CENTRAL OFFICE GROUND

1. GENERAL

1.01 This section describes a visual inspection of the various leads and connections of the central office power plant and distributing frame protective grounding systems. It is revised to change the frequency of performance.

1.02 This is an insurance inspection and should be required for regular performance annually and following building alterations or other activities which may directly or indirectly affect the reliability of the central office ground connections.

1.03 It is assumed that the grounding systems have been properly installed according to the standards existing at the time of their installation. Consequently, the inspection covered by this section is not intended to result in the correction of existing systems to conform to current standards if they met the standard requirements existing when they were installed. In the case of offices acquired by this company after installation, it should be determined that the grounding system is adequate.

1.04 The method by which the necessary protective grounding system is furnished differs somewhat in individual offices and the person making the inspection should familiarize himself with the particular arrangement used.

1.05 In general, the grounding system centers at the main distributing frame ground bus-bar, and this bus-bar is connected to the central office ground by means of the distributing frame ground lead, a continuous No. 0 copper lead. In offices up to an ultimate of 1500 lines a No. 6 copper lead may be used. Some of the older systems may have two No. 0 leads between the M.D.F. bus-bar and the central office ground, one being connected to each end of the bus-bar. In offices up to an ultimate of 200 lines using driven ground rods for the central office ground, two copper leads, constituting the two ends of a loop which includes the ground rods, are connected to the M.D.F. bus-bar. In the older offices this loop consists of No. 12 copper wire and in the later offices of 104 copper line wire (.104" diameter). Connected to the M.D.F. bus-bar are the various ground leads such as the lead to the bonding bar on the M.D.F. conduit ground lead, central office battery ground lead, telegraph power board ground lead, and other central office ground leads, although some of these may be run direct to the central office ground connection if substantially shorter leads would result from this procedure.

1.06 The central office ground connection is usually made to the water service pipe near the point of entrance to the building, or to 5 or more 3/4" galvanized iron pipes driven into the ground either inside or outside the building and at least 2 feet from the building wall, with approximately 8 inches of the pipe above the floor or ground level. Boards 1" x 4" are run between the protruding ends of the pipes and fastened to them by means of pipe straps, to serve as a protection to the ground connecting leads. Whether inside or outside the building, if the leads and electrodes will not be subjected to mechanical injury, the electrodes may be in a trench and driven flush with the floor or ground levels. If the pipes forming the ground electrodes are driven outside the building, they may be buried approximately 1 foot beneath the surface of the earth and in this case, in the later installations, the protection board is omitted but the pipe, clamp, and bare wire are painted with asphaltum paint, wrapped with several layers of muslin, and

the whole saturated with the paint. In offices up to an ultimate of 100 and 200 lines, 3 and 5 ground rods, respectively, may be employed in the general manner described for pipe grounds. With the later systems using either driven pipe or rod grounds the electrodes should be bonded by means of a lead of the same size as the distributing frame ground lead to any small private water system in the building and also to the ground used by the power company if it uses a separate ground.

1.07 Ground connections are made to water pipes, when available, by means of suitable ground clamps. Each lead should be provided with a brass tag, inscribed "Do Not Disconnect," near the connection. The tag should be securely attached by suitable means. If only one lead is used it is usually connected to the water pipe on the street side of the meter, although it may be connected to the house side if the meter is outside of the building or is otherwise inaccessible. The pipes on the street and house side of the meter must be bonded in all cases by means of suitable ground clamps and a copper lead of the same size as the distributing frame ground lead or larger. If two leads are used, the same procedure is followed as for one lead except that each lead is connected to a different water pipe if more than one is available. If only one water pipe is available one lead should be connected to it on the house side and the other on the street side of the meter, if there is a meter. In the absence of water pipes, gas pipes may be used for the ground, connection being made to the street side of the meter. In some of the older offices the ground lead may be connected on the house side of the gas meter, in which case the pipes should be bonded around the meter in the same manner as with water pipes.

1.08 When a driven pipe ground is used, the distributing frame ground lead is attached to the pipes by means of suitable ground clamps bonded to a short copper lead, at least No. 6 in size, which is either wrapped around the ground lead and soldered or attached by means of a solderless cable tap or connector. If two ground leads are used, one is connected to each end of the multiple connection to the pipe ground.

1.09 In offices where ground rods are used the wire connecting the rods should be run in a loop and both ends of the loop should be terminated at the distributing frame ground bus-bar. Connection between the ground rods and the distributing frame ground lead is by means of a double tube copper sleeve or soldered connection.

1.10 Where two leads are attached to the same ground clamp each should be terminated in a separate hole.

1.11 The frames of machine tables, motors, generators, etc., having a satisfactory path to the grounding system through their framework and conduit connections, and the metal cases of meters and relays mounted on a grounded metal panel may not be provided with a separate ground connection.

1.12 Frames, cabinets, racks, etc., containing equipment which is not connected to commercial power need not be grounded. Also, conduits and lead covered or flexible steel covered cables which do not carry commercial or emergency alternator power or ringing and tone leads need not be grounded. However, much of this equipment will be grounded incidentally by being clamped to grounded racks or frames.

1.13 Current standards and those in effect

during recent years, barring details, are represented in the informational data in 1.05 to 1.11. If in certain instances detailed information applying to a specific office seems necessary it can be obtained through the usual channels from the maintenance engineer.

2. METHOD

2.01 The following grounds, ground leads, and connections of the central office grounding system shall be inspected for satisfactory appearance and physical condition, and for the proximity of objects which may present a service hazard to the grounding system network, particularly during and following equipment additions or building alterations. Check bolted, soldered, and clamp connections for looseness and for evidence of corrosion.

M.D.F. ground bus-bar

Ground lead between the M.D.F. ground bus-bar and the water or gas pipe or made ground

Bonding bar on M.D.F.

Ground clamp connections at water or gas pipe grounds

Bonding connections at water or gas meters

Connections at made grounds when accessible, also protecting boards, etc.

Aerial cable sheath ground lead

Conduit ground leads (including sheaths of lead covered or armored cables)

Battery ground leads

Telegraph power board ground lead

Power company ground lead

Power switchboard framework ground

Machine table ground

Transformer ground (ringing machine)

Case and secondary winding ground (power board instrument transformers)

Generator, motor, and rectifier frame ground (excepting portables with potentials of 150 volts or less to ground)

Emergency alternator frame ground

Metal cases of meters and relays, ground (used with voltage of 150 or more)

Other miscellaneous ground connections

2.02 Observe that clamps are provided around both ends of groups of flexible steel covered cables carrying ringing and tone leads, and that these clamps at each end are connected to the ringing ground bar or stud on the panel or to the grounded transformer tap.

2.03 When performing the inspection of the items listed in 2.01 observe that all ground lead and meter bond connections to water or gas pipes are provided with a brass tag inscribed "Do Not Disconnect" securely attached to the lead near the ground clamp. Replace any of these tags found missing. The number of the tag is P-411719.

3. REPORTS

3.01 The required record of this routine should be made on the proper form.