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BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G45.150.1
Issue 1, May, 1945
AT&T Co Standard

CONCRETE AND MORTAR
MIXING AND PLACING CONCRETE

1. GENERAL

1.01 This section contains information designed to assist in obtaining maximum usefulness from the materials employed in the preparation of concrete for underground conduit and manhole construction.

2. MATERIALS

2.01 Cement as specified in G45.110.1 shall be used for all concrete.

2.02 Fine and coarse aggregates as specified in G45.120.1 shall be used for all concrete.

2.03 The water to be used in mixing concrete shall be clean and free from acids, alkalis, oils and organic materials. In general, water suitable for drinking purposes is satisfactory.

3. CONCRETE PROPORTIONS AND CONSISTENCY

3.01 Concrete proportions and consistency shall be as specified in G45.140.1 for the particular work in hand.

4. PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT

4.01 Before placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris and ice shall be removed from the place to be occupied by the concrete, forms shall be thoroughly wetted (except in freezing weather) or oiled and the reinforcement shall be thoroughly cleaned of ice or other harmful coatings.

4.02 Water shall be removed from the space to be occupied by the concrete before the concrete is deposited. In no case shall concrete be deposited in water or shall water be allowed to flow into or pass through the concrete. Sections G41.110 and G43.118.1, respectively, provide information relative to approved methods for handling water during trench work or in the course of manhole excavation and construction.

5. INSPECTION OF FORMS

5.01 Concrete shall not be placed until the forms and reinforcement have been inspected by the inspector or supervisor.

6. MIXING

6.01 Machine-mixed concrete is better than hand-mixed; therefore, a machine should be used wherever practicable.

6.02 The concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged.

6.03 For job-mixed concrete, the mixer shall be rotated at a speed recommended by the manufacturer and mixing shall be continued for at least one minute after all materials are in the mixer.

6.04 Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of G45.145.1.

6.05 When mixing concrete by hand, first mix the sand and cement together dry and then add the stone or gravel; turn until thoroughly mixed to a uniform color, and then add water and turn until thoroughly mixed.

7. CONVEYING

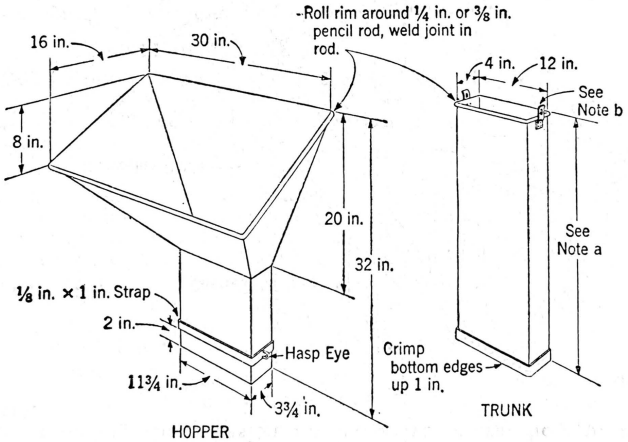
7.01 Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of the materials.

7.02 When wheelbarrows or buggies are used to convey the concrete, runways shall be placed over rough ground or pavement to reduce the amount of jarring or vibration.

8. PLACING

8.01 Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The point at which the concrete is being placed shall be shifted as required so that it will not be necessary for the concrete to flow more than about 2 feet in any direction to reach its final position. For manhole walls, the concrete shall be poured in horizontal layers not more than 18 inches deep.

8.02 To avoid separation of materials, concrete should not be allowed to drop freely into position more than about 3 feet. A hopper and trunk of the type illustrated may be found useful when depositing concrete for manhole walls. The purpose of the device is to retard the rate of drop of the concrete so segregation will be avoided. In pouring a deep wall a hopper with a trunk extending to within 3 feet of the bottom of the wall should be used first until the bottom pour of concrete to a depth of about 3 feet has been completed around the manhole. Then a shorter trunk should be substituted and the depositing of concrete resumed until the wall has been brought up to within 3 feet of the final level. Thereafter the hopper is no longer needed.

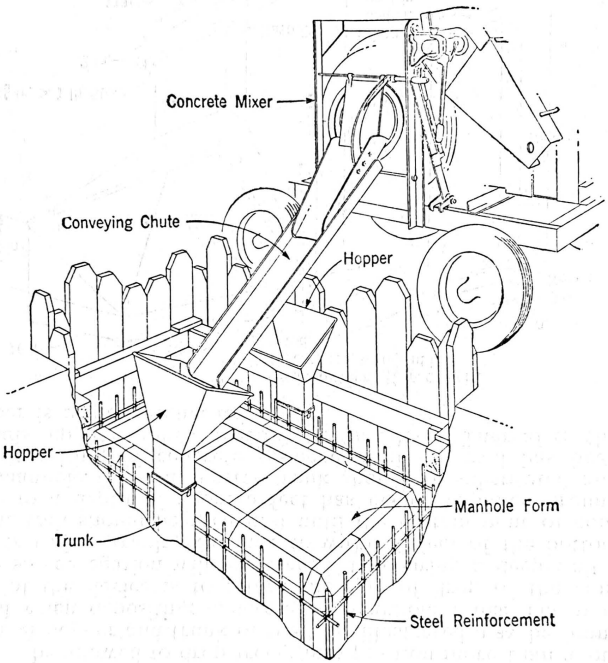


NOTE: Make of #20 Gauge Galvanized Steel

a - Length of Trunks to be 2 ft.-6 in., 5 ft., 7 ft.-6 in., etc.

b - Offset Hasp to fit over rolled rim and eye on Hopper

8.03 Two sets of the hopper and trunk are recommended for the average size manhole. The equipment should be set up as illustrated. By moving the devices along the wall, the concrete can be deposited close to its final position, thus reducing the occasion for excessive lateral flow in the form.



8.04 When sectional steel forms are used, they can be assembled progressively upward as the walls are poured, thereby allowing convenient access for compacting and placing the concrete in a manner to avoid segregation.

8.05 Each layer of concrete shall be thoroughly compacted by suitable means before the succeeding layer is placed, and the concrete shall be thoroughly worked around the reinforcement, embedded fittings and into the corners of the forms. It is recommended that the compacting be done by mechanical vibration wherever practicable, using concrete with the proper

consistency. The vibrator shall be of the internal type which has a vibrating head that is inserted in the mass of concrete and shall be approved by the inspector or supervisor. In manual consolidation, the concrete shall be thoroughly spaded at the face of the forms and throughout the mass of concrete, penetrating in each case into the layer previously deposited.

8.06 Any excess water that forms on the surface of concrete placed in forms shall be bailed or drained off at a low point in order to reduce the possibility of resulting porous concrete. Very little, if any, of this water should appear if concrete of the right consistency has been used and proper procedures have been followed when the concrete is placed and compacted.

8.07 No concrete that has partially hardened or been contaminated by foreign material shall be deposited on the work, nor shall concrete reworked with water be used.

8.08 When concreting is once started it shall be carried on as a continuous operation, if practicable, until the placing of the section is completed. If concrete is to be deposited in contact with other concrete which will have been in place more than one hour, the surface of the older concrete shall be prepared in accordance with the provisions of Part 9 at the time placing is suspended.

9. CONSTRUCTION JOINTS

9.01 Construction joints are undesirable in manhole construction and any plan of operations requiring such joints should have the approval of the inspector or supervisor.

9.02 If placing of concrete must be interrupted before completion of the structure, the following provision should be made immediately to prepare the surfaces which will be in contact with the fresh concrete when placing is resumed. Remove any excess water on the surface of the joint as described in paragraph 8.06. Place a 4″ x 4″ timber in the soft concrete for the entire length of the joint in order to provide a keyway for the concrete to be placed later. The timber should be so manipulated as to produce a "V" shaped depression in the concrete about 4 inches wide at the top.

9.03 When the additional concrete is to be poured, the timbers shall be removed and the upper surface of the hardened concrete examined for porosity. If porous concrete is present it shall be chipped out before the additional concrete is placed. The joint shall then be cleaned of all dirt, debris, or other foreign material and the surface of the concrete thoroughly wetted. Immediately before the fresh concrete is placed, the surface of the joint shall be covered with a cement-water

paste of a thick creamy consistency. About 1/2 inch of mortar consisting of 1 part cement and 2 parts sand and also of a thick creamy consistency may be substituted for the cement-water paste.

10. CARE OF CONCRETE AFTER PLACING

Curing Procedures

10.01 After concrete has been placed in locations exposed to the weather, such as concrete in pavement slabs and manhole roofs, it shall be so protected as to prevent the loss of moisture from the surface. The protection may consist of covering the concrete with wet burlap, canvas, sand or straw and should be applied as soon as the concrete is hard enough to receive it. The cover should be prevented from drying out by occasional sprinkling. If a cover is not provided, the concrete itself should be kept wet by sprinkling as required.

10.02 For construction during low temperatures, additional measures should be taken to prevent the loss of heat from exposed concrete, as discussed in G45.170.1.

10.03 The means employed for curing concrete manhole roofs should be maintained up to the time of backfilling over the roof. Protection for concrete pavement should be maintained until the pavement is opened to traffic.

Backfilling and Repaving Over Manhole Roofs

10.04 Backfilling and repaving over manhole roofs may proceed as soon as the concrete in the roof has attained sufficient strength for the manhole opening form to be removed and for the frame and cover to be placed. Usually the backfilling and repaving may be done the day after the roof is poured.

Removal of Forms

10.05 Manhole forms shall not be removed until it is certain that the concrete has hardened sufficiently to sustain its own weight and also the weight of any backfill and pavement that has been placed over the roof. Under average conditions forms may be removed in not less than 48 hours when normal cement is used and in not less than 24 hours when high early strength cement is used.

10.06 When removing the forms care shall be exercised to prevent damage to the concrete from hammering or prying.

Opening Structures to Traffic

10.07 Manholes shall not be subjected to traffic loads for a period of 7 days for normal cement construction and for a period of 3 days for high early strength cement construction after the concrete has been poured.

10.08 Concrete pavement may be opened to traffic after not less than 6 days for normal cement and 2 days for high early strength cement provided the provisions of 10.07 are also complied with.

11. CONCRETE SURFACES

11.01 All concrete shall be sound and exposed surfaces smooth and free of honeycomb. Defective concrete shall be chipped out to sound concrete and the openings shaped so that the mortar filling will be keyed in place. Chipped out openings shall be dampened and then filled with freshly made patching mortar of the type described in G45.160.1. The mortar shall be placed in layers not exceeding one inch in thickness and the surface roughened to improve the bond with each succeeding layer. Each layer shall be allowed to harden for at least 12 hours before the application of the succeeding layer.

12. WATER LEAKS

12.01 It is expected that manholes constructed in accordance with these practices will be reasonably water-tight upon their completion. If water leaks develop, however, which in the opinion of the inspector or supervisor require correction, they shall be repaired by the methods described in G43.410.1.