RECONDITIONING CENTRAL OFFICE AND PBX EQUIPMENT DAMAGED BY WATER

1. GENERAL

1.01 This section tells how to recondition central office or PBX equipment damaged by water. It generally covers action to take to keep water from entering buildings.

1.02 Water damage may result from several causes, i.e., floods, defective plumbing, fire fighting, etc.

1.03 See BSP 167-790-811 for reconditioning power equipment.

1.04 Detailed procedures for assembling, disassembling, or adjusting various types of switching equipment are covered in associated BSPs.

1.05 The importance of thorough planning and organization cannot be over emphasized. It can reduce the time required for service restoration.

1.06 The knowledge and resourcefulness of each employee must be depended upon since severity of the damage, type of equipment involved, etc., will vary in each case.

1.07 "Central office" includes any building which houses communication equipment.

2. PREVENTION AGAINST WATER DAMAGE

2.01 Prevent water from entering buildings by using sand bags, pumps, plank barricades, or any other effective means.

2.02 If water is caused by defective plumbing, shut it off at the control valve. If this valve cannot be reached, turn off main valve supplying the building. Employees who maintain central office and PBX equipment should know where these valves are.

2.03 Water from other sources may be minimized or avoided by using temporary partitions, tarpaulins, etc.

2.04 If it is necessary to abandon an office due to rising water, de-energize the equipment to prevent electrolytic corrosion. Remove all main discharge and associated alarm fuses.

2.05 If partial damage could occur to bays, panels, etc., remove potential from equipment affected.

2.06 Office drawings, subscriber line cards, cable books, etc., are valuable records during emergencies. Move them to a safe location if there is danger of flood or other water damage.

2.07 Follow established emergency procedures when reporting water damage or impending disaster. Give location, time of emergency, action being taken, approximately how long the office can stay in service before abandonment, etc.

3. EFFECTS OF WATER ON EQUIPMENT

3.01 Electrolytic Corrosion - Metallic parts of energized equipment are subject to corrosion when exposed to excessive surface moisture. The degree of corrosion depends on the time, potential, electrolytic make-up, etc. Equipment connected to positive battery is particularly subject to corrosion while equipment with negative potential may not be visibly affected. Electrolytic corrosion generally damages affected equipment within minutes. Damaged equipment must usually be replaced.

3.02 Corrosion without electrolytic action - when equipment is not energized, cor-

rosion may result on metals i.e., nickel-silver, copper, and zinc when exposed to moisture containing corrosive salts (sea water, etc.). Corrosion without electrolytic action is seldom severe enough to affect service.

3.03 Contact Contamination - Contacts of base metals are used on step-by-step banks, commutator segments, etc. Unless electrolytic corrosion occurs on base metal contacts, normal cleaning procedures are generally effective after water damage. Noble metal contacts, e.g. palladium and No. 2 contact metal, are not subject to corrosion. Usual cleaning procedures are effective for removing dirt, lint, and loose corrosion products lodged on noble metal contact surfaces. However, corrosion may form around the base of these contacts at the junction with base metal springs due to galvanic action.

3.04 Swelling of Insulators, Panel Cork Rolls. Etc. - Insulators, spool heads, panel cork rolls, and other materials containing fibrous fillers will swell as water is absorbed and contract partially or fully as these materials dry out. Loose spring pile-ups may result.

3.05 Open Relay Windings - Open relay windings may occur due to electrolytic corrosion when equipment is re-energized, if moisture has not been sufficiently removed.

3.06 Silt and Debris - Flood water generally is heavy-laden with silt which is deposited as the water velocity is reduced. It usually contains fine particles of clay which are nearly impossible to remove by flushing, if allowed to dry. Debris lodges in multiple wiring, cable forms, inside relay covers, etc., and if not thoroughly removed, will continuously sift out and produce contact contamination after the equipment is dried.

4. REMEDIAL ACTION AFTER WATER DAMAGE

4.01 Water damaged central office and PBX equipment generally can be reconditioned and reused without requiring subsequent increased maintenance effort provided that:

(a) Electrolytic corrosion is not present.

(b) Equipment is promptly washed with clean water.

(c) It is thoroughly dried out and cleaned before battery potential is again applied.

4.02 The general plan for reconditioning water damaged equipment is as follows:

(1) Flush mud and debris off equipment.

(2) Drive off surface moisture.

(3) Dry out the equipment.

(4) Pressure-clean equipment to remove silt.

(5) Clean contacts.

(6) Relubricate.

(7) Make operational tests or routines.

(8) Place equipment back in service.

(9) Make "post-damage" inspections for a reasonable period.

NOTE: All or part of the above should be done dependent upon the kind and extent of the water damage and contamination.

4.03 As water recedes or is otherwise removed from the building, promptly flush off the equipment with clean water. Do not remove equipment covers. This procedure should begin as soon as possible to clean equipment of mud while it is still in a semi-fluid state.

4.04 Begin the flushing operation at the high water mark and work downward to remove the silt and debris. After equipment has once been soaked, flushing can do no further harm. Do not dampen equipment which has not been subjected to water damage.

4.05 After flushing is completed, remove equipment covers, open sewn cable forms, bank multiples, etc., to about eight inches above the high water level. Again flush equipment down,

to remove remaining sand, silt, and debris. Use a hose, preferably equipped with a nozzle, which provides a rotational multi-directional spray to dislodge the harder-to-remove particles. Direct the stream to both upper and lower sides of terminal strips, banks, etc.

4.06 If equipment quantities are relatively small, it may be desirable to remove dismountable equipment from the frames for flushing, cleaning, and drying. Tag equipment to insure its return to the location from which it was removed.

4.07 Do not use rust inhibitors or other compounds designed to drive out moisture since they may leave gummy deposits or corrosive agents, on relay parts and interfere with operation.

4.08 After the flushing operation is completed, remove surface moisture with air compressors and/or dry cleaning cloths of the type commonly used in central offices. Start at the high water mark and work downward.

4.09 Clean and mop equipment room floor after surface moisture is removed. Continue cleaning and mopping operations when required to control silt being carried into the office by workman.

5. DRYING OPERATIONS

5.01 Some telephone apparatus will dry out sufficiently for service in 24 hours. Practically all of it can be dried in 72 hours. Apparatus and wiring forms will dry more quickly if disassembled sufficiently to allow free circulation of air.

5.02 Circulated warm air directed over damp equipment will aid the drying process.

CAUTION: Do not subject telephone switching equipment to temperatures above 130° F, or damage may result to capacitors and other circuit elements. Provide thermometers for use during restoration activities.

5.03 Do not use desiccants for drying equipment and wiring as excessive quantities would be needed. Use of desiccants generally will produce contact contamination. Use building heating and ventilating equipment if available to raise the temperature and provide circulation.

5.04 Forced air circulation may be obtained by use of electric fans where power is available.

5.05 The thermidor portable electric heaters (Model HF-5161) at various locations are good to use as drying equipment. They are equipped with a 20 foot cord, polarized plug, and electric fan for circulation. The air temperature circulated by this unit will not exceed 120° F.

5.06 Other sources of heat found practicable in water damage restoration are as follows:

(a) Infrared heat lamps (250 Watt) - These should be equipped with swivel or clamp-on type sockets for clamping to equipment frames or racks made up to hold them.

(b) Various commercial heaters.

(c) Manhole heaters.

(d) Portable hair driers (if used, should be hand operated).

NOTE A: An attendant should always be present during the drying operation to make sure that equipment is not overheated.

NOTE B: Avoid direct application of heat lamp rays or hair driers to panel banks. This would tend to soften the tar binder in the banks and tar may flow and spread on the terminals. Remove lubrication from panel banks before heat is applied.

5.07 Keep fire extinguishers available during the drying operation.

5.08 Caution: Make certain all portable electric equipment is grounded as described in BSP 010-111-010 to avoid accidental electric shock.

6. INSULATION RESISTANCE REQUIREMENTS & MEASUREMENTS

6.01 The net normal insulation resistance on a connection through a central office or PBX is about 15 megohms. Equipment and cabling will function satisfactorily without damage after the drying operation has raised the insulation resistance to 0.5 megohm or greater. Take insulation resistance measurements throughout the office frequently to check the drying rate.

6.02 Use a megger, KS-14510 Volt-Ohm-Milliammeter or equivalent.

7. OPERATIONS AFTER DRYING

7.01 Corrosion products lower insulation resistance. They should be removed, particularly on relay springs near noble metal contacts and at exposed edges of spring pile-ups. If left on equipment, corrosion products will continue to dislodge and cause contact contamination and other trouble conditions. A stiff brush, such as a tooth brush, will aid in removing these products if used with a vacuum cleaner.

7.02 Relubricate equipment in accordance with appropriate BSP sections.

7.03 Clean relay and other contacts if inspection routines or operational tests disclose contamination.

7.04 Clean and treat step-by-step banks. Remove deposits between terminals since dirt particles will cause excessive wiper and terminal wear. The method of cleaning and treating these banks is covered in other BSP sections.

7.05 Before attempting to place equipment back in service:

(a) Test and clear troubles on alarm circuits.

(b) Retest outside cable facilities and remove heat coils on lines in trouble.

7.06 Restore fuses progressively to prevent placing an abnormal load on the power plant.

7.07 In certain cases, the use of line load control or the removal of all heat coils before attempting to restore service will prevent placing an abnormal load on the equipment. Restore line load control or heat coils progressively.

8. POST DAMAGE INSPECTIONS

8.01 Make periodic inspections after water damaged equipment has been restored to service. Inspections should continue for at least six months to help detect abnormal conditions that may develop, such as shortened wiper life, etc.