

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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MANHOLES
CONCRETE FORMS
ERECTION OF FORMS

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1. SUPPORT FOR FORMS

1.01 In monolithic construction, the forms should be supported by means of four 5/8-inch bolts resting on two transverse wood planks as shown in Part 3, G43.122.1. The planks should be properly positioned, leveled and firmly seated in the bottom of the excavation before erection of the forms is started.

1.02 In cases where the floor of the manhole is poured first, a period of at least 12 hours should be allowed for hardening of the concrete before erection of the forms is started. The forms should rest directly on the floor slab.

2. ERECTION DETAILS

2.01 In erecting the forms, the parts should be assembled in accordance with the arrangement shown in the appropriate assembly diagram. Care should be taken to turn each panel used in the side walls so that the row of insert holes is at the top of the panel. In general, the assembly of each tier of parts should be completed before erection of the

parts for the next tier is started. Ordinarily, erection of the entire form should be completed before the concrete is placed. However, where unstable soils are encountered, it may be found desirable to pour the walls tier by tier as the forms are erected. The latter method of construction permits the progressive removal of the sheeting braces which otherwise might interfere with erection of the forms.

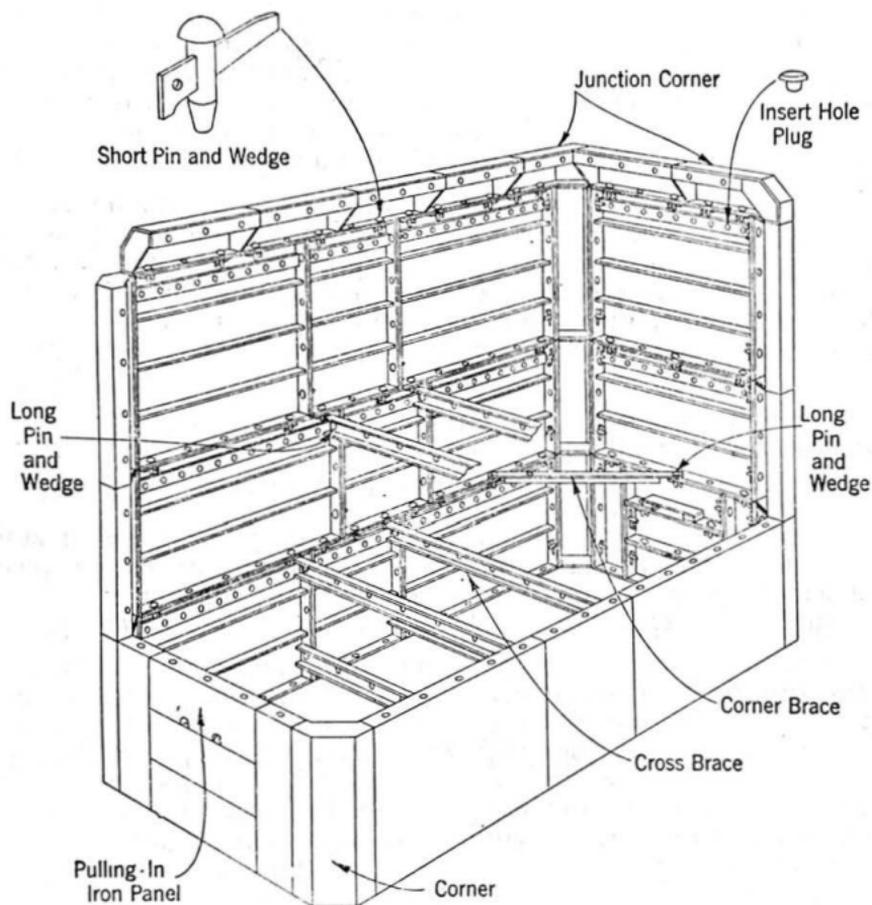
2.02 Holes on 6-inch centers are provided in the flanges of the panels and corners for use in joining the parts together by means of the pins and wedges. The short pins should be used for this purpose, the long pins being for use only at braces, where it is necessary for the pin to pass through three thicknesses of metal. It is not necessary to place pins in all of the flange holes, but a sufficient number of the pins and wedges should be used to bind the parts into a rigid structure and to tighten all joints so that no appreciable amount of mortar can leak through. As the parts are assembled, however, the wedges should be pressed only lightly into the slots of the pins. **It is important that this practice be followed, in order to retain flexibility in the form structure during assembly.** Then, when the assembly is complete, the wedges should be driven up tightly and additional pins and wedges added as required. Where the tier by tier method of pouring the walls is employed, however, each tier of parts should be tightened before pouring is started. In driving the wedges into place, they should not be hammered excessively beyond the point where the form parts have been drawn tightly together, since too much pounding may deform the pins.

2.03 Corner braces are used only for squaring up the forms. For manholes of the sizes commonly used, two braces placed at diagonally opposite corners at the junction of the two lower tiers of form parts are adequate. For deeper or larger manholes additional corner braces should be added as required.

2.04 Cross braces are required at or near the junction of any two panels placed end to end in the side walls of the form assembly. For the lower tier of parts, the cross braces should be attached to the vertical flanges 3 inches above the bottom and 3 inches below the top. For each successive tier, the cross braces should be attached to either the horizontal or vertical tiers at or near the top. Cross braces may be omitted for the top tier.

2.05 For bracing the 3 foot wide manholes, two corner braces are joined together with short pins and wedges to make a single brace of the proper length. For bracing the 4 foot, 4 foot-6-inch and 5 foot wide manholes, two cross braces are similarly joined to make a single brace of the proper length.

2.06 Except in the case of very small manholes, the assembly work can be handled efficiently by three men, one man selecting the form parts and handing them down into the excavation and two men, equipped with hammers and aligning tools, joining the parts together.



3. PLACING PULLING-IN IRON PANELS

3.01 The pulling-in iron panels are designed to accommodate standard No. 2 pulling-in irons. The pulling-in iron is placed in the slots in the panel during assembly of the parts and is held in position by the panel above, the two panels being held tightly together by means of the pins and wedges.

3.02 Usually it will be found convenient to preassemble all of the small panels which comprise the 18-inch or 24-inch tier sections containing the pulling-in irons.

4. PLACING CONCRETE INSERTS

4.01 As erection of the form progresses, insert hole plugs should be removed from the side-wall panels wherever the assembly diagram shows that an insert is required. These insert hole plugs can be readily knocked out by holding one of the slotted pins against the riveted end of the plug and striking the pin with a hammer. Concrete inserts should then be attached to the form through these holes. Usually the man in the assembly crew who selects the parts can remove the insert hole plugs and attach the inserts before he lowers the panel into the excavation.

4.02 If the manhole under construction is of the same dimensions as the previous manhole for which the forms were employed, the operation of knocking out the insert hole plugs can be avoided by selecting panels in which the holes are already punched out and using them in the proper places in the side walls of the assembly. This can be done without the aid of special markings on the form parts, because any error can be detected easily by a visual check on the insert location.

4.03 If the manhole under construction is of a different size than the manhole for which the forms were last used, all vacant insert holes should be refilled with plugs and new holes selected as required.

5. PLACING RECESS FORMS

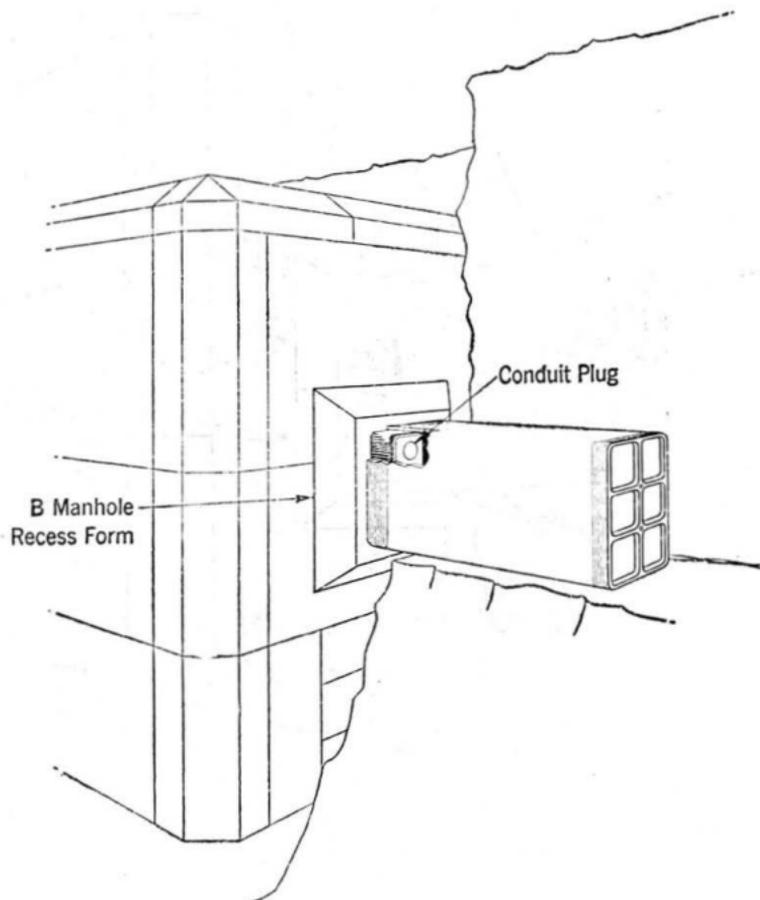
5.01 The manhole recess forms are designed to be fastened to the entering conduit by means of rubber conduit plugs.

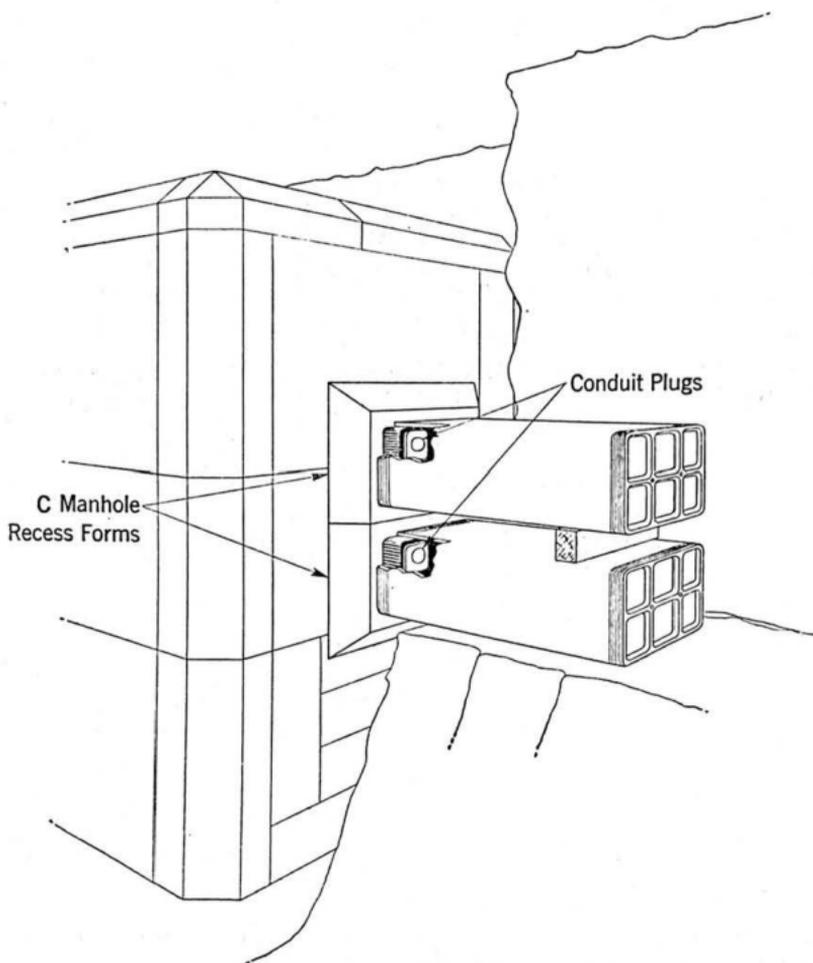
5.02 When the manhole is being constructed prior to construction of the duct run, the recess form is attached to a standard conduit unit and then butted against the manhole form and held in position with stakes or by other suitable means. The conduit unit is thus cast in place in the manhole wall when the concrete is poured.

5.03 An alternative method of placing the recess form is to bolt it to the manhole form through a suitably positioned insert hole at the time the manhole form is being assembled. A convenient way of doing this is to cut a 37-hole cable rack to a length that will fit inside the flanges of the recess form and then place a carriage bolt through one of the hook holes in the rack and through an insert hole in the manhole form with the nut on the inside of the manhole form. The position of the recess form should then be adjusted and the form tightened in place. The space between the face of the recess form and the wall of the excavation should be filled in with a temporary wooden form so as to provide a hole through

the wall into which the conduit can later be inserted and cemented in with mortar.

5.04 If the duct run is being constructed in advance of the work on the manhole and recessing of the duct entrances in the manhole is contemplated, care should be exercised to position the ends of the conduit accurately so as to leave the correct amount of clearance for the manhole form and the recess forms. A clearance of about 1/2 inch should be provided between the end of the conduit and the outside face of the recess form to care for irregularities. Some slight adjustment in the position of the recess forms is obtainable by slipping the plugs partially out of the ducts. Where this is done, the space between the conduit and the steel face of the recess form may be calked with paper or other available material if desired. If extreme adjustment is required, longer bolts and two rubber plugs for each duct can be used.





6 PLACING ROOF OPENING COVER-PLATE AND MANHOLE OPENING FORM

6.01 The roof opening cover-plate is placed over the hole in the roof of the assembled manhole form in order that concrete may be dumped on the top of the form and from there shoveled into the wall space. This plate must be removed before placing the manhole opening form and pouring the roof.

6.02 The manhole opening form is centered over the opening in the roof of the manhole form and held to prevent movement until it has been surrounded with concrete. The 28-inch and 31-inch opening forms which are used with 27-inch and 30-inch Type R frames are not quite large enough to completely cover the opening ordinarily left in the roof of the

manhole form. In such cases the small uncovered spaces at the four corners of the roof opening should be covered with pieces of terne plate or doubled pieces of roofing felt such as that used for mortar bandages.

6.03 The proper size of manhole opening form for use with a manhole frame of specified size and type is given in G43.126.1.

7. ERECTION OF FORMS AROUND CABLE OR OTHER STRUCTURES

7.01 When it is necessary to build or rebuild a manhole around working cables, certain of the larger panels called for in the assembly diagram should be omitted so as to provide an opening in the forms through which the cables can pass. The size of this opening should be reduced as much as practicable by installing one or more smaller panels in place of the omitted panel. The 6-inch x 18-inch and 6-inch x 24-inch panels are useful for this purpose. When the opening has been closed as far as practicable with form parts, the small opening remaining can be closed with 2-inch x 6-inch timber which has been notched out to take the cables. The crevices around the cables should then be filled with paper or other suitable material. The wooden pieces can be held in place by driving nails into them through the pin holes in the flanges of the adjacent form parts.

7.02 The same procedure as that described above can be followed when the location of the manhole is such that it is necessary to permit existing foreign pipe lines or conduit formations to pass through the completed manhole. When the location of the foreign structure is such that it is necessary to omit one or more corner pieces in the form assembly, these can be replaced by a 6-inch x 6-inch angle made of 2-inch x 6-inch and 2-inch x 4-inch timber. It is not necessary to bevel this angle to match the beveled corner pieces of the form.

8. CENTER RACK MANHOLES

8.01 For constructing center rack manholes, two complete manhole forms of standard width should be erected side by side. It is usually desirable to separate the two forms by a distance of 6 inches for a common center wall between the two compartments. This arrangement greatly simplifies the roof construction, since from a strength standpoint each half of the roof can be considered as the roof of a single manhole. Six-inch straight sections of clay conduit may be placed at each end of the form to act as spacers and also as sleeves to permit cables to be extended from one compartment to the other.