BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G41.126.1
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AT&T Co Standard

MAIN CONDUIT
LAYING B FIBRE CONDUIT

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1. GENERAL

1.01 This section describes the use of B (thin-walled) Fibre Conduit in the construction of main conduit. This single duct material is laid up in multiples as required and is joined by sleeve couplings furnished with the conduit. It is used as an alternative to multiple clay conduit. It is also used on bridges and viaducts in situations where the conduit can be included in the concrete of the structure. B Fibre Conduit is always installed with concrete encasement.

1.02 The nominal length of 3½-inch B Fibre Conduit is 8 feet, as listed in G40.060.1. Shipment of up to 15% of the total footage in shorter lengths is permitted. The minimum short length is 7 feet. Other information regarding weights, adapters and accessory fittings for B Fibre Conduit is included in G40.060.1.

1.03 Ends of B Fibre Conduit cut in the field to obtain shorter lengths or to salvage broken lengths can be joined by means of adapters. Where a large amount of cutting is necessary, a more satisfactory joint can be obtained using a commercially available field tooling machine to restore the standard taper to the cut ends.

2. HANDLING AND STORAGE

2.01 In unloading fibre conduit from freight cars and in other bulk handling, observe the caution notice usually tacked to the outside of each carload by the manufacturer. The dust from the coal tar pitch in fibre conduit can be irritating to the eyelids and other exposed skin of the face and hands unless steps are taken to avoid excessive contact. If dust is difficult to control, wear work gloves and goggles.

2.02 In handling fibre conduit, use reasonable care not to strike the milled ends against hard surfaces. These portions are thinner than the wall of the conduit and, if fractured, may damage the inside of the duct or impair the joint.

2.03 Whenever possible, avoid stacking fibre conduit on an unyielding surface. Conduit stored in this manner for long periods may tend to flatten. For outside storage, a surface of smooth soil, sand, gravel or cinders is best. Do not pile on wood strips, as these may deform the layer of ducts resting on them. If it is necessary to store indoors, lay the material on a smooth, level section of floor.

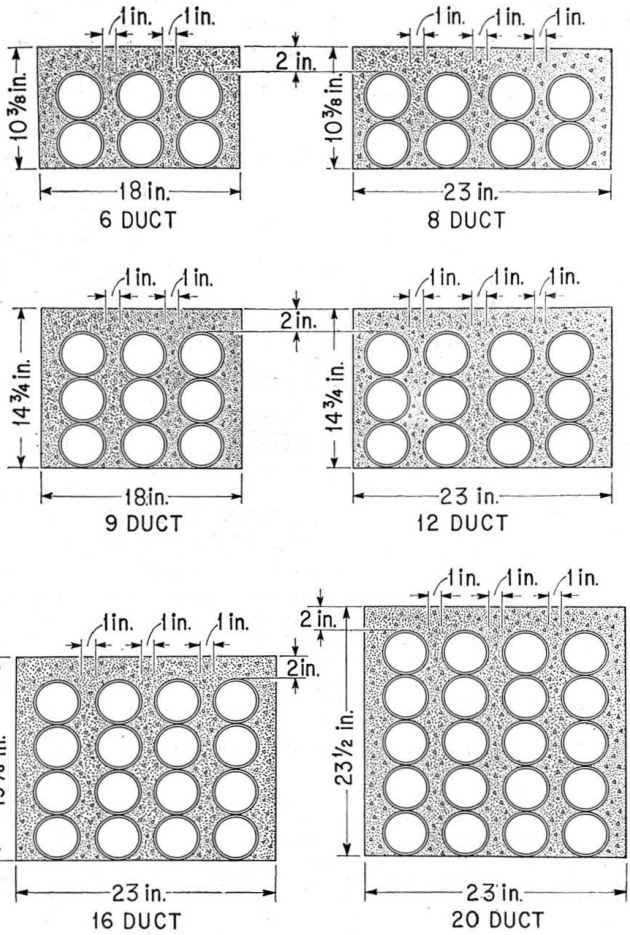
2.04 In piling, lay the bottom tier straight with the pieces touching each other their entire length. The height of piles expected to remain through warm weather should be limited to 5 feet. If upward bending of the ends of the top layer of conduit is observed during long periods of hot weather, turning the bent pieces over will straighten them.

2.05 Store cartons of couplings and other fittings under shelter for protection of the packages. Cartons are marked to indicate the proper position for stacking.

3. TRENCHING

3.01 As the walls of the trench for fibre conduit are to act as forms for the concrete encasement, the trench width is made no greater than is necessary to provide the nominal side concrete thickness. Except in situations where there is no alternative, fibre conduit should be used only if the trench sides can be expected to hold up until the concrete is placed. Other conditions will either require excessive volumes of concrete or extra labor for the provision of side forms.

3.02 The following illustrations show nominal trench widths and concrete requirements for various basic formations. The formations suggested are selected to conform to minimum working requirements and to make most efficient use of the concrete. Variations may be required to meet special conditions, or one or more ducts may be added to the basic formations.



3.03 The widths shown allow for approximately 1½ inches of concrete at the sides of the formation. Unavoidable irregularities of the trench will result in minor variations either way from this thickness, but this will not be of serious consequence. The objective should be to use less rather than more

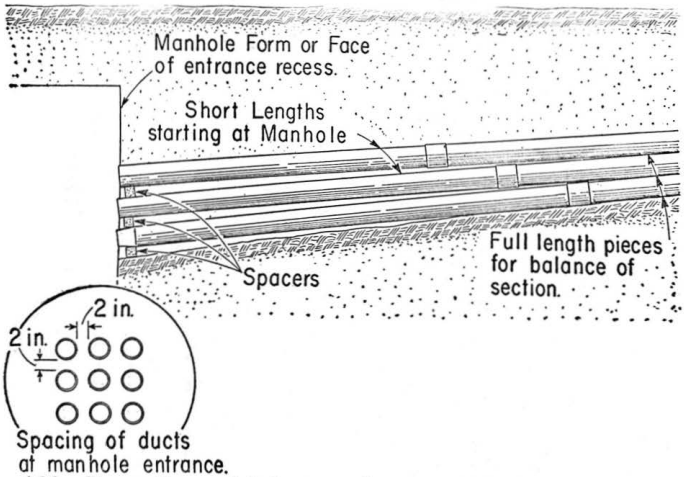
concrete as long as the space between the trench wall and the duct is completely filled.

3.04 All other phases of trench work for B Fibre Conduit, such as depth, grading, preparation of trench bed, etc., follow the general recommendations of G41.110.

4. PLACING

4.01 At manhole entrances, the ducts should be separated from each other both vertically and horizontally by about 2 inches. This is to provide space around the individual ducts to permit later caulking and sealing if necessary. Separation can be obtained by plastic spacers or by inserting bricks between the ducts.

4.02 The bottom row of ducts should be full length sections. For upper layers, short lengths selected from the shipment should be used, if available. As an alternative, full length sections can be cut back about 6 inches in each succeeding row. The purpose is to stagger the joints for easier coupling. If cut pieces are used, place the cut end at the manhole. Full length pieces are used for the balance of the section. Each piece as laid is provided with a coupling on the outer end.

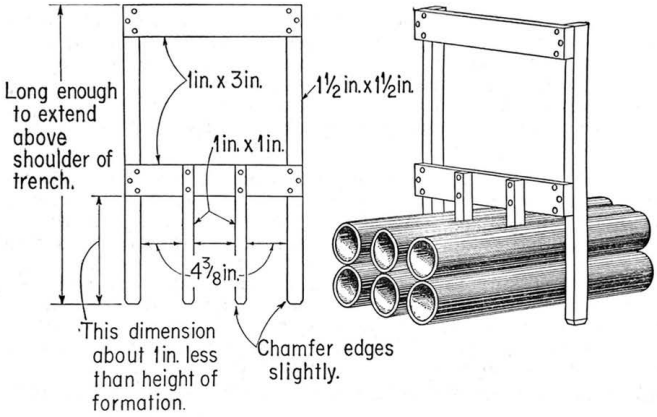


Spacing of ducts at manhole entrance.

4.03 Formations of 3 ducts or less in height are carried forward in the full formation, that is, as each tier of 8-foot lengths is laid, the ducts immediately above are placed. Place the first layer of ducts directly on the trench bed after making certain that the duct has proper bedding and that there are no

large stones or rock underneath which might deform the conduit. Then place the second layer of ducts. In laying, do not follow deviations in trench alignment in order to maintain side clearance. Lay the ducts as straight as possible even though it may reduce the side clearance for short distances.

4.04 Before placing further layers, some means is provided in the trench to separate the ducts horizontally and space them from the trench walls. One way is to insert wooden strips of the proper dimensions wherever needed. Another device which serves both to space the ducts and prevent their floating when placing concrete is shown below. If a third layer is required, these ducts are laid and coupled by inserting the lengths between the vertical spacers.



4.05 Drive each length snugly into the adjoining coupling by tapping with a mallet on a piece of wood held against the coupling of the length being placed. Do not drive too tightly or the couplings will split.

4.06 Proceed with succeeding lengths, providing spacers at approximately 8-foot intervals, until sufficient trench footage of completed formation has been placed to receive concrete. See Part 5 for quantities of concrete required.

4.07 If the formation is more than 3 ducts in height, a maximum of 3 tiers is laid first, using spacers suitable for a 3-high formation. This portion is then concreted to about the top of the second tier. After this, the remaining tiers are placed and concreted. Efforts to work concrete down through formations more than 3 ducts high are likely to result in unsatisfactory distribution of the concrete.

Vertical Curves in Fibre Conduit

4.08 Vertical curves of less than 50-foot radius in fibre conduit are completely encased in concrete for the curved portion to provide added support for the ducts during cable placing. A curve of such radius would be reached when the drop in the grade of the trench bed exceeded 2½ feet over a distance of 15 feet measured horizontally.

4.09 Suitable encasement can be obtained either through the use of plastic spacers by themselves or by using the construction discussed in the foregoing and placing 1 inch by 1 inch wood strips under each tier of ducts with 2 inch by 2 inch wood spacers under the bottom tier.

5. CONCRETE

Grade and Quantities

5.01 The concrete used with B Fibre Conduit is the Class 2B mix described in G45.140.1, but with maximum size of aggregate reduced to ⅜ inch instead of ½ inch. It has a nominal compressive strength of 2500 pounds per square inch. The slump should be at the upper end of the range, preferably 7 to 8 inches. It is important that concrete of this type be obtained in order to permit adequate distribution and assure proper support for the conduit. Any adjustments required in the consistency of the concrete as received should be made in accordance with G45.145.1. It should have just enough slump to flow to the bottom of the formation and yet not be so wet as to cause the ducts to float.

5.02 The approximate quantities of concrete required for the support of various duct formations appear below. These quantities are based on 3½-inch conduit with the minimum thickness of concrete as shown on Page 3. Allowance should be made for any excess needed for sections requiring complete encasement, formations intermediate between those shown, etc.

NUMBER OF DUCTS	CU. YDS. OF CONCRETE PER 100 FT. OF TRENCH	FEET OF TRENCH PER LOAD OF CONCRETE		
		4 YDS.	5 YDS.	6 YDS.
6	2.7	148	185	222
8	3.3	121	151	182
9	3.6	111	139	166
12	4.4	91	113	136
16	5.2	77	96	115
20	6.8	59	74	88

Placing Concrete

5.03 Placing concrete around fibre conduit should be carried out in accordance with the recommendations of G45.150.1. Adjust the delivery chute so that the fall of concrete into the trench is as short as practicable. Use a splash board to divert the flow of concrete away from the trench sides and avoid dislodging soil and stones.

5.04 Formations not over 3 ducts high are concreted to full depth in one operation. The lower cross-piece of the spacer illustrated in paragraph 4.04 can be used as a guide to approximate the 2-inch cover required over the ducts. Leave the spacers in place until the concreting has been completed at least one duct length (8 feet) beyond the spacer. Weights or ties should not be necessary to keep the ducts from floating if the spacers are built so that their lower cross-pieces bear on the top ducts.

5.05 As the concrete is deposited, use slicing bars or a similar tool to work the concrete down the **sides of the formation** and between the ducts. It should be possible to see the concrete flowing along the bed of the trench just ahead of the point where it falls from the chute. As the spacers are removed, puddle the concrete to fill any remaining voids.

5.06 If the final formation is to be over 3 ducts high, the concrete is placed approximately to the top of the second tier of ducts and the spacers are left in place. When ready to place the remaining tiers, the spacers are raised, but not removed. The final ducts are then placed by inserting them through the vertical legs of the spacers. Concreting of these ducts follows, as described above.

6. BACKFILLING

6.01 Backfilling is started as soon as practicable following completion of the concrete work. The first foot of fill should be selected material, free of large stones or broken pavement that might damage the conduit under tamping. Thoroughly tamp this fill and then continue with the restoration of the remaining fill in accordance with G41.110.

6.02 On warm, sunny days, if the first foot of fill cannot be placed and tamped immediately following the concrete work, it is advisable to sprinkle a layer of 1 or 2 inches of fine soil over the concrete immediately after leveling. This is to prevent too rapid evaporation of water from the surface of the concrete.