BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G41.130
Issue 1, July, 1943
AT&T Co Standard

MAIN CONDUIT
JOINTS

Part | Page

1. TYPES OF JOINTS

1.01 In laying Clay Conduit one of three types of joints may be employed, depending on the circumstances:

(a) The mortar bandage joint for use generally with Clay Conduit.

(b) The troweled or plastered joint to be used in connection with repairs or for minor conduit extensions.

(c) A joint consisting of a wrapping of cheese-cloth to which a paint of neat cement and water has been applied. This joint is employed only where the conduit is to be encased in concrete.

1.02 The operations involved in joining the other conduit materials less commonly used in main conduit construction are comparatively simple and, accordingly, are included in the respective sections covering laying.

2. MORTAR BANDAGE JOINTS

2.01 In principle, the mortar bandage is a cement wrapping prepared on the job for application around the joint. The bandage is made by folding a cheese-cloth envelope so that it encloses a ribbon of plastic cement mortar. Just under the cheese-cloth forming the outside of the wrapper is a strip of asphalt saturated roofing felt. This strip makes the bandage easier to handle and helps to retain the water during the setting

of the cement. Included within the mortar is a second strip of cheese-cloth which acts as a binder to reinforce the mortar against displacement during handling. The bandage most commonly used is 1/2 inch in thickness and 7 inches wide, but for joining some of the shorter and special pieces a 5 inch bandage is specified.

Materials

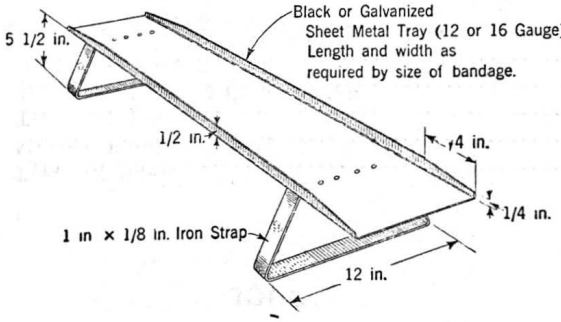
2.02 The materials required in making mortar bandages are included in G40.051, "List of Materials."

2.03 The amounts of materials required for mortar bandages for use with the various sizes of Clay Conduit are indicated in G40.055, "Material Tables."

Equipment

2.04 The preparation of the bandages will be simplified by the use of a portable table which, as illustrated under 2.12, permits the necessary materials to be placed within easy reach.

2.05 The bandages are made with the aid of a metal tray the details of which are illustrated below.



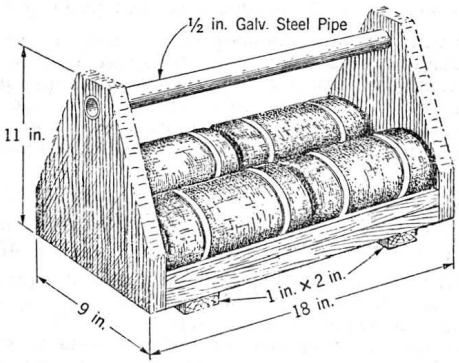
2.06 The dimensions of the trays for use in preparing bandages for the various sizes of conduit are shown in the following table:

DIMENSIONS OF TRAYS USED IN PREPARING MORTAR BANDAGES

Conduit		For regular construction		For mitered conduit and 6 inch lengths	
Number of Ducts	Size Inches	Width Inches	Length Inches	Width Inches	Length Inches
1	3¼	5	25	5	25
2	3¼	5	32	5	32
3 4	3¼ 3¼	7	42	5	42
6	3¼	7	51	5	51
8 9	3¼ 3¼	7	61	5	61

Note: Trays for all sizes of bandages are ½ inch in depth.

2.07 **The carrying tray shown below is designed to hold two bandages placed side by side.**



BANDAGE CARRYING TRAY
Make of ¾ in. Material

Mortar for Bandages

2.08 Mix mortar according to the instructions given in G45.160.1 for the preparation of mortar for joints, using the amounts of materials indicated in G40.055. Use the mortar employing the special portland cement wherever possible, as this mortar handles more easily, gains strength more rapidly and in general tends to produce a better bond with the conduit.

2.09 Only freshly mixed mortar should be used. Any mortar which shows signs of hardening before it is used should be discarded. Do not attempt to rework such mortar with additional water or cement.

2.10 Avoid an over-wet mix. A bandage made of thin mortar will bunch up in the middle as it is rolled. In the trench it will thin out at the upper corners when stroked and tend to slump at the sides of the joint. There is also danger when using a thin mortar that, while stroking, some of the mortar may be forced out at the ends of the bandage and get into the ducts.

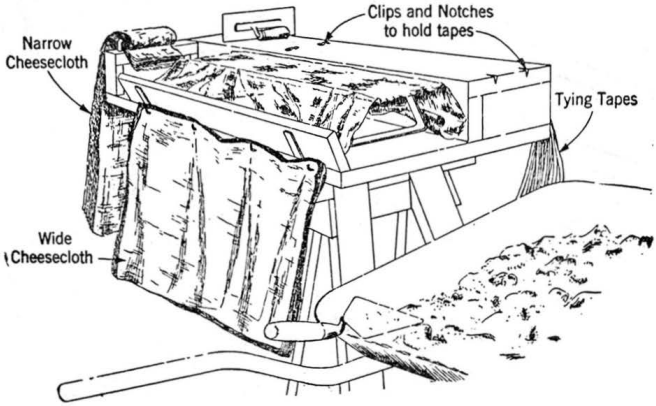
Note: A good test for consistency is to trowel the bare tray level full of mortar and then hold the tray by one end so that it hangs vertically. A mortar which is too thin will run out.

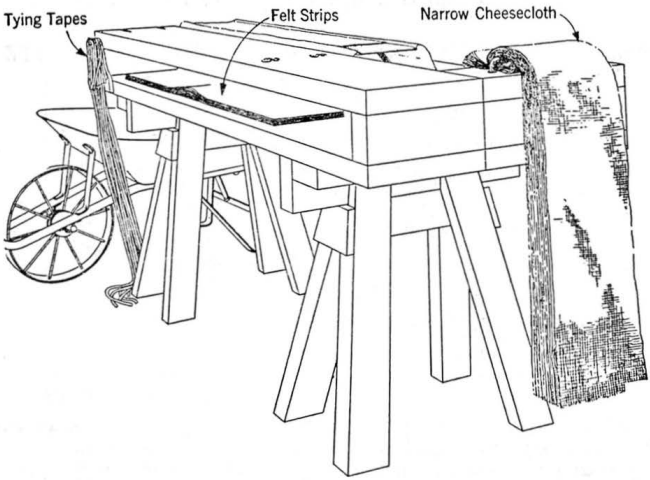
2.11 It is best to trowel the mortar directly from a wheelbarrow placed at the end of the table. This facilitates the transfer of the mortar to the tray and permits the excess mortar to be troweled off into the barrow.

Preparing Bandages

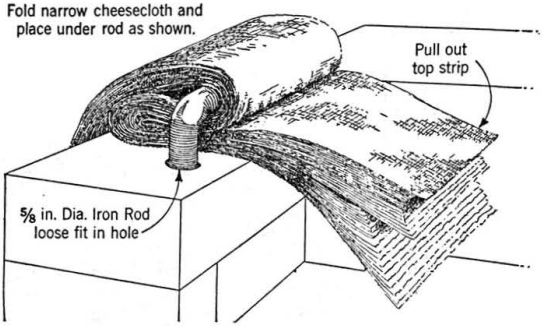
Caution: The intimate contact with fresh cement necessary in these operations may cause some soreness of the hands through the action of the alkali on the skin. If this condition is noticed it may be avoided by wearing light rubber gloves or rubber coated fabric gloves.

2.12 Two men working on opposite sides of the table are employed in making the bandages. They are supplied with cheese-cloth, both wide and narrow strips, felt strips and tying tapes arranged on the table as shown.



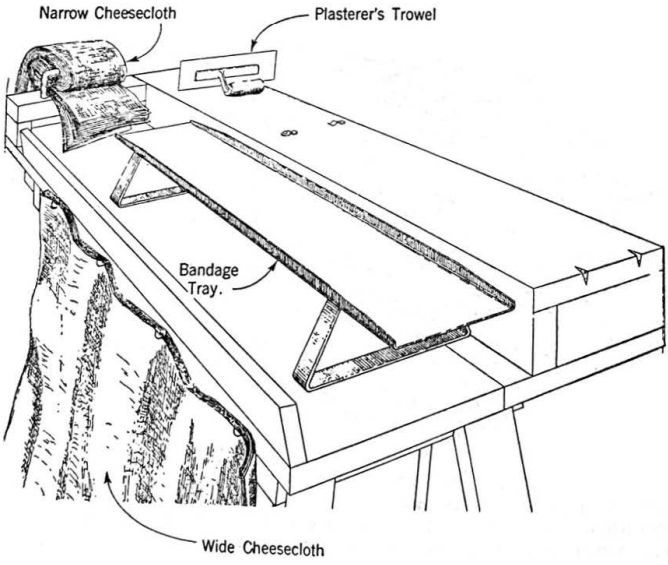


2.13 The narrow cheese-cloth strips are arranged in a fold as shown. These ends may be pulled out from the top, one at a time, without disturbing the balance of the strips.

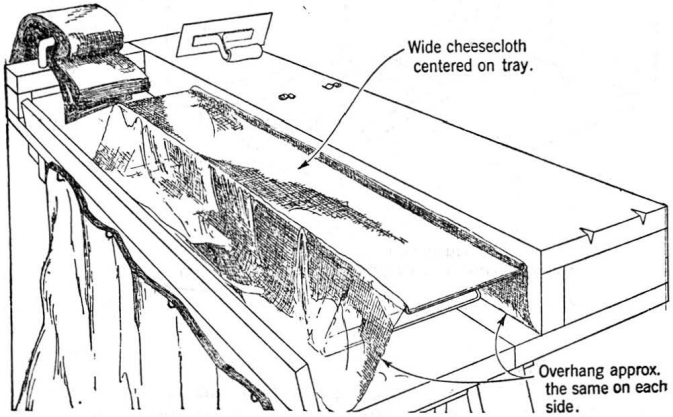


2.14 The operations of preparing a bandage are as illustrated below:

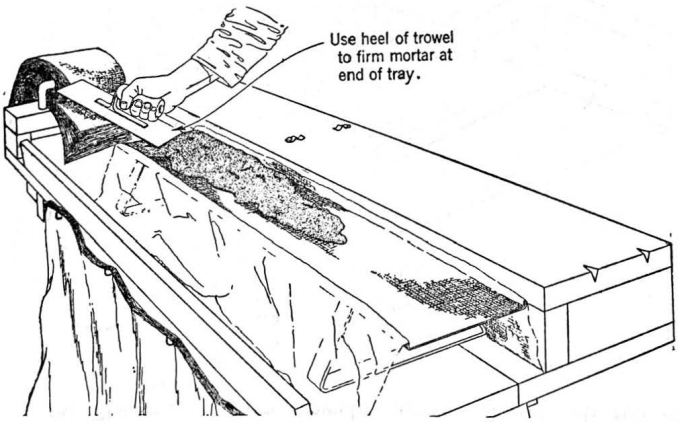
(1) Tray and material in position ready for use.



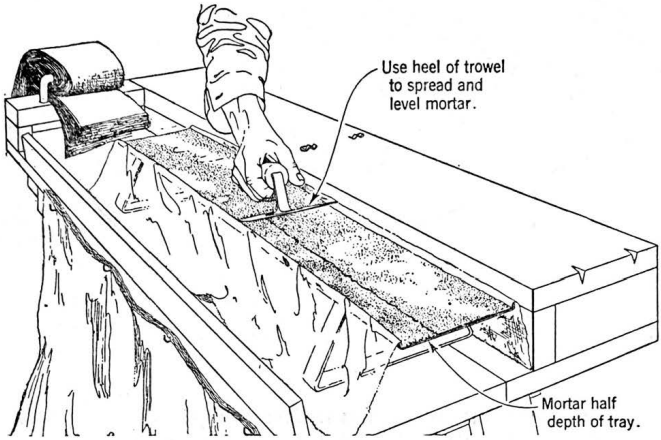
(2) Place a strip of wide cheese-cloth lengthwise on the tray with the overhang about equal on each side of the tray.



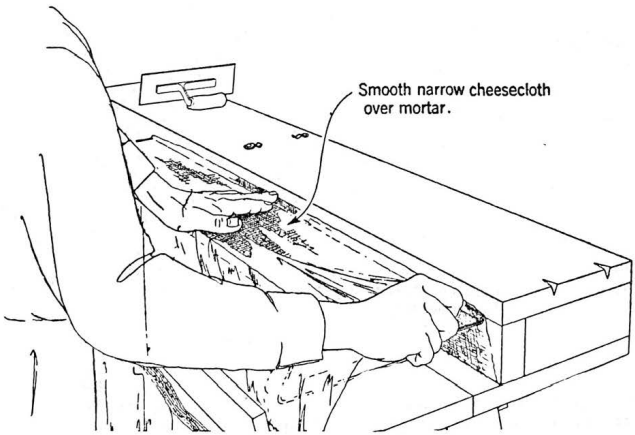
(3) As one operator places mortar in the tray the second using the heel of the rectangular trowel evens off one end, pressing the mortar firmly to fix the cheese-cloth to the tray.



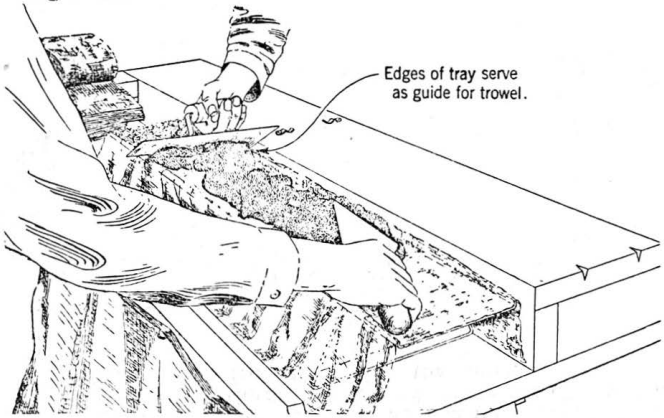
(4) The tray is then troweled approximately half full of mortar.



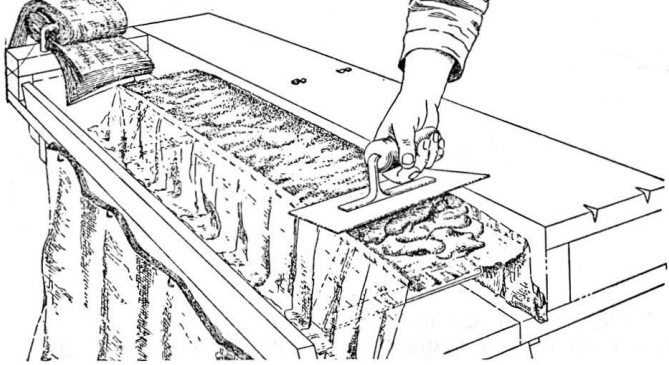
(5) A narrow cheese-cloth reinforcing strip is pulled from the loop at the end of the table and smoothed out lengthwise in the half-filled tray.



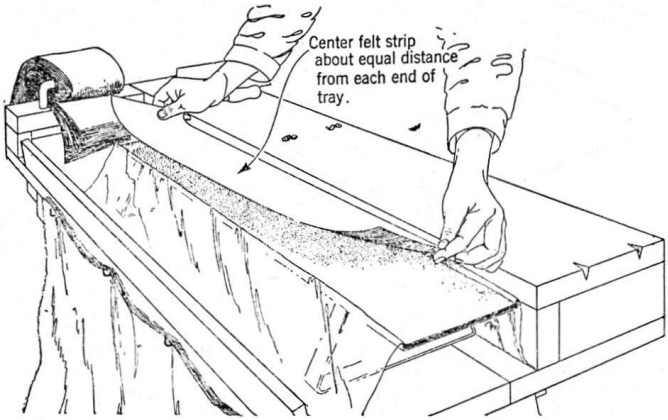
(6) The tray is troweled level full with mortar—one man troweling mortar from the barrow and the other leveling it off.



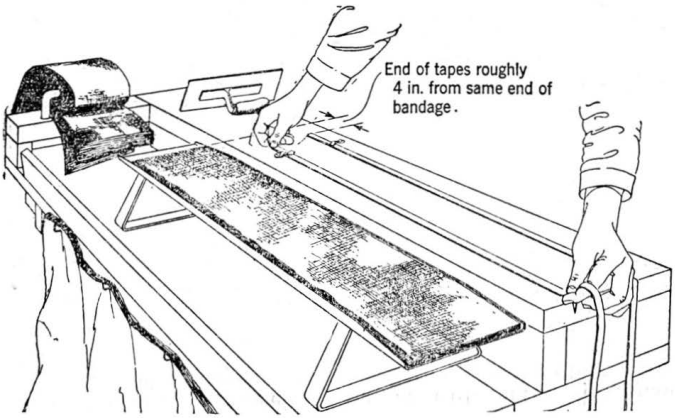
(7) Using the sides of the tray as a guide, one stroke of the plasterer's trowel evens off the mortar as it is placed in the tray. When used in this manner the straight edge of this trowel produces a bandage of the desired thickness. Other trowels generally have curved sides, and unless special care is exercised when using them for leveling the final layer of mortar there is a tendency to thin out the mortar along the center of the bandage.



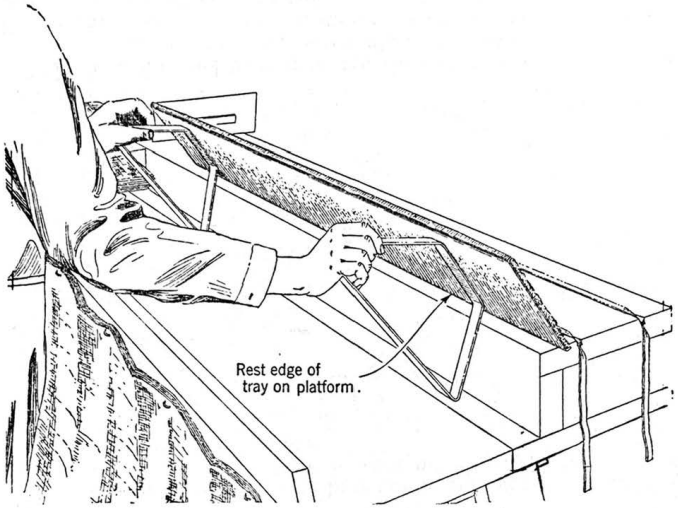
(8) A strip of asphalt saturated felt is laid on the mortar about equal distance from each end of the tray.



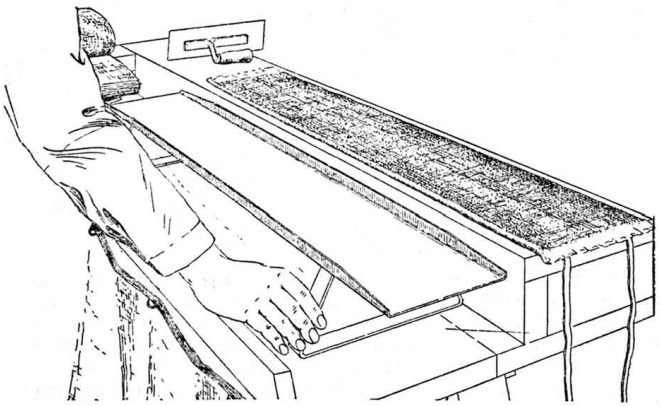
(9) One operator folds the edges of the cheese-cloth over the mortar and felt strip and secures them in place by stroking them down in the wet mortar at the ends of the tray. The second operator places the tapes in the clips and notches provided for the purpose. The tapes should be so placed on the platform that the ends under the clips will be roughly 4 inches from the end of the bandage.



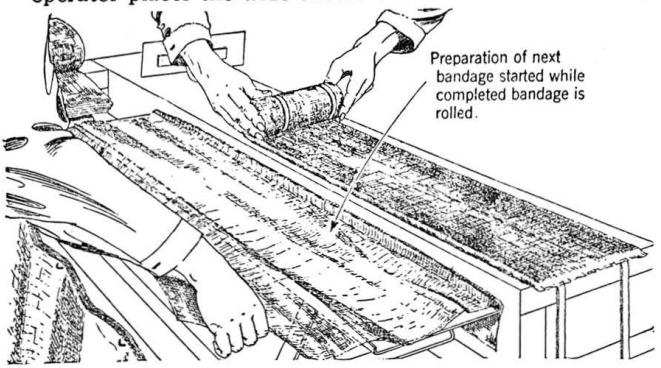
(10) The tray is then rolled over to dump the bandage onto the tapes.



(11) The tray is returned to position in preparation for the next bandage.



(12) One operator rolls the bandage from the ends toward the middle carrying the tapes along in the roll. The amount of bandage rolled up from either end should be about the same so that when the bandage is unrolled in the trench, it will be evenly spaced under the joint. The second operator places the wide cheese-cloth for the next bandage.



(13) As the rolling of one bandage is completed the making of the next bandage is well under way, thus making the operation continuous.

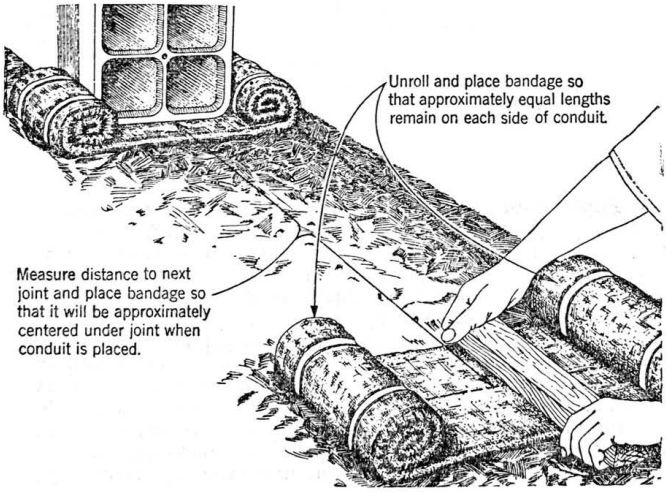
2.15 The finished bandages are then carried to the point of tile laying and deposited along the side of the trench. When bandages are being transferred to the trench side, they should be carried side by side. Piling them in layers will tend to force the water out of the bandages and make them unfit for use.

Applying Bandages to Joints

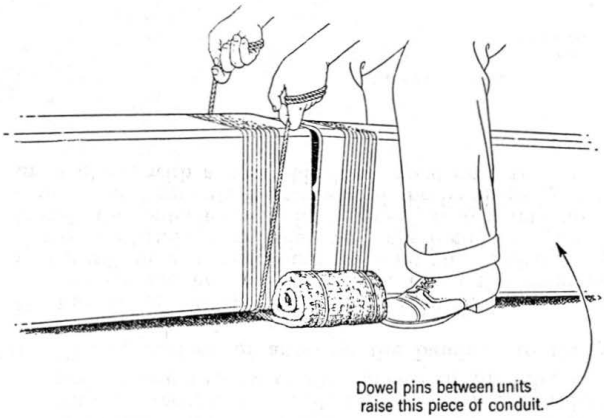
Note: In making joints, use only plastic bandages. Bandages must be applied before the mortar has started to set, or within 30 minutes from the time of mixing the mortar. When a fresh bandage is unrolled and smoothed, a thin cement paste is easily flooded through the cheesecloth by patting or stroking with a trowel or block of wood. This is essential to obtaining a good bond. If cement paste does not flood through to the surface the water has dried out or drained out or the cement has started to set. Such bandages can usually be detected by their relatively harsh, granular feeling. Bandages which are not plastic cannot be improved by stroking, and cracks developed during the unrolling will remain. Plastic bandages are easily stroked to an even thickness and adhere readily to the surface of the tile.

2.16 The operations of applying the bandage to the joint are as follows:

(1) Lay off the distance to the next joint, and place a bandage on the bed of the trench. Place the bandage so that it will be centered under the joint and so that the portion of the bandage left rolled up is about equal on each side. Unroll the bandage just far enough to accommodate the conduit, and smooth the surface of the bandage by patting or stroking with a short block of wood or a trowel.

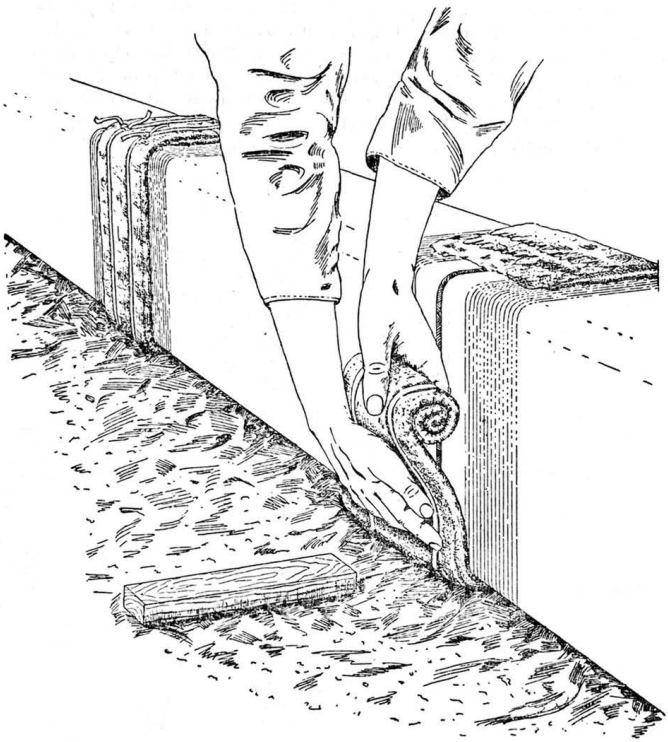


(2) Lower the next unit into place, being careful to lift it and the adjacent unit clear of the bandage while butting the ends together. This latter operation may be facilitated by the use of a sling of houseline or similar material previously placed across the bed of the trench and employed as illustrated below. As an alternative to the use of a sling, a tool made of 1/4 inch round steel having a handle at one end and a short hook bent at 90° on the other end can be used to engage the wall of the top duct and lift the conduit while it is being pushed into place. **Roll the bandage back snugly against the sides of the tile to prevent any falling dirt from getting on the bonding surface of the bandage.** These operations are performed by the two men laying tile.

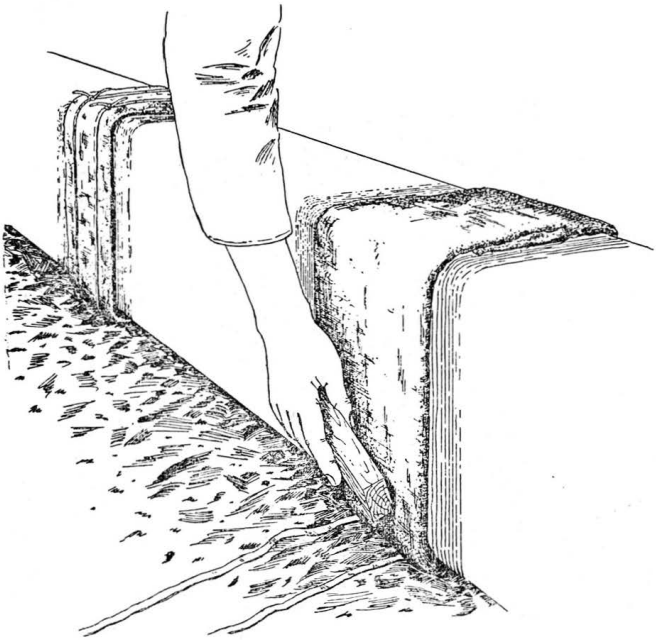


Note: The succeeding operations are performed ordinarily by a third man who completes the bandage.

(3) Unroll the bandage and draw it up the sides and over the top of the joint.

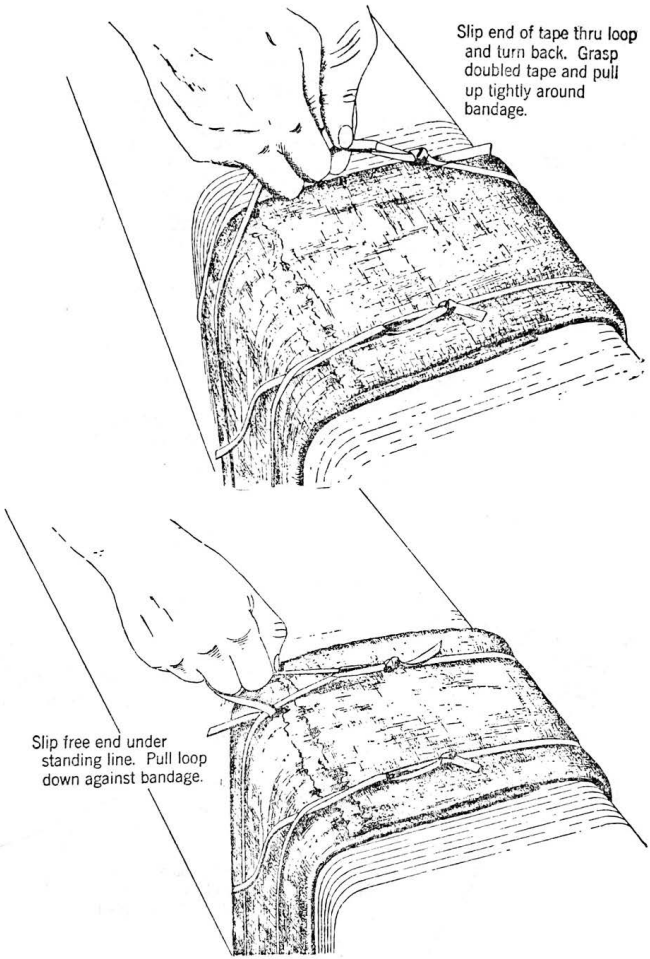


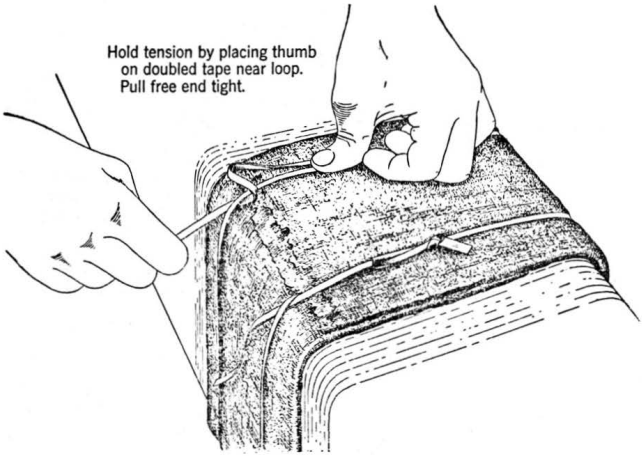
(4) After a side is drawn up it is stroked upward using the edge of a block of wood 1 inch by 2 inches and about 7 or 8 inches long. This operation works the mortar through the cheese-cloth on the inside and smooths out any cracks or unevenness in the mortar.

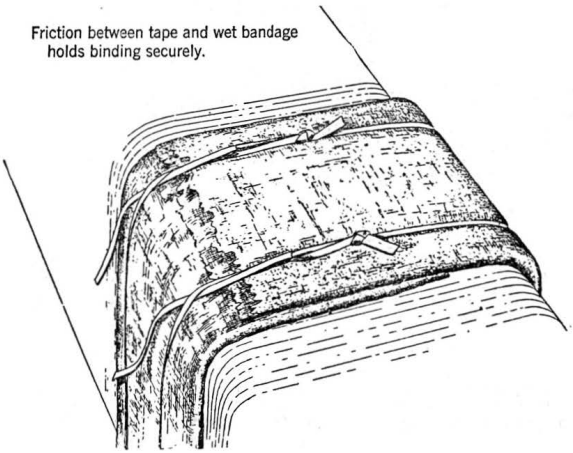


(5) After the bandage has been smoothed over the joint bring the tapes up tightly and tie them at the top. This operation may be performed as shown below by threading one end through a loop tied in the other end or by tying with an ordinary square knot near one corner. The loop is formed by tying an overhand knot in a bight at one end of the tape. The operation of tying is an important feature in compacting the bandage all around the conduit and in obtaining a firm bond between bandage and tile

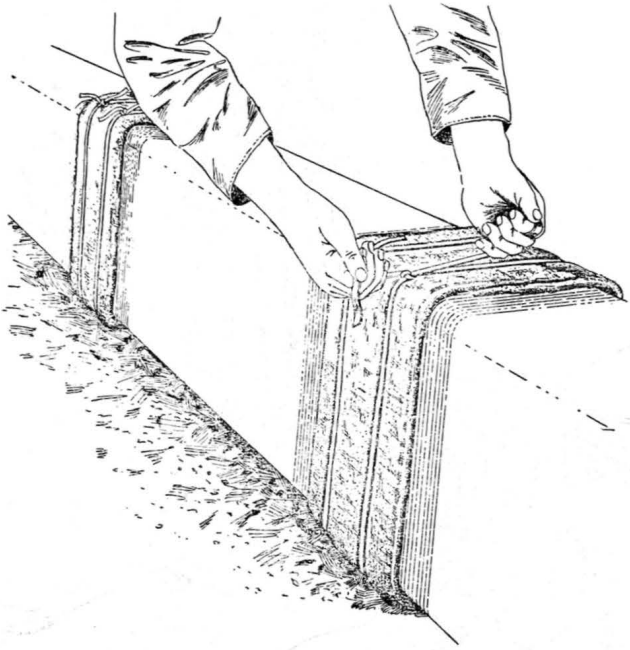
(a) Using loop tie:



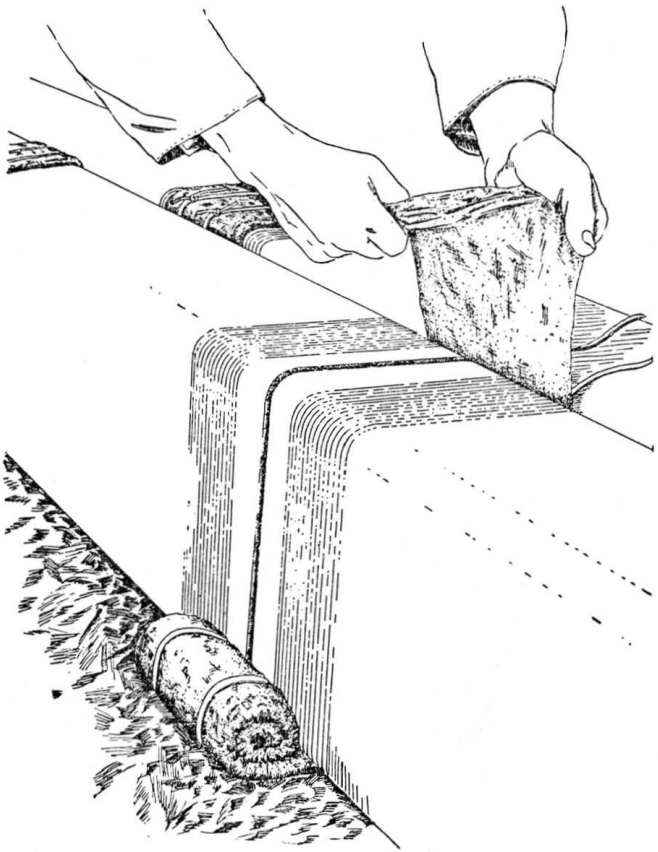

Hold tension by placing thumb
on doubled tape near loop.
Pull free end tight.


Friction between tape and wet bandage
holds binding securely.

(b) Using square knot near one corner.



2.17 When laying conduit in a formation consisting of several units placed side by side the joints between the first units placed are completed as described above. But as the second units are placed beside the first the workmen laying the conduit will unroll one side of the bandage and lay it over the conduit already in place, as described in G41.120. After the conduit is placed in position the final operations of completing the joints are carried out by the third man as before.



3. TROWELED JOINTS

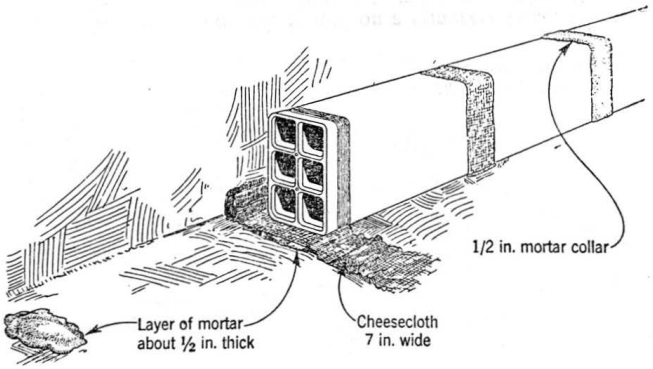
3.01 The troweled mortar joint is a collar of cement mortar formed around the tile at the joint by plastering with a mason's trowel. The operations required in making the joint are as follows:

(1) Before laying the conduit, place at the joint location a layer of cement mortar about 1/2 in. thick in which to bed the joint.

(2) Moisten a strip of cheese-cloth 7 inches wide and long enough to lap six inches at the top when wrapped once around the tile. Center it over the mortar on the bed of the trench.

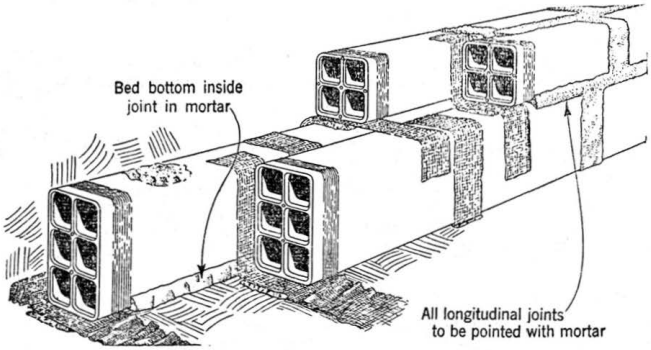
(3) Lay the conduit on the cheese-cloth and after setting the next piece of conduit, using two dowel pins at each joint, wrap the cheese-cloth around the joint.

(4) Plaster the joint with mortar to a thickness of 1/2 inch on the sides and top and wide enough to cover the scarifications on each piece. Be careful to see that the bottom corners of the joint are well plastered.

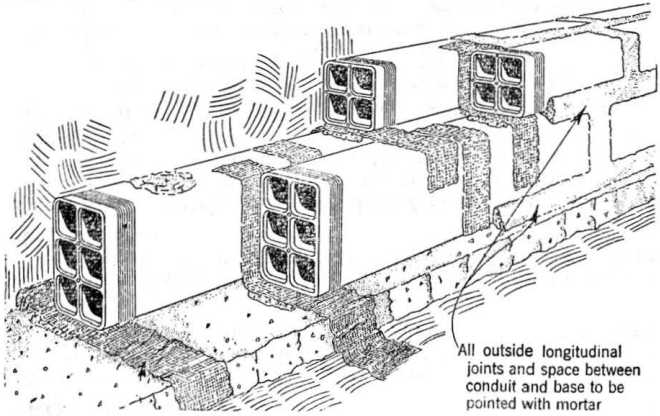


Note: Troweled mortar joints are easily destroyed and care should be exercised to see that the conduit is not moved after the joints are completed.

3.02 When the formation consists of two or more multiple units laid side by side without a concrete base, all outside longitudinal joints between units should be pointed and the bottom longitudinal joint between units should be bedded in mortar. This is to prevent silt and roots from entering the inside vertical joints which cannot be reached for troweling.



3.03 When the conduit is laid on a concrete base, all outside longitudinal joints between units and also the space between the conduit and the base should be pointed. This seals all outside openings and makes it unnecessary to bed the bottom longitudinal joint between units.



4. JOINTS FOR ENCASED CLAY CONDUIT

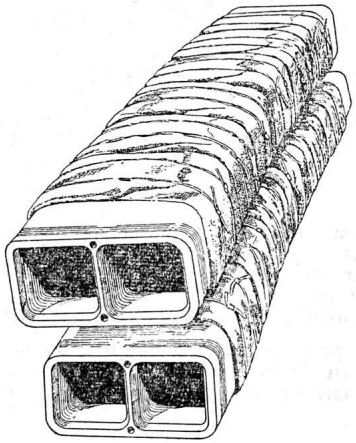
4.01 In laying multiple conduit to be encased use two dowel pins at each joint. Complete the joint in the following manner:

(1) Wrap each joint with a strip of moistened cheese-cloth 7 inches wide and long enough to encircle the joint with 6 inches overlap at the top.

(2) Using a wide brush, paint all exposed cheese-cloth with a grout composed of neat cement and water mixed to the consistency of a thick paint.

5. PREJOINING CLAY CONDUIT

5.01 By using mortar bandages, prejoining of curved or straight sections several feet in length may be carried out in a convenient store-yard or rented space near the job. In the construction of multiple curves, such as at a central office entrance, the use of prejoined sections will be found of considerable advantage. By employing this method, the handling and joining of numerous short sections in the restricted working space of the trench will be avoided.



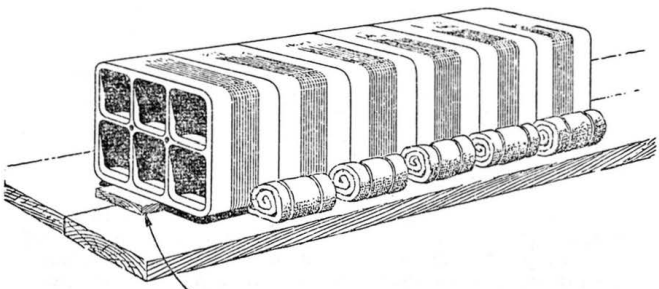
5.02 The length of section which can be handled conveniently will in most cases be determined by the weight of the section and by the mechanical equipment available for handling.

Excessively long pieces do not accommodate themselves readily to irregularities in the trench bed. In general, the best results will be obtained by restricting the length of prejoined sections to that which can be readily handled by two men.

Assembling

5.03 Refer to the material tables for the size of bandage to be employed with the type of conduit to be joined. Prepare the bandages as outlined under Part 2 of this section.

5.04 Select a level surface such as that afforded by a plank or paved area and on it space unrolled bandages to the number required to join the total number of pieces in a prejoined length. Using dowel pins assemble the various pieces on the bandages and complete the joints in the usual way.



Curing

5.05 To withstand handling and the shocks and jarring due to transportation for any great distance, prejoined sections should receive extra attention. Completed joints should be cured by covering them with tarpaulins or burlap bags and keeping them continuously moist for a period of at least 3 days, if special rapid hardening cement is used in the mortar, and at least 7 days, if ordinary portland cement is used. The curing time with special cements may be shortened to 24 hours, if particular care is exercised in handling and transporting the sections.