BURIED PLANT
PRECAUTIONS

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1. GENERAL

1.01 This section covers the precautions to be observed when placing and handling buried plant.

1.02 This section is reissued to:

- Revise procedures for handling of power cables.
- Add procedures for exposing joint buried plant.
- Add shoring requirements.

Arrows ordinarily used to indicate changes have been omitted.

2. ORDINANCES AND PERMITS

2.01 All local ordinances and public regulations should be observed.

2.02 Permits required for buried cable or wire work must be obtained before starting the work and should be retained for immediate reference during the progress of the work. Permits will be required for the following:

(a) Opening streets

(b) Closing a thoroughfare to traffic

(c) Excavating on private property

(d) Placing materials on the street or on private property

(e) Blasting

(f) Pushing pipe under streets or railroads

(g) River or stream crossings.

3. MAINTENANCE OF TRAFFIC—WARNING SIGNALS

3.01 When excavating along or across highways, streets, or alleys, perform the work in a manner that will minimize interference with traffic. If necessary, the opening may be bridged with a structure of adequate strength to provide suitable passage for any traffic which is likely to pass over it.

3.02 Protect all openings, construction material, excavated material, cable reels, or machinery left on streets, highways, or other accessible locations, with standard warning devices as described in the 620 Division of the Bell System Practices.

Observe any other precautions which may be required by local regulations or by existing conditions.

4. WORKING ON PRIVATE PROPERTY

4.01 Before starting work on private property, make sure the necessary easements or permits have been obtained in accordance with local instructions.

4.02 Special care should be exercised to avoid damage to fences, trees, shrubs, flowers, etc. Disturbance of the ground surface by heavy apparatus should be kept to a minimum.

4.03 When opening a trench in an established lawn, the sod should be carefully removed so it can be replaced when the work is completed. The sod should be cut into long strips and rolled up or cut into pieces and stacked with grass-to-grass and soil-to-soil. It is desirable that the sod be kept wet from the time it is removed until at least three days after it is replaced. To avoid damage to the lawn, tarpaulins should be placed along the side of the trench to receive the soil taken from the excavation.

4.04 In pasture or range land, it is desirable to have livestock removed before starting work. If this is not practical and excavations are to be left unattended, openings should be protected with temporary fencing or planking of sufficient strength to protect the livestock.

4.05 Close gates and repair fence openings as soon as possible. If it appears that it will be necessary to enter a field at frequent intervals after the cable is installed, it may be necessary to install a gate. If a gate is to be placed in the fence, it will be indicated on the work print.

4.06 It is important that the work be conducted in such a manner as to minimize inconvenience to the occupant of the property. After the work is completed the property must be restored and left in good condition.

4.07 Close as much trench as practical before the end of each day of work. Avoid having more trench open at one time than is necessary.

4.08 The trench or plow furrow should be firmly tamped (See Section 629-200-220). In addition, it should be periodically inspected for settling especially following the first rain after completion of the work.

5. PLOWING AND TRENCHING

5.01 A buried or underground cable project will often require the use of heavy construction equipment and the transportation of heavy loads. Certain soil conditions may be encountered that will not support these loads. To avoid hazards, unnecessary delays, or to prevent the equipment from becoming mired, carefully observe local conditions when using this heavy equipment.

5.02 Only qualified personnel should operate construction equipment.

5.03 Unbalancing or overturning plowing equipment when lowering the plow share into the ground may be avoided by gradually increasing the plow share depth.

5.04 At start of construction, verify the center line of the excavation from a clearly defined object, such as bench mark, edge of curb, pole, fire hydrant, etc. The center line should be shown on the work print by direction and distance.

5.05 The location of all subsurface structures across or near the proposed route must be determined before excavation begins. Uncover and expose all known conflicts (including buried cable) in advance.

5.06 Excavation near other subsurface structures should be performed in a manner that will avoid accidental contact of the digging tools with such structures.

5.07 A trencher or plow train should never be placed in operation without an approved signal system with which all of the employees on the job are familiar. (See Section 620-020-020 for signals used by Outside Plant Forces.)

5.08 While the trencher or plow is in motion or the engine is running, no attempt should be made to remove roots, vines, or other foreign matter entangled with the equipment.

5.09 As a general rule, do not ride on or walk close to trail-type plows because of the danger of the plow tipping when a large obstacle is struck.

5.10 Do not walk between the units of the train when the equipment is in motion.

5.11 Shear pins are usually fitted to plows to limit the maximum force to which the unit is subjected. Since shear pins are sometimes ejected with considerable force after shearing, be sure to replace the caps used to restrict the travel of the pins.

5.12 When winching the train and in other winching operations, stay clear of the path of the rope or winch line. The 649 Division of the Bell System Practices cover the winching operation.

5.13 No one should rest their hands on a moving winch line or permit the moving winch line to pass through the hands. This is especially important near a block or sheave.

5.14 Under normal conditions with stable soil, shoring is not required unless trenches, pits, or excavations are 5 feet or more in depth and employees have occasion to enter them. This 5-foot guide should be modified to shorter depths if unstable soil conditions or rainy weather exist or if heavy traffic or equipment is in proximity to the trench, excavation, or pit. Section 622-020-020 outlines these requirements.

6. EXPOSING JOINT BURIED PLANT

6.01 Accurately locate the path and depth of the cable to be exposed as outlined in Section 634-220-500, 634-220-501, or 634-220-515 before starting excavation.

DANGER: In regard to depth determination, neither the low nor high frequency methods outlined in Section 634-220-500 or 634-220-501, respectively, can be relied on to give more than an approximate indication of the depth of cable in joint-buried systems.

6.02 Determine the path and depth of the power plant either by power company staking or assuming random lay.

6.03 Excavation of joint buried plant may be performed when the ***power company is present*** if ***all*** of the following conditions are met and the following procedures are followed:

CONDITIONS

(a) There is no known or suspected power trouble..

(b) The voltage is known.

(c) Safety headgear and eye protection are worn.

(d) Bell System E insulating gloves are worn.

PROCEDURES

(a) Use of ***wooden handle*** shovel or similar tool having ***equivalent insulating value.***

DANGER: DO NOT USE DIGGING BARS OR TOOLS WITH METAL HANDLES IN THE VICINITY OF JOINT BURIED CABLES.

(b) Start digging at a point 6 to 12 inches to one side of the established path.

(c) When at the depth of the cable, dig toward the cables to expose them.

(d) If digging conditions are encountered which require tool other than a shovel, use a wooden handle pick or similar tool having equivalent insulating value.

Power company employees shall be requested to separate or move primary and secondary cables, service leads in main trenches, and secondary leads exceeding 300 volts to ground in service trenches.

6.04 Excavation of joint buried plant may be performed when the ***power company is not present*** if ***all*** of the following conditions are met and the following procedures are followed:

CONDITIONS

(a) There is no known or suspected power trouble.

(b) The voltage has been determined to be less than 300 volts to ground by one of the following methods:

(1) Verification with power company records

(2) Power company staking

(3) Personal positive knowledge of the area, primary route, and transformer location.

(c) Safety headgear and eye protection are worn.

(d) Bell System E insulating gloves are worn.

(e) The power company has been notified and permits these procedures.

(f) The location and depth of the telephone plant has been determined.

(g) The location and depth of the power plant has been determined (power company staking or known joint plant).

(h) The area to be excavated is a secondary trench and not in an industrial or commercial area where the service voltage is likely to exceed 300 volts.

PROCEDURES

(a) Use a ***wooden handle*** shovel or similar tool having ***equivalent insulating value.***

DANGER: DO NOT USE DIGGING BARS OR TOOLS WITH METAL HANDLES IN THE VICINITY OF JOINT BURIED CABLES.

(b) Start digging at a point 6 to 12 inches to one side of the established path.

(c) When at the depth of the cable, dig toward the cables to expose them.

(d) If digging conditions are encountered which require tool other than a shovel, use a wooden handle pick or similar tools having equivalent insulating value.

(e) Separate power and telephone plant using wooden handle of a shovel or a section of tree pruner handle. Do not apply excessive leverage to the exposed plant as this could damage the telephone sheath or the power insulation.

(f) Place dry wooden boards between telephone and power plant and cover power plant with insulating blankets.

In case of known or suspected power trouble, telephone employees shall not excavate, move, separate or in any way handle power cables of any voltage until the power trouble has been cleared.

6.05 Wearing insulating gloves, electrically identify and mark the exposed telephone cables as follows before handling, opening, or cutting.

DANGER: Except in the case of a cut cable, visual identification shall never be attempted. Never assume that a particular cable is a telephone cable because other cable in the trench have been identified by the power representative. Cables must be electrically identified and marked even though they have been identified in an adjacent pit, for the cable may be transposed in the connecting trench.

(a) Using a 76, 146A, or KS-14103-type test set, place a tone at a terminal or central office between one conductor of a pair in one group and a conductor of a pair in a second or different group.

(b) Short these conductors at the distant end; then, using 101B or 105D test set (exploring coil) in conjunction with 147-type amplifier, identify the telephone cable. ***Do not use a ground return with the tone because the telephone cable sheath ground and the power neutral are interconnected and the tone will be picked up on power cable.***

(c) After ***positive*** electrical identification has been made, mark the cable with paper tape or muslin, etc, before any further work commences.

(d) Where telephone cables have been cut and positive identification can be made because

the conductors are clearly visible, electrical identification is not required.

7. HANDLING OF POWER CABLES

7.01 Where there is joint burial of telephone and power facilities handling of power cables should be observed as follows:

DANGER: Telephone employees shall not move or handle any power cable (primary, secondary, or service leads) in the main trench or primary cables anywhere at any time. Power company employees shall be requested to move primary and secondary cables, service leads in main trench, and secondary service leads exceeding 300 volts to ground in service trench when required.

(a) When maintenance or repair of telephone facilities are required that involves ***no known or suspected power trouble*** and the power company is present, telephone employees may separate secondary leads (300 volts to ground or less) from telephone wires or cables provided all of the following conditions are met.

(1) Bell System insulating gloves, safety headgear, and eye protection are worn.

(2) Local agreement with power company permits handling.

(b) In the case of known power trouble, the handling of moving of power cables of any voltage is prohibited until the power trouble has been cleared.

8. PROPERTY OF OTHER COMPANIES

8.01 Before starting burying operations, locate all foreign plant that may interfere with the proposed telephone route. (See Section 620-060-530.) Make every effort to avoid contact with the underground or buried plant belonging to other utilities, municipalities, etc.

8.02 Other companies who have buried or underground facilities should be requested to establish the location of these facilities and to expose, identify, and suitably protect their interest while work is in progress.

8.03 The ***pipe locators*** covered in the 634 Division of the Bell System Practices may be used to locate ***metallic*** facilities such as gas pipe, water pipe, cable, etc. The ***pipe locator*** should be used ahead of trenching, plowing, and pipe pushing operations.

8.04 To prevent damage in areas where other companies' buried or underground facilities are plastic, such as gas pipe, water pipe, etc, these facilities must be located, exposed, and protected while work is in progress. ***There is no test equipment available to locate plastic pipe.***

8.05 When foreign objects are encountered while digging, plowing, trenching, or pipe pushing, stop operations immediately. Expose and investigate them with caution. Do not cut, chop through, or break off underground obstructions without first determining if they serve a useful purpose. Under no circumstances should underground electrical plant or pipe line (gas or other) be disturbed.

8.06 ***If a gas line should be broken or damaged:***

(a) Turn off all spark producing equipment.

(b) Leave the hole open to allow gas to dissipate into atmosphere.

(c) Warn residents and the public in the vicinity.

(d) Notify local fire department.

(e) Notify local gas company.

(f) Keep the public clear of the area until condition is cleared.

(g) Notify your supervisor.

8.07 ***If an electric line should be broken or damaged:***

(a) Barricade location until condition has been cleared.

(b) Notify the local electric company.

(c) Keep the public clear of the area.

(d) Notify your supervisor.

8.08 ***If a pipe line other than gas should be broken or damaged:***

(a) If a liquid is noticed which appears to be volatile, such as gasoline, follow instructions in 8.06.

(b) Notify the appropriate utility, municipality, etc.

(c) Notify your supervisor.

9. DAMAGE TO CABLE AND WIRE—HANDLING REELS

9.01 The coverings surrounding the sheath are provided for corrosion and mechanical protection. Puncturing or damaging the coverings will nullify this protection. It is important, therefore, to avoid damaging the cable and wire in transit from the storage area to the job, and on the job.

9.02 When loading or unloading reels, keep all persons away from the rear of the trailer to avoid possible injury in case unexpected movement of the reel occurs. No one should be permitted on the trailer platform during the loading and unloading operations. In handling reel spindle locks, make sure the tractor winch operator signals approval before latching or unlatching. The latch must be handled only when there is no movement of the spindle.

9.03 After reels are delivered to the job, they should be securely blocked to prevent rolling if the cable is not to be immediately placed. Reels should be stored where they will not inconvenience the public or obstruct the view of drivers, particularly at intersections. If possible, they should be left on side streets in preference to main thoroughfares. Reels should not be left at locations where there is a possibility of grass fires or near other fire hazards. Reels should not be left on grades if it can be avoided. When it is necessary to leave a reel on a grade, block it so it cannot roll.

9.04 On steep hills move reels by power equipment. Do not detach trailer slings before the reel is effectively blocked.

9.05 Since a full reel of cable of maximum size weighs as much as 9 tons, exercise careful control of its movement. Do not permit a heavy reel to tilt. When uneven ground conditions are encountered, provide a substantial runway of heavy planks leveled by blocking so tilting of the reel will not occur. If practical, use power equipment for moving.

9.06 In turning reels, do not press against the cable or wire with bars. Reels should not be dropped since the flanges are likely to sink into the ground with the result that the cable may be crushed between the ground and the drum of the reel.

9.07 When it is necessary to roll the reels over soft ground, use planks to prevent the flanges from sinking. Do not roll reels over rocks or other projecting objects that are likely to damage the cable or cause reels to tip.

10. DAMAGE TO CABLE AND WIRE—PLOWING

10.01 Excessive strains should not be placed on cable or wire. Excessive strain at the start of plowing operations can be eliminated by starting the plow slowly and without jerks. If the free end of the cable or wire is anchored to a pole or tree, the use of a spring or spring scale with a spring rate of approximately 100 pounds per inch is recommended between the cable and the pole or tree to cushion the shock loads. Grease or otherwise lubricate the reel and spindle so the reel turns freely.

10.02 Where it is necessary to pull the cable over the ground or in the trench, avoid dragging it over rocks, tree trunks, stumps, etc, that might injure the outer sheath. When pulling cable along the route under road pavements, across pipelines, etc, the setup should be such that undue strain will not be placed on the sheath or its protective coverings. A cable reel pressure alarm is available for attaching to the reel end of the cable to give an audible alarm warning of any sheath damage that might occur while plowing. (See Section 081-600-011.)

10.03 Sharp bends should not be made in the cable or wire, since severe bending is likely to crack the sheath or separate the protective coverings and expose the sheath. Special care is required in handling coaxial cables because of the damage (kinks or dents) that occurs to the coaxial tubes without apparent damage to the cable sheath or protective covering.

10.04 A plowshare should be lowered into and raised from the excavation gradually to avoid pinching the wire or cable where it comes out of the feed chute. Do not back the plow when the share is buried in the ground. If necessary to back the plow, excavate behind the share and hold the wire or cable clear as the plow is backed.

10.05 Where the cable and wire have not been buried to a sufficient depth by plowing, stop the plow and pull from the reel sufficient slack so the wire or cable may be laid to the side while a trench is dug.

10.06 If the passage of a plow through rocky soil or boulders necessitates handwork to obtain proper depth, inspect the sheath for cuts and upon replacing, protect the cable or wire by placing around it a cushion of earth free from sharp rock fragments before backfilling the remainder of the trench.

10.07 If injury to the cable or wire is suspected, and the cable or wire is accessible for examination without digging, immediately inspect for evidence of cuts. If the incident occurs during plowing, mark the spot with a stake so that the location may later be identified if subsequent tests indicate a defect in the section.

10.08 In preparation for splicing, for the completion of terminations, and occasionally in locating trouble, it is necessary to excavate to uncover the facility. ***The need to exercise extreme care in digging around the cable or wire cannot be emphasized too strongly.***

10.09 With certain precautions, disc-insulated coaxial cables up through the 6 unit size can be satisfactorily plowed with a system standard C, D, or Ryan C plow. If plows equipped with double feed tubes are used, always use the forward feed tube for plowing coaxial cable. Regardless of the sheath makeup or mechanical protection provided, the following precautions are to be followed:

Note: C and D plows are rated "MD".

(a) Turn cable reel by hand as the plow starts moving.

(b) Place cable reel on arbor supports of plow whenever possible rather than on reel trailer.

(c) Raise share no more than 6 inches when plow is not in motion.

10.10 Disc-insulated coaxial cables of eight and twelve units should not be plowed except under exceptional circumstances and ***only*** under optimum soil conditions.

10.11 Plowing of disc-insulated coaxial cables larger than the 12 unit size ***should not*** be attempted under any conditions.

11. OPEN FLAMES

11.01 Care should be exercised if an acetylene torch is used in removing the wrappings over the sheath from cable at pedestal terminal, handhole, and buried splice points. This work should preferably be done before a tent or other shelter is placed in order to avoid fire hazards.

11.02 In areas where combustible gases or liquids are piped or stored, such as near gasoline service stations, the atmosphere of trenches shall be tested for combustible mixtures before acetylene torches, furnaces, open flames, or other materials or devices which create a flame or hot spark are used.

11.03 If combustible mixtures are present, no work with an open flame shall be done until the supervisor has been notified and the atmosphere cleared.