EARTHQUAKE PROTECTION AND DISASTER BRACING FOR CENTRAL OFFICE AND P.B.X. EQUIPMENT EXCEPT FOR POWER EQUIPMENT

FLOOR AND CEILING FASTENING

BSP 800-610-155 FIGURES 1, 12 and 12S

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1. GENERAL

1.1 Scope

1.11 This section contains the requirements and recommended supplementary measures to be followed in the supporting and fastening of telephone equipment other than power equipment in critical target areas, offices serving important military or atomic installations, and areas subject to earthquake shocks.

1.12 The requirements covered in this section should be followed except as modified by applicable specifications and drawings.

1.2 Associated Information

1.21 Refer to the Associated Handbook Information Reference Chart for the location of information to which reference may be necessary when performing operations covered by this section.

1.22 Reference should also be made to the specifications and drawings furnished to the job.

1.23 Earthquake and disaster protection information in this section supplements information contained in the other sections of this handbook. The equipment used in earthquake and disaster protection areas is usually the same as that installed in any other area. The method of installing equipment is also fundamentally the same as that employed in other areas. Earthquake and disaster protection areas differ from other areas in that equipment requires additional floor fastenings, overhead fastenings, bracing for auxiliary framing, cable rack, frames, etc. No effort will be made in this section to repeat methods which are covered in other sections of this handbook.

1.3 Precautions Against Personal Injury and Equipment Damage

1.31 The precautions to be taken against personal injury and to prevent damage to equipment and service interruptions are covered in this section with the associated operations. General precautions are covered in Handbook 0 and are to be observed at all times as they apply to the particular operation being performed.

1.4 Arrangement of Tools

1.41 Prior to starting operations covered by this section, the tools and other items required should be arranged at

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ASSOCIATED HANDBOOK INFORMATION REFERENCE CHART

Subject	Handbook	Section
Location, Erection and Assembly		
General Safety Precautions	30	1A
General Requirements and Information	30	1B
Drilling in Masonry and Setting Self-Drilling Anchors	30	9
Auxiliary Framing - High Type	30	10
Auxiliary Framing - Low Type	30	11A to 11C incl.
Cable Rack - Requirements and Fabrication	30	13A to 13D incl.
Earthquake Protection for Power Equipment	30	17B
Hardening of Central Office and Main Station Equipment	30	18
Erecting, Placing and Fastening Frames, Racks and Associated Parts	30	20A to 20C incl.

the work location so as to minimize fatigue and inconvenience when handling.

1.5 Arrangement of Figures

1.51 The figures in BSP 800-610-155 are frequently referred to in job specifications and drawings. For this reason where figures from BSP 800-610-155 are reproduced in this section, they are numbered to agree with the corresponding figures in the BSP as far as possible. (Where a duplication of figure numbers would result from this procedure, the numbers are followed by a letter for the purposes of differentiation.) Such figures are identified by a note beneath each figure title.

1.6 Piece Part Information

1.61 The list of parts shown in Figure 1A will facilitate the identification of piece parts frequently used on earthquake and disaster protection jobs. While it is intended that the list include all parts which otherwise might be difficult to identify, it will be impractical to keep the list up to date at all times.

1.7 Building Construction

1.71 The special bracing requirements covered herein are based on standard central office ceiling heights and building conditions. It is assumed that floors and columns will be of a good grade of concrete, preferably with no plaster on the columns and ceilings, since the method of support called for herein relies upon bracing to columns and the ceiling. For unusual building construction, ceiling heights and framing conditions, it will be necessary to work out the manner of special bracing locally or on a job basis.

1.8 Basic Principles

1.81 Equipment framework structures are rigidly secured at both bottom and top, so as to lessen the chances of damage from blast pressures and so that in the event of movement the building and equipment will sway in unison.

1.811 Floor-supported distributing frames, relay racks, traffic register cabinets, and similar frames used in the Electronic Switching System (ESS), Electronic Translator System (ETS), and Traffic Service Position System (TSPS) not normally attached to auxiliary framing or to the ceiling, will not ordinarily require special bracing at the top, except in the case of power boards (see Section 17B).

1.82 Where the number of hold-down bolts normally provided is not considered adequate, additional bolts are provided.

1.83 Ends of auxiliary framing bars or channels are rigidly bolted together into continuous lines. For some types of equipment, more positive attachments of frame structure to superstructure are used. Extra details are provided to prevent horizontal-resting cable racks from slid-

ing. Toothtype lockwashers are used under nuts of "friction" fastenings where the possibility of one member ironwork sliding on another exists, for example, under the nut of a J bolt used to secure a length of cable rack to auxiliary framing.

1.84 The amount of bracing to ceilings is greatly increased. Major braces are of angle or flat-bar material to add greater rigidity. A bending tool, Figure 1C of Section 17A1, is provided to slightly alter the angle of the brace when necessary. The threaded rod brace is limited to cable racks and other minor applications. The ends of auxiliary framing bars or channels are not allowed to touch the walls. Cable racks hung by threaded rods are braced both sidewise and endwise.

1.9 Verification

1.91 Items for the verification of the equipment installed by the operations covered in each section are listed at the end of that particular section.

2. INSTALLING EQUIPMENT

2.1 The tools required for the operations in this section are the same as those listed in the specific sections covering the type equipment being installed.

3. FASTENING EQUIPMENT

3.1 Self-Drilling Anchors

3.11 The following piece parts for self-drilling anchors in the lengths shown shall be used unless otherwise specified:

Size	Length In Inches	COMCODE No.
1/4-20	1-1/8	841209703
3/8-16	1-1/2	841209729
1/2-13	2	841209737
5/8-11	2-1/2	841209745

3.2 Location of Self-Drilling Anchors

3.21 The locations of self-drilling anchors for anchoring some frames to the floor in earthquake protection areas are shown on the following drawings:

H-249-139 Common Systems and Toll
H-582-211 No. 1 Crossbar and Panel
H-582-226 Common Systems and Step-by-Step

3.22 When laying out the floor, the location of the self-drilling anchors can be spotted by means of a template or by making direct measurements from the end of the frames.

3.3 Setting Self-Drilling Anchors

3.31 The self-drilling anchors are placed in the floor and expanded before the frames are erected. The installing operation is covered in Section 9A of this handbook.

3.4 Bolt Assemblies

3.41 Drawing H-555-120 lists the groups of fastenings required in earthquake detection areas. Some of the more common self-drilling anchor bolt assemblies and the piece parts are shown in Figure 1B. The table in this figure affords a cross-reference between the various assemblies and the associated figure and paragraph number.

3.5 Fastening Equipment to Floor

3.51 Floor-Supported Frames and Cabinets: Floor-supported distributing frames, relay racks, traffic register cabinets, No. 1 AMA accounting center relay cabinets, card translator cabinets, and similar frames or cabinets shall be fastened to the floor in the standard manner by means of 3/8"-16 self-drilling anchors and studs. A self-drilling anchor and stud shall be installed at every hole provided in the frame or cabinet base, but no additional self-drilling anchors and studs will be necessary, except as follows:

3.511 Cable Duct-Type Frames: These frames are 7-feet high, floor-supported, single or double bay and have 5-inch wide steel channel upright with unequal flanges with sheet-steel base construction. See Paragraph 3.525 for 9-foot, 10-foot 6 inch, 11-foot 6 inch cable duct-type frames.

3.5111 Where these frames are used in conjunction with Electronic Switching System Frames, they shall be fastened to the floor in the standard manner using two 3/8"-16 self-drilling anchors and studs with hold-down bars per bay. Frames arranged back to back shall be considered as two separate line-ups. Single and double bay frames shall be fastened in accordance with ED-97173-50.

3.5112 Where these frames are used in other than Electronic Switching System offices, they shall be fastened to the floor in the standard manner using two 3/8"-16 self-drilling anchors and studs with expansion bolt plates per bay. Frames arranged back to back shall be considered as two separate line-ups. Single and double bay frames shall be fastened in accordance with ED-97173-50.

3.52 Frames Supported by Auxiliary Framing should be fastened to the floor in the standard manner using 3/8"-16 self-drilling anchors and studs. For panel and step-by-step dial switching frames, and any frames or racks for which additional studs are not specified herein, the regular number of holding-down studs will be adequate. A self-drilling anchor and stud should be installed at every hole provided in the frame base. The installer shall drill for and provide extra self-drilling anchors and studs on the following basis:

3.521 Distributing Frames and Protector Frames: Table A indicates the distributing frames and protector frames requiring additional 3/8"-16 self-drilling anchors and studs or floor fastenings required in each case. The extra studs should be of the same type as the regular studs and should be spaced approximately midway between the regular studs. Additional fastenings should be used as required when the base angles are attached to cable slot facia angles. Frames 9'-0" high or less require no additional studs.

(a) On single-sided distributing frames having 10" wide frames bases, one 8/3"-16 self-drilling anchor and stud should be used in each framework unit instead of one for approximately each twelve verticals as usually provided.

3.522 Relay Racks

(a) For channel relay racks, the regular standard fastening of one 3/8"-16 self-drilling anchor and stud per bay is satisfactory, providing the uprights of adjacent bays are adequately bolted together. When not bolted together, two 3/8"-16 self-drilling anchors and studs per bay should be used in the holes already provided in the base angle.

(b) Bulb-angle relay racks in a line-up should be fastened to the floor with one 3/8"-16 self-drilling anchor and stud per bay. Two 3/8"-16 self-drilling anchors and studs should be used for an isolated bay.

3.523 No. 1 Crossbar and No. 4 Toll Angle-Type Switching Frames: These frames have angle uprights, twin top angles and sheet-metal base construction provided with leveling screws and shall be fastened to the floor as follows:

(a) One 3/8"-16 self-drilling anchor and stud should be provided for each crossbar frame 4'0" or less in length and two self-drilling anchors and studs for each frame over 4'0" in length. Where one stud per frame is provided, it should be located adjacent to a frame leveling plate, and where two are used, they should be adjacent to the outer leveling plates of the frame.

3.524 Crossbar No. 5 Type Frames: These frames have sheet-metal box-type uprights and sheet-metal base construction with a continuous slot from one end to the other; they are not provided with leveling screws. They should be fastened to the floor as follows:

(a) One 3/8"-16 self-drilling anchor and stud should be provided for each single bay frame, located approximately in the center of the bay. Two 3/8"-16 Self Drilling Anchors and studs should be provided for each 2-bay frame, one to be located approximately in the center of the bay. Talking Battery Filter units furnished on Trunk Relay Rack bays must be removed in order to fasten the bay to the floor. They should be dismounted from the base immediately prior to fastening the bay to the floor and remounted as soon as the frame is secured to minimize the possibility of damage.

3.525 Cable Duct-Type Frames: These frames have 5-inch wide steel channel uprights with unequal flanges and sheet-steel base construction. Single and double bay frames are provided in 7-foot, 9-foot, 10-foot 6-inch, and 11-foot 6-inch heights. Except for the floor supported 7-foot frame (see Paragraph 3.511), these frames are supported by

auxiliary framing and shall be fastened to the floor in the standard manner using one 3/8"-16 self-drilling anchor and stud with bolt plate per bay. For single bay frames, the fastening shall be located at the end of the frame nearer the end of the line-up in accordance with ED-97170-50. For double bay frames, the fastening shall be located at the outer end of each bay in accordance with ED-97171-50. Where frames of this type are arranged back to back, they shall be considered as two separate line-ups. Two 3/8"-16 self-drilling anchors and studs with bolt plates shall be used for each isolated bay.

3.5251 The unequal flange duct-type bay framework described above replaces the previous equal flange design (ED-63409-01, ED-63409-01 and ED-63460-01). Frames with equal flanges shall be fastened to the floor with one 3/8"-16 self-drilling anchor and stud centrally located in the base of each frame in a line-up. Frames arranged back to back shall be considered as two separate line-ups.

3.53 Switchboards and Desks: In the case of switchboard sections having removable lower units arranged for fastening to the floor with 3/8"-16 self-drilling anchors, studs and clips located between the adjacent units, such as the No. 12 Board, No. 1 Teletypewriter Switchboard, No. 3 Tool, 3CL, and the DSA Switchboard, some modification in the fastening method will be required as follows:

3.531 Universal Switchboard Sections: These boards having a channel-iron base member are standard for all new switchboard sections of the heavier type. The lower unit should be fastened to the floor by means of angle details bolted to the channel base by the installer as shown in Figures 12 and 12S. These details are used only in the rear of the lower unit, the standard 3/8"-16 self-drilling anchor, stud, and clip method of fastening being continued for the front end of the channels. Locations of the floor fastenings are also shown in Figures 12 and 12S.

3.532 The standard 3/8"-16 self-drilling anchor, stud and clip, used to fasten the 3CL switchboard lower unit to the floor, should be installed to the front of the center upright, instead of its normal position at the rear to permit installation of angle details shown in Figures 12 and 12S.

3.54 No. 12 Switchboard: Fasten each lower unit to the floor with two 3/8"-16 self-drilling anchors and studs using the 13/16" holes already provided in the 2" x 2" base angles.

3.55 Nos. 1A, 3A and 3C Teletypewriter Switchboards: Each lower unit should be fastened to the floor with a 3/8"-16 self-drilling anchor, stud and clip between sections at the front and a 3/8"-16 self-drilling anchor and stud in each of the two holes in the base angles at the rear.

3.56 Nos. 2, 3, 4 and 6 Information Desks, Call Distributing "B" Switchboard, No. 2 Repair Service Desk, No. 4 Toll Switchboard and No. 43 Ticket Filing and Rate Quoting Desk: Use one 1/4"-20 flat-head screw and self-drilling anchor for each leg.

3.561 No. 7 Information Desk: Use two 1/4"-20 flat-head screws and self-drilling anchors per desk as specified in Section 30A of Handbook 30 (BSP 800-614-154.).

3.57 Rotary card files used in conjunction with various desks should be secured to the desk top by means of flat-head screws using nuts and washers where the underside of the top is not readily accessible.

3.58 The following practices generally used for other switchboards will be satisfactory also in earthquake and disaster protection areas:

3.581 No. 1 Trunk or Subscriber Sections, No. 1 and No. 3 Toll (49 jack) Sections, and No. 1 and No. 3 Toll Tandem (49 jack) Sections should be fastened to the floor with four 3/8"-16 self-drilling anchors and studs per section.

3.582 No. 3 Cable Test Desk and No. 14 Local Test Desk: Two 3/8"-16 self-drilling anchors and studs should be used in each lower unit, one toward the front and the other toward the rear, in opposite base angles.

3.583 Cordless B and Other Small Sections: Use two 3/8"-16 self-drilling anchors and studs per section.

TABLE A
(PAR. 3.521)

Type of Frame	Verticals per Unit	Extra Floor Studs or Fastenings									
		1	2	3	5	6	9	10	11	20	21
MDF	per ED-10802-01	0	-	-	0	1	-	2	2	-	-
CDF	per ED-60321-01 (A&M)	-	-	-	0	0	-	2	-	-	-
CDF	per ED-60585-01	-	-	-	0	0	-	2	-	-	-
TOLL DF	per ED-61936-73	0	-	0	-	-	0	-	-	-	2
CDF	per ED-62000-71	0	-	-	0	0	-	2	-	-	-
MDF	per ED-90074-01 (A&M)	0	0	0	1	-	-	2	2	3	4
MDF	per ED-90141-01 (A&M)	0	0	0	0	-	-	2	2	3	4
PROT F	per ED-90274-01	0	0	0	0	-	-	2	2	4	4
PROT F	per ED-90275-01	0	0	0	0	-	-	2	2	3	4
MDF	per ED-90279-01 (A&M)	0	0	0	0	-	-	2	2	3	4
MDF	per ED-90280-01 (A&M)	0	0	0	0	-	-	2	2	3	4
IDF	per ED-90284-01 (A&M)	-	-	-	0	1	-	2	2	3	4
CDF	per ED-90427-01 (A&M)	0	-	-	0	0	-	2	-	-	-
TDF	per ED-90663-73	-	-	-	0	0	-	2	2	3	4
MDF	per ED-91001-73	0	0	0	0	-	-	2	2	3	4
MDF	per ED-91006-78	0	0	0	1	-	-	2	2	3	4
IDF	per ED-91021-72	-	-	-	0	1	-	2	2	3	4
MDF	per ED-91023-73	0	0	0	0	-	-	2	2	3	4
MDF	per ED-91235-78	0	0	0	1	-	-	2	2	3	4
DJG	per ED-91252-72	0	0	0	0	0	-	2	2	-	-
CDF	per ED-91420-01 (A&M)	-	-	-	0	0	-	2	-	-	-
MDF	per ED-91670-76	0	0	0	1	-	-	2	2	3	4
CDF	per ED-91674-73	0	-	-	0	0	-	2	-	-	-
CDF	per ED-91676-73 0	0	-	-	0	0	-	2	-	-	-
PROT F	per ED-92976-71	0	0	0	0	-	-	2	2	3	4

3.584 23-Type Desks: Use a 841209703 3/8"-16 by 1-1/2 inch self-drilling anchor and stud, one or two per leg, as required by the holes in the leg.

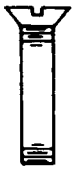
3.59 The standard fastenings are satisfactory for all cable turning sections.

4. VERIFICATION ITEMS

	VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	REFERENCE Par. No.	REFERENCE Fig. No.
	FASTENING FRAMES - BOTTOM OF FRAME		
4.1	Floor Fastenings		
4.11	Number and Location of floor fastenings correct.	3.51 to 3.59	12, 12S
4.12	Frames located in accordance with floor plan drawing.	3.21	

R.H.M. SCREW

P-206568	(.164"-32 X 3/4")
P-353446	(.216"-24 X 3/8")
P-210237	(1/4" -20 X 5/8")
P-210231	(1/4" -20 X 3/4")
P-210232	(1/4" -20 X 7/8")



F.H.M. SCREW

R-210380	(1/4" -20 X 9/16")
P-210218	(5/16"-18 X 3/4")
P-210616	(1/2" -13 X 1-1/2")

H.H. CAP SCREW

P-172485	(1/4" -20 X 5/8")
P-125616	(1/4" -20 X 3/4")
P-133102	(1/4" -20 X 7/8")
P-146298	(1/4"-20 X 1")
*	(1/4" -20 X 3")
P-160127	(5/16"-18 X 1")
P-170396	(5/16"-18 X 3/4")
P-210528	(5/16"-18 X 2-1/2")
P-160841	(3/8" -16 X 1/2")
P-210224	(3/8" -16 X 5/8")
P-108511	(3/8" -16 X 3/4")
P-125775	(3/8" -16 X 7/8")
P-127312	(3/8" -16 X 1")
P-228678	(3/8" -16 X 1-1/8")
P-146273	(3/8" -16 X 1-1/4")
P-210134	(3/8" -16 X 1-3/8")
P-147285	(3/8" -16 X 1-1/2")
*	(3/8" -16 X 5")
P-160914	(1/2" -13 X 5/8")
P-210317	(1/2" -13 X 7/8")
P-160382	(1/2" -13 X 1")
P-160381	(1/2" -13 X 1-1/8")
P-170013	(1/2" -13 X 1-5/8")
P-210182	(1/2" -13 X 2")
P-210620	(1/2" -13 X 2-1/4")
P-423923	(1/2" -13 X 2-1/2")
P-423924	(1/2" -13 X 3")
P-423925	(1/2" -13 X 3-1/4")
P-423926	(1/2" -13 X 3-3/4")
P-423929	(1/2" -13 X 4-1/2")
P-210530	(5/8" -11 X 1")
*	(5/8" -11 X 1-1/4")
P-422083	(5/8" -11 X 1-1/2")
P-411914	(5/8" -11 X 2-3/4")
P-429504	(5/8" -11 X 5-1/2") (THREADED ENTIRE LENGTH)

H.H. CAP SCREW
DRILLED FOR COTTER PIN

P-427796	(3/8" -16 X 1-3/8")
P-427795	(1/2" -13 X 3-3/4")

STUD - (SLOTTED ONE END)

841-213-697	(3/8"-16 x 2-1/4")
841-213-713	(3/8"-16 x 4-1/4")

HEXAGONAL NUT

P-206518	(.164"-32)
P- 94442	(1/4" -20)
P-154248	(5/16"-18)
P-160120	(3/8" -16)
P-125614	(1/2" -13)
P-210263	(1/2" -13) 5/16" THICK

SHAKEPROOF LOCK WASHER

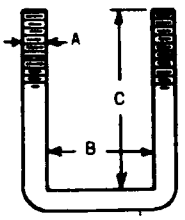
P-423636 (1/4")	NO. 1114
P-423638 (3/8")	NO. 1120
P-423639 (1/2")	NO. 1124
P-423640 (5/8")	NO. 1128

SPRING LOCK WASHER

P-221761 (.164")

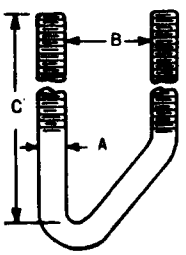
WASHER

P-160105	(5/16"X3/4"X.065" STEEL)
P-471030	(.328"X7/8"X1/16" PHENOL FIBRE)
P-284172	(.574 X 1.125 X .080" STEEL)



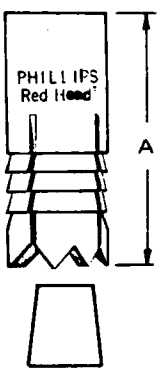
"U" BOLT

	A	B	C
P-426938	1/2"	3-1/16")	3"
P-429655	1/4"	3/4"	3-1/4"



"V" BOLT

	A	B	C
P-402987	3/8"	2-1/16"	3"
P-415793	1/2"	2-1/16"	5"
P-429648	5/8"	1-9/16"	10"



SELF-DRILLING ANCHOR

	Thread Size	A. Dim
841-209-703	1/4"-20	1-3/32"
841-209-729	3/8"-16	1-17/32"
841-209-737	1/2"-13	2-1/32"
841-209-745	5/8"-11	2-15/32"

FIBRE BUSHING

DET.92 OF ED-91182-10	.266"x.375"x7/64" LONG
DET.93 OF ED-91182-10	.266"x.375"x7/32" LONG
DET.94 OF ED-91182-10	.266"x.375"x11/32" LONG

* NO PIECE PART NO. - ORDER BY DESCRIPTION.
** USE P-411915 5/8" - 11 X 3-11/16" H.H. BOLT

(RP-10358-0)

FIG. 1A PIECE PARTS USED IN EARTHQUAKE PROTECTION AREAS (PAR. 2.61)

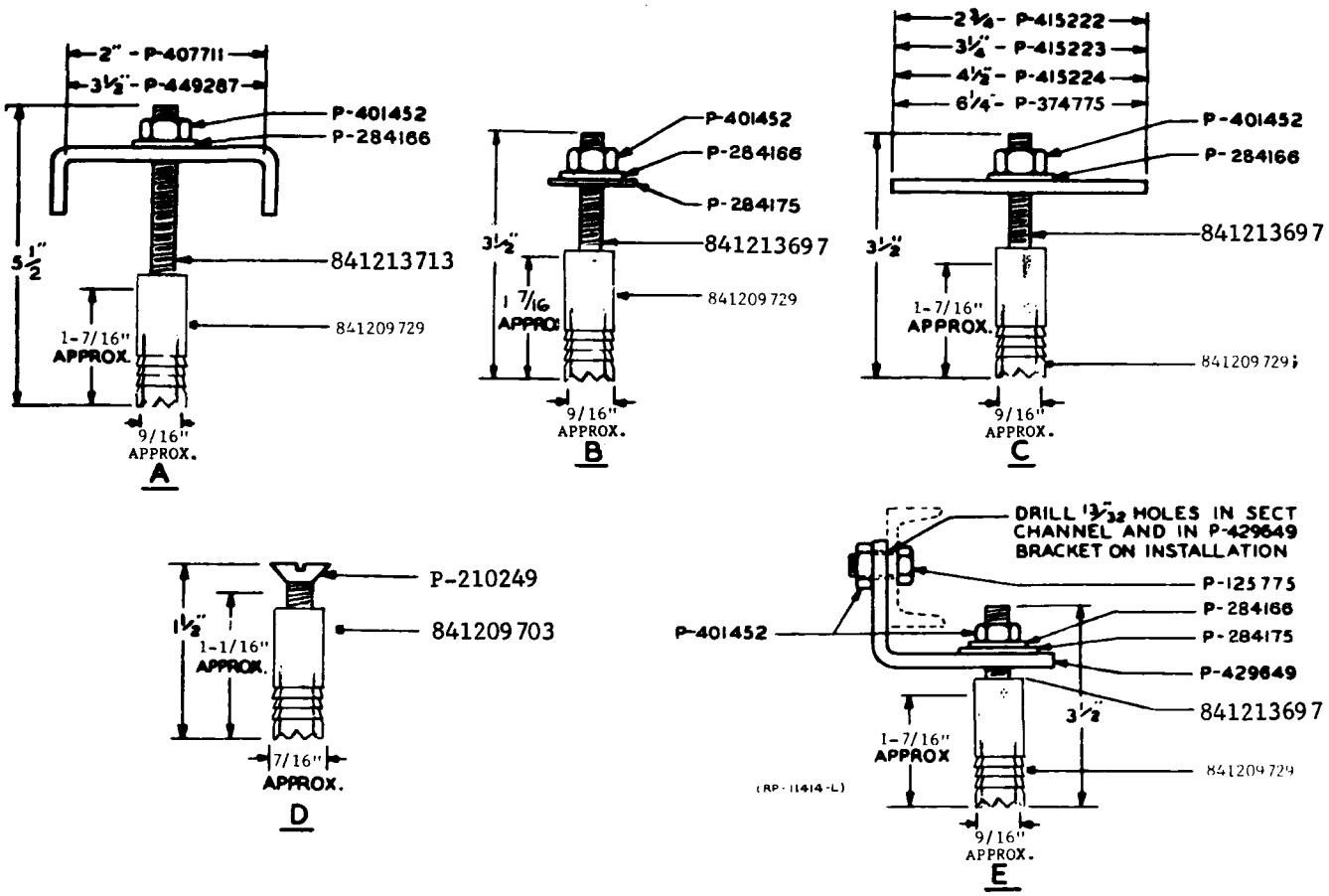
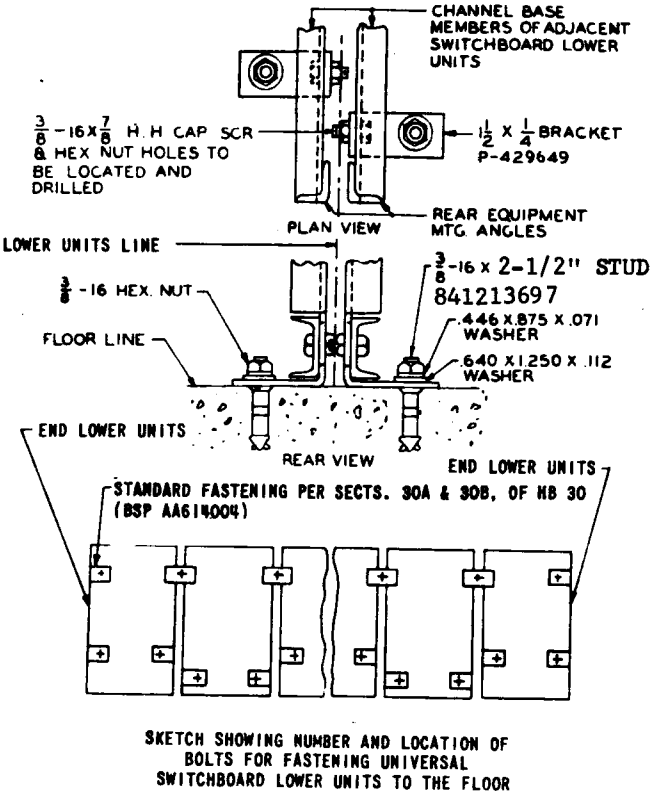


Figure and Paragraph Nos.

Illustration

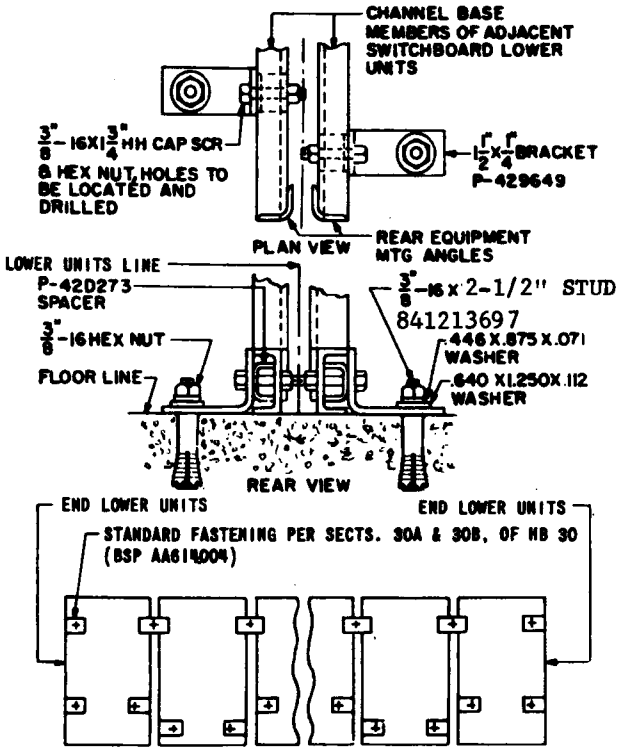
A--------Fig. 12, 12S, and Pars. 3.531, 3.532
B--------Figs. 12N, 25, 40A and Pars. 3.51, 3.52 to 3.524 incl., 3.54 to 3.56 incl., 3.591
C--------Fig. 24, (Not including Clamp Plate) and
Pars. 3.523(a), 3.524(a), 3.525, 3.55
D--------Pars. 3.57, 3.571
E--------Figs. 12, 12S, and Pars. 3.531, 3.532

FIG. 1B ANCHOR BOLT ASSEMBLIES FOR FASTENING EQUIPMENT TO FLOOR
(PAR. 3.41)



SKETCH SHOWING NUMBER AND LOCATION OF BOLTS FOR FASTENING UNIVERSAL SWITCHBOARD LOWER UNITS TO THE FLOOR

FIG. 12 FLOOR FASTENINGS FOR UNIVERSAL SWITCHBOARD LOWER UNITS A & M ONLY (PARS. 3.531, 3.352) (BSP 800-610-155, Fig. 12)



SKETCH SHOWING NUMBER AND LOCATION OF BOLTS FOR FASTENING UNIVERSAL SWITCHBOARD LOWER UNITS TO THE FLOOR

FIG. 12S FLOOR FASTENINGS FOR UNIVERSAL SWITCHBOARD LOWER UNITS (PARS. 3.531 , 3.352) (BSP 800-610-155, Fig. 12S)

Indicates new or changed information.

Engineering Planning Manager
Common Installation Engineering

Reason for Reissue:

1) To remove reference to square head machine bolts in Fig. 1A.
2) To add requirement for securing 2 Bay Crossbar No. 5 Frames in Par. 3.524(b)