

AUXILIARY FRAMING - LOW TYPE
ARRANGEMENT, SUPPORT AND BRACING

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| <ul style="list-style-type: none">1. <u>GENERAL</u>1.1 <u>Scope</u>1.11 This section covers the arrangement of low type auxiliary framing and the permanent supports and bracing required for all types of systems including power, where applicable.1.12 Where auxiliary framing fastenings to cable racks and frames are involved, reference should be made to the 13 Series and 19 Series of Sections in this handbook.1.2 <u>Associated Information</u>1.21 "Cabling, Cable Rack and Auxiliary Framing Plan" Drawings and the "Ironwork" Specification furnished the job. Samples of these drawings are shown in Handbook 1.1.22 Sections of Handbook 3 covering Scaffolding, Ladders and Stools. | <ul style="list-style-type: none">1.23 Where an office is to be precabled reference should be made to Handbook 10 for special auxiliary framing information and requirements.1.24 The requirements contained in Section 10 of this handbook which covers high type auxiliary framing should be followed in low-type framing installations, as far as they apply. Where threaded rods are used for the support and bracing of low type auxiliary framing, the requirements covered in Section 10 regarding the use of threaded rods, ceiling inserts, beam clamps etc., also apply.1.25 Sections of this handbook covering the installation of Cable Rack (13 Series) and Erecting, Placing and Fastening Frames (19 Series.)1.26 The General section of this handbook covering general requirements and information.1.27 Section 11A of this handbook. |
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1.3 Precautions

1.31 General safety precautions against personal injury and equipment damage are outlined in the "General" sections of this handbook. Precautions applying to specific operations are listed with the associated paragraphs.

1.32 When using the tools listed below for cutting auxiliary framing be sure they are properly lubricated and maintained in accordance with the information in the Sections of Handbook 28 associated with the tool.

1.4 Tools

1.41 In addition to the tools supplied in the general kits, one or more of the Power Saws listed below may be required for the operations.

Tool

R-2557 Portable Power Hack Saw
R-3030 Portable Power Hack Saw
R-3031 Portable Power Hack Saw
R-3103 Portable Hydraulic Shear
R-3148 Reciprocating Power Saw
R-3623 Portable Band Saw

1.5 Arrangement of Figures

1.51 The figures in BSP 800-614-155 are frequently referred to in job specifications and drawings. For this reason, where figures from 800-614-155 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 purposes of differentiation.) Such figures are identified in the sections by a note beneath each figure title.

1.6 Verification

1.61 Items for the verification of the equipment installed by the operations covered in this section are listed in paragraph 5, this section.

1.62 The items in paragraph 5 also may be used as a self check guide when performing operations covered by this section.

2. ARRANGEMENT OF AUXILIARY FRAMING

2.1 General

2.11 In general, auxiliary framing should be run in continuous lengths at right angles to the frames they support.

2.12 The arrangement showing the relative location of framing for any particular installation is shown on the "Cabling, Cable Rack and Auxiliary Framing Plan" drawing furnished the job. Sufficient notes are provided on the drawing and the auxiliary framing specification to enable the installer to determine the height at which the auxiliary framing is to be installed. Deviations from the drawing shall be made only with equipment engineering approval.

2.2 Interference With Other Equipment

2.21 The auxiliary framing and connecting details should be located so that they will not interfere with the cable rack supports in step-by-step offices with 11-ft. 6-in. auxiliary framing and panel offices, or with the cabling, lighting fixtures, conduit, or other equipment.

2.22 Framing bars or channels should not pass directly over frame uprights, (except in 11'-6" step-by-step systems where it is desirable to facilitate frame support) since in this position the frame uprights would interfere with the frame fastening details.

2.23 Framing may be staggered as covered in Paragraphs 2.71 and 2.72 and Figure 9D to avoid interference.

2.3 Spacing of Pairs of Bars or Channels

2.31 The pairs of bars or channels are spaced approximately 5/8" apart.

2.32 The 2" x 9/16" x 3/16" channel auxiliary framing should be paired with the backs of the channels to the outside as shown in Figure 22A.

2.33 Channels are not as rigid as bars and may become bent during installation causing them to become wavy in a side-wise direction. If this condition should occur additional clips, P-258449, bolts, P-403467, and nuts, P-401452, should be used as necessary to hold the channels parallel.

NOTE: When carrying auxiliary framing bars of channels from one location to another they should be carried on edge so that bending will be kept to a minimum.

2.4 Spacing and Support Between Pairs of Bars or Channels

2.41 The pairs of bars or channels run perpendicular to the frame lineups should be located on approximately 5'-0" centers and in no case shall be spacing exceed 6'-0" except in the following instance.

2.411 On additions to step-by-step systems, with 11'-6" auxiliary framing, the framing may be spaced 6'-0 5/8" apart so that the framing can be located directly over the channel type uprights where they are conveniently in line. This will facilitate frame support during installation. (This does not always apply to uprights adjacent to main aisles since the framing is to be set back at least 9" from these aisles where they contain conduit runs. See paragraph 2.812.)

CAUTION: WHERE FRAMING BARS OR CHANNELS CANNOT BE LOCATED DIRECTLY OVER THE LEFT HAND UPRIGHTS OF CHANNEL TYPE CONNECTOR FRAMES, AND IT IS NECESSARY TO LOCATE THEM NEAR THE LEFT HAND END OF THE FRAME, THEY SHOULD BE PLACED WITH THE MID-POINT BETWEEN THE TWO BARS OR CHANNELS EITHER 6" OR 7" FROM THE LEFT HAND END OF THE FRAME OR 12" TO 14" FROM THE END, IN ORDER TO PREVENT INTERFERENCE WITH FUSE PANEL CONNECTIONS.

2.42 The pairs of bars or channels run parallel to the frame lineups should be located on approximately 5'-0" to 6'-0" centers and not have a 6 foot maximum limitation associated with it.

2.5 Spacing of Splices in the Same Aisle

2.51 Splices in the same aisle of adjacent pairs of bars or channels of regular auxiliary framing should be avoided as far as practicable. In no case should more than two adjacent pairs be spliced in the same aisle. Splices should be placed at least one aisle apart. See Figure 1.

NOTE: The above requirement does not apply where frames are installed in small buildings and the framing bars are attached to both walls as in carrier auxiliary stations.

2.52 When using the 2-Hole Splice Plates to splice channels to channels or channels to bars, the splices should be located in the aisles and positioned so that they do not interfere with clips used to fasten ladder track, etc. See Figure 1.

2.53 The new P-390391 3-Hole Splice Plate for channels is designed such that ladder track, lighting, cable rack, top of frames, etc., can be attached at the splice location thereby considerably reducing amount of channel layout effort. Refer to Section 11A Figure 9L for additional information on assembly of this type of splice.

2.6 Extending Auxiliary Framing

2.61 **General:** To obtain maximum rigidity, framing bars or channels should be installed in stock lengths (approx. 20') wherever possible. However, in order to stagger the splices as covered in the foregoing paragraph, it will be necessary to start alternate runs of bars or channels with shorter lengths (preferably 10').

NOTE: To facilitate checking the arrangement and installing the framing, it will be advisable to mark on the floor the overhand of the framing bars or channels and cable rack where required for the support of ladder track, aisle cable racks, lighting conduits and the junctioning of the framing for future lineups of frames.

2.611 Alternate method of extending bar or channel framing for additions to existing equipment which eliminates the necessity for cutting back the existing bars or channels is shown in Figure 9M.

2.62 Extensions Beyond End Lineups

2.621 Where one additional row of frames is to be installed for ultimate equipment, the auxiliary framing should be extended on the initial installation to provide for this condition, allowing for ultimate cable rack, ladder track, or lighting conduit. See Figure 2 and Figure 8.

2.622 Where more than one row of frames are to be installed for ultimate equipment or where one ultimate row of frames is separated from the initial equipment by columns, the framing bars or channels on the initial installation should extend approximately 3" beyond the last set of clips, as shown in Figure 8 to provide for splicing. See arrangement shown in Figure 2.

2.63 Closing Ends of Bars or Channels

2.631 Where bars or channels of low-type auxiliary framing extend more than 3" beyond a clip or support, they shall be equipped with finishing clips as shown in Figure 10.

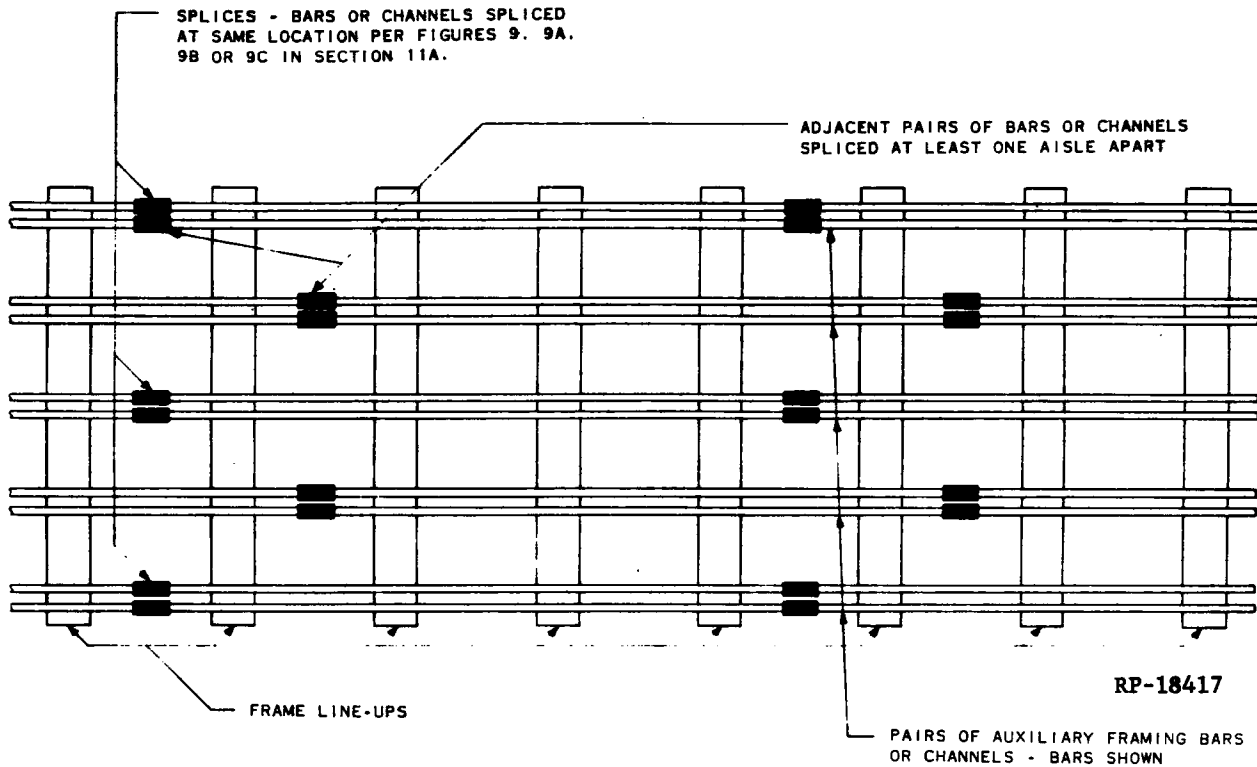
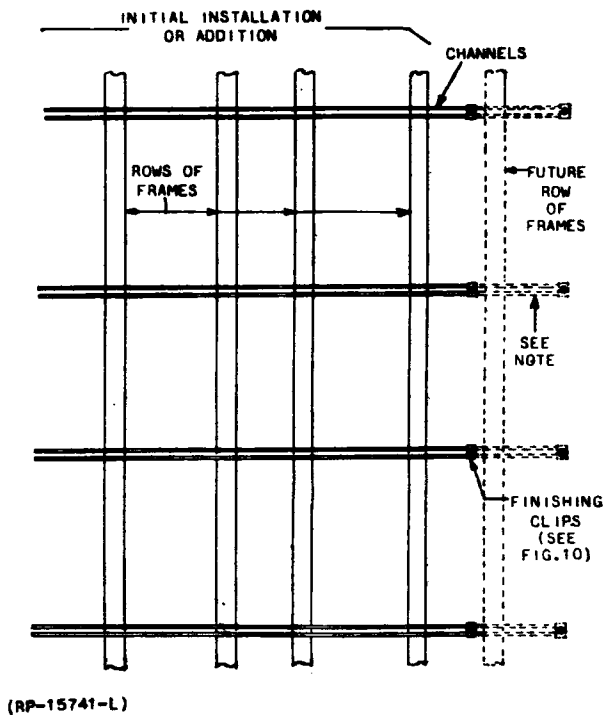


FIG. 1 TYPICAL ARRANGEMENT OF AUXILIARY FRAMING SPLICES
(PARS. 2.51 and 2.52)



NOTE: WHERE ONE ADDITIONAL FUTURE ROW OF FRAMES IS TO BE INSTALLED FOR ULTIMATE EQUIPMENT, THE CHANNELS SHOULD BE EXTENDED AS SHOWN BY DOTTED LINES.

FIG. 2 ARRANGEMENT OF AUXILIARY FRAMING ON INITIAL INSTALLATION OR ADDITION OTHER THAN ULTIMATE TO FACILITATE EXTENDING ON FUTURE ADDITIONS
(PARS. 2.621, 2.622)

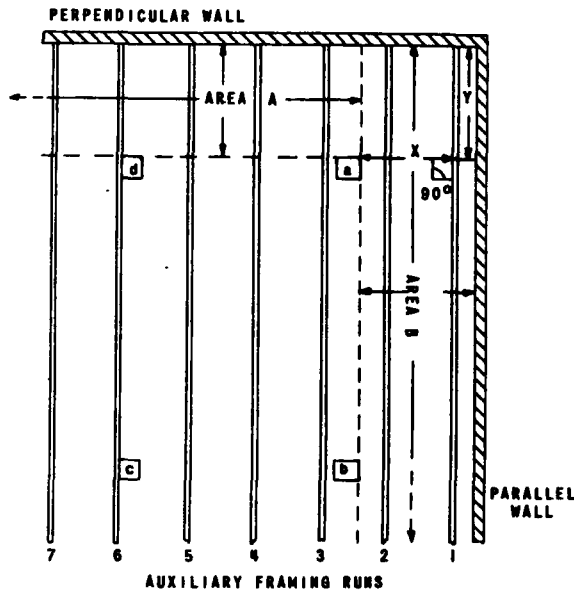
(a) Clips may be omitted where the ends of the bars or channels extend to within 3" of a wall, column or other vertical surface.

2.64 Minimum Clearance at Ends of Framing

2.641 In the placing of auxiliary framing, regardless of the means of support, a minimum clearance of 1/2" shall be maintained between the ends of the framing bars or channels and any building obstruction as shown in View B of Figure 8.

2.7 Extensions on Additions

2.71 It is permissible to stagger the pairs of framing bars or channels, instead of running them in a straight line, where necessary to eliminate the necessity of cutting back existing bars or channels, to meet the requirement covering the location of splices when being extended by channels. Where this is done, the extension should be made in the following manner.



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NOTES:

1. PERPENDICULAR AND PARALLEL WALLS ARE PERPENDICULAR AND PARALLEL RESPECTIVELY TO AUXILIARY FRAMING RUNS.
2. TO DETERMINE THE REQUIREMENTS FOR BRACING OUTER EDGES WHEN COLUMN BRACING IS PROVIDED, AREAS A AND B OF A TYPICAL BUILDING CORNER MUST BE CONSIDERED. AREA A IS BOUNDED BY THE PERPENDICULAR WALL, A STRAIGHT LINE ALONG THE OUTER EDGES OF THE COLUMNS ADJACENT TO THIS WALL AND A SEGMENT OF THE BOUNDARY LINE OF AREA B. AREA B IS BOUNDED BY PART OF THE PERPENDICULAR WALL, THE PARALLEL WALL, AND A STRAIGHT LINE ALONG THE OUTER EDGES OF THE COLUMNS ADJACENT TO THE PARALLEL WALL. IF EITHER OF THESE AREAS IS OCCUPIED BY FRAME LINEUPS OR CONTINUOUS UNEQUIPPED SPACE FOR FUTURE LINEUPS WHICH EXTENDS 10 FEET OR MORE FROM A COLUMN IN A DIRECTION PERPENDICULAR OR PARALLEL TO THE AUXILIARY FRAMING RUNS, THE FOLLOWING CONSIDERATIONS MUST BE MADE.

A. CONSIDERATION OF AREA A

1. IF DISTANCE (Y) IS LESS THAN 10 FEET, NO BRACING WILL BE REQUIRED IN THIS AREA.
2. IF DISTANCE (Y) IS 10 FEET OR MORE, BRACING WILL BE REQUIRED. TO BE ECONOMICAL OF MATERIALS AND ALSO SATISFY GENERAL BRACING REQUIREMENTS, RUNS WITHIN THE AREA WHICH ARE ALREADY COLUMN BRACED SHOULD BE SELECTED FOR ADDITIONAL DIAGONAL BRACING. THESE RUNS WILL REQUIRE ONLY END BRACING SINCE THEY ARE ALREADY BRACED ALONG THEIR LENGTH BY COLUMN BRACING. EXAMPLE: RUNS 3 AND 6)

B. CONSIDERATION OF AREA B

1. IF DISTANCE (X) IS LESS THAN 10 FEET, NO BRACING WILL BE REQUIRED UNLESS DISTANCE (Y) IS 10 FEET OR MORE.
2. IF DISTANCE (X) IS 10 FEET OR MORE BRACING WILL BE REQUIRED.
3. WHEN BRACING IS REQUIRED ON RUN (1), IT SHOULD BE PLACED AT EACH END OF THE RUN AND AT COLUMN INTERVALS (APPROXIMATELY EVERY 20 FEET) ALONG IT.

2.72 The first and each alternate pair of bars or channels to be added should overlap the existing bars or channels just enough to make a connection to the tops of the last and next to last row of existing frames. See Figure 9D. The added pairs of bars or channels may overlap on either side of the existing pairs of bars or channels provided that the standard spacing between pairs of bars or channels is observed. See Paragraphs 2.41 and 2.42. Splices beyond the points where the existing and additional framing overlap should be made in the usual manner as covered in Section 11A.

2.8 Framing Adjacent to or Over End or Main Cross Aisles

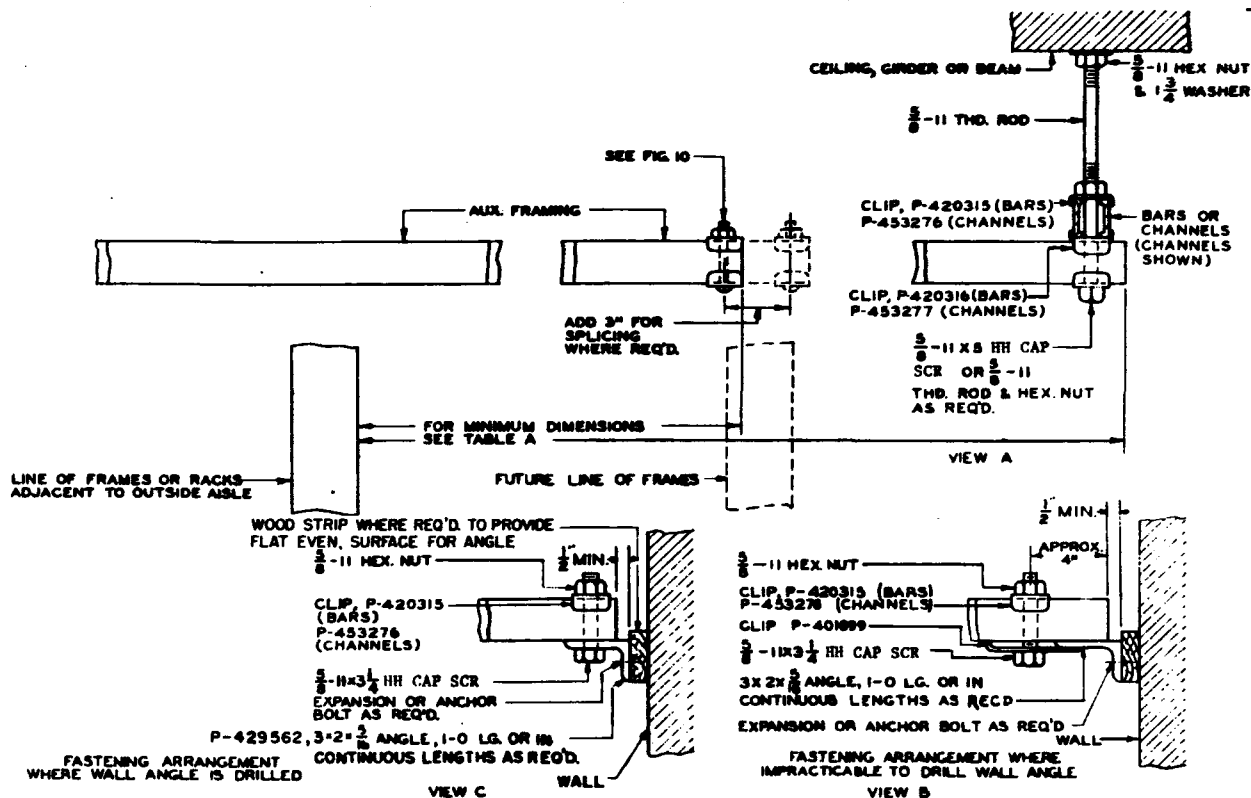
2.81 Adjacent to End or Main Aisles

2.811 Framing adjacent to end or main cross aisles should be located as near the frame uprights as practicable, except at aisles containing conduit runs in which case, the framing should be set back from the extreme end of the lineup a minimum of 9". Exceptions to the foregoing occur in existing panel systems and some types of toll systems where the auxiliary framing has been set back a minimum of 6". In these instances, additional auxiliary framing shall be installed to conform with the existing arrangement. In No. 5 Crossbar and similar installations where bar-type cable racks are employed, the horns of the cable racks should be located no closer than 3" to the auxiliary framing. In all cases the framing at the ends of lineups should not be located more than 2'-6" from the ends of these lineups.

2.82 Over End or Main Aisles

2.821 In general, no regular auxiliary framing should be placed over main or end aisles except as required for the support of rolling ladder tracks. Where support of the main or end aisle cable racks from framing bars or channels extended into or across the aisles is required, the framing should be arranged as shown in the 13 Series of Sections covering the installation of cable racks.

FIG. 3 SUPPLEMENTARY DIAGONAL BRACING FOR OUTER EDGES OF BUILDING BAYS ADJACENT TO WALLS (PAR. 4.21 (a) (1))



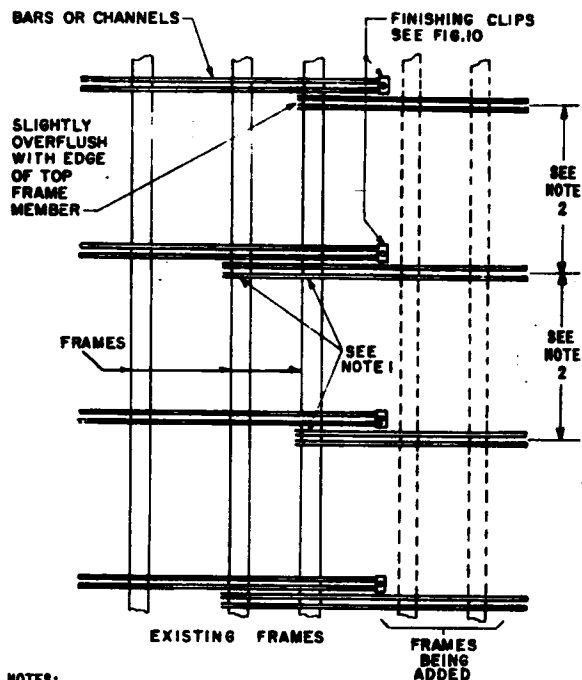
ARRANGEMENT	EXTENSION OF FRAMING BEYOND LAST LINE OF FRAMES					
	SYSTEM					
	STEP BY STEP	PANEL	TOLL TERMINAL	TOLL SWBD. & NO. 11 MAN.	CROSSBAR NO. 1 TANDEM TOLL NO. 4	CROSSBAR NO. 5
FRONT OF FUTURE LINE FACES OUTSIDE AISLE	4-4 $\frac{1}{2}$		6-5	5-3	4-6 $\frac{1}{2}$	4-5 $\frac{1}{2}$ Δ
REAR OF FUTURE LINE FACES OUTSIDE AISLE	4-11		7-2 $\frac{1}{2}$	5-11	4-10 $\square$	5-2 $\square$
FRONT OF INSTALLED ULTIMATE LINE FACES OUTSIDE AISLE	1-5		3-0	2-4 $\frac{1}{2}$	1-8	1-4
REAR OF INSTALLED ULTIMATE LINE FACES OUTSIDE AISLE	1-5 $\frac{1}{2}$		2-8	2-8	1-8 $\frac{1}{2}$	2-0 $\frac{1}{2}$
PROVISION FOR INSTALLING ULTIMATE LINE OF DOUBLE SIDED FRAMES		6-7				
ULTIMATE LINE OF DOUBLE SIDED FRAMES INSTALLED		2-5				
FRONT OF FUTURE SINGLE SIDED FRAMES FACE OUTSIDE AISLE		6-9				
REAR OF FUTURE SINGLE SIDED FRAMES FACE OUTSIDE AISLE		6-11 $\frac{1}{2}$				
FRONT OF INSTALLED ULTIMATE SINGLE SIDED FRAMES FACE OUTSIDE AISLE		2-6				
REAR OF INSTALLED ULTIMATE SINGLE SIDED FRAMES FACE OUTSIDE AISLE		2-8 $\frac{1}{2}$				

NOTES:

1. WHERE HIGH INTENSITY LIGHTING IS INSTALLED IN PANEL SYSTEMS 11/2" SHALL BE ADDED TO THE PANEL FIGURES.
2. WHERE NO. 1 CROSSBAR FRAMES ARE INSTALLED IN STEP BY STEP SYSTEMS, THE CROSSBAR FIGURES SHALL APPLY FOR THESE FRAMES.
3. Δ THIS DIMENSION APPLIES WHERE WIRING AISLES ARE 1 FOOT 11 INCHES. SUBTRACT 2 INCHES WHERE WIRING AISLES ARE 1 FOOT 9 INCHES.
4. $\square$ THIS DIMENSION APPLIES WHERE APPARATUS AISLES ARE 2 FEET 6 INCHES. ADD 6 INCHES WHERE APPARATUS AISLES ARE 3 FEET.

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→ FIG. 8 SUPPORT OF END OF AUXILIARY FRAMING - EXTENSION OF BARS OR CHANNELS BEYOND THE LAST LINE OF FRAMES
(PARS. 2.621, 2.622, 2.641, 3.31, 3.32, 3.33)
(BSP 800-614-155, Fig. 8)



NOTES:

1. ENDS OF STAGGERED BARS OR CHANNELS MUST OVERLAP SUFFICIENTLY TO ALLOW BOTH PAIRS TO BE FASTENED TO THE SAME FRAME OR FRAMES WITH ALTERNATE PAIRS OF CHANNELS OVERLAPPING EXISTING BARS OR CHANNELS OVER TWO ROWS OF FRAMES AS SHOWN. THE EXTENDED CHANNEL MAY BE PLACED ON EITHER SIDE OF THE EXISTING FRAMING PROVIDED THE MAXIMUM SPACING OF 6'-0" IS NOT EXCEEDED. THE EXTENDED CHANNELS NEED NOT BE FASTENED TO CABLE RACK, LADDER TRACK, ETC. IN THE AISLE WHERE THEY OVERLAP THE EXISTING FRAMING.

2. SPACING BETWEEN CENTERS OF ADJACENT PAIRS OF EXTENDED FRAMING CHANNELS MUST MEET THE EXISTING REQUIREMENT OF APPROX. 5'-0" - MAX. 6'-0".

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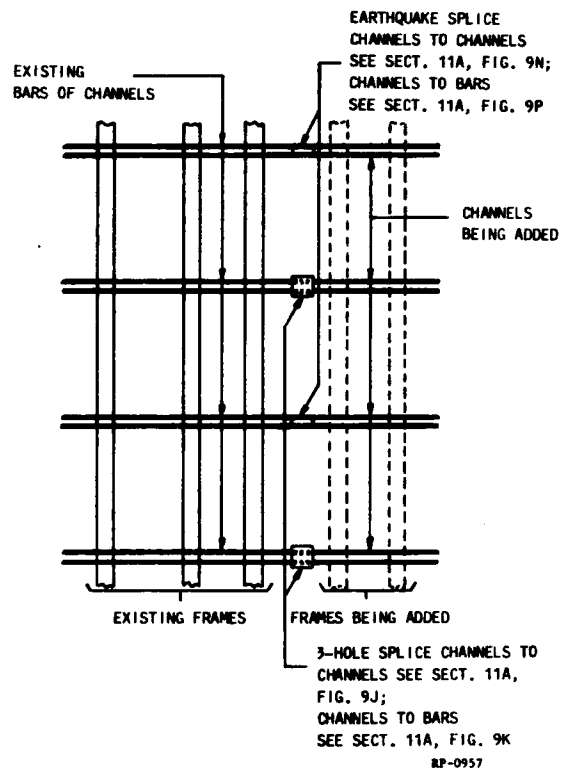
FIG. 9D ARRANGEMENT FOR EXTENDING BAR OR CHANNEL FRAMING TO ELIMINATE NECESSITY OF CUTTING BACK EXISTING FRAMING (PARS. 2.71, 2.72) (BSP 800-614-155, Fig. 9D)

3. PERMANENT SUPPORT

3.1 General

3.11 The frames, cable rack and auxiliary framing form an interlocking, self-supporting structure when the installation is completed. Reference should be made to the 13 Series (cable rack) and the 19 Series (fastening frames) of sections when fastening the framing to the cable rack or frames to complete the self-supporting structure.

3.12 In areas where the self-supporting structure is not complete such as over unequipped areas or where the framing extends sufficiently beyond the last lineup of frames, support shall be provided as covered in the following paragraphs. Where threaded rods are used for the support of low type auxiliary framing, the requirements covered in Section 10 for high-type auxiliary framing regarding the use of threaded rods, ceiling inserts, beam clamp etc. are applicable to low-type framing.



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FIG. 9M ARRANGEMENT FOR EXTENDING BAR OR CHANNEL FRAMING WITH CHANNEL FRAMING - ELIMINATING NECESSITY OF CUTTING BACK EXISTING FRAMING (PAR. 2.611) (BSP 800-614-155, Fig. 9M)

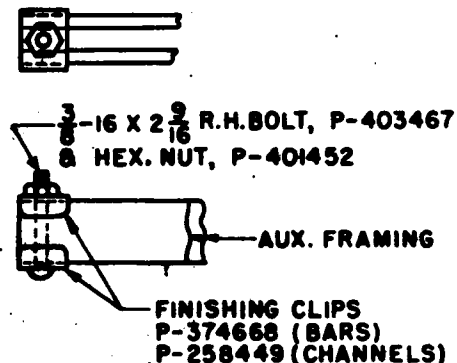


FIG. 10 FINISHING CLIPS ON AUXILIARY FRAMING (PAR. 2.631) (BSP 800-614-155, Fig. 10)

3.2 Auxiliary Framing at the Ends of Frame Lineups

3.21 Framing should be provided so that the distance between the end of the lineups and the last point of support will not exceed 2 ft. 6 in. Short frames located at ends of lineups, that are less than 2 ft. 6 in. in length, should have at least one point of top support. See the 20 Series of Sections for fastening auxiliary framing to frames.

3.3 Extensions Beyond the Last Lineup of Frames

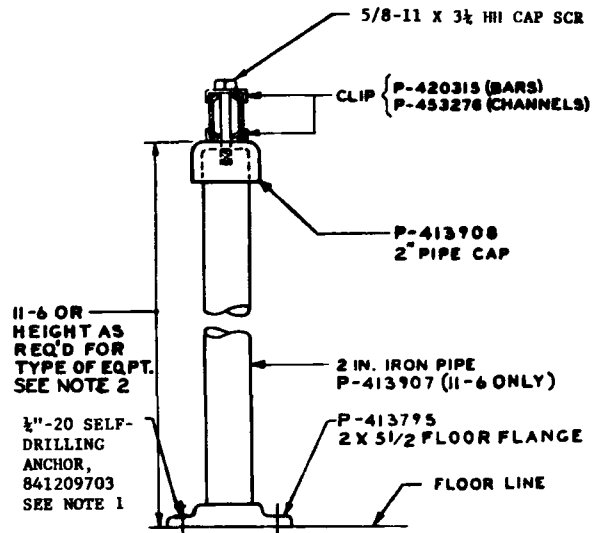
3.31 Where the auxiliary framing supports cable racks, ladder tracks, or lighting conduits over the aisle beyond the last row of equipment, no support will be required at the ends of the bars or channels, unless the distance between the last point of support and the furthestmost point of load exceeds 2 ft. 6 in. As indicated in the table in Figure 8, additional support will rarely be required where the ultimate line of frames at the outside aisle is installed.

3.32 Where one additional row of frames is to be installed for ultimate equipment, the auxiliary framing should be extended and supported from ceiling inserts or wall as shown in Figure 8. The means of support used is determined by the following.

3.33 Where no ceiling inserts or beam clamps are available for the support of the auxiliary framing, it may be run to the wall and fastened as shown in Figure 8 if the distance from the last support to the wall does not exceed 6'-0"; otherwise it should be supported by means of hanger bolts or other approved means of support from beams or partitions. Supports attached to columns are not ordinarily recommended although in rare cases such supports are used. Where it is impracticable to make ceiling attachments an iron pipe stand may be used to support the framing bars or channels as shown in Figure 11A.

3.4 Auxiliary Framing Over Unequipped Areas

3.41 Where convenient, the auxiliary framing over unequipped areas should be supported by locating the framing directly under the ceiling inserts. If this is not practicable, additional framing should be employed as follows:



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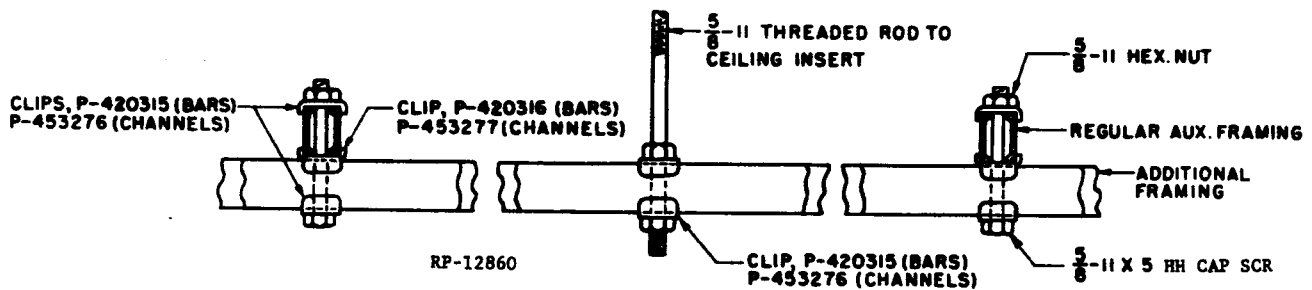
NOTE:

1. ONLY TWO SELF-DRILLING ANCHORS SHOULD BE USED AND THE FLOOR FLANGE SO LOCATED THAT THE HOLES IN THE FLOOR WILL BE COVERED BY THE BASE OF FUTURE FRAMES.
2. FOR 11-6 USAGE COMPONENTS ARE FURNISHED AS ASSEMBLY P-414473.

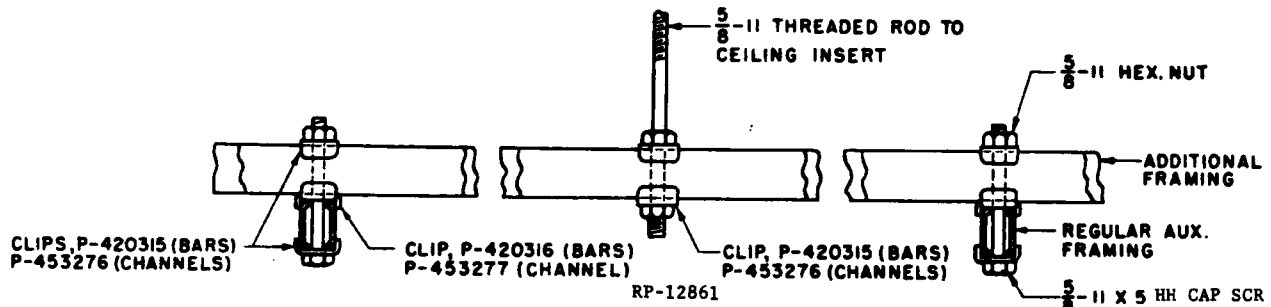
FIG. 11A PIPE STAND SUPPORT OF AUXILIARY FRAMING (PAR. 3.33)
(BSP 800-614-155, Fig. 11A)

3.42 Where auxiliary framing is unsupported for a distance in excess of 8'-0", (see Note below) as for example where more than one row of frames is omitted between rows or where adjacent rows of frames are more than 8'-0" apart, the auxiliary framing should be supported by additional pairs of bars or channels placed at right angles to the regular auxiliary framing and located under ceiling inserts or beam clamps. These bars or channels should be fastened above the auxiliary framing where practicable, and they should be supported from ceiling inserts or beam clamps by means of 5/8" threaded rods, clips, and nuts as shown in Figures 21, 22 and 22A

3.43 If the additional bars or channels are placed below the regular framing, the exposed ends of the bars or channels should be protected with P32B304 finishing caps as shown in Figure 23C, except where they are within 3" of a wall, column, or vertical surface. This requirement does not apply when the ends of the framing extend to within 3" of a wall, column or vertical surface.



→ FIG. 21 ADDITIONAL FRAMING PLACED BELOW REGULAR AUXILIARY FRAMING
(PARS. 3.42, 4.11) (BSP 800-614-155, Fig. 21)



→ FIG. 22 ADDITIONAL FRAMING PLACE ABOVE REGULAR AUXILIARY FRAMING
(PARS. 3.42, 4.11) (BSP 811-614-155, Fig. 22)

NOTE: In computing the unsupported distance for a pair of auxiliary framing bars or channels, the cable rack over an open area may be considered as a framing bar (or channel) support if the cable rack is supported independently of the framing in question.

4. BRACING

4.1 General

4.11 The entire regular auxiliary framing structure is braced parallel to length of the regular framing bars with either (a) column braces consisting of short pairs of bars or channels bolted at right angles to the regular framing so as to be held tightly against opposite sides of the column or (b) with adjustable rod or angle type braces run with a slope of approximately 45° to the ceiling. The braces are located at approximately column intervals. In buildings not having columns, the braces should be installed approximately 20 feet apart at 90 degree angles measured perpendicular and parallel to the auxiliary framing. Additional framing shown in Figures 21 and 22 requires no bracing.

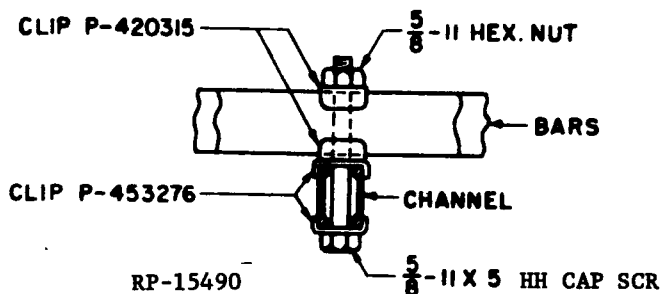


FIG. 22A FASTENING CHANNEL-TYPE AUXILIARY FRAMING AT RIGHT ANGLES TO BAR-TYPE AUXILIARY FRAMING
(PAR. 3.42) (BSP 800-614-155, Fig. 22A)

4.2 Column Bracing

4.21 Where column bracing is used the braces should consist of a single auxiliary framing bolted at right angles with the flat portion of the single auxiliary framing brace placed flatly below regular auxiliary framing tight against opposite sides of the column as shown in Figure 23, Section B-B.

(a) The outer edges of building bays adjacent to walls will require

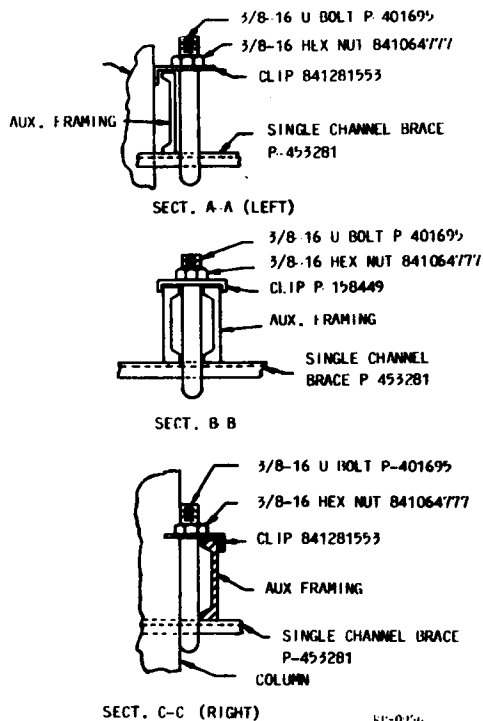
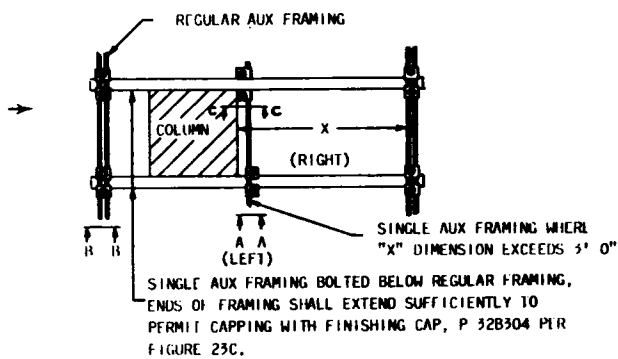


FIG. 23 BRACING AUXILIARY FRAMING TO COLUMNS (PAR. 4.2)
(BSP 800-614-155, Fig. 23)

supplementary braces in addition to the column braces where the framing bars or channels extend 10 ft. or more beyond the last column brace. These supplementary braces should be of the ceiling type.

(1) Where column bracing is provided, supplementary diagonal braces are required as shown in Figure 3.

(b) If single channel braces at columns are placed below regular auxiliary framing because cable racks or other interferences prevent their being installed, the exposed ends of the channels should be protected with P-32B304 finishing caps as shown in Figure 23C.

4.211 Where "X" dimension, in Figure 23, exceeds 3'-0" a single auxiliary framing shall be placed at right angles and on end above column bracing channels as shown in Section A-A and Section C-C.

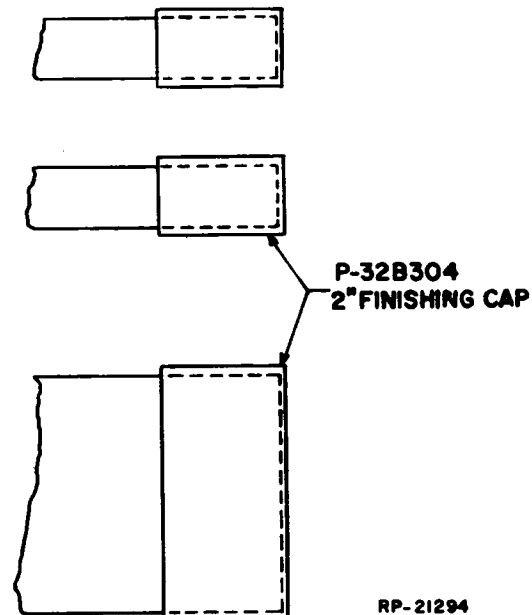


FIG. 23C 2" FINISHING CAP FASTENED TO EXPOSED ENDS OF CHANNEL OR BAR TYPE AUXILIARY FRAMING WHERE SAFETY HAZARDS ARE INVOLVED (PARS. 3.43, 4.21(b))
(BSP 800-614-155, Fig. 23C)

4.22 Where the condition of double channel braces are required, as indicated in Figure 23D, the braces should touch the column on both sides for the entire width of the column, (except where face of column is curved, in which case the channels should touch the column either at the center or at corners). Securely tighten all bolts.

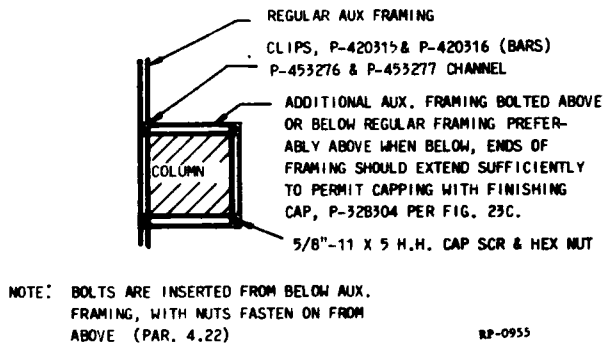


FIG. 23D DOUBLE AUXILIARY FRAMING COLUMN BRACE

4.3 Ceiling Bracing

4.31 Where ceiling type braces are used throughout an area unsuited to column braces, such as mill type buildings (heavy timber construction) or other buildings having columns not suited for attaching braces or where they are used as supplementary braces in areas having column bracing, the braces should be attached to the ceiling and to the auxiliary framing as shown in Figures 24, 25 and 25A. The type of brace to be used should be as follows:

Distance Between Ceiling and Auxiliary Framing

1'-6" or less

Over 1'-6" to 4'-0"
Incl.

Over 4'-0"

Type of Brace

Single Rod Brace
(Fig. 24)

Double Rod Brace
(Fig. 25)

Double Angle
Brace (Fig. 25A)

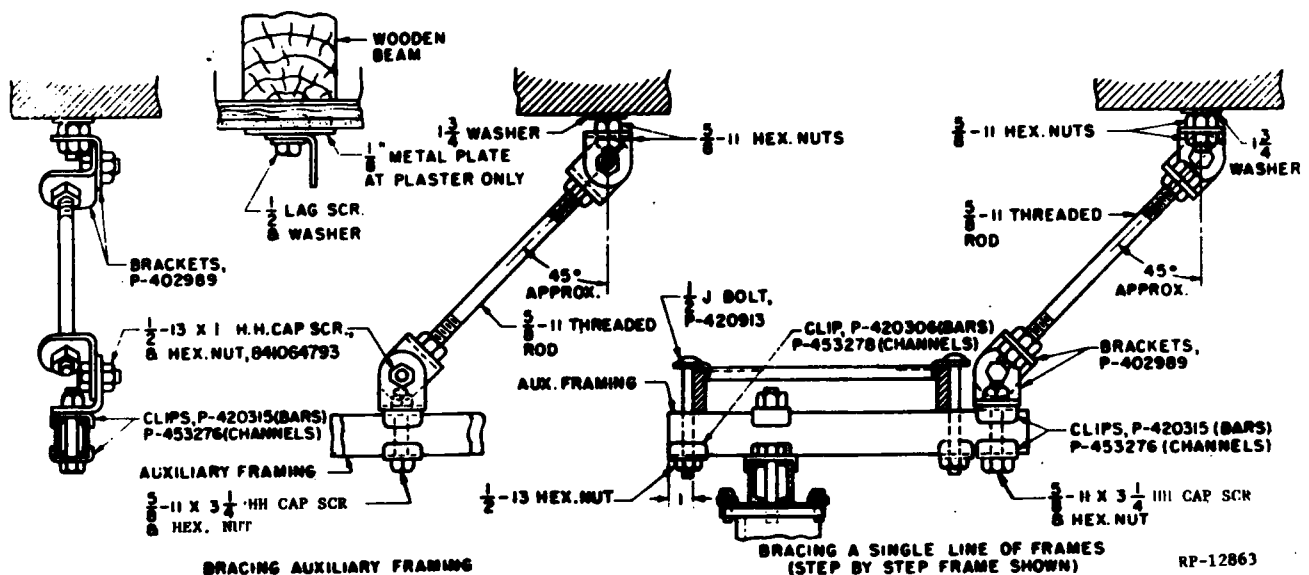


FIG. 24 BRACING WITH SINGLE ROD BRACE
(PAR. 4.31)
(BSP 800-614-155, Fig. 24)

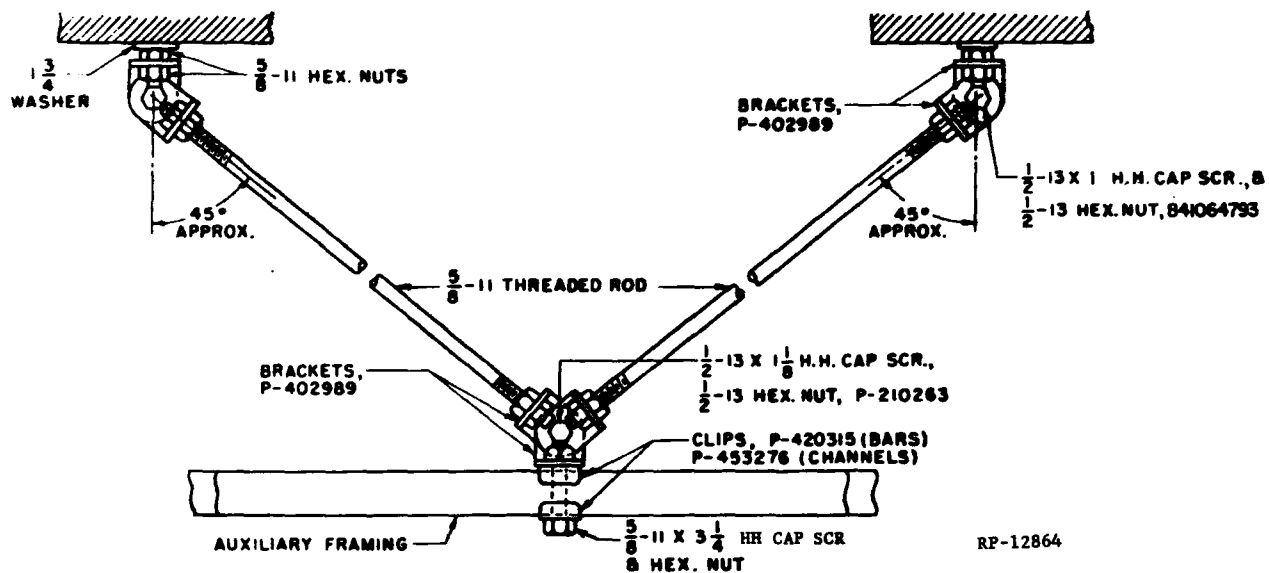


FIG. 25 BRACING OF AUXILIARY FRAMING WITH DOUBLE ROD BRACES
(PARS. 4.31, 4.311(a))
(BSP 800-614-155, Fig. 24)

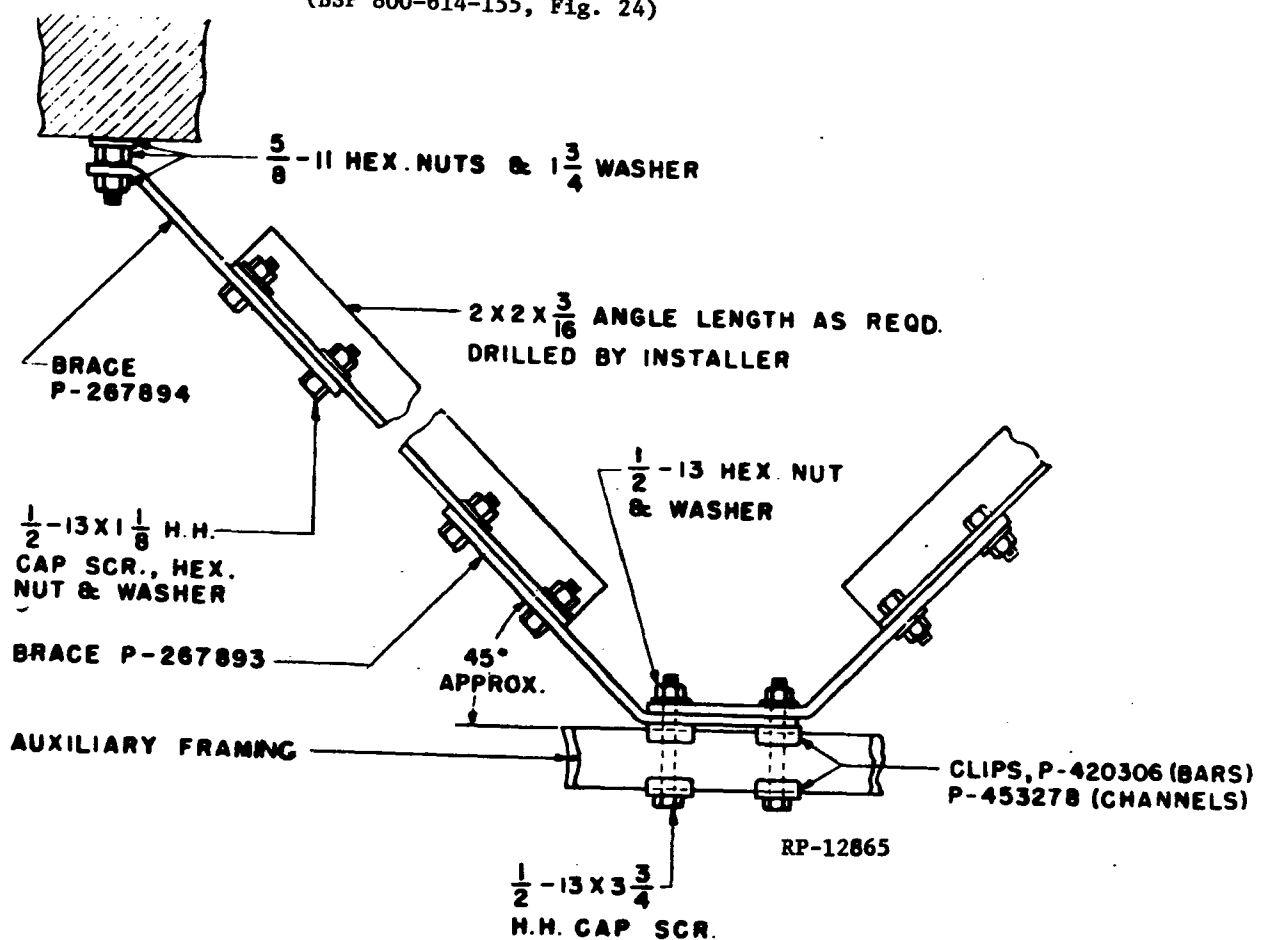


FIG. 25A BRACING OF AUXILIARY FRAMING WITH ANGLE DOUBLE BRACES
(PARS. 4.31, 4.31(a))
(BSP 800-614-155, Fig. 25A)

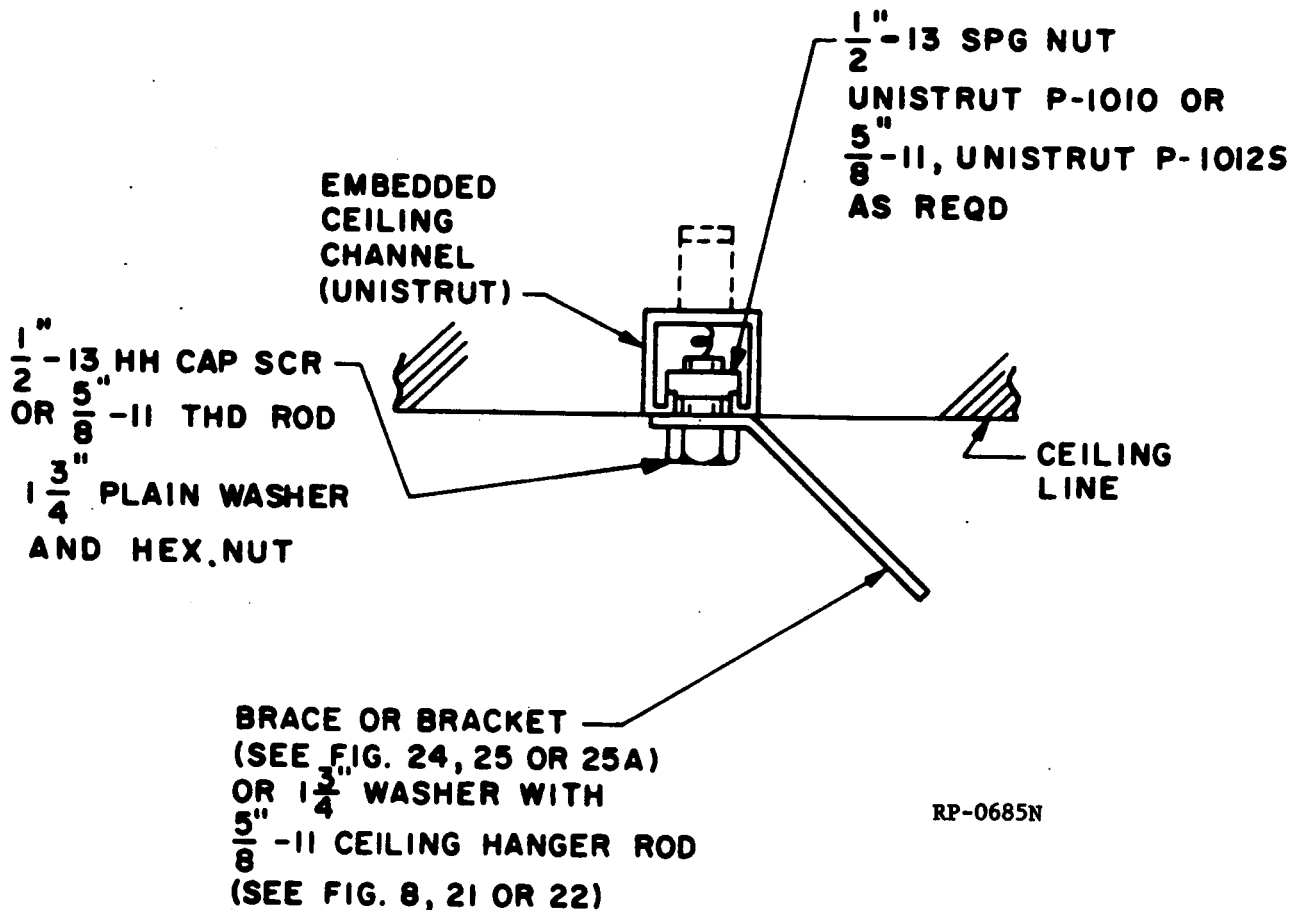


FIG. 26 FASTENING AUXILIARY FRAMING BRACE OR CEILING HANGER ROD TO EMBEDDED CEILING CHANNEL (UNISTRUT) (PAR. 4.34) (BSP 800-614-155, Fig. 26)

Where braces are to be attached directly to frame top angles, they should be fastened as outlined in the section covering the installation of high type auxiliary framing.

(a) While Figures 25 and 25A show double braces sloping from the same point of attachment to the auxiliary framing, it may sometimes be necessary to attach these braces at separate points along the framing in order to avoid interferences, such as cable runs and ventilating ducts. In such cases keep the points of attachment to the auxiliary framing as close together as possible. Another alternative which may be used to avoid interference is the inverted double brace (braces sloping from a common point on the ceiling to two points on the auxiliary framing).

4.32 The slant of auxiliary framing braces should, where possible, be parallel with the regular auxiliary framing. Where single rod braces are used, the braces for any one lineup of frames should slant in the same direction but adjacent rows of braces should slant in opposite directions.

4.33 Auxiliary framing in power rooms requires bracing only where it supports bus bars over floor-mounted batteries.

4.34 Where continuous rows of embedded ceiling channel (Unistrut) are provided, the braces shall be fastened as shown in Figure 26.

5. VERIFICATION ITEMS

5.1 General

5.11 The following contains the verification items for the equipment installed by operations covered in this section.

5.12 Where practical, the essentials of the requirement are included in the verification item. Where this is not practical, a brief statement of the requirement appears as one or more subparagraphs of the verification item. In each case, reference is made to each requirement.

5.13 Verification items which are followed by the symbol (D) may be checked on the "Cabling, Cable Rack and Auxiliary Framing Plan" drawing furnished for the job.

5.14 Verification items marked (P) are so designated to denote that the equipment should be verified before a portion of the work become discernible due to additional installation operations. If this does not apply, verify in the regular manner

5.2 Verification Items - Auxiliary Framing

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS		REFERENCE	
		PAR. NO.	FIG. NO.
5.21	<u>General Procedures</u>		
5.2101	Stock lengths used where practical	2.61	
5.2102	Run continuous lengths except to avoid interferences and need for cutting back existing framing on additions.	2.11, 2.23 2.71, 2.72	9D
5.2103	Auxiliary framing installed at the correct height. (D)	2.12	
5.2104	When perpendicular to framing, spaces on approximately 5'-0" centers and in no case over 6'-0" except over Step-by-Step frames with channel uprights where space may be 6'-0 5/8".	2.41, 2.411	
5.2105	When parallel to framing spaced on approximately 5'-0" or 6'-0" centers does not have 6'-0" maximum limitation associated with it.	2.42	
5.2106	Framing not run over main or end aisles except for support or ladder track. (D)	2.821	
5.2107	Does not interfere with cabling lighting conduit or other equipment.	2.21	
5.2108	Properly located with respect to end frame uprights at main and end aisles.	2.811	
5.2109	Auxiliary framing channels not wavy.	2.33	
5.2110	Extensions of framing beyond end lineup provides for additions. (D)	2.621, 2.622, 3.32	8
5.2111	Minimum clearance of 1/2" between ends of framing and building obstructions.	2.64	8
5.2112	Finishing clips installed where ends of framing extend more than 3" beyond clip or support.	2.631	10
5.2113	Channels paired will backs to the outside.	2.32	22A
5.2114	Where stagger arrangement is followed, extended pairs of bars or channels overlap sufficiently to allow fastening to the same frame or frames.	2.23, 2.71 2.72	9D
5.22	<u>Supports</u>		
5.221	Distance between the last point of support and farthermost point of load not over 2'-6".	3.21, 3.31	
5.222	Properly supported over area for future frames or equipment - unsupported distance not over 8'-0".	3.42	

VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS		REFERENCE	
		PAR. NO.	FIG. NO.
5.23	<u>Splices</u>		
5.231	Not more than two adjacent pairs of bars or channels spliced in same aisle.	2.51 2.51(note)	
5.232	With the exception of the three hole framing splice, splices do not interfere with ladder track, lighting conduit, cable racks, etc.	2.52	
5.24	<u>Braces</u>		
5.241	Bracing provided in power and battery rooms only where framing supports individual or widely spaced bus bars.	4.33	
5.242	Located at column intervals.	4.11	
5.243	Column braces tight against sides of columns.	4.21	23
5.244	Ends of additional pairs of bars or channels placed under regular auxiliary framing protected with rubber finishing caps.	3.43 4.21(b)	23C
5.245	Framing extending 10' or more beyond last column brace provided with diagonal braces to ceiling.	4.21(a)(1)	
5.246	Correct type threaded rod or angle brace used.	4.31	
5.247	Slant of braces parallel to regular framing where possible	4.32	
5.248	Bracing provided for embeded ceiling channel (unistrut).	4.34	26
5.25	<u>Bolts, Nuts and Screws</u>		
5.251 (P)	Kind and size as specified and installed in all places requiring them.	(See Section 1B)	
5.252 (P)	Free from stripped threads and defaced heads.	(See Section 1B)	
5.253 (P)	Not burred unless specified.	(See Section 1B)	
5.254 (P)	Sufficient thread engagement and properly tightened.	(See Section 1B)	

→ Indicates new or changed information.

[Vertical line at side of paragraphs
indicates requirements.

Engineering Planning Manager
(Installation)

Reason for Reissue:

U bolt in Fig. 23 reversed with
Section C-C added to clarify left
and right u bolt.