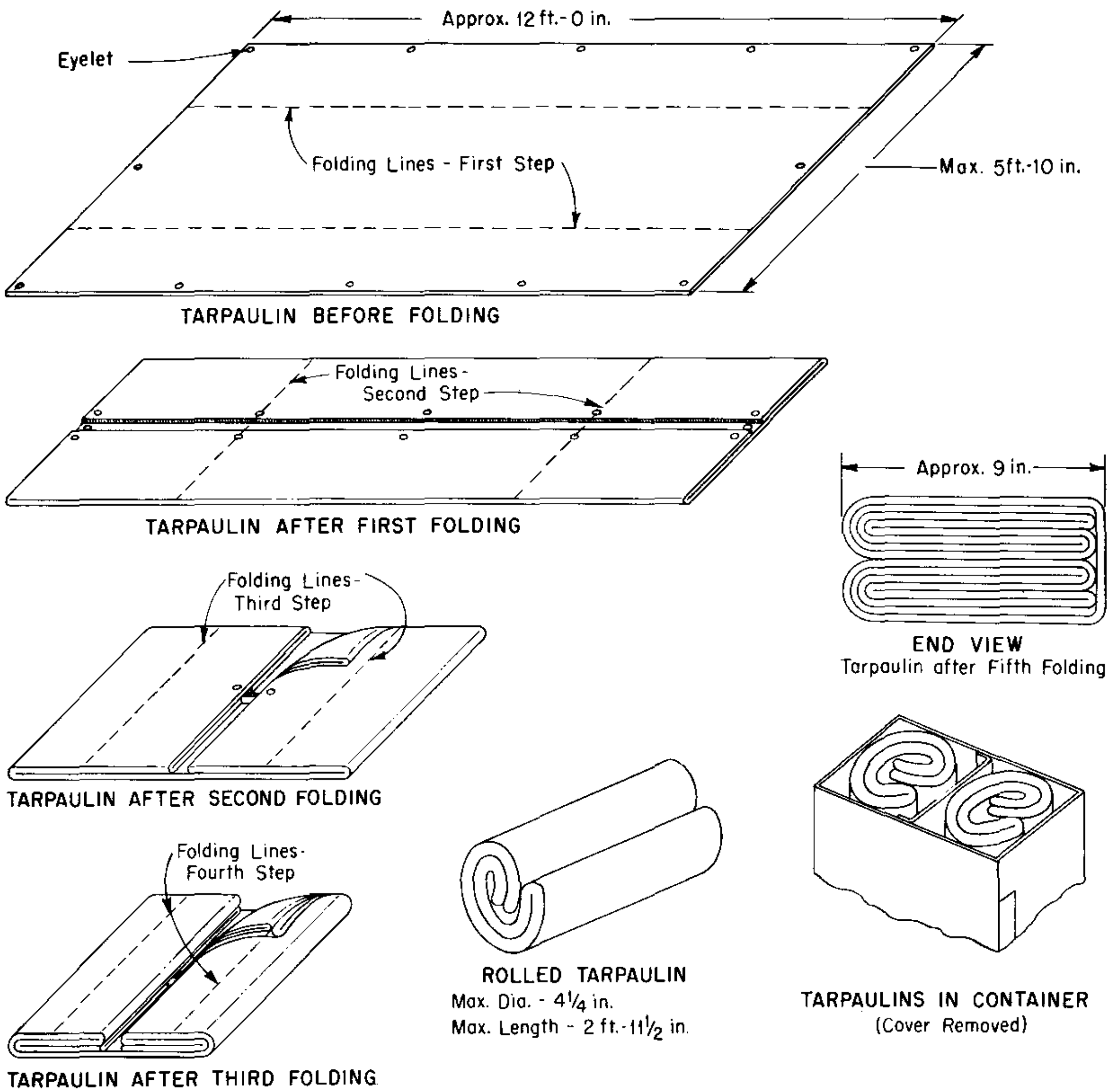

Approx. 12 ft.- 0 in.
Eyelet
Folding Lines - First Step
Max. 5 ft.-10 in.
TARPAULIN BEFORE FOLDING
Folding Lines - Second Step
TARPAULIN AFTER FIRST FOLDING
Approx. 9 in.
END VIEW
Tarpaulin after Fifth Folding
Folding Lines - Third Step
TARPAULIN AFTER SECOND FOLDING
Folding Lines - Fourth Step
TARPAULIN AFTER THIRD FOLDING
ROLLED TARPAULIN
Max. Dia. - 4 1/4 in.
Max. Length - 2 ft.-11 1/2 in.
TARPAULINS IN CONTAINER
(Cover Removed)

Fig. 2

cabinet or closet. Inspection is made to see that doors open readily.

9.02 Fire Hose Inspection:

(a) Inspection of fire hose is made annually. However, while unracking of the hose on exposed racks is done annually, it is required only every three years for hose on enclosed racks.

(b) When unlined linen hose becomes wet for any reason it deteriorates rapidly. For this reason, hydrostatic testing of the hose is not recommended.

(c) Should a hose become wet, it should be replaced with Underwriters Laboratories approved unlined linen hose unless the procedure for drying is followed as outlined in the directions given in the latest issue of pamphlet No. 198, "Care of Fire Hose," issued by the National Fire Protective Association.

(d) The exterior of the hose is cleaned by vacuuming. The hose rack, pipe fittings and hose cabinets are wiped clean with a damp or treated dust cloth.

(e) Indications of moisture are looked for, giving special attention to the loop close to the point where the hose is connected to the valve. If there is discoloration of the hose at the valve, such as would occur from water leakage, twisting of the hose by hand at the point of connection may cause it to tear indicating need for removal of the defective section and resetting of the coupling.

(f) The threads of the couplings are inspected and any injured or defective couplings are replaced. They are so adjusted that they can be easily tightened by hand. Oil or grease is not used, as they are likely to cause deterioration of hose and rubber washers. Threaded fittings are cleaned of any corrosion or foreign matter. Where couplings are polished, care is taken to keep the polish from coming in contact with the hose as the chemicals in metal polishes can damage it.

(g) The rubber washers, both at the hose valves and at the nozzles are examined and any that are lacking in strength or elasticity are replaced.

(h) After unracking and examining the hose for cracks, breaks or other evidence of deterioration, it is reconnected and replaced on the rack, making the folds in new locations to avoid creating a permanent set or breaks at the folds.

(i) The date of the inspection and inspector's name or initials should be entered in the gray linen tag (Form E-4307, "Fire Hose Inspection") attached to the rack. Inspection should include assurance of the Underwriters Laboratories approval label which should be affixed to the hose, the date of the manufacture of the hose, and manufacturer's identification.

(j) Consideration should be given to the replacing of unlined linen hose on exposed racks after fifteen to twenty years and on enclosed racks after twenty-five to thirty years, depending upon local conditions.

9.03 Standpipe Systems Inspection:

(a) The National Board of Fire Underwriters pamphlet No. 14 entitled "Standpipe and Hose Systems" specifies that hydrostatic testing of dry standpipe systems be done at intervals of not less than five years. This applies also to the dry portion of piping in a wet standpipe system between the check valve in the fire department inlet pipe and the outside multiple connection.

(b) Dry standpipes over ten years old should be tested with air at a pressure not exceeding twenty-five pounds per square inch to determine their tightness before water is turned into them for hydrostatic test.

(c) Hydrostatic testing of wet standpipes, except for dry sections, is not considered essential, when the system is supplied directly and only from a street water main. Hydrostatic testing of standpipes served by both a roof gravity or pressure tank and from the street mains is done, at least every three years. Such a test will determine the tightness of tank check valves. In such cases, tank supply control valves are turned off during the test so that in the event of a bad break, contents of tanks will not be lost.

(d) Fire pumps are usually turned over at weekly intervals with capacity tests made every three years. It is desirable that fire pump capacity tests be tied in with hydrostatic standpipe tests when required by local authorities.

(e) Where fire pumps are installed, pump capacity tests are made only after a hydrostatic test of the standpipe system has been made. The roof hose outlet should be opened to permit a limited flow through this highest outlet to assure an unobstructed standpipe before the system is returned to service.

(f) Hydrostatic testing of standpipe systems is done with a manually operated hydraulic pump. Standpipes are hydrostatically tested at a pressure of fifty pounds in excess of normal static pressure or, where fire pumps are installed, fifty pounds above maximum pump discharge pressure.

(g) The main gate valve in the water supply (sealed open) is checked to ascertain that it is in the proper open position.

(h) At the Fire Department connections, the check valves are inspected to determine that they are in working condition.

(i) The valves at hose connections are checked to assure that they are closed tightly to prevent leakage of water. The drip connections (where installed) at hose valves are checked to determine that they are open. This is done to avoid the possibility of any water that may leak past the valve from getting into the hose.

(j) All check valves throughout the standpipe system should be examined to make sure they are in proper working order.

Note: Check valves should be located on all supply lines from each separate water supply serving the standpipe system including the Fire Department (multiple) connections.

(k) The end valve of each standpipe system, located, for example, on the roof in the case of buildings over three stories in height, is opened to establish that there is a free flow of water. Adequate provision is made for carrying off the water to avoid water damage.

(l) Test procedures may differ with each installation and it is recommended that local fire departments be asked to cooperate with Telephone Company personnel in carrying on tests of standpipe systems.

(m) Where frequency of routine is suggested appropriate records should be maintained to make sure that such routines are being performed.

Form E-4400

Bell System

HYDROSTATIC TEST RECORD

FOR WATER FILLED, SODA ACID

AND FOAM FIRE EXTINGUISHERS

OFFICE OR BLDG. ____________________

SERIAL NO. ____________________

OBVERSE

HYDROSTATIC TEST RECORD

DATE	PRESSURE	INSPECTOR	
		COMPANY	PERSON

REVERSE