Installation Engineering Handbook 30
Western Electric
Service Division

Section 6A
8-31-72
Replaces: Section 6A
Dated: 4-19-51
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Dated: 2-27-69

LAYING OUT FLOORS
COMMON INFORMATION, REQUIREMENTS AND METHODS
(INCLUDES SPECIFIC INFORMATION FOR COMMON SYSTEMS BAYS AND RACKS)

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1. GENERAL

1.1 Scope of Section

1.11 This section covers common information, requirements and methods for the laying out of floors prior to placing the equipment. It also includes specific information, requirements and methods for common systems bays and racks.

1.12 Additional sections to this handbook pertaining to specific Floor Layout are as follows:

System	Section
No. 1 Crossbar, Local and No. 4 Toll	6B
Step-by-Step	6D
Manual	6E
Panel	6F

1.13 Each figure in this section and in other sections of this series (Laying Out Floors) illustrates only conditions to which reference is made in the text and is not to be considered as covering the requirements for other conditions that may be shown in the figure.

1.2 Precautions Against Personal Injury, Equipment Damage and Service Interruptions

1.21 The specific precautions to be taken against personal injury, equipment damage and service interruptions are covered in this section and other sections of this series (Laying Out Floors), with the associated method. General precautions are covered in Handbook 0 and are to be observed at all times as they apply to the operations being performed.

1.3 Arrangement of Tools

1.31 Prior to starting operations covered by this section and other sections of this series (Laying out Floors), the tools and other items required should be arranged at the work locations so as to minimize fatigue and inconvenience when handling.

1.4 Required Tools and Supplies

1.41 In addition to the tools supplied in the general kits, the tools and supplies listed below are required for the work operation outlined in this and other related sections of this handbook.

Marker, Felt Tip, Black)	See	*83426302
Marker, Felt Tip, Red)	Note A	*83426301
or		
Pencil, China Marking, Black)	See	*83612001
Pencil, China Marking, Red)	Note A	*83612002
Pressboard or Masonite		(Obtain Locally)
Setting Tool and Masonry Drill Set		R-2837
Straight Edge, 5 Ft.		R-1315
Tape, Steel, 50 Ft.	(See Note B)	R-7860
Tape, Cellophane, Transparent, 3/4"		*83542330
or		
Tape, Drafting, 1"		*83542001

NOTES: (A) When selecting either marker or pencil, that color should be chosen which will contrast most with the color of the linoleum or floors being marked.

(B) R-7860 is included in the R-2837 Set.

* These items are listed in Handbook 250, Installation Stationery Supplies.

1.5 Verification

1.51 Items for the verification of the work performed by the operations covered in this section are listed in Section 6V.

1.52 To prevent accumulative errors, the items marked "P" in Section 6V are so designated to denote that the work covered by the items should be verified before other operations are started.

2. FLOOR PLANS AND FRAME LOCATING DIMENSIONS

2.1 General

2.11 The frames in a fully equipped office are located in paired rows. With this arrangement, each frame aisle is either an apparatus (front) or wiring (rear) aisle, since it is common to either the apparatus or wiring side of two rows of frames.

2.12 Locating dimensions for the ends of lineups are shown to the ends of the base on floor plan drawings.

2.13 The convention for the first frame of a group as shown on the floor plan drawing includes detailed dimensions. Other frames of a group are shown in block form only.

2.14 Dimensions in brackets should not be used for locating equipment as they are only approximate and may vary with building conditions.

2.15 Locating dimensions for various common systems fuse bays and relay racks as shown on floor plan drawings apply as covered in Paragraphs 2.2 to 2.5.

2.2 Channel Type Relay Racks (With Sheet Metal Base)

2.21 For these relay racks per ED-91590-70, locating dimensions on floor plan drawings apply to the front side of the bay. This is to the outside surface of the 4-7/8" Extension Guard Rail for 12" bays and to the outside edge of the side without a guard rail for 10" bays. Refer to Figure 1.

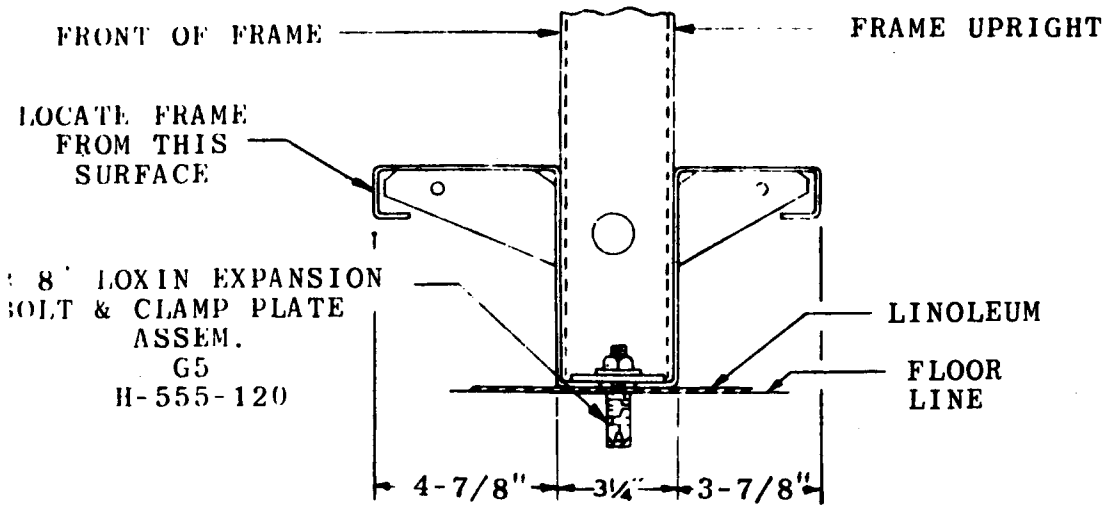
2.22 The 3/8" Loxin Expansion Bolt and Clamp Plate Assembly per Drawing H-555-120, Grp. 5 are used in the 10" and 12" Frame Base shown in Figure 1. It consists of a Clamp Plate P-415222, Shield P-428519, Stud P-427634, Hex. Nut P-401452, and Washer P-170089. It is not necessary to remove excess length of stud.

2.3 Channel Type Relay Racks With Floor Angle and Detachable Guard Rails

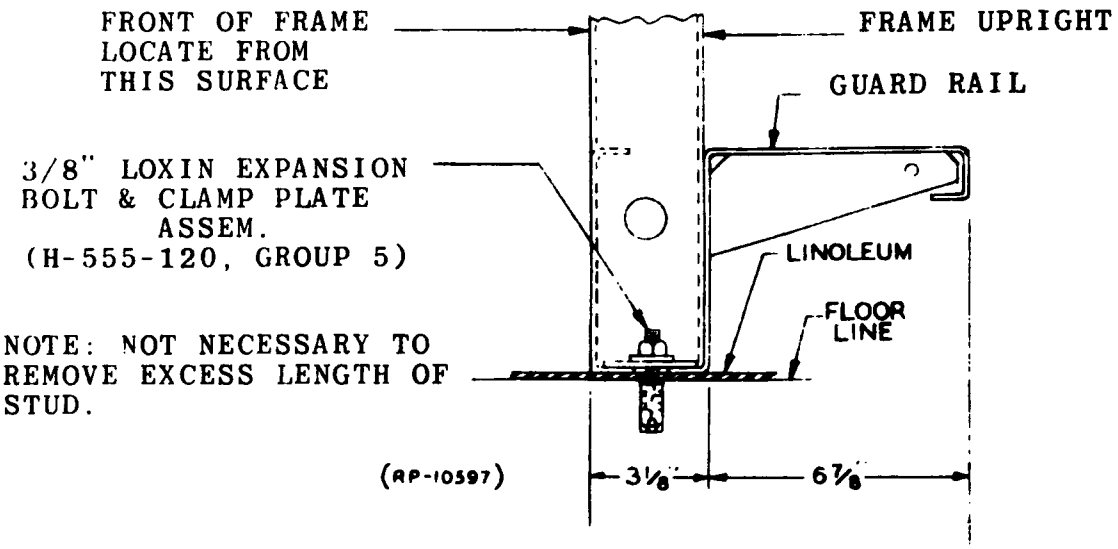
2.31 For these relay racks per ED-90672-70, locating dimensions on floor plan drawings apply to the outer edge of the heel of the floor angle which is the front side of the bay. Refer to Figure 2.

2.4 Angle Type Relay Racks With 10" Sheet Metal Base

2.41 For these relay racks per ED-91183-30, locating dimensions on floor plan drawings apply to the outside edge of the narrow (1-7/8") guard rail which is the front of the frame. Refer to Figure 3.

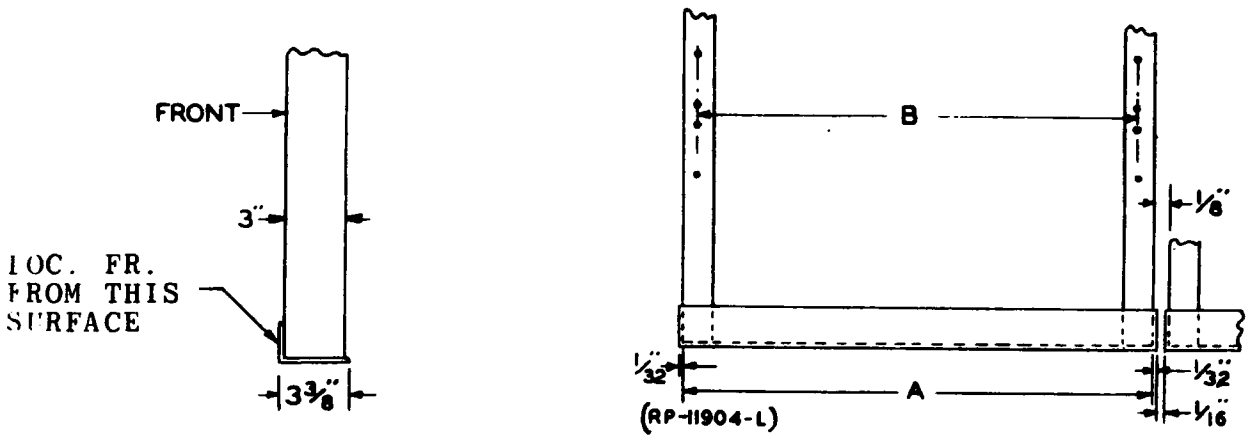


(B) 12" FRAME BASE



(A) 10" FRAME BASE

FIG. 1 DIMENSIONS FOR CHANNEL TYPE RELAY RACK WITH SHEET METAL BASE (ED-91590-70) (PAR. 2.21 AND 2.22)



	A	B
19" MOUNTING PLATES	1'-8 3/8"	1'-6 5/16"
23" " "	2'-0 3/8"	1'-10 5/16"

NOTE:-GUARD RAILS NOT SHOWN.

FIG. 2 DIMENSIONS FOR CHANNEL TYPE RELAY RACK HAVING FLOOR ANGLE AND DETACHABLE GUARD RAILS (ED-9067-70) (PAR. 2.31)

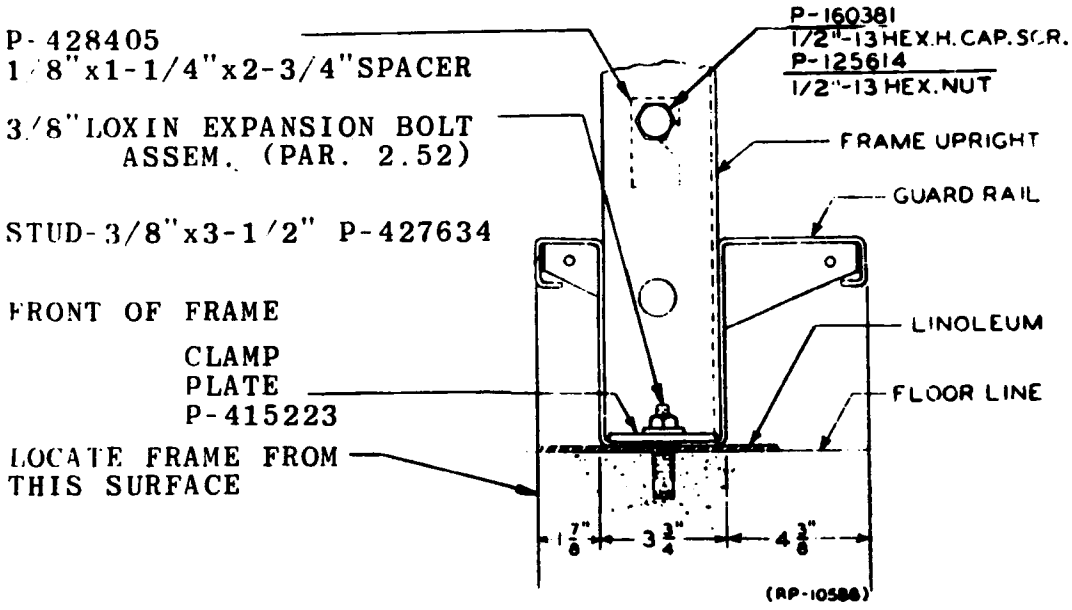


FIG. 3 DIMENSIONS FOR ANGLE TYPE RELAY RACK WITH 10" SHEET METAL BASE PER ED-91183-30 (PAR. 2.41)

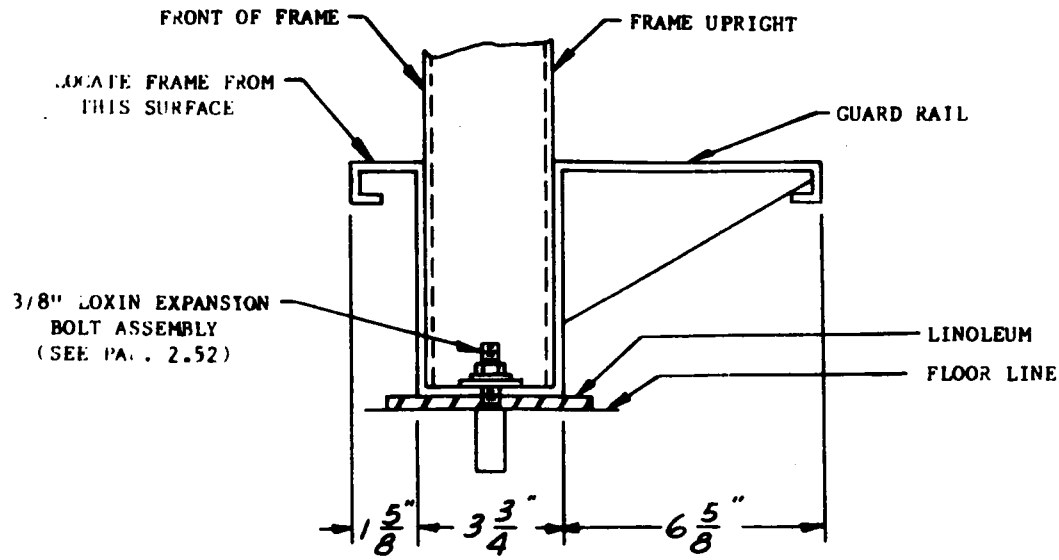


FIG. 4 DIMENSIONS FOR ANGLE TYPE RELAY RACK WITH 12" SHEET METAL BASE PER ED-91837-71. PAR. 2.51

2.5 Angle Type Relay Racks With 12" Sheet Metal Base

2.51 For these relay racks per ED-91837-71, locating dimensions on floor plan drawings apply to the outside of the narrow (1-5/8") guard rail which is the front of the frame. Refer to Figure 4.

2.52 The 3/8" Loxin Expansion Bolt and Clamp Assembly per Drawing H-555-120 Grp. 5 are used in the 10" and 12" Frame Base shown in Figures 3 and 4. It consists of a Clamp Plate P-415222, Shield P-428519, Stud P-427634, Hex Nut P-401452 and Washer P-170089. It is not necessary to remove excess length of stud.

2.6 Fuse Bays and Relay Racks With Angle Type Guard Rails

2.61 For these relay racks per ED-91774-70, locating dimensions on floor plan drawings apply to the front side of the bay which, contrary to other frames, is to the outer edge at the toe of the base angle. Refer to Figure 5.

3. USUAL PROCEDURE FOR LAYING OUT FLOORS

3.1 The usual procedure for laying out a floor is as follows:

(1) Layout reference lines.

(2) Layout and mark both ends of the lineups.

(3) Layout and mark the guard rail location, from the reference line, at the two ends of each line up.

(4) Check cable holes with relation to frame lineups.

(5) Using a template, mark the base lines and the overframe cable rack locations, using the guard rail lines to locate the template.

(6) Layout and mark the end lines for the bases of intermediate frames in the lineup.

(7) Mark frame designations.

(8) Score frame case location.

(9) Mark and cut linoleum when necessary.

(10) Spot expansion bolt locations.

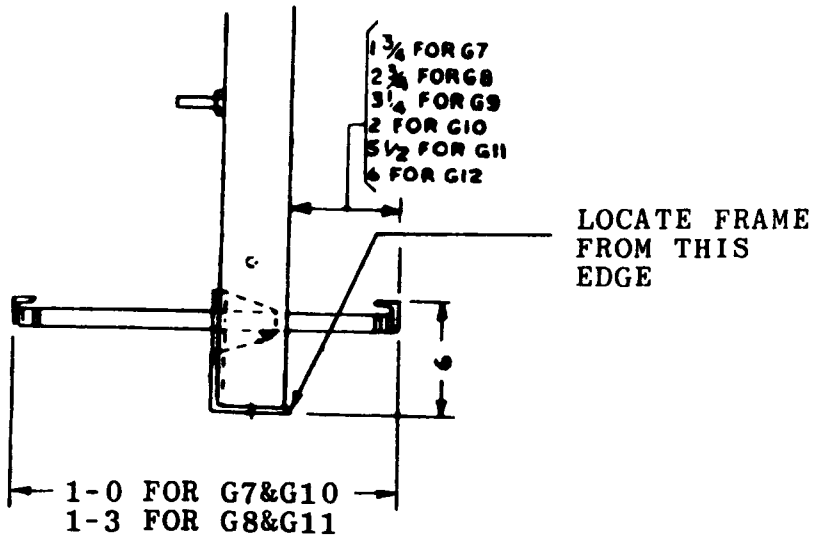


FIG. 5 DIMENSIONS FOR FUSE BAYS AND RELAY RACKS WITH ANGLE TYPE GUARD RAILS PER ED-91774-70 (PAR. 2.61)

3.2 To facilitate the operations, the floor should be laid out, where practicable, before the equipment or materials have been placed on the floor.

4. REQUIREMENTS AND METHODS

4.1 Common

4.11 Layout the floor in accordance with the floor plan drawing and job specification.

4.111 Before proceeding check room dimensions and the location of the floor plugs or other reference points to determine whether they are as represented on the floor plan drawing.

4.12 In general a steel tape should be used for laying out floors, since linen tapes increase in length when under tension.

CAUTION: WHERE A STEEL TAPE IS USED AROUND LIVE EQUIPMENT, EXTRA CARE SHALL BE TAKEN TO AVOID PERSONAL INJURY (SHOCK) AND SERVICE INTERRUPTIONS DUE TO SHORT CIRCUITS.

4.13 Marking all reference lines and layout lines before starting the erection of the equipment will make it easier to detect and correct possible errors.

4.14 Where linoleum is on the floor, thumb tacks placed temporarily at approximately 10' intervals along chalk lines will facilitate the identification of the line locations until the lines have been traced with a china marking pencil or felt tip marker per Note A of Paragraph 1.41.

4.15 When laying out a line at right angles to another line, make the radius lines, shown in Figure 6, 6 feet or longer, where possible, to insure accuracy. Point A on the base line is the location through which the line at right angles is to be drawn. From point A, points B and B' are marked using C as a radius (equal to any distance suitable to the size of the room). From points B and B', point D is located using X as a radius. A line drawn through points D and A will be at right angles to the base line. Figure 7 shows an alternate method of drawing lines at right angles to another line.

NOTE: It is impraticable to draw a line of any considerable length at right angles to another by means of a square.

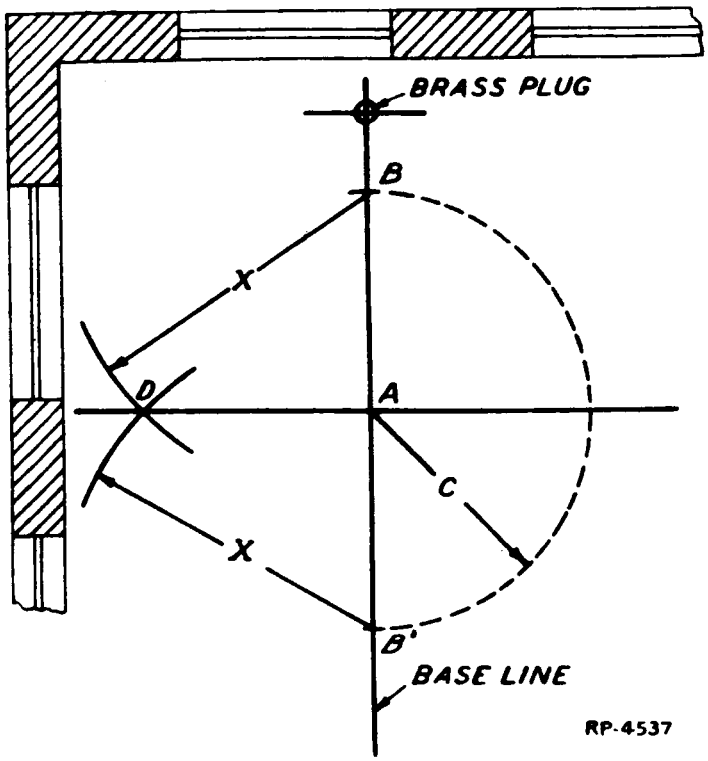


FIG. 6 DRAWING LINES AT RIGHT ANGLES TO ANOTHER LINE (PAR. 4.15)

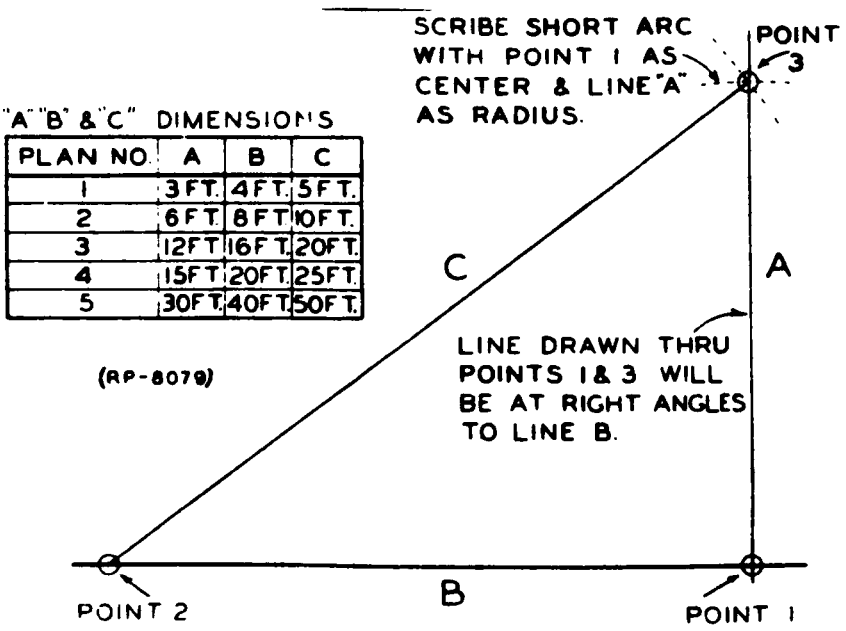


FIG. 7 DRAWING LINES AT RIGHT ANGLES TO ANOTHER LINE (PAR. 4.15)

4.16 To prevent the possibility of accumulative error where a number of short dimensions are to be laid out in a straight line, the total dimension should be marked off first and this divided into the shorter dimensions.

4.2 Locating and Laying Out References Lines

4.21 In making measurements for reference lines, make certain that they are taken from the correct points as shown on the floor plan drawings where floor plugs or other reference points have not been installed by the telephone company.

4.211 Where measurements are given from outside of walls, reference lines may be located as shown in Figure 8 through a window at each end of the room and at an intermediate window if the room is long. Figure 9 shows a method of extending a line on the other side of a column or other obstruction.

4.22 By checking the location of marked lines with respect to cable holes or the cable slot for the M.D.F., it can be ascertained whether any discrepancies exist which may later cause trouble in locating equipment and running in cable. If a discrepancy large enough to cause trouble is found, originate a J.I.M.

4.23 On additions where floor plugs or other points of reference are not readily accessible owing to linoleum on the floor or interference of equipment, reference lines may ordinarily be located from cable holes or frames already in place.

4.24 Use Chalk Line, R-1384, to snap extended lines on the floor between marked reference lines. Trace these chalk lines with the appropriate china pencil or felt tip pen using Straight Edge (R-1315) or a straight piece of framing bar.

4.25 If the china pencil is used to trace the chalk extension lines, cover the traced lines with Transparent Cellophane Tape. This will prevent the traced lines from becoming obliterated. Where linoleum is on the floor, the Transparent Cellophane Tape shall be used.

4.26 Since the ink contained in these felt tip markers is of the non-water-soluble type, the installer can mark the linoleum or floors directly. However, the end lines drawn with the felt tip pens must be covered when all frames in a line-up are in place.

4.27 If the frame line-ups are subject to movement, or if there is some doubt about the exact location of frame base lines or end lines, or other lines that will not be covered by equipment such as guard rail lines and overframe cable rack lines, the felt tip markings shall be made on a piece of Transparent Cellophane Tape or Drafting Tape which may be removed later leaving no permanent markings.

4.3 Locating Equipment

4.31 Locate the equipment to conform with the dimensions on the floor plan drawing using the lateral dimensions (A, B, C, etc.) shown in handbook figures.

4.3101 Layout and mark, with a china marking pencil or felt tip marker per note A of Paragraph 1.41, the two end lines for the bases of each lineup.

4.3102 Layout and mark, with a china marking pencil or felt tip marker per Note A of Paragraph 1.41, approximately 6" beyond both ends of each lineup, short lines representing the edges of the guard rails and the edge of overframe cable racks. These lnes should be used for locating the templates, described in the following paragraph, and for checking the location and horizontal alignment of the equipment after it has been erected.

4.3103 Templates, similar to the one shown in Figure 10, will facilitate laying out the base lines. It is important to mark the front of the frame on the template, because the overhang of the guard rail with respect to the frame uprights is not always the same on the front and the rear. The end of the templates correspond to the guard rails and the saw marks to the edges of the frame base and the edge of overframe cable rack stringers. Use two templates, one at each end of the frame lineup as covered in the following paragraph.

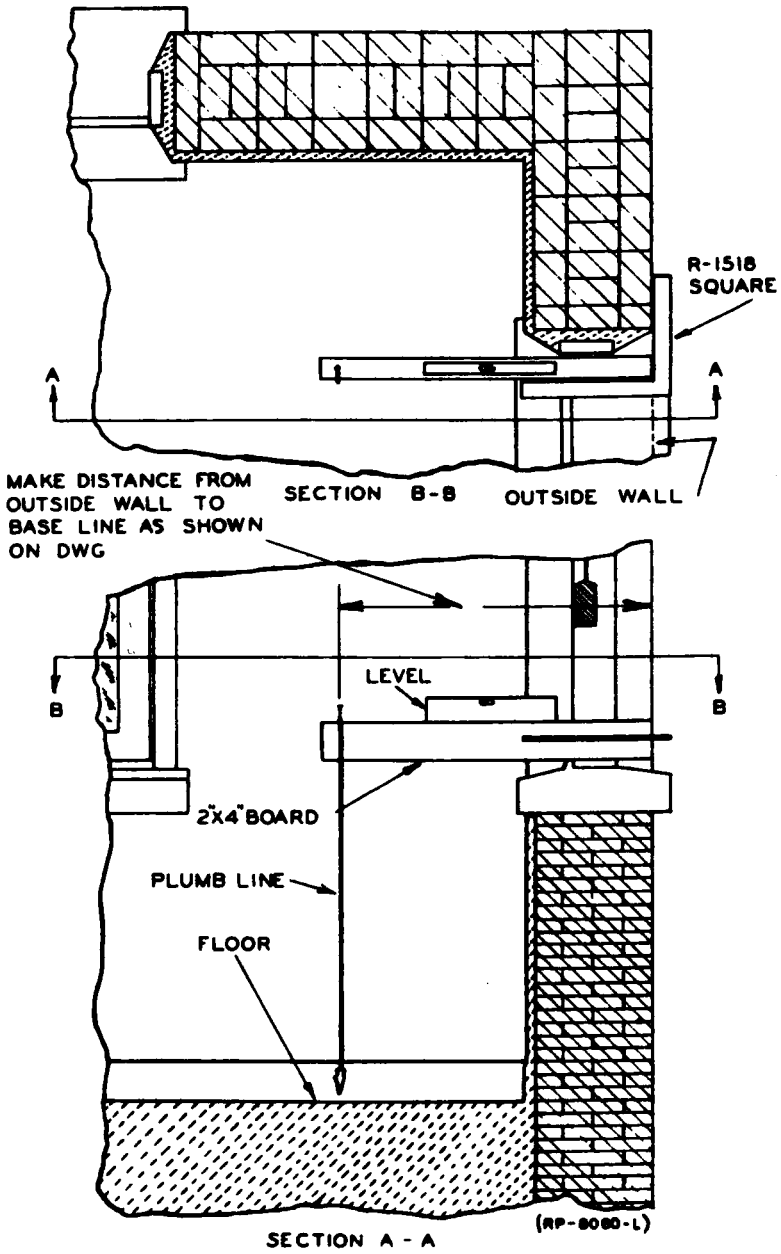


FIG. 8 LOCATING REFERENCE LINES FROM OUTSIDE WALLS (PAR. 4.211)

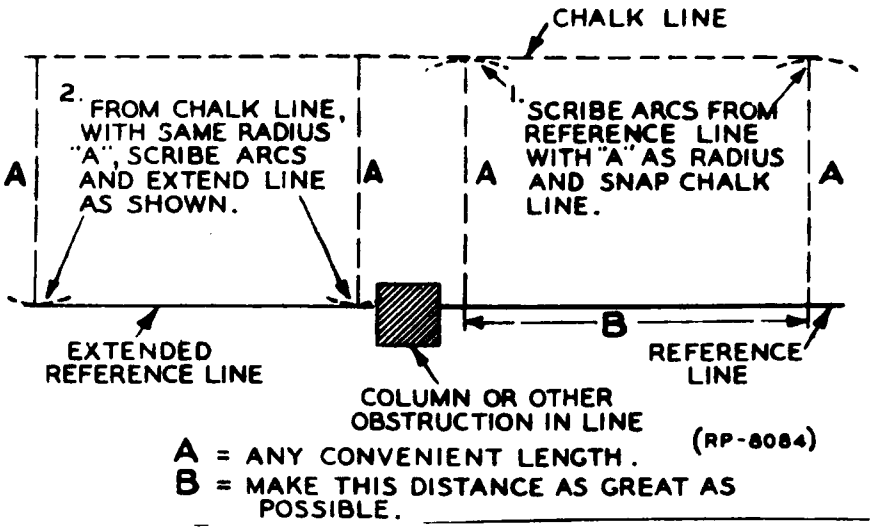


FIG. 9 EXTENDING LINE THROUGH COLUMN OR OTHER OBSTRUCTION (PAR. 4.211)

4.3104 The lines for the frame bases and the overframe cable rack stringer over the rear of the lineup should be marked for the entire lineup by inserting the chalk line in the saw marks in the templates. The templates are held with the saw marked edge against the floor, properly located by the guard rail lines at the end of the lineup after which the chalk line is snapped.

4.3105 For spacing parallel lineups of frames, pieces of wood, cut to the proper dimensions, will provide a ready means of obtaining the spacing.

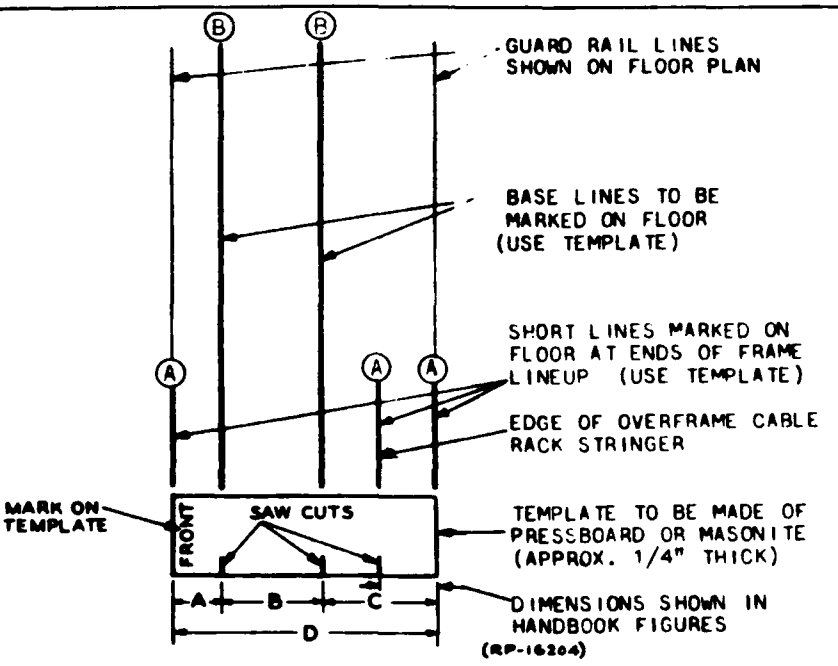
4.3106 In moving the template from one frame lineup to the adjacent lineup it will, in general, be necessary to reverse the templates end for end.

4.3107 Check the dimensions locating the cable holes shown on the floor plan drawings with the chalk marks laid down for the frame bases to make sure that the lineups are located properly with respect to the cable hole.

4.3108 After the base lines have been checked in accordance with the preceding paragraph, use a suitable straight edge (either the R-1315 Straight Edge, a piece of auxiliary framing or a piece of 2" x 4") and score these lines into the linoleum with a screwdriver or other suitable tool to prevent the lines from becoming obliterated. Where there is no linoleum on the floor, trace the chalk line with a china marking pencil or felt tip marker per Note A of Paragraph 1.41, using a suitable straight edge.

4.3109 Using the R-1653 Rule or the R-7860 Steel Tape, mark one end line (same end for all frames in the lineup) for the bases of the intermediate frames in the lineup making sure to allow for the proper clearance between the ends of frames as shown in the floor plan drawing. Marks should be made with a china marking pencil or felt tip marker per Note A of Paragraph 1.41.

4.3110 When marking the end lines for the bases each frame designation should be marked on the floor with a china marking pencil or felt tip marker per Note A of Paragraph 1.41 so that the base or grouting will cover the designations. This will save time when the frames are being erected.



A Short lines locating guard rails and overframe cable rack marked approximately 6" beyond end lines for bases in each lineup. Use red china pencil.

B Chalk lines locating frame bases marked for entire lineup as follows:

(a) Insert chalk lines in saw marks of templates.

(b) Hold templates with saw marked edge against floor on guard rail lines described in A.

(c) Snap chalk line.

FIG. 10 MAKING UP TEMPLATES FOR LAYING OUT FLOORS (PAR. 4.3103)

4.3111 After all markings are complete cover them with Transparent Cellophane Tape, to prevent them from being obliterated. This does not include the scored lines in the linoleum locating the frame bases.

4.3112 Where linoleum is to be removed and grouting is not required, cut the linoleum to fit closely around the equipment. Where grouting is required accurate cutting is unnecessary if the linoleum is allowed to extend 1/8" to 1/4" under the base angles.

(a) Hold the linoleum knife (R-2135) at a slight angle (approx. 10^{o}) with the end of the blade pointing in toward the center of the piece to be removed. Cutting in this manner will tend to raise the piece of linoleum and facilitate its removal.

4.4 Locating Expansion Bolt Holes

4.41 For frames with detached base angles, the angles may be used as a template or the holes in the floor can be drilled through the base angle holes.

4.411 Relay rack and fuse board base angles are furnished with two floor bolt holes per bay, only one of which is used except for an isolated bay.

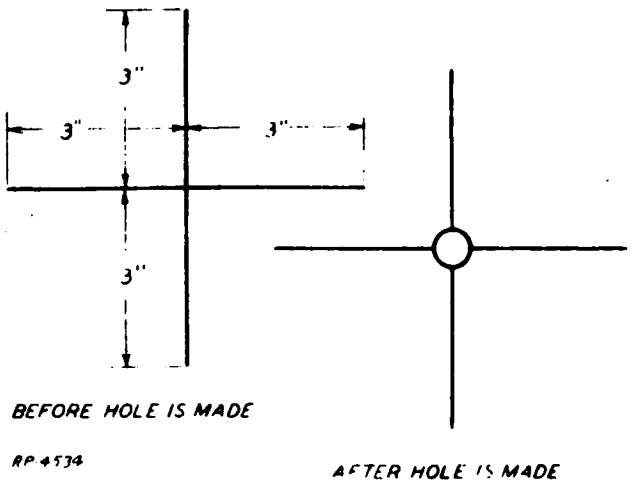


FIG. 11 LAYING OUT HOLE CENTERS FOR CHECKING ACCURACY OF DRILLING (PAR. 4.44)

4.42 For frames having welded base angles, the location of the holes can be determined from the "Floor Angle Expansion Bolt Hole Location" drawings as follows:

Drawing	System	Equipment
H-249-139 (Kearny Controlled)	Common, Manual and Toll	Dist. Frs., Fuse, Bays, Relay and Register Rks.
H-299-201 (Kearny Controlled)	Common, Manual Panel, P.B.X., Telegraph and Toll	Switchboard and Desks
H-582-211 (Hawthorne Controlled)	Crossbar (Earthquake Protection Jobs Only) and Panel	Frames
H-582-226 (Hawthorne Controlled)	Common and Step-by-Step	Dist. Frs., Fuse, Bays, Relay and Register Rks. SXS Frs.

4.43 Where only a few frames are involved, the holes are generally laid out directly on the floor. Where there are several frames of the same type, a template cut to the contour of the base angle and having holes indicating the locations of the expansion bolt holes will facilitate this operation.

4.44 Lines drawn through center points of holes locations before drilling, as shown in Figure 11, will enable the accuracy of the drilling to be checked, where required.

→ Arrowed lines indicate new or changed information.

[Bracket at side of paragraphs indicates requirements.

Assistant Manager
Common Installation Engineering

Reason for Reissue:
1. To include information from TI 6A dated 2-27-69.
2. To update format of Section.
3. To rearrange information contained in Section.
4. To add Paragraph 2.41 and Figure 4.
5. To revise Figures 1, 2, 3 and 5.