Installation Engineering Handbook 30
Western Electric
Service Division

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ALIGNMENT OF FRAMES

STEP-BY-STEP SWITCH FRAMES

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1. GENERAL

1.1 Scope

1.11 This section covers the specific requirements and alignment procedures for step-by-step switch frames.

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

1.2 Associated Information

1.21 Refer to the Associated Handbook Information Reference Table 1 for the location of information to which reference may be necessary when performing operations covered by this section.

1.3 General Information Pertaining to Arrangement of Tools, Precautions, Verification, Specification, Drawings and Figures

1.31 Refer to Section 27A for information pertaining to the above subjects.

2. INSTALLING EQUIPMENT

2.1 Tools

2.11 The tools listed below will be required for the operations covered by this section. Other tools available in the General Tool Kits also may be required.

R-1313 Line, Fish
R-1314 Plumb Bob, Steel

ASSOCIATED HANDBOOK INFORMATION REFERENCE TABLE 1

Subject	Handbook	Section
Alignment of Frames - Common Requirements and Information	30	27A
Erecting and Fastening Step-by-Step Frames	30	19E1
General Safety Precautions	30	1A
Precautions Against Personal Injury, Equipment Damage and Service Interruptions	0	

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2.12 On large jobs it will be advantageous to requisition an R-2642 Plumbing Fixture. See Paragraph 3.311.

2.2 Materials

R-3225 Shim, Step-by-Step Frame - Sheet Metal Base, 1/16" x 1-1/2" x 3-1/4"

R-3226 Shim, Step-by-Step Frame - Sheet Metal Base, 1/8" x 1-1/2" x 3-1/4"

NOTE: The number of shims required by a job will vary with the variations of the floor surface where step-by-step frames having sheet metal bases will be installed. Since there is no way of determining the number required prior to the start of the job, it is suggested that two R-3225 and one R-3226 Shims be requisitioned from Installation Stockkeeping for each frame being installed so that some shims will be available on the job when they are needed. If additional shims are required, they should be requisitioned. Jobs having shims left, should, if possible, send them to another step-by-step job (with frames having sheet metal bases) in the area rather than return them to Stockkeeping. When necessary to shim spaces 3/8" or more, it will be permissible to use 3-1/4" lengths of auxiliary framing bar, if available on the job.

3. ALIGNING PROCEDURE

3.1 Frame Channel Top Members

3.11 Locate and align the frame channel top members with respect to the lines previously laid out on the floor as shown in Figure 1.

3.12 Distance between tight line and surface of bar at fastenings to the auxiliary framing should be within 1/16" throughout length of line-up. This is to insure proper location of frame uprights.

3.2 Sheet Metal Base Assemblies

3.21 Align sheet metal base assemblies so that the following requirements are met:

3.211 The sheet metal base assemblies may follow the general contours of the floor.

3.212 The difference in level of the top surfaces of sheet metal base assemblies at the joined ends shall not exceed 1/16".

(a) Since no leveling screws are furnished on the step-by-step sheet metal base assemblies, it may be necessary to shim the base assemblies to meet the above requirement. Standard shims (see Paragraph 2.2) are available for this purpose.

(b) When shims are used, they shall be placed adjacent to the base floor fastenings with the 3-1/4" dimension perpendicular to the frame lineup.

3.213 The junctions in ladder guard rails on the sheet metal base assemblies should be as nearly flush as practicable so as not to interfere with the easy operation of the ladder.

3.214 The sheet metal base assemblies within a line-up should not be more than 1/8" out of its normal position (in or out from a straight line extending the full length of the line-up).

3.22 Tighten floor fastenings on each sheet metal base assembly as each base is aligned.

3.3 Frame Uprights - Bulb Angle or Channel Uprights on Frames Equipped With Frame Channel Top Members

3.31 Plumb the two end uprights of each line-up of frames. In the case of an isolated frame, plumb the two end uprights of the frame.

3.311 Where the number of uprights to be plumbed is sufficient to warrant the use of a plumbing fixture, use R-2642 Plumbing Fixture for bulb angle uprights.

3.312 When an R-2642 (see Figure 2) is used, assemble the fixture on the end up-rights as follows:

(a) Attach Detail 1 of the fixture as close to the top of the upright as convenient and Detail 2 just above the frame base member.

(b) When securing Details 1 and 2 to the frame upright, tighten the "spanner" bolt first and then the hook bolt. This will prevent the end of the detail from being drawn away from the upright when the hook bolt is tightened.

(c) Note that the stop of each detail bears firmly against the upright and that the detail is approximately level.

(d) The fixture details must be mounted bottom side up on the upright at the end of the frame opposite to that illustrated in Figure 2.

3.32 After each end upright of a line-up has been plumbed, secure both end uprights at the top and bottom to prevent movement.

3.33 Plumb intermediate uprights of a line-up using a plumb bob. The alignment of intermediate uprights can be checked by means of an R-1313 Fish Line stretched tightly between the end uprights near the top of the bay. Tighten top and bottom fastenings as each intermediate upright is aligned.

3.34 When in final alignment, each line-up should meet the following requirements:

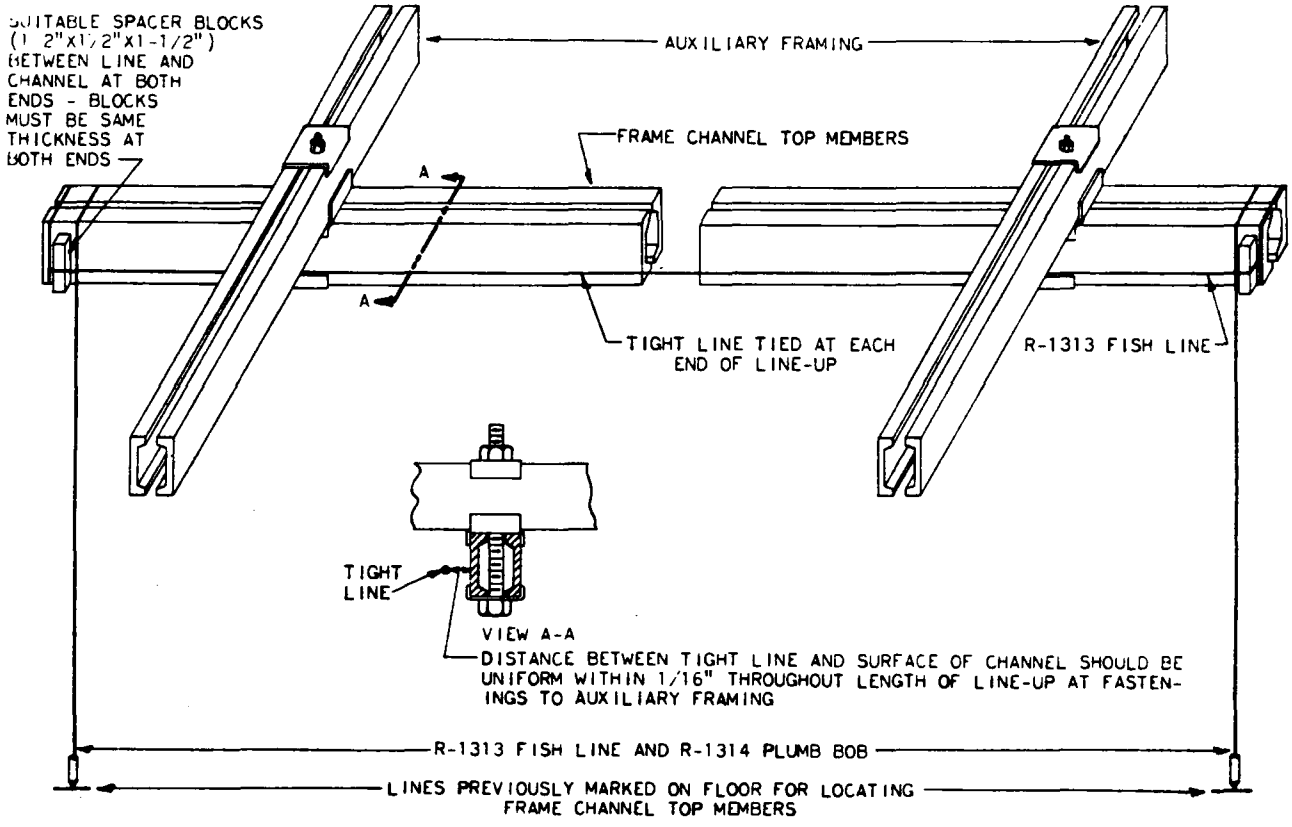

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FIG. 1 LOCATING AND ALIGNING FRAME CHANNEL TOP MEMBERS (PAR. 3.11)

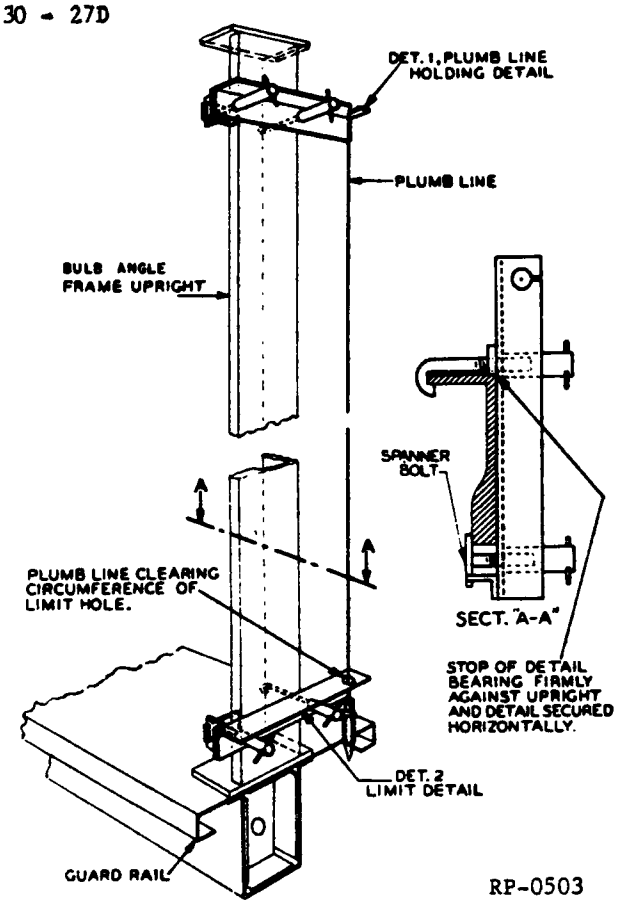

FIG. 2 USE OF R-2642 PLUMBING FIXTURE ON BULB ANGLE UPRIGHTS (PAR. 3.312)

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3.341 A frame shall not be out of its normal position (in or out from a straight line extending the full length of the line-up) more than 1/8".

3.342 Uprights plumb within 1/4". See table in Section 27A.

3.4 Frame Uprights - Bulb Angle or Channel Type Uprights on Frames Without Frame Channel Top Members

3.41 Uprights for frames without the channel top members are installed in conjunction with the installation of auxiliary framing and over-frame cable rack; therefore, the plumbing and aligning requirements must be met as each upright is secured in place.

3.42 When in final alignment, the frames should meet the requirements in Paragraphs 3.341 and 3.342.

3.5 Securing Frames

3.51 Where column bracing is used, it should be checked for evidence of shifting after the frames have been aligned.

If necessary, relocate the braces and securely tighten them against the column. Care should be taken so as not to disturb the alignment of the frames.

4. VERIFICATION ITEMS

	VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	REFERENCE PAR.NO.	REFERENCE FIG.NO.
4.1	Bays and Frames		
4.11	Bays, frames and other similar type structures should meet the following alignment requirements in so far as they apply to the particular type of framework.		
4.12	Vertical parts plumb to within allowable tolerances.	3.342	
4.13	Line-up of bays or frames not out of alignment (Front-to-Rear from a straight line) more than 1/8" in full length of line-up.	3.341	
4.14	Alignment of frame channel top members (step-by-step frames) within 1/16" at fastenings to auxiliary framing throughout line-up.	3.12	1
4.15	Bays and frames may follow the general contour of floor.	3.211	
4.16	Difference in level of crossbar and other frames of sheet metal base design not more than 1/16" gauged at top surface of sheet metal guard rail.	3.12	

	VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	REFERENCE PAR.NO.	REFERENCE FIG.NO.
4.17	Joined ends of frames of sheet metal, base construction, including box type (No. 5 Crossbar) frameworks as nearly flush as practicable.	3.213	
4.18	Junctions in ladder guard rails approximately flush-vertical misalignment not more than 1/16".	3.212	
4.19	Shim used under sheet metal base of step-by-step frames to offset extreme uneveness of floor.		

→ Indicate new or changed information.

[Vertical lines at side of paragraphs indicate requirements.

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Reason for Reissue:
To add Par. 1.2, 1.3 and 4