BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G41.128.1
Issue 1, April, 1953
AT&T Co Standard

MAIN CONDUIT
LAYING B CEMENT CONDUIT

1. GENERAL

1.01 This section describes the use of B (thin-walled) Cement Conduit in the construction of main conduit. In general, this conduit is used in duct formations of sizes which would normally be built with multiple Clay Conduit but where conditions are such that construction and maintenance operations would be benefited by using a single duct material of this type. It can also be used on bridges and viaducts in situations where the conduit can be included in the concrete of the structure. It is always installed with concrete encasement.

1.02 B Cement Conduit is sufficiently strong to withstand shipment and normal handling. In assembling and in concreting operations, however, care should be exercised to prevent breakage.

1.03 The standard length of 3-1/2-inch B Cement Conduit is 10 feet, although shipment of up to 15% of the total footage in shorter lengths is permitted. All such short lengths will be multiples of 6 inches and no piece will be shorter than 3 feet.

1.04 One tapered coupling is furnished with each length of straight B Cement Conduit. Bends and curved segments are made of heavy wall stock and ordinarily furnished with one regular coupling. When ordered for use with thin-wall conduit, these fittings are supplied with adapters cemented to each end.

1.05 Cut ends of B Cement Conduit, resulting from the need to obtain additional short lengths in the field or to salvage broken lengths, can be joined by means of the adapters described in G40.060.1. A more satisfactory joint can be made by using a commercially available tapering tool to restore the standard taper to the cut end and permit its use with the standard coupling.

1.06 Other information regarding lengths, weights and accessory fittings for B Cement Conduit are included in G40.060.1.

2. TRENCHING

2.01 The minimum trench width for B Cement Conduit should be 6 inches greater than the width of the conduit structure to allow for the side concrete encasement.

2.02 All other phases of trench work for B Cement Conduit, such as depth, excavation, grading, etc., should follow the general recommendations of G41.110.

3. CONCRETE

3.01 All B Cement Conduit runs are to be encased in concrete, both around the structure and between the individual ducts. The concrete used is the Class 2B mix described in G45.140.1. It may be either ready-mixed or job-mixed concrete.

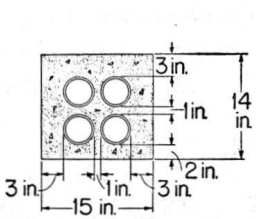
3.02 The minimum requirement for concrete coverage is 2 inches below the duct formation, 3 inches at the sides and top and approximately 1 inch between ducts.

3.03 The approximate quantities of concrete required for encasement of various duct formations are as listed below. These quantities are based on 3-1/2-inch conduit with minimum thickness of encasement as shown on the following pages. Allowance should be made for any excess required because of trench irregularities, conduit of different size, etc.

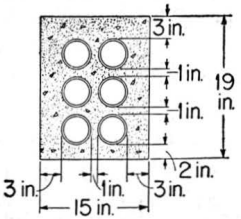
Number of Ducts	Cu. Yds. of Concrete per 100 Feet of Trench
4	4.1
6	5.4
8	6.7
9	6.9
10	8.0
12	8.5
15	10.1
16	10.3
18	11.7
20	12.2

4. DUCT FORMATIONS

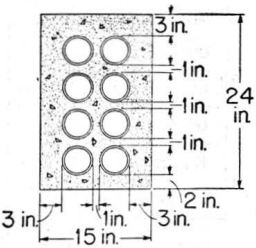
4.01 Unless trench conditions require otherwise, the formations of the ducts for various complements are as follows:



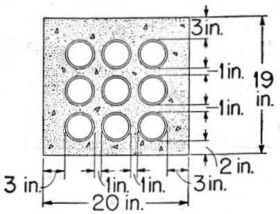
4 DUCT



6 DUCT



8 DUCT



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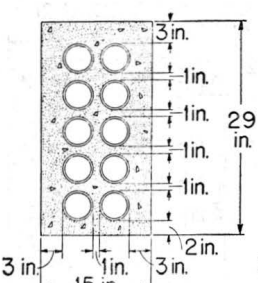
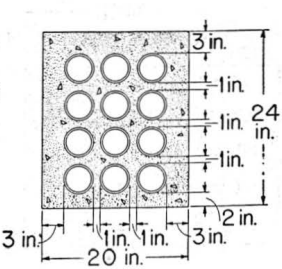
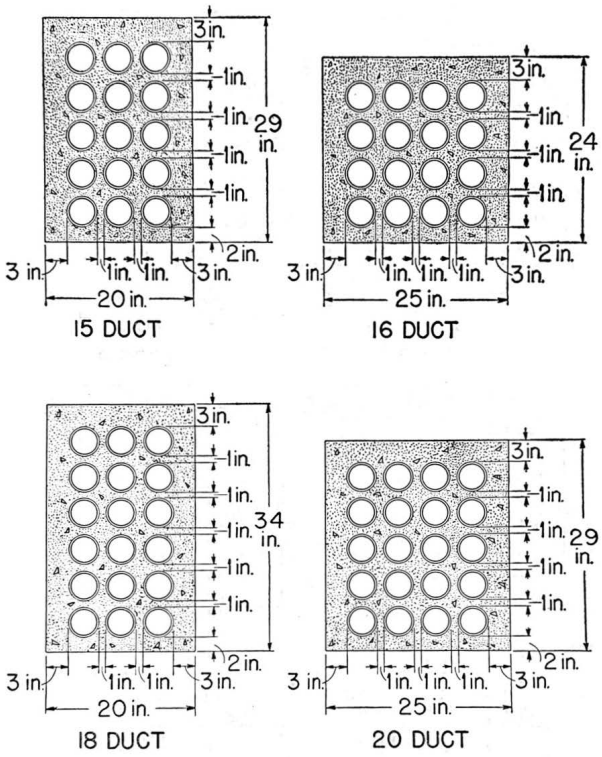


10 DUCT



12 DUCT

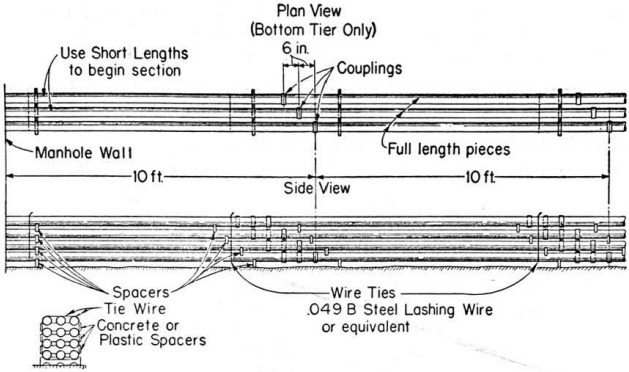


5. PLACING CONDUIT

Built-Up Method

5.01 The preferred method of placing B Cement Conduit is to assemble the complete structure in the trench prior to concreting. Commercially available spacers of concrete or plastic are used to support the first and successive tiers of ducts and to provide the necessary separation between tiers. Using 10-foot lengths of conduit, 2 spacers are used for each length, with a spacer placed not more than 2 feet from each end. Lengths less than about 6 feet require only one spacer for adequate support.

5.02 It is desirable to stagger the joints between the lengths of conduit forming a tier of ducts and also between those of successive tiers so that no joints coincide with other joints immediately above, below or to the side. The desired staggering can be had by starting at one end of the manhole section with lengths cut to obtain the following arrangement.



5.03 At the start of laying, place a spacer across the trench near each end of the shortest length in the lowest tier. If the bed of the trench is yielding, place plank, brick or other support under the spacers to hold them at the required level. This latter construction is also used where conditions call for base thickness in excess of the minimum 2 inches.

5.04 Lengths of conduit should be prepared for laying by placing couplings on the outer ends. Fit each coupling securely in place by tapping with a hammer on a strip of wood placed across the end of the coupling.

5.05 As each length of conduit is laid inspect it for smoothness and cleanliness of bore. Discard any lengths showing cracks that might result in breakage during assembly or concreting.

5.06 Place the first lengths of the bottom tier on the base spacers. Set interduct spacers on successive tiers near the ends of the shortest length in each tier. Follow with successive tiers and spacers in the first section until the formation is complete.

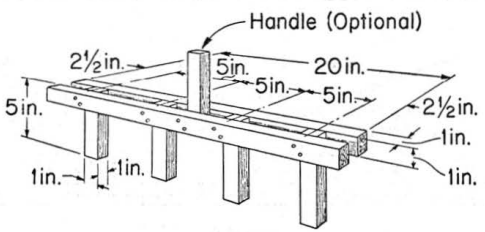
5.07 Bind the assembled section together by placing a wire tie completely around the formation near the spacers. The purpose of the tie is to prevent the ducts from being displaced during the concreting operation.

5.08 Proceed with the next duct section, using full length pieces of conduit and working from the bottom to the top. Place spacers and ties as before. As the work proceeds, maintain the direction of the conduit to both line and grade. Encasement with concrete can proceed as soon as several sections have been completed.

Tier by Tier Method

5.09 A formation of B Cement Conduit can also be laid by placing and concreting each tier of ducts separately to eliminate the need for permanent spacers. For this work, wooden or metal "combs" or gages similar to the one shown below are used to obtain the required vertical and horizontal separation.

COMB FOR FORMATION 3 DUCTS WIDE



5.10 Concrete for the base may be placed to the required 2-inch thickness and the bottom tier of ducts laid on it, or the ducts can be laid on brick or other durable supports spaced about 5 feet apart along the trench to provide the 2-inch elevation above the trench bed.

5.11 The ducts are started as for the built-up method to obtain the staggered arrangement of couplings. Combs are then inserted at approximately 5-foot intervals along the tier of ducts to fix the lateral separation and align the formation with the trench sides. Concrete is then placed to complete the encasement of the bottom tier of ducts, using the top of the horizontal portion of the comb as a gage of the cover over the ducts.

5.12 The combs are then removed, the remaining voids in the concrete filled in and the operation repeated for the next tier of ducts.

Curves

5.13 Large radius curves in B Cement Conduit can be made by substituting "Deflection" or angle couplings for straight couplings as required. The angle coupling produces a 5-5/8 degree offset in the line. This results in a curvature of approximately 10-foot radius for each foot of conduit length between angle couplings. For example, 10-foot lengths of conduit laid with angle couplings only will produce a curve of approximately 100-foot radius; 5-foot lengths, 50-foot radius; 2-foot lengths, 20-foot radius, etc.

5.14 Curves of other radii may be formed by using alternate straight and angle couplings. The combined length of straight conduit between angle couplings determines the approximate radius in the same ratio as mentioned above. Additional curvature arrangements are possible through use of the conduit bends and curved segments described in G40.060.1.

6. PLACING ENCASEMENT

6.01 In placing encasement concrete around ducts assembled by the **built-up method,** the objective should be to complete the coverage of as much conduit as practicable in one pour. Direct the concrete by means of chutes so as to avoid dislodging soil and stones from the sides of the trench. Use a thin slicing bar to work the concrete between and under the ducts as it is being placed.

6.02 Concrete for encasing built-up conduit should be mixed of a consistency near the lower end of the slump range for Class 2B concrete in order to reduce the tendency for the duct formation to float.

6.03 Ducts assembled by the **tier by tier** method are dependent on the concrete between ducts to maintain separation, since permanent spacers are not used. For this reason the concrete in place must be allowed to attain a partial set before proceeding with the duct work. This can be done by completing one tier between manholes before starting on the next tier. The alternative, in case it is desired to carry along the complete formation, would be to use a stiffer concrete. For such use, Class 2B concrete should be ordered with a slump range of 2 to 4 inches, with preference for the lower slump indicated.

7. BACKFILLING

7.01 Backfill to a depth of about 1 foot should be placed as soon as the concrete has taken its initial set.

7.02 Tamping of the initial backfill in accordance with G41.110 and restoration of the remaining fill should follow in about 24 hours.