

LOCATION, ERECTION AND ALIGNMENT
OF POWER EQUIPMENT

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2. GENERAL2.1 Cautions

2.11 See Handbook 0 Section 1S and Handbook 30 Section 1A for precautions against personal injury to hands, eyes, etc.

2.12 Low voltage circuits normally not considered a shock hazard, may still cause serious burns when high currents flow through accidental shorts.

2.13 The nature of a working power room presents many inherent hazards both to the installer and to service. No installer shall be permitted to work in a working power room except as a helper until he is familiar with these hazards.

2.14 Steel measuring tape due to its hazard shall not be used in a working power room.

2.2 Scope

2.21 This section contains information necessary for locating, fastening, leveling and aligning frames, bays, racks, boards, cabinets, casings, panels, etc., expressly associated with power apparatus. Repairing and refinishing asbestos and slate panels previously contained herein is now covered in Handbook 22.

2.22 "Frames" as used herein, refer to all power, bays, frames, cabinets, frameworks with or without casings, unless specific types of frameworks or frames are referred to, e.g., channel framework, angle framework, etc.

2.23 In earthquake areas and on disaster control jobs refer to Handbook 30 for number of fasteners and method of securing power equipment and frameworks. Generally this section requires more fasteners and imposes more stringent requirements than contained herein.

2.24 Methods for installing channel type relay rack (used both for power frames and miscellaneous office equipment) are principally used for other than power applications. They are covered by Handbook 30.

2.25 Job drawings covering the erection of cable rack and auxiliary framing over power boards and generator control bays are supplemented by figures and requirements in Handbook 30.

2.26 Equipment provided with shock mountings or vibration isolators are leveled and placed on floors, piers or machine tables in accordance with Section 129 in Handbook 19. This section also covers leveling and placing machine tables supporting such equipment.

2.27 Laying out floors, drilling for and setting anchors, and use of required tools are detailed in Handbook 30 and should be used with this section. These operations should be completed before the frames are placed.

2.28 Specific instructions detailed in job papers or on framework assembly drawings take precedence over requirements herein.

3. INSTALLING EQUIPMENT3.1 Tools

The following tools listed are in addition to those contained in tool kit No. 3.

Code	Description
R-1562	Cutters, Bolt
R-1357	Drill, Electric, 1/2"
Kit 36	★Electric Hammer Kit

★NOTE: Used for drilling concrete containing stone which is too hard to drill with a carboloy drill and when amount of work involved is too great for economical use of the hand drilling method.

R-2728	Gun, Caulking
R-1497	Hoist, Rope, Self Locking
R-2044	Hook, Hoisting (for Mounting Rectifiers)
R-1315	Straight Edge, 5'

3.2 Supplies

Code	Description
KS-14666	Cloth, Cleaning
RM-641598	Compound, Caulking
RM-585920	Oakum, Rope
KS-8662	Paint, Enamel, Gray

3.2 Supplies (Cont'd)

<u>Code</u>	<u>Description</u>
R-3163	Paper, Abrasive
RM-647651	Petrolatum
Obtain Locally	Screws, Lag
R-3261	Sealer Coater
KS-7860	Spirits, Petroleum
R-2805	Tape, Acetate Fiber, 3/4"

4. WATERPROOF FLOORS

4.1 Before drilling into any basement floor or basement wall it shall be the installer's responsibility to determine from the telephone company representative whether or not waterproofing has been provided. Usually this is covered on job drawings or in job specifications.

4.2 If no waterproofing was used proceed with the conventional method of setting anchors as detailed in Handbook 30.

4.3 When waterproofing was used the telephone company will decide the method for securing the frames.

4.31 They may wish to subcontract the work of drilling and setting the anchors or they may instruct the installer in methods of fastening and rewaterproofing.

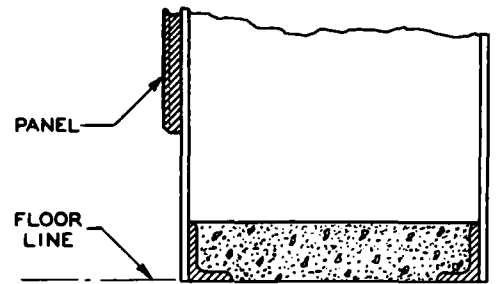
4.32 Drilling in waterproofed floors, where authorized, is limited to depths not exceeding three inches; however, any floor with a nonreinforced topping of two inches or less in thickness will necessitate the drilling of a deeper hole to secure the anchor to the structural slab.

4.4 If the waterproofing cannot be temporarily broken to accept anchors the "poured concrete block" method should be considered, however, some frames cannot be secured in this manner.

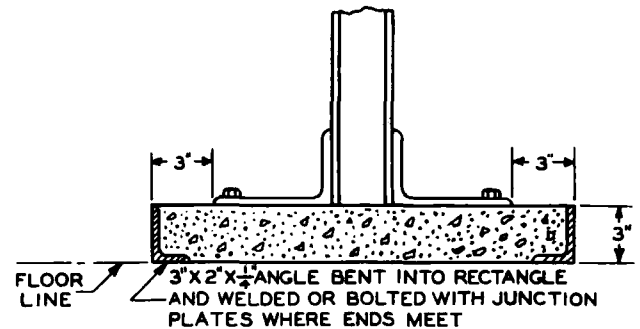
4.41 Frames equipped with pull-out units, where an appreciable amount of the weight may be shifted outboard, cannot be fastened by this method. An example of such a frame is the rectifier associated with the 410-B Plant. See Figure 9. For these instances the weight of the concrete does not provide sufficient ballast to prevent the framework from tilting.

4.42 Cabinets, and frames with casings such as those associated with 425-A Plant, cannot be fastened in this manner when the acceptable thickness of concrete in its base would interfere with ventilation.

4.43 To use the "poured concrete block" method pour a concrete slab on the unroughened floor as shown in Figure 1. This requires the rear angle of angle-box type framework be left in place. Floor coverings such as linoleum, asphalt tile, etc., need not be removed before pouring the concrete.



GENERATOR PANEL FRAME WITH SHEET METAL SIDES



SECTION OF FLOOR SUPPORTED CHANNEL FRAME WITHOUT CASING

NOTE:

1. WHERE BOLTS ARE USED INSTEAD OF WELDS, THE BOLTS SHOULD HAVE FLAT HEADS, COUNTERSUNK AND PLACED UP THROUGH FROM THE BOTTOM.

(RP-1475-A)

FIG. 1 EXAMPLES OF FRAMEWORKS WEIGHTED TO WATERPROOFED FLOORS (PAR. 4.43)

4.431 Mix the ingredients in the following proportions:

- 1 part by volume of cement
- 3 parts of clean coarse sand
- 5 parts broken stone

The broken stone should be of a size that will pass through a 1" screen. Cement, sand and stones must be mixed thoroughly before water is added, in order to secure satisfactory strength in the finished concrete. Add enough water to make the concrete "pour" properly after it has been thoroughly mixed. The amount required will usually be equal in volume to the amount of cement used, but will vary somewhat depending on the kind and dampness of the broken stones used and the dampness of the sand.

4.432 Pour the concrete, and by tamping, force it into all parts of the form to insure a mass free of air bubbles and voids. "Float" the top by leveling with a straight edged board.

4.433 Let the concrete set for one hour before smoothing with mason's trowel, R-1557.

4.434 Cure the concrete by moistening the exposed surfaces twice a day for two days. This will increase the strength of the finished block.

4.435 Finish the exposed surfaces, after the block has dried for at least 48 hours by applying a priming coat of R-3261 sealer/coater. When this has dried thoroughly, apply a coat of KS-8662 gray enamel.

4.5 When breaking the floor is not permitted the operating company may waive the fastening requirements particularly where heavy bays and cabinets are involved.

4.6 Support may also be effected without disturbing the waterproofing, by braces provided at the top of the frameworks similar to earthquake bracing as shown in Handbook 30.

5. LOCATION OF EQUIPMENT

5.1 Locate power frameworks and associated equipment to conform to the particular plans of each installation.

5.2 Where limiting dimensions or tolerances are not specified, locate the equipment to within such limits of the specified dimensions as will insure satisfactory functioning and workmanlike appearance of the equipment.

6. FRAMEWORKS - GENERAL

6.1 A cabinet is a sheet metal structure which supports the equipment it encloses, while a casing is a sheet metal structure placed around a completely installed unit of equipment or framework.

6.2 Box type framework is of two types. The Sheet Metal - Box Type covered by Handbook 30 is used for No. 5 Crossbar switch frames. The Angle - Box Type is used for the main power board and may be specified for ac power distribution.

6.3 Bases of power frameworks are drilled for leveling screws to facilitate vertical alignment and leveling the framework. The necessary leveling screws, 1/2" -13 x 1-1/2" (P427445), are furnished with the power board framework.

6.4 In a line-up where there are different types of frames, each group of frames of the same type should be considered as a separate line-up when determining the number and location of floor fastenings.

7. ERECTING

7.1 General

7.11 Fasten power frameworks, which are drilled for hold down bolts, to nonwaterproofed floors as shown in Figure 2.

7.12 Locate, drill holes and set anchors as required, in accordance with Handbook 30.

7.13 Frames, such as large rectifier cabinets, are too heavy to be used as a "hole locating template." Lay out the holes with a rule or a job made template and drill and set the anchors before placing the framework.

7.14 The vertical alignment of all power frameworks shall be plumb within the allowable deviations in Table A. Measure the deviation over the entire height with the R-1314 plumb bob and R-1652 6' folding rule. Any acceptable deviation from straightness of the part, should be ignored as straightness requirements are shop responsibility.

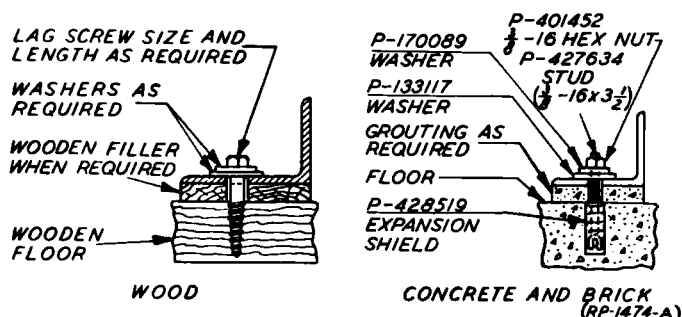


FIG. 2 FASTENING FRAMEWORKS TO NONWATER-PROOFED FLOORS (PAR. 7.11)

TABLE A

MAXIMUM ALLOWABLE DEVIATION FROM VERTICAL PLUMB (PAR. 7.14)

Height	Maximum Allowable Deviation from Plumb
4' 6" and Less	1/16"
Over 4' 6" and Less than 7'	1/8"
7' to 9' inclusive	3/16"
Over 9'	1/4"

7.15 Frames in a line-up may step up or down to conform to the general contour of the floor provided the difference in level of adjacent frames does not exceed 1/16" and provided the difference in level between the highest and lowest frame of the line-up does not exceed 1/2".

7.16 Joined ends of frames should not be out of alignment (in or out from a straight line extending the full length of the line-up) more than 1/16".

7.17 After loosely assembling all bays start aligning and leveling with the bay at the highest spot on the floor. See Angle - Box Type Frames for exception. Use leveling screws as provided and shims as shown in Figure 3.

7.2 Cabinets

7.21 Isolated cabinets such as motor starters, self contained power distribution service cabinets, generator control bays, floor mounted rectifiers, etc., shall be secured to the floor with four hold down fastenings. See Figure 4. Some motor starters are provided with only two holes in the base in which case only two fastenings are required. When two or more cabinets are adjacent to form a line-up and are fastened together, provide a floor fastening at each of the four over-all corners for the line-up. Along the base where the cabinets join, provide one fastener in the front of one cabinet and one fastener in the rear of the adjacent cabinet.

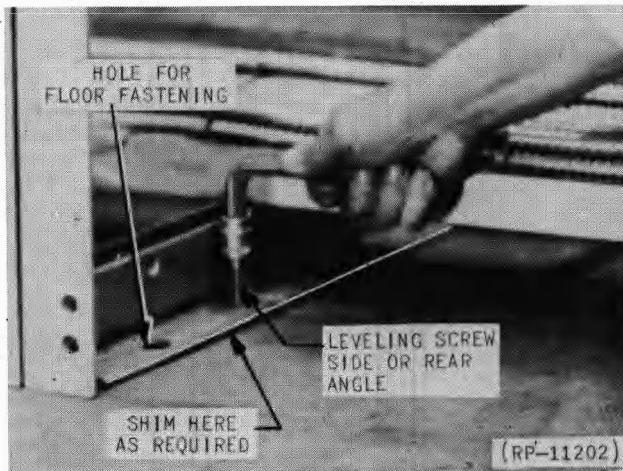


FIG. 3 LEVELING POWER FRAMEWORK WITH LEVELING SCREWS (PARS. 7.17 and 7.306)

7.22 Drill the floor and place the anchors in accordance with Handbook 30.

7.23 Align the cabinets with leveling screws when provided and shim to satisfy plumbing requirements. Securely tighten all framework and anchor fasteners.

7.3 Angle - Box Type Frames

7.301 Examples of Box Type Framework are ED-80842-01, ED-80483-01 and -30. See Figure 5. ←

7.302 Loosely assemble the framework of all bays, if not shop assembled. Locate them approximately in their final position.

7.303 Angle - Box Type Framework is now provided without a front floor angle. The operating company may, however, request bays with front floor angles when additions are made to an existing line-up. When the front floor angle is provided, the front of the bay is fastened to the floor through this angle. In the absence of the angle the forward floor fastening holes located behind the front apron are used. ←

7.304 Secure each bay, not adjacent to another bay, with one fastener in either of the front holes and one fastener at the rear of each side angle. For adjacent bays (bays in a line-up) provide one fastener in either the left front or right front hole retaining the choice throughout the line-up and also provide one fastener in each rear corner of the over-all line-up and, one at each junction (either bay) of two bays. ←

NOTE: Additional holes provided are required when framework is used in earthquake areas.

7.305 Drill the floor and place the anchors in accordance with Handbook 30. ←

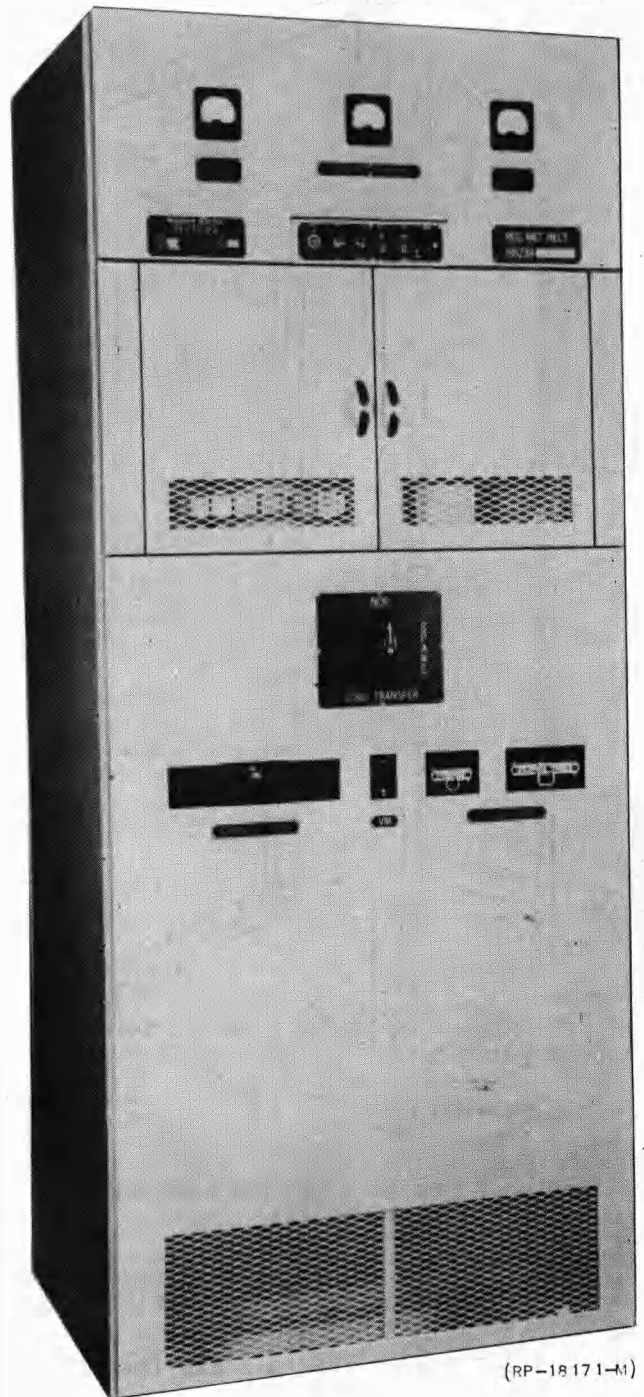


FIG. 4 FLOOR MOUNTED RECTIFIER CABINET (PAR. 7.21)

7.306 Select as an originating bay to be first anchored into place, one which will be in a key position. This will usually be a bay to which the bus bars to the batteries or charging equipment will be connected. Locate the highest spot on the floor for the given line-up to determine the shims necessary to level the originating bay. Use the leveling screws furnished to ←

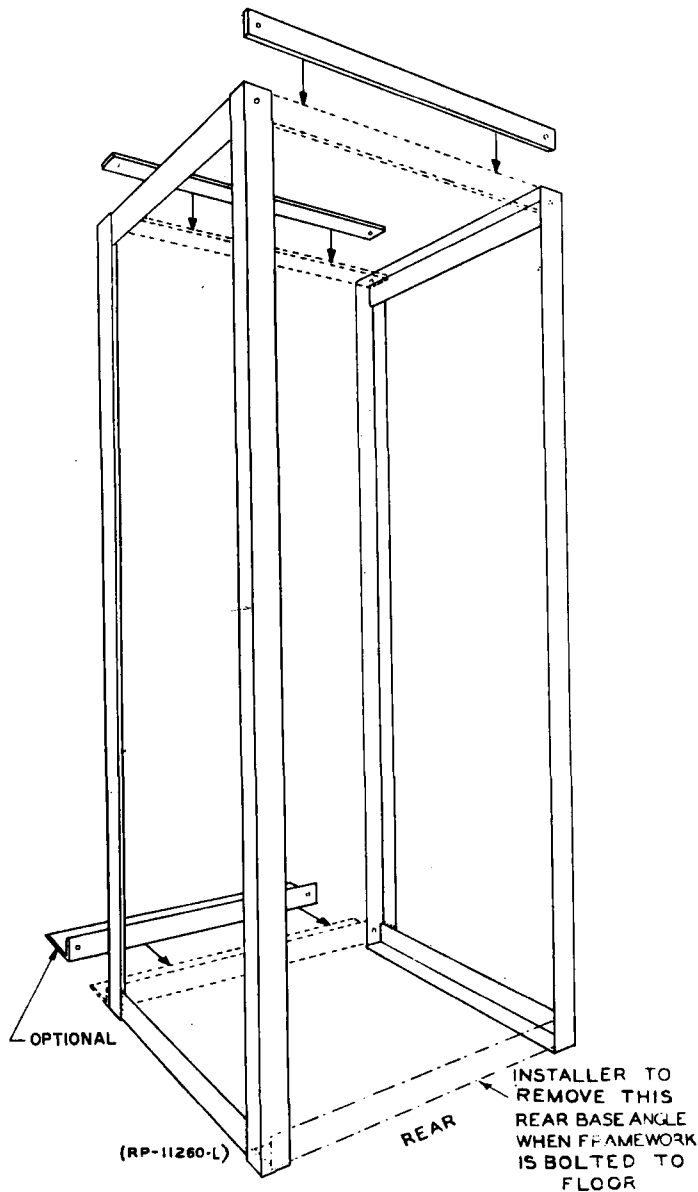


FIG. 5 ANGLE - BOX TYPE FRAMEWORK
(PAR. 7.301)

[aid in placing the shims. Align the bay with the R-1314 plumb bob and secure floor fasteners against shims, not against leveling screws. See Figure 3.

7.307 Repeat this process for all succeeding bays.

7.308 Locate interbay bolts near the top and bottom of the vertical front and rear angles. Use spacers P-404660 as necessary to maintain bays within the allotted space and provide clearance between edge of panels.

7.309 Mount panels as the work progresses to insure sufficient space for the panels and clearance between bays. Observe maximum misalignment between panels as described in Paragraph 9.

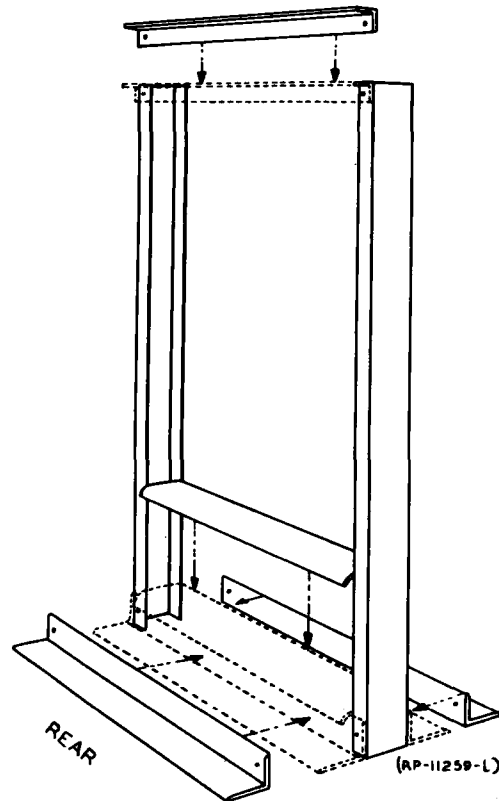


FIG. 6 CHANNEL TYPE FRAMEWORK
(PAR. 7.41)

7.310 Secure tightly all framework and anchor bolts. Remove all leveling screws and rear floor angles.

7.4 Channel and Angle Type Frames

7.41 Channel and angle frameworks may be equipped with open base angles as may be contained in a casing (sheet metal enclosure). See Figures 6 and 7.

7.42 When channel and angle frames are provided with open base angles, fasten at each hole. When contained in a casing and the assembly is not in a line-up, provide a floor fastening at each corner. Where channel and angle frameworks contained in casings are adjacent as in a line-up, and are fastened together, provide a floor fastening at both outside corner holes on each of the end frameworks in the line-up. At the junction of frameworks where base members are adjacent, provide two floor fastenings staggering one in each casing.

7.43 Place anchors as instructed in Handbook 30. Use leveling screws when provided, and shims, to bring framework and casings within plumbing requirements.

7.44 After alignment tighten all assembly bolts and hold down fasteners.

7.5 Duct Type Frames

7.51 Floor supported frames shall be secured with a hold down fastening at each hole.

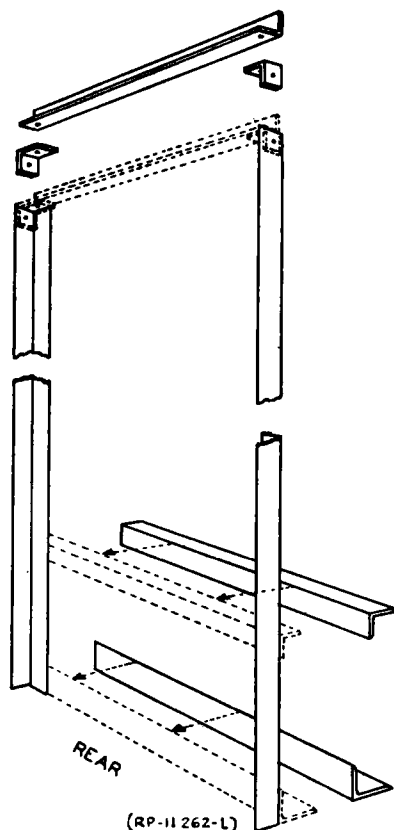


FIG. 7 ANGLE TYPE FRAMEWORK
(PAR. 7.41)

7.52 Auxiliary framing supported frames shall be secured with a hold down fastening in the center of each base when adjacent to another frame. When not directly adjacent to another frame locate two hold down fastenings near the ends of the base. See Figure 8.

7.53 Drill the floor and place the anchors in accordance with Handbook 30.

7.54 Use shims with floor supported frames. Align and securely tighten all framework and anchor fasteners.

7.6 J86273 Rectifiers Used in the 410-B Plant

7.61 Special treatment is required for fastening rectifier cabinets as used with the 410-B Power Plants. Because the weight of the apparatus can be shifted outboard for maintenance, substantial and reliable anchoring is required. When waterproof floors are encountered, the telephone company shall decide on the method for rewaterproofing since, with these rectifiers, filling the base with concrete is not permitted. See Figure 9.

7.62 Secure the cabinet with one anchor at each corner.

7.63 Drill the floor and place the anchors in accordance with Handbook 30 making sure that each anchor is rigidly set.

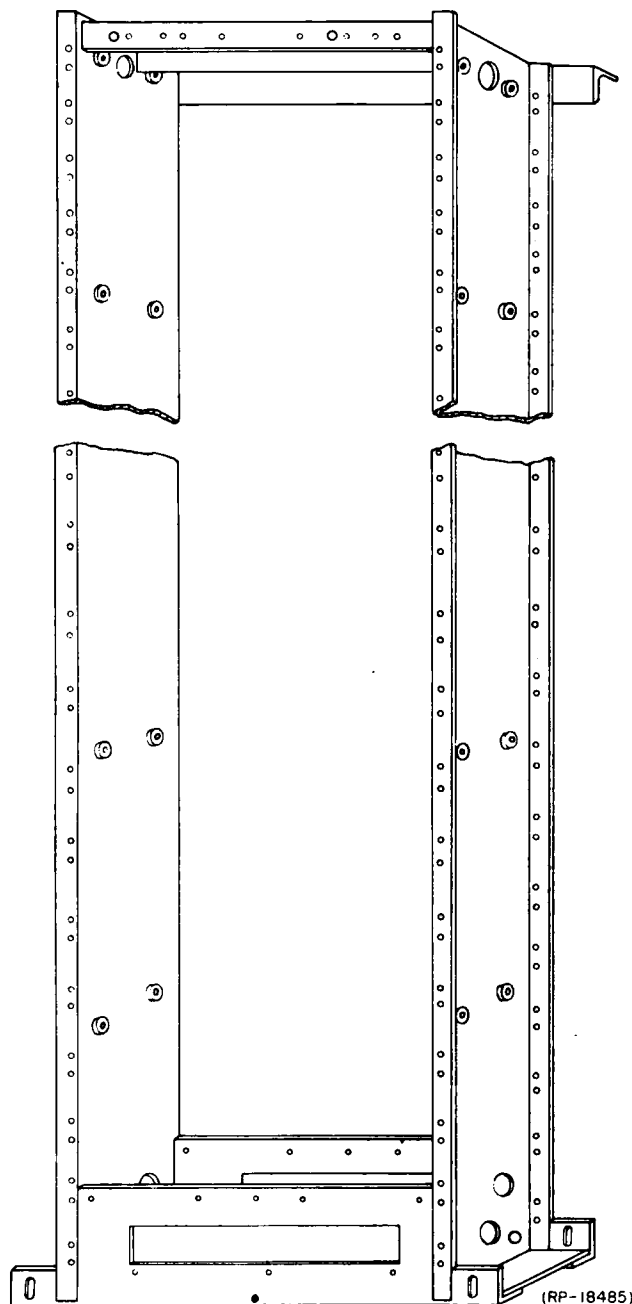


FIG. 8 AUXILIARY FRAMING SUPPORTED, DUCT
TYPE FRAME (PAR. 7.52)

7.64 Use leveling screws when provided, and shims, to bring cabinet within plumbing requirements.

7.65 After alignment tighten all assembly bolts and hold down fasteners.

8. EXPOSED STUDS IN EXPANSION SHIELDS

8.1 The excess lengths of the studs in expansion shields securing open base members should be cut off approximately

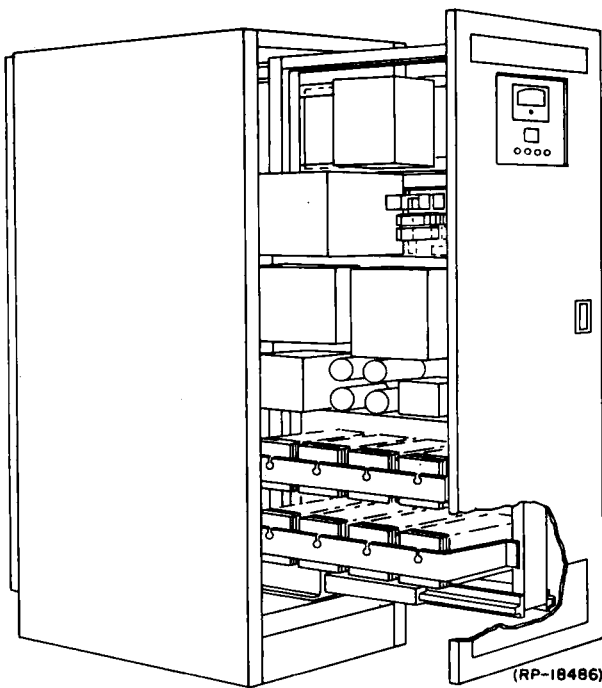


FIG. 9 RECTIFIER ASSOCIATED WITH THE 410-B POWER PLANT (PARS. 4.41,7.61)

flush with the nut after the frame aligning operations have been completed. Use the R-1562 bolt cutter. Any burrs remaining after the cutting operation should be removed with a file. Finish to match surroundings. It is not necessary to cut off the excess lengths of the studs where they are not exposed such as in casings and cabinets.

9. MOUNTING

9.1 Rack Mounted Rectifiers

9.11 Mount these rectifiers by using the R-2044 hoisting hook and the R-1497 rope hoist. Lifting loops furnished with these rectifiers are secured to the two top holes on each side member of the rectifier framework, and then fitted to the lifting hook as shown in Figure 10.

9.12 It will be necessary to remove the lower bolt and nut fastening each loop to the rectifier before securing the upper part of the rectifier in place. Remove the lifting loop only after the rectifier is secured with holding screws at top and bottom.

9.13 Where rectifiers are mounted near the top of the frameworks, erect a higher level of auxiliary framing bars temporarily to which the hoisting hook may be attached.

9.14 Where the ceiling height is limited, it may be of advantage to mount the rectifier on the frameworks while on the floor. The framework with the rectifier mounted may then be hoisted into position as an assembled unit. When

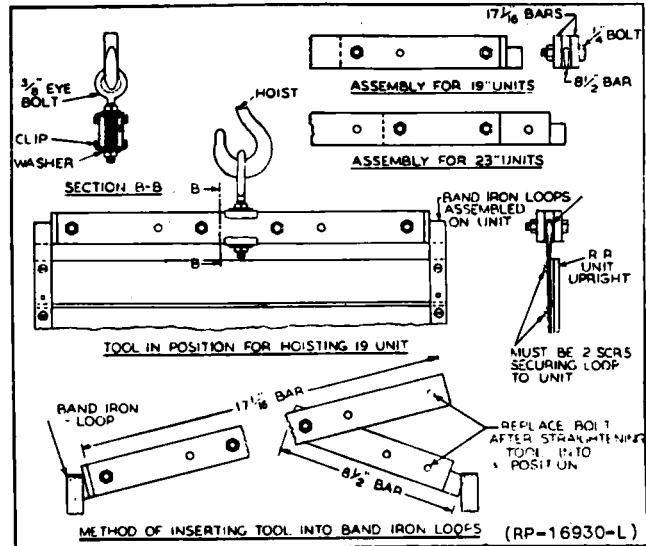


FIG. 10 R-2044 HOISTING HOOK FOR RECTIFIERS (PAR. 9.11)

the R-2667 battery hoist is available, it may be employed to take the weight of the rectifier provided the rectifier is securely fastened to the hoist platform and the hoisting rope is used as an added precaution.

9.2 Panels

9.21 Asbestos panels are easily marred. Moisture from the hands, oils, scuffing, etc., noticeably mark the finish. Do not lean the face of the panel against objects. Use RM-669152 cotton gloves furnished in Tool Kit #3 and handle by grasping the edge of the panel, not by the studs or other apparatus.

9.22 The front face of adjoining power panels of the same nominal thickness should not be out of plane more than 3/32" and the edges of adjoining panels should not be separated more than 3/32".

10. CAULKING

10.1 Floor conditions normally encountered in telephone offices are such that the frames do not have to be shimmed an excessive amount to satisfy level requirements; therefore, grouting is no longer required.

10.2 Spaces 3/16" or more between the frame bases and the floor shall be filled with wooden strips or RM-641598 Caulking Compound.

10.3 When caulking is used, seal around the entire base of isolated frames or collectively around frames in a line-up when appearance and good workmanship dictates.

10.4 Use RM-585920 Rope Oakum as a back stop for the caulking compound where spaces over 3/8" exist between the frame base and the floor.

10.5 Apply the compound flush with the base of the frame and extend inward for at least 3/8".

10.6 Refer to the grouting and caulking section in Handbook 30 for assembly of the caulking gun and painting the compound.

11. VERIFICATION

NOTE: Inspect the following items to determine that the requirements have been met. The numbers following the requirement refer to the associated paragraph.

- 11.01 Depth of drilling in waterproof floors. 4.32
- 11.02 Framework located according to job papers. 2.28, 5.1
- 11.03 Equipment located within specified limits. 5.2
- 11.04 Frames secured with proper type fasteners. 7.11
- 11.05 Frames are plumb vertically. 7.14
- 11.06 Frames are level. 7.15
- 11.07 Frames are horizontally aligned. 7.16
- 11.08 Proper number of fasteners for Cabinets. 7.21
- 11.09 Cabinets securely tightened and aligned. 7.23
- 11.10 Proper number of fasteners for Angle - Box Type Frames. 7.304
- 11.11 Box Type frames properly aligned. 7.306

11.12 Framework and anchor bolts securely tightened on Box Type frames. 7.310

✓ 11.13 Rear base angle removed on Box Type frames except when filled with concrete. 7.310

11.14 Proper number of fasteners for Channel and Angle frames. 7.42

11.15 Channel and Angle frames properly aligned. 7.43

11.16 Framework and anchor bolts securely tightened on Channel and Angle frames. 7.44

11.17 Proper number of floor fasteners required for Duct Type frames. 7.51-7.52

11.18 Duct Type frames properly aligned. 7.54

✓ 11.19 Duct Type framework and floor fasteners securely tightened. 7.54

11.20 J86273 Rectifiers properly fastened. 7.61-7.63

11.21 J86273 Rectifiers properly aligned. 7.64

11.22 J86273 Rectifier framework and anchors securely set and tightened. 7.63, 7.65

✓ 11.23 Exposed expansion shield studs removed and finished. 8.1

11.24 Panels flush with adjacent panels. 9.22

11.25 Frames caulked when required. 10.2

11.26 Finish for caulking. 10.6

→ Arrowed lines indicate new or changed information.

[Vertical lines at side of paragraphs indicate requirements.

R. W. HILLEGAS

Engineer of Installation

Reason for Reissue:

- (1) To remove "repair and finish of panels" which is now contained in Handbook 22.
- (2) The poured concrete block method of making frames secure to waterproofed floors corrected to remove impression that a bond was required between the concrete and the floor.
- (3) To recognize the omission of the front floor angle when assembling and fastening Angle - Box Type Frames.

Replaces Section 2 dated 2-20-58.