

CFR INSULATED
METAL ROOF PANEL
DIAPHRAGM STRENGTH
TECHNICAL BULLETIN



PIONEERING INSULATED METAL PANEL TECHNOLOGY

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INTRODUCTION

Metl-Span's leadership in composite panel technology provides yet another important design solution for the construction industry.

Diaphragm Strength is included in the performance capability of Metl-Span's CFR Insulated Roof Panel, which already leads the industry in weathertightness, structural performance and thermal performance.

Metl-Span's exclusive clinching clip design (patent pending) locks the adjacent roof panels together so that the entire roof can act as a diaphragm.

When using the CFR roof panel, the cost and interior space intrusion of conventional bracing can be eliminated on many steel-framed buildings. This is done without fastener penetrations that compromise weathertightness and without costly below-roof erection.

Using the diaphragm strength data provided in this technical bulletin, your building designer can integrate the CFR roof panel's diaphragm strength into your building's steel framing design and, in many cases, avoid the aesthetic and space problems of X-bracing or the high cost of portal frames.

The CFR roof panel's diaphragm strength and shear stiffness values have been verified by extensive full-scale testing in accordance with ASTM E455 procedures.

Included in this technical bulletin are suggested architectural and installation details for your building designer and erector to use for application of the CFR roof panel's clinching clip design.

This technical bulletin is to be used in conjunction with the Architectural Design Guide and Installation Guides for the CFR Insulated Metal Roof Panel, which are provided by Metl-Span®.

When using the CFR roof panel's diaphragm strength capability on a specific project, the order to Metl-Span must clearly specify the requirement for the diaphragm clips and diaphragm clip erection tools.

CUSTOMER RESPONSIBILITIES

Metl-Span® does not guarantee and is not liable for the quality of building design and roof erection, and is not responsible for roof defects that may be attributed to improper design, erection or negligence of other parties.

The customer is responsible for selecting competent building designers and erectors and must assure that the application of the CFR roof diaphragm strength capability is suitable for the specific building and is in accordance with good engineering and construction practices and all applicable building codes and regulations.

Clarification concerning the CFR Insulated Metal Roof Panel should be directed to the Metl-Span Technical Services Dept. Contact the Metl-Span office:

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Lewisville, Texas 75057
TEL: (972) 221-6656
FAX: (972) 436-7028
WEB: **metlspan.com**

DIAPHRAGM DESIGN DATA

METL-SPAN® CFR INSULATED METAL ROOF PANEL WITH DIAPHRAGM CLIPS

DIAPHRAGM STRENGTH DESIGN		
ROOF THICKNESS	DIAPHRAGM SHEAR STRENGTH	DESIGN SHEAR STIFFNESS
2"	*158.2 lb./ft.	*2434.4 lb./in.
2-1/2"	157.3 lb./ft.	2375.1 lb./in.
3"	156.4 lb./ft.	2315.9 lb./in.
4"	*154.6 lb./ft.	*2197.3 lb./in.
5"	144.7 lb./ft.	1853.9 lb./in.
6"	*134.8 lb./ft.	*1510.5lb./in.

The above values are based on the following conditions:

1. * = Tested values per ASTM E455 procedures. Other values are interpolated.
2. Roof panels are Metl-Span's CFR 42 (3'-6' wide) panels with 24 gage steel (min.) exterior face and 26 gage steel (min.) interior face.
3. Roof panels are attached to supporting structure with Metl-Span's CFR diaphragm clips at each (eave, intermediate and ridge) roof support member, with a minimum of (2) 1/4" - 14 fasteners per clip.
4. Roof support members are 16 gage steel (min.) at 5'- 0 3/16" (max.) spacing.
5. Starter and finish roof panel edges are attached to rake support members with 1/4" - 14 (min.) through-panel fasteners at 12" (max.) spacing.
6. Rake support members are 16 gage steel x 2" x 3" (min.), and are continuous along the rake edges of the roof.
7. Roof panels and diaphragm clips are installed, clinched and seamed in accordance to the instructions in this technical bulletin.
8. Design shear strength is calculated with a factor of safety of 2.35 for wind loads only. Call Metl-Span's Technical Services Dept. for other allowable loads.

Copies of the CFR Insulated Metal Roof Panel-Diaphragm Strength test reports are available, per request to Metl-Span.

Important: The diaphragm strength provided by the roof panels is not fully effective until all of the required roof panels and diaphragm clips are installed. To prevent damage to the roof system and potential failure of the structure, appropriate temporary bracing of the structure must be provided until the roof installation is completed.

ARCHITECTURAL DETAILS

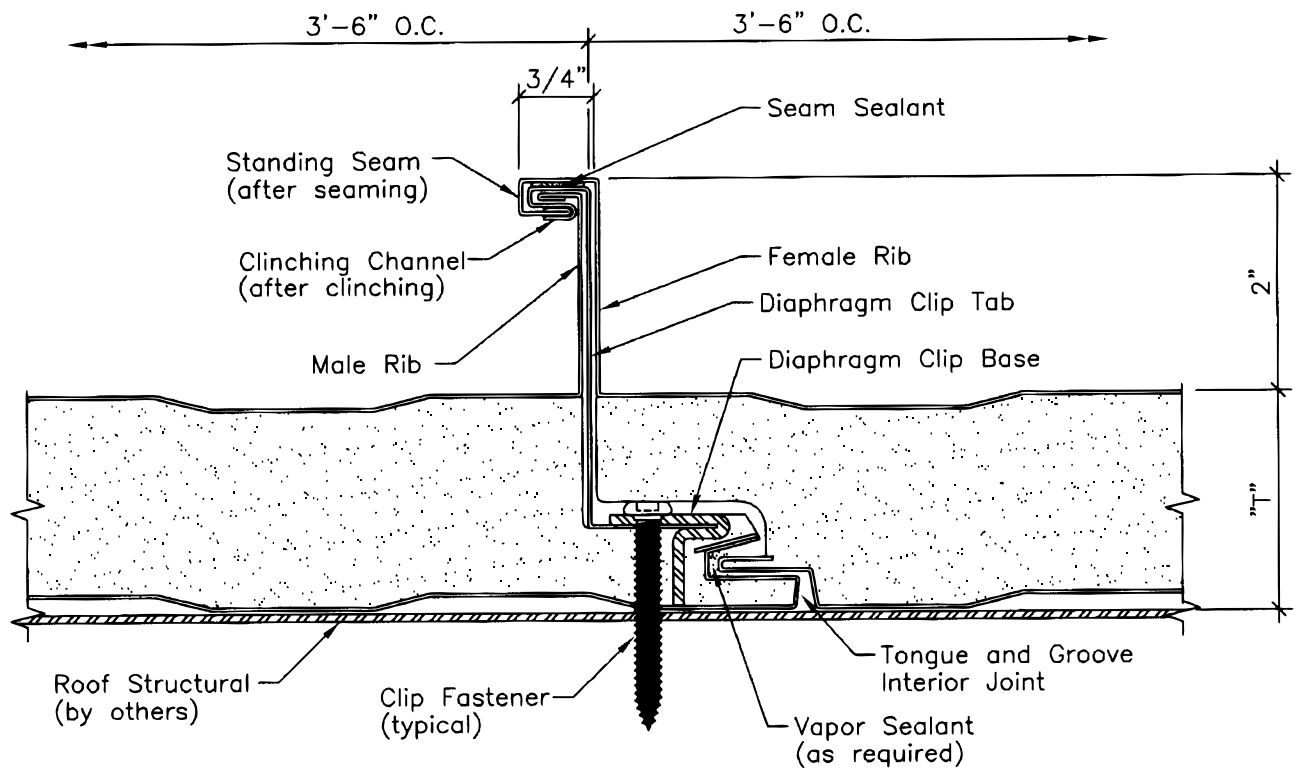
Following are suggested architectural details for the application of the CFR roof panel's diaphragm clip design.

These details are intended to be used in conjunction with the details in the CFR Insulated Metal Roof Panel Architectural Design Guide, which is provided by Metl-Span®.

In case of conflict between this technical bulletin and the specific project's installation drawings, the installation drawings will take precedence.

PANEL SIDELAP SECTION

C817.501.1

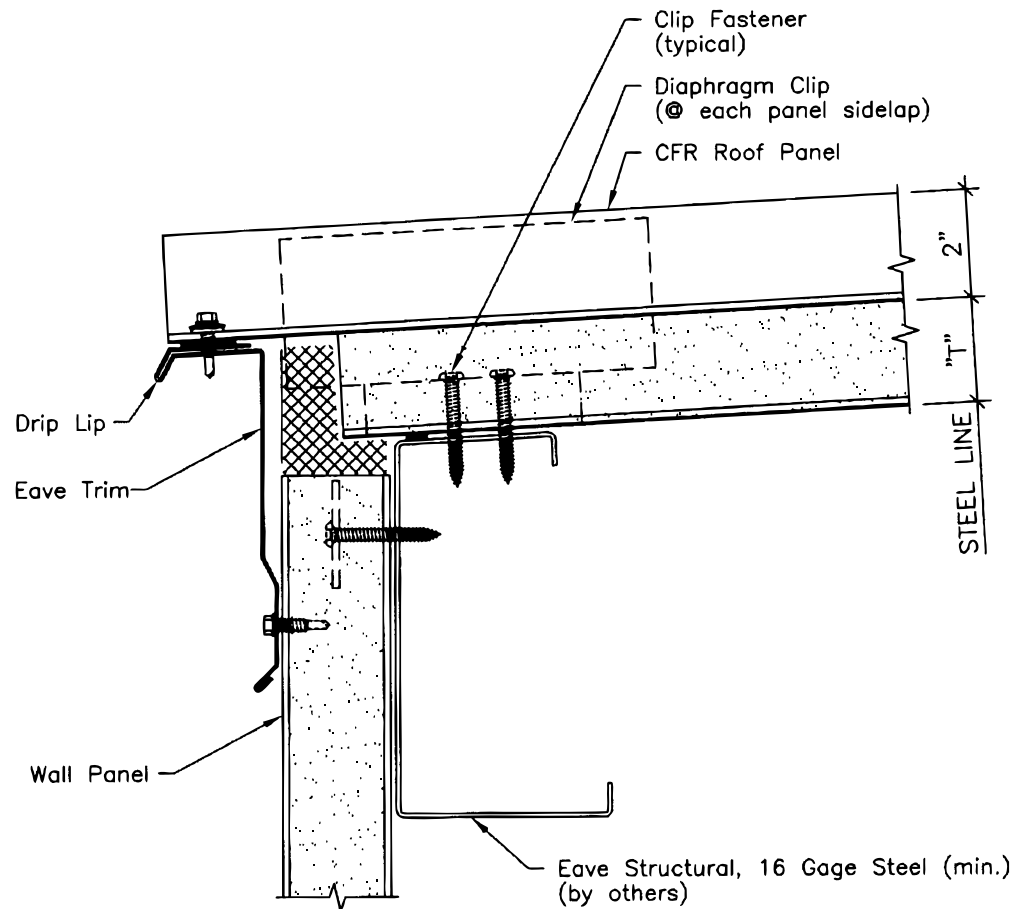


"T" = Panel Thickness (2", 2-1/2", 3", 4", 5", OR 6")

PANEL SIDELAP SECTION (with Diaphragm Clip)

TYPICAL EAVE SECTION

C817.502.1

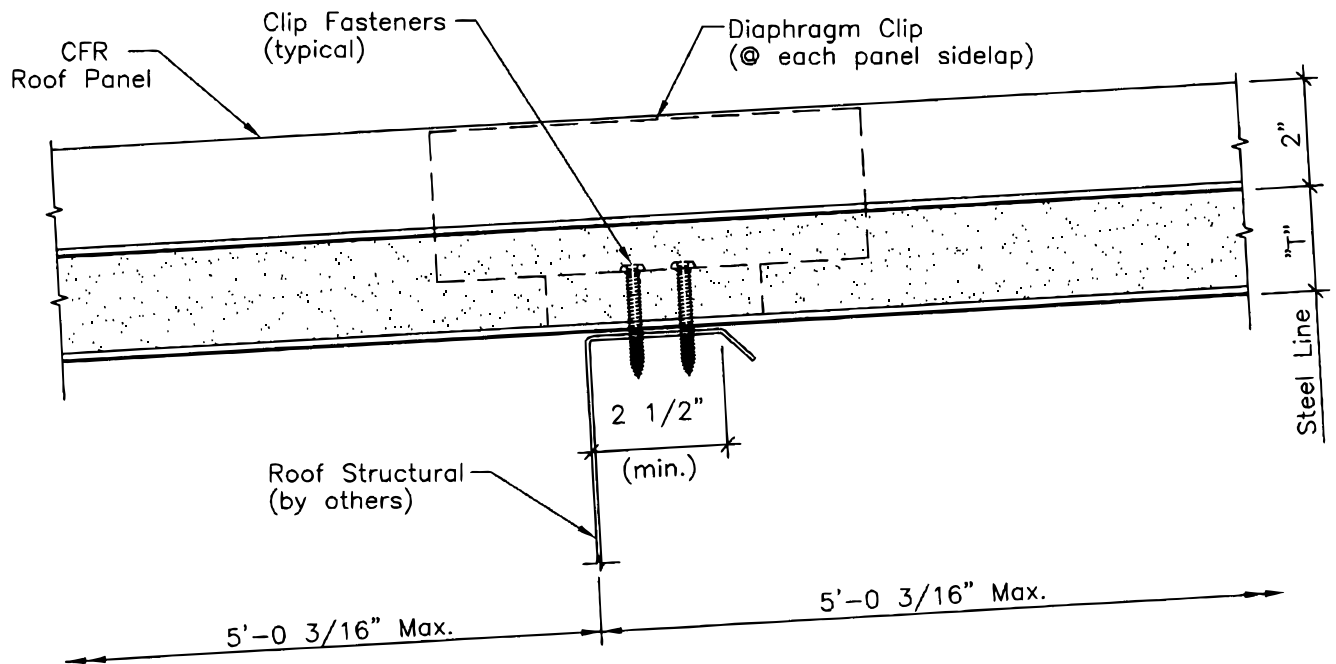


"T" = Panel Thickness (2", 2-1/2", 3", 4", 5", OR 6")

TYPICAL EAVE SECTION
(with Diaphragm Clip)

SECTION AT ROOF STRUCTURAL

C817.505.1

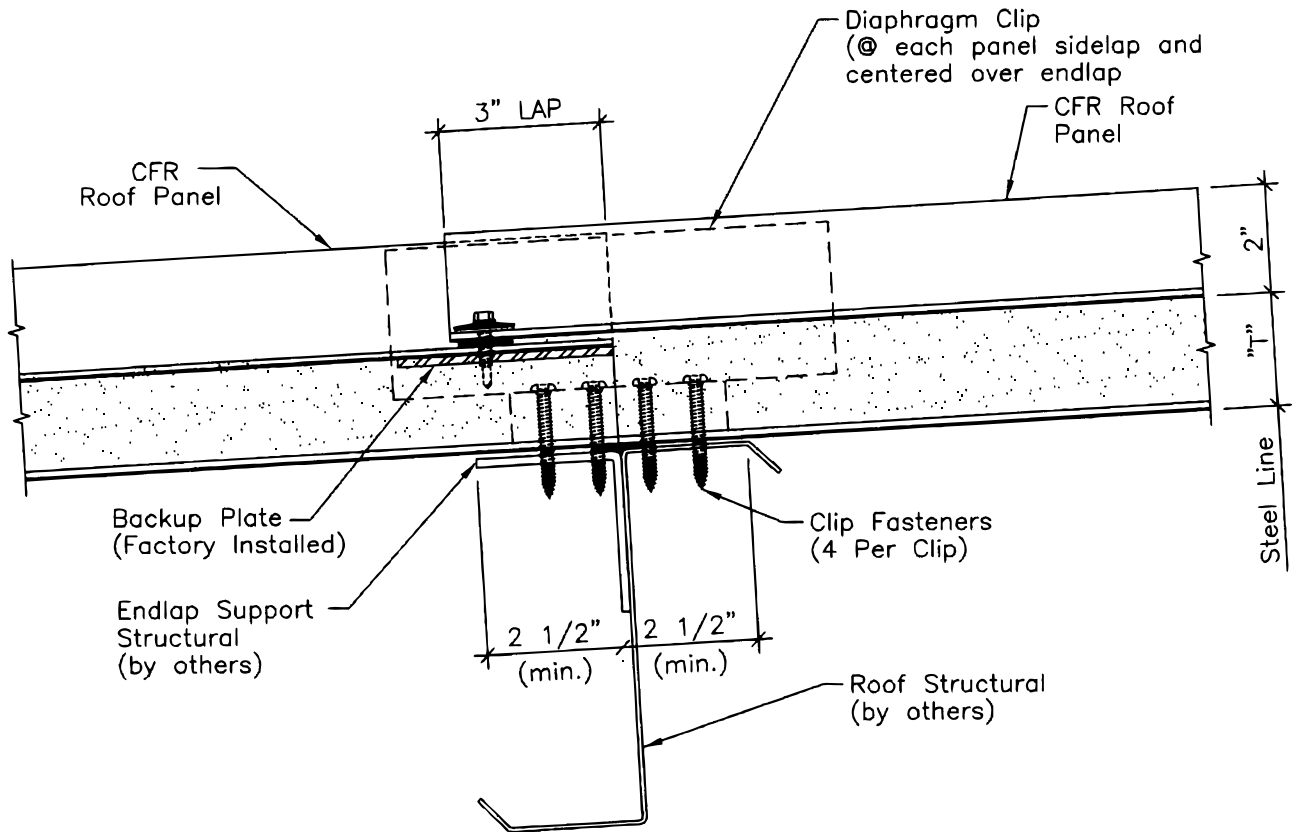


"T" = Panel Thickness (2", 2-1/2", 3", 4", 5", OR 6")

SECTION AT ROOF STRUCTURAL
(with Diaphragm Clip)

PANEL ENDLAP SECTION

C817.506.1

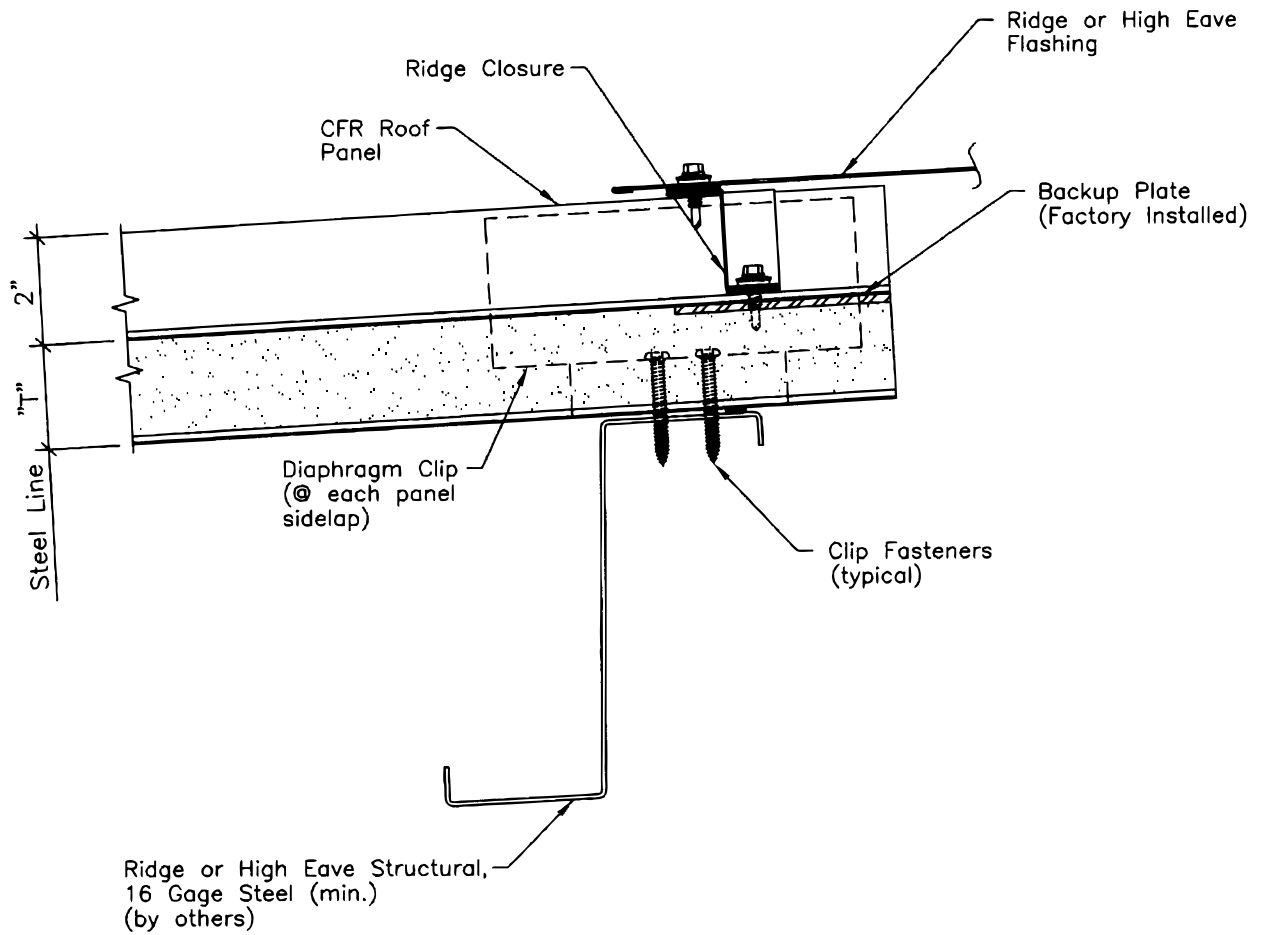


"T" = Panel Thickness (2", 2-1/2", 3", 4", 5", OR 6")

PANEL ENDLAP SECTION
(with Diaphragm Clip)

TYPICAL RIDGE OR HIGH EAVE SECTION

C817.503.1

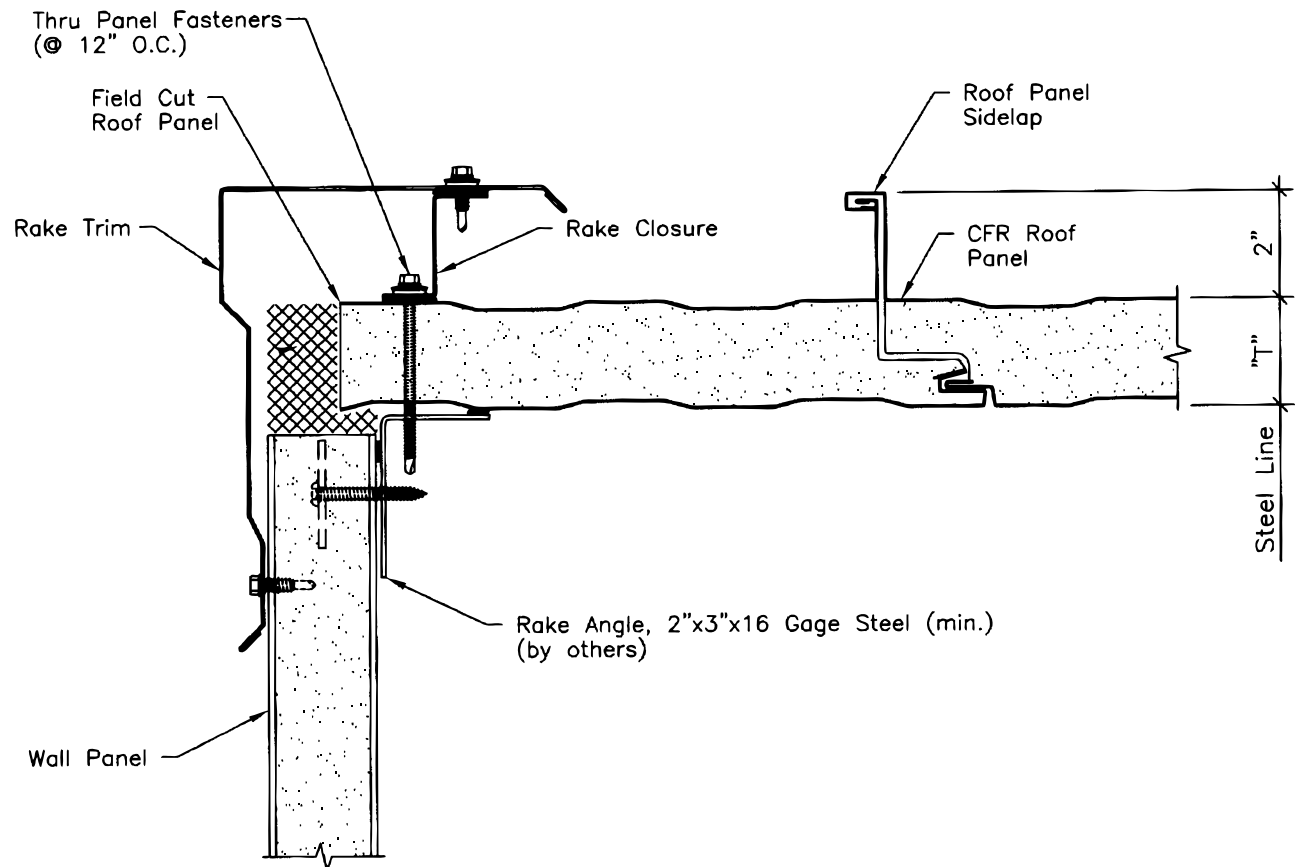


"T" = Panel Thickness (2", 2-1/2", 3", 4", 5", OR 6")

TYPICAL RIDGE OR HIGH EAVE SECTION
(with Diaphragm Clip)

TYPICAL RAKE SECTION

C817.504.1



"T" = Panel Thickness (2", 2-1/2", 3", 4", 5", OR 6")

TYPICAL RAKE SECTION
(with Diaphragm Clip)

ERECTION GUIDE DETAILS

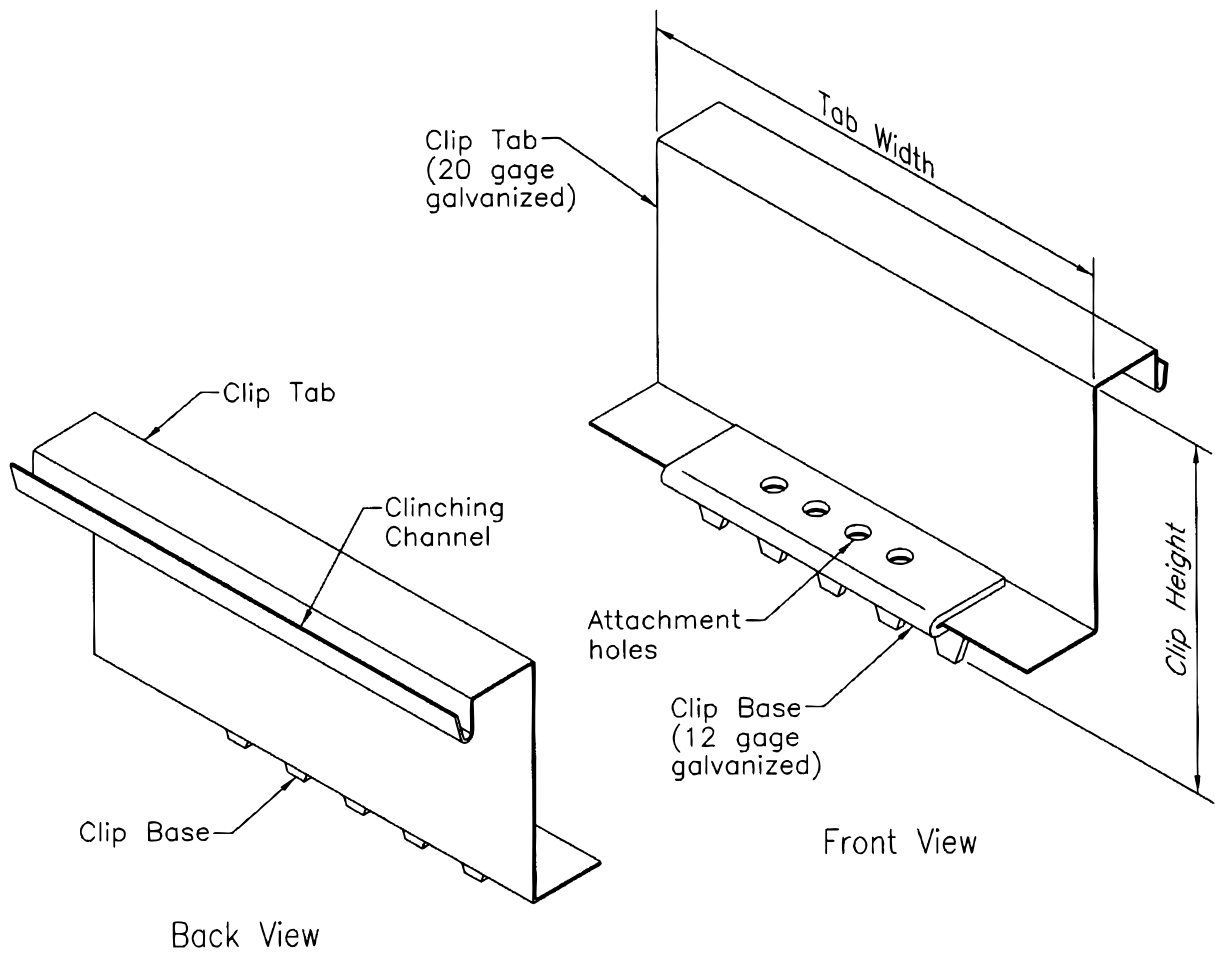
Following are suggested erection guide details and instructions for the installation of the CFR roof panel's diaphragm clip design. Included are details of the diaphragm clip and erection tools required for installation of the diaphragm clip.

These details are intended to be used in conjunction with the details and instruction in the CFR Insulated Roof Panel Installation Guide, which is provided by Metl-Span®.

In case of conflict between this technical bulletin and the specific project's installation drawings, the installation drawings will take precedence.

DIAPHRAGM CLIP DESCRIPTION

C817.601.1

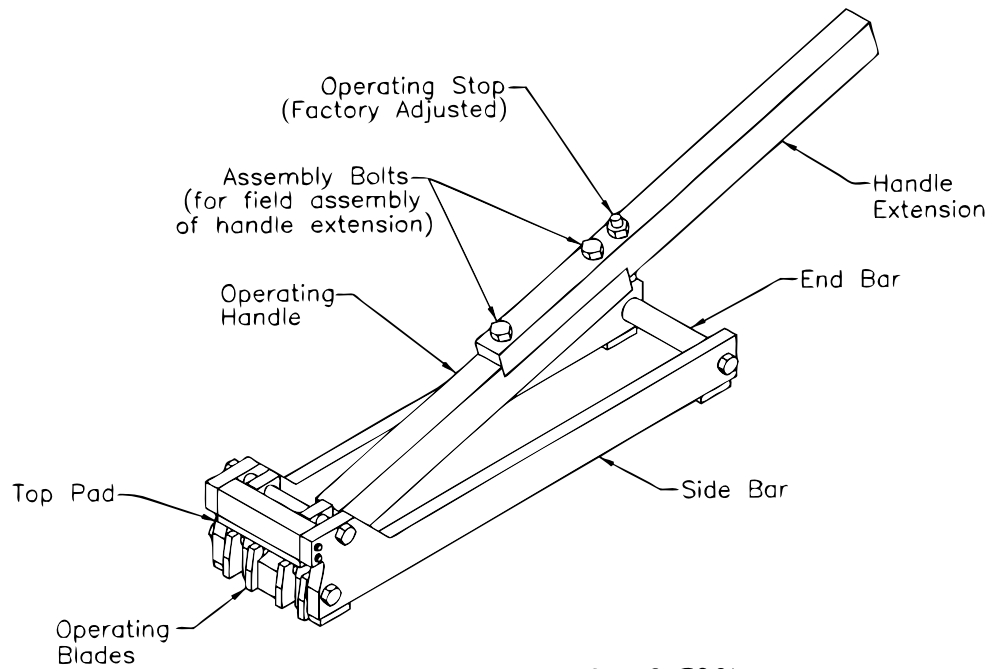


Roof Panel Thickness	Clip Height	Tab Width	Part Number
2"	3 7/8"	8"	4216 GNC
2 1/2"	4 3/8"	8"	4220 GNC
3"	4 7/8"	8"	4224 GNC
4"	5 7/8"	8"	4232 GNC
5"	6 7/8"	8"	4240 GNC
6"	7 7/8"	8"	4248 GNC

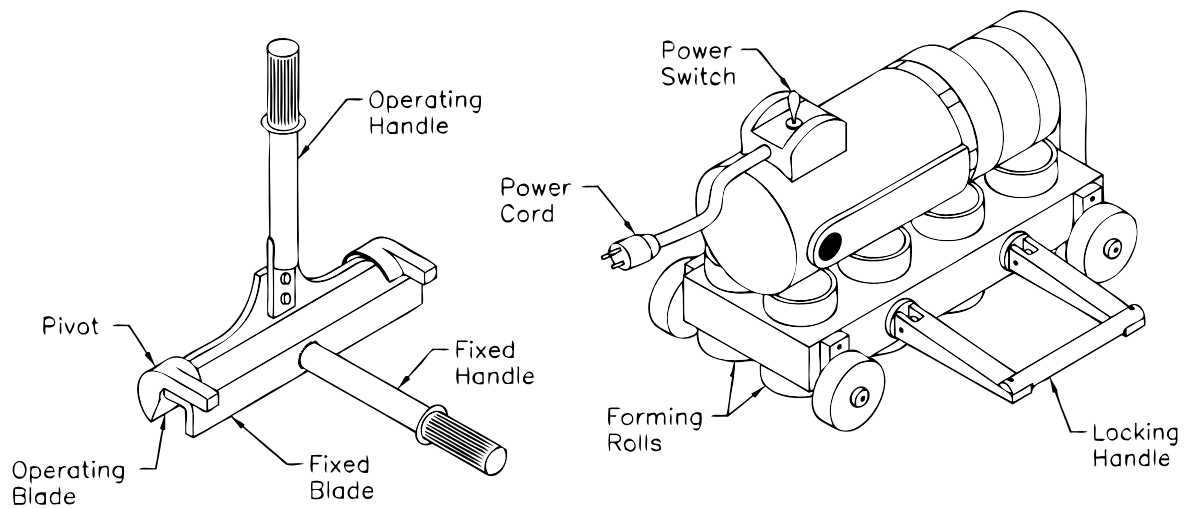
DIAPHRAGM CLIP DESCRIPTION

DIAPHRAGM CLIP ERECTION TOOLS

C817.602



DIAPHRAGM CLIP CLINCHING TOOL



MANUAL SEAMER
(Adjusted for Diaphragm Clips)

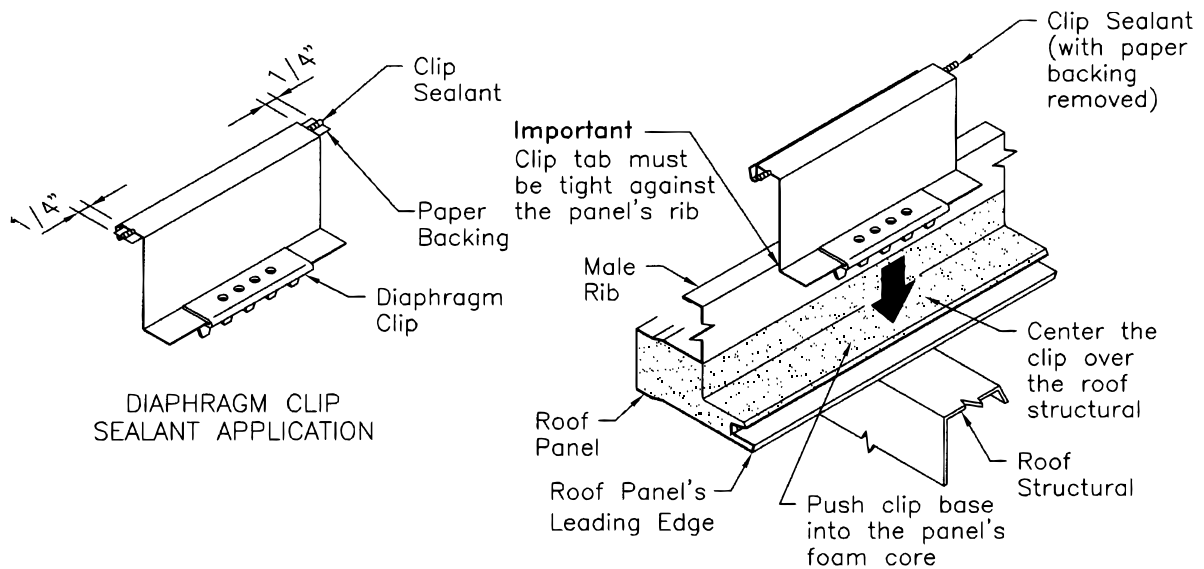
MOTOR SEAMER

DIAPHRAGM CLIP ERECTION TOOLS

Note: The CFR clinching tool, manual seamer and motor seamer must be ordered from Metl-Span. Do not attempt to install the roof with other tools which are not specifically designed for the CFR roof with diaphragm panel clips.

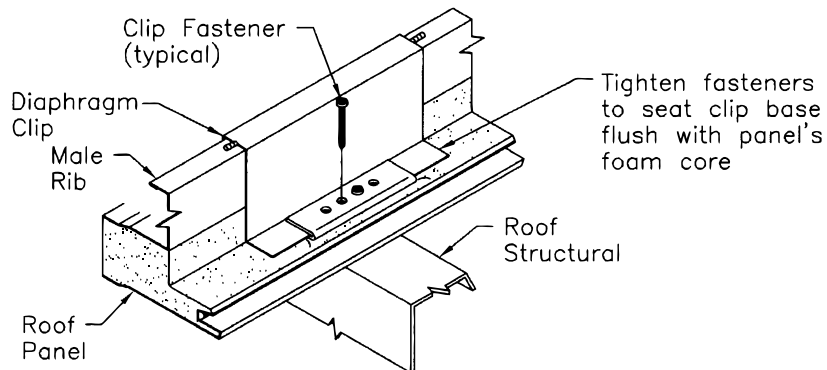
DIAPHRAGM CLIP INSTALLATION

C817.603.1



DIAPHRAGM CLIP SEALANT APPLICATION

DIAPHRAGM CLIP POSITIONING



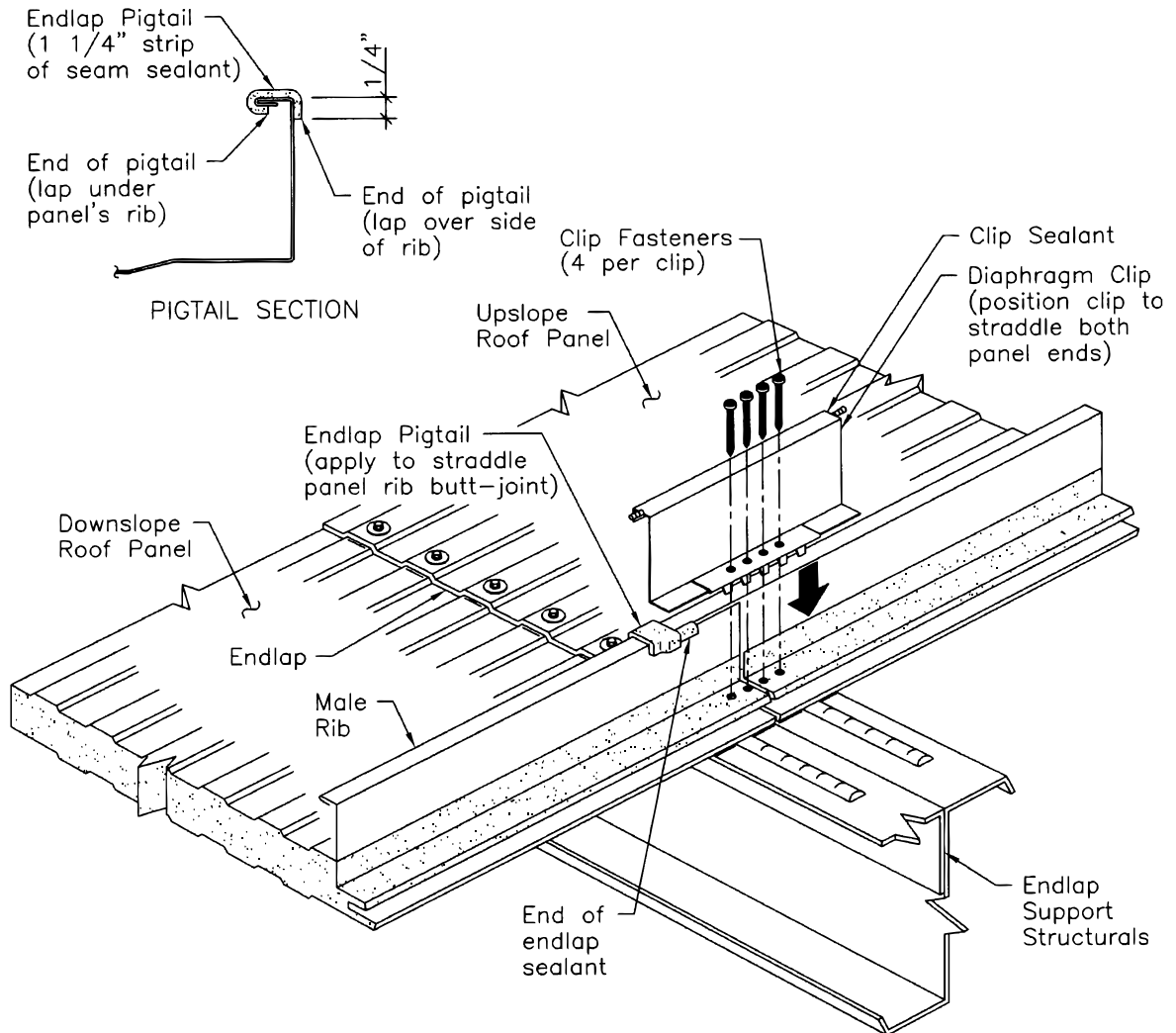
DIAPHRAGM CLIP FASTENING

DIAPHRAGM CLIP INSTALLATION

1. Apply clip sealant to underside of the clip's tab. Extend sealant 1/4" beyond each end of clip tab.
2. Remove sealant's paper backing and position clip over the panel's leading edge. Align the clip's center attachment holes over the roof structural's top flange.
3. While holding the clip tight against the panel's edge, push the clip's base into the panel's foam core.
4. Fasten the clip to the roof structural with the clip fasteners.
5. Important: Do **not** crimp the clip's tab with the manual seaming tool at this time.

ENDLAP PIGTAIL AND CLIP INSTALLATION

C817.507

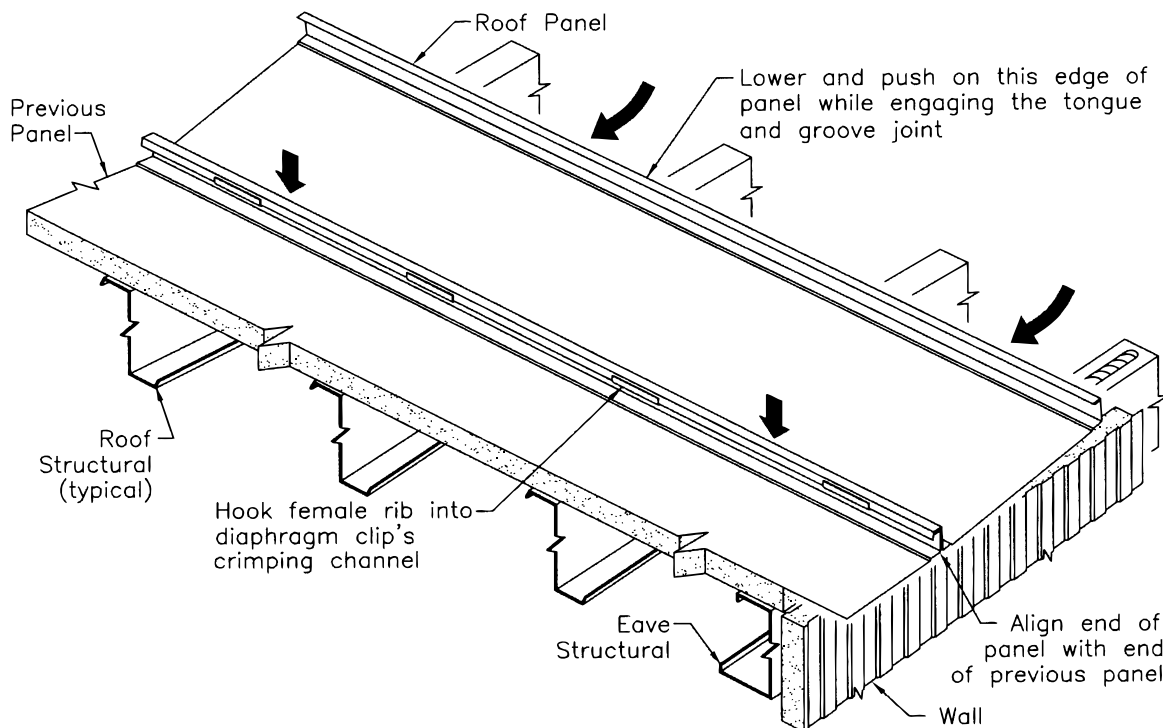
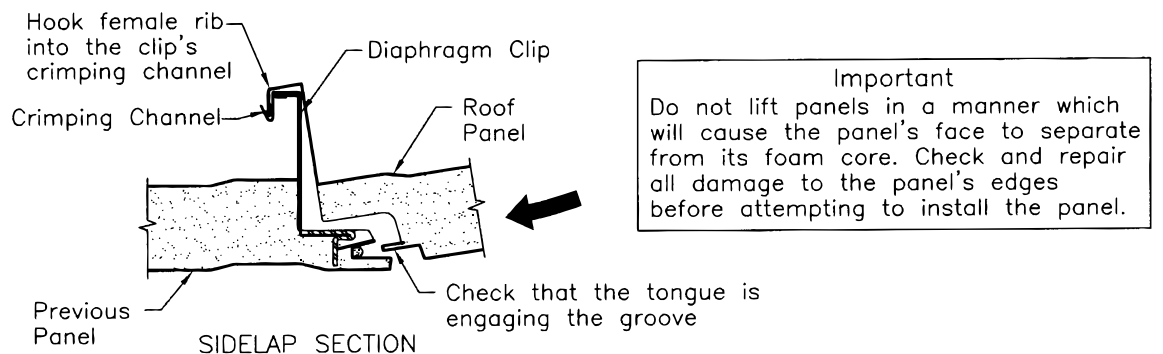


ENDLAP PIGTAIL AND DIAPHRAGM CLIP INSTALLATION

1. Apply endlap pigtail to straddle the male rib's butt joint. Use 1 1/4" strip of seam sealant for pigtail. Lap one end of pigtail over the side of the rib. Lap the other end under the rib.
2. Install diaphragm clip to straddle the panel ends. Position the clip base so all (4) fasteners can be fastened to the endlap support structurals.

PANEL SIDELAP ENGAGEMENT

C817.604.1

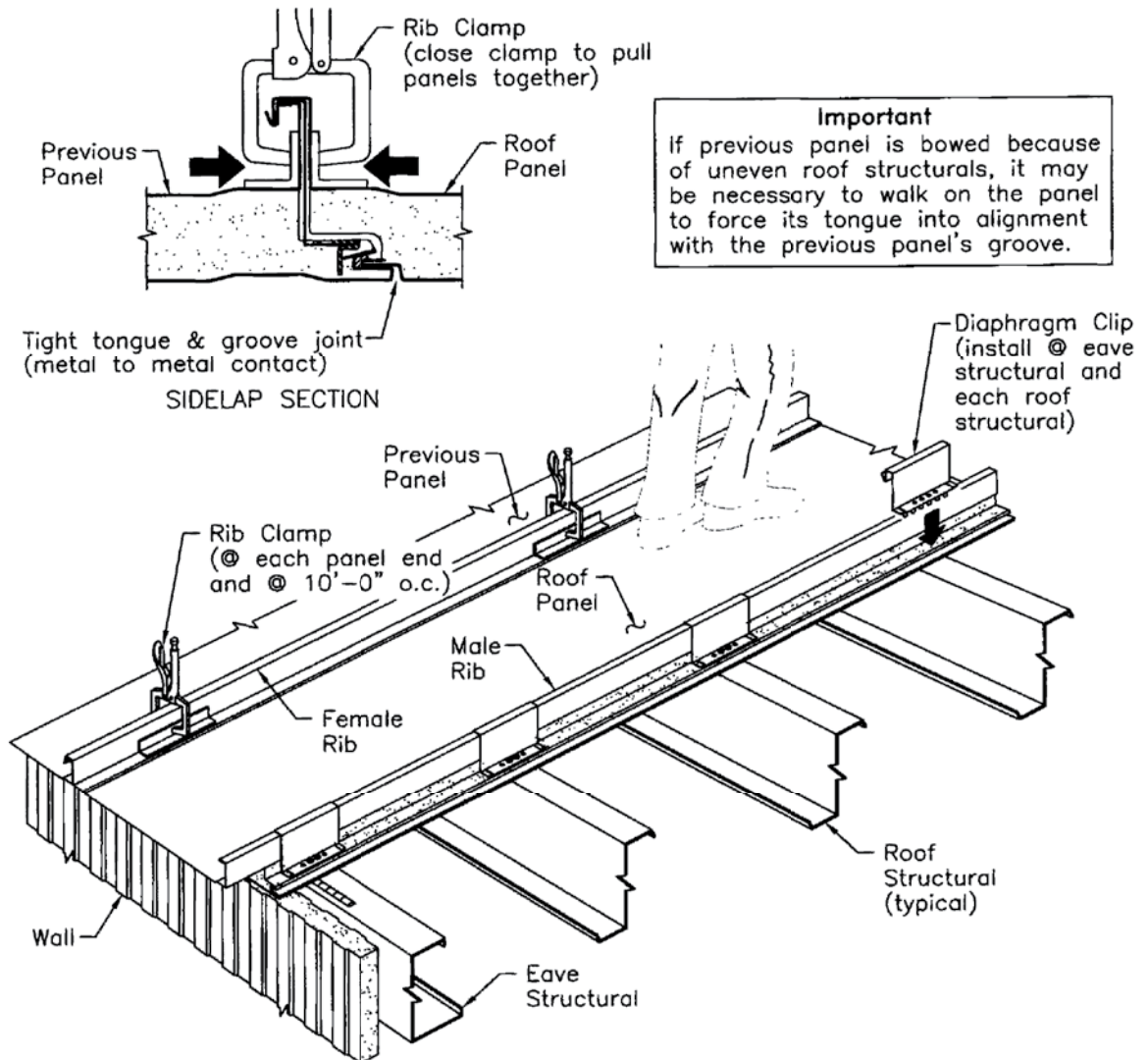


PANEL SIDELAP ENGAGEMENT (with Diaphragm Clip)

1. Remove the paper backing from the seam sealant on the previously installed panel.
2. Carry the roof panel to its position, next to the previous panel.
3. Tilt the panel to hook its female rib over the male rib of the previous panel and into the diaphragm clip's crimping channel.
4. Align the eave end of the panel with the end of the previous panel.
5. Lower and push on the leading edge of the panel so that its tongue engages the groove of the previous panel.

PANEL INSTALLATION

C817.605.1

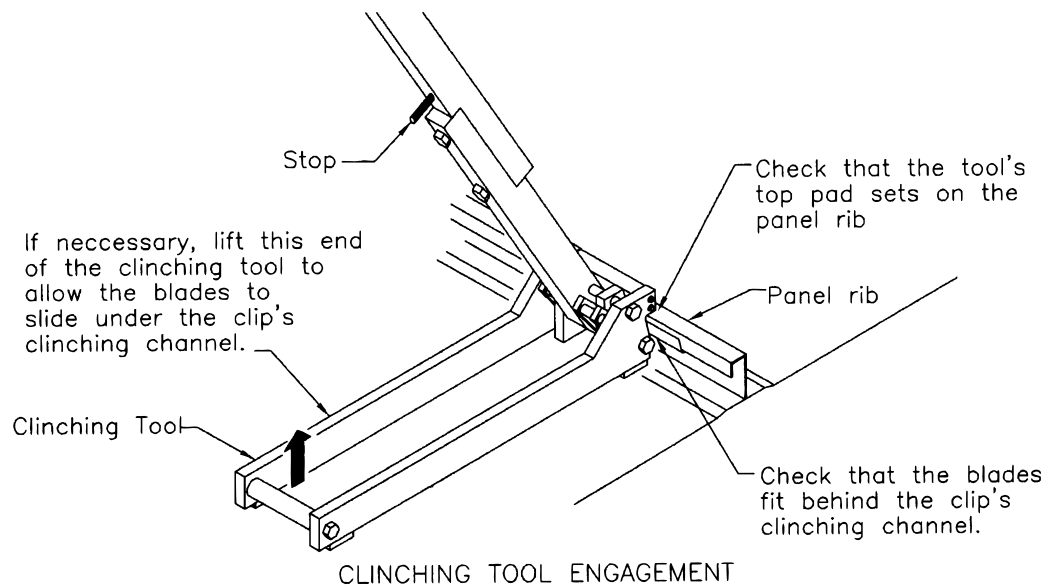
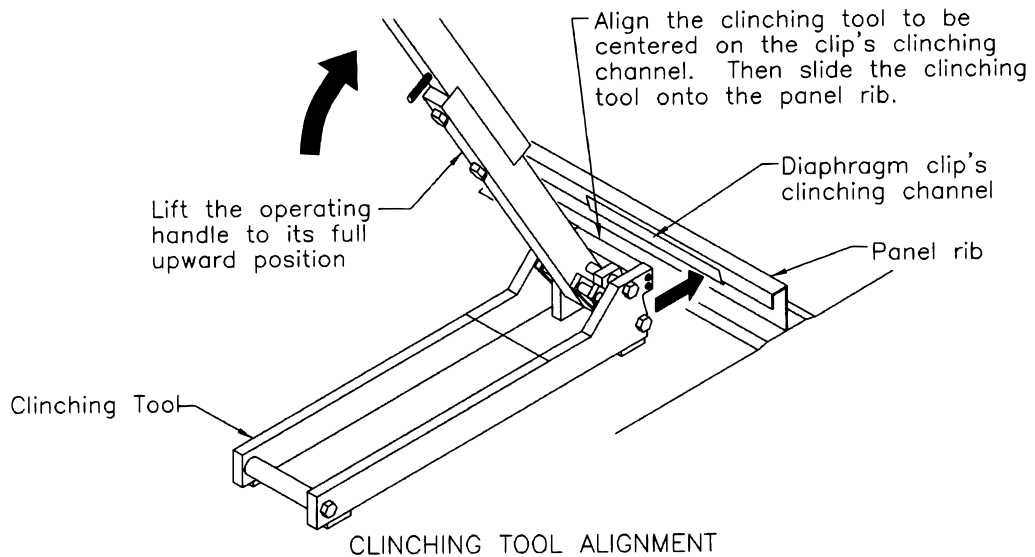


PANEL INSTALLATION (with Diaphragm Clip)

1. Use the rib clamps to pull the panel sidelap together.
2. Check that the panel's tongue and groove joint is fully engaged. Metal to metal contact at the interior face is desired.
3. Important: If the adjacent panels are bowed due to vertical misalignment of the roof structurals or thermal bowing, it may be necessary to walk along the panel's trailing edge to force the panel's tongue into vertical alignment with the previous panel's groove. Then use the rib clamps to pull the panel sidelap completely together.
4. Secure the leading edge of the panel to the eave and roof structurals with the diaphragm clips.

DIAPHRAGM CLIP CLINCHING

C817.606

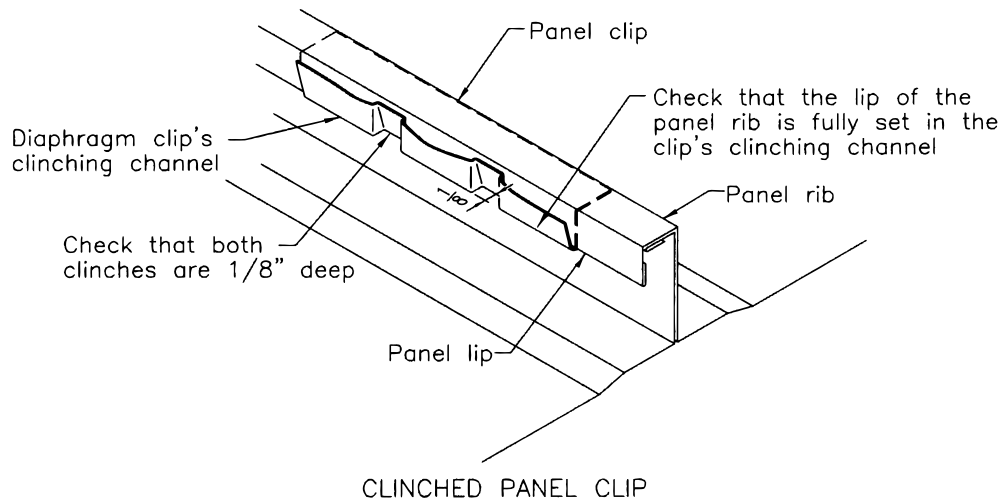
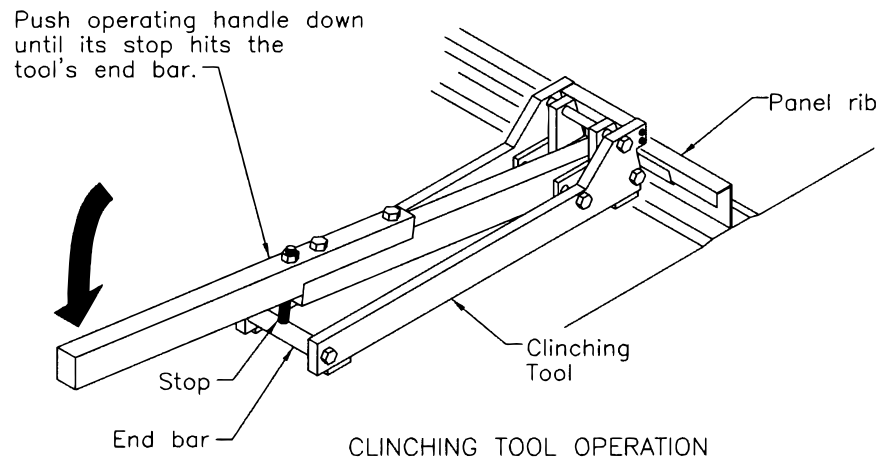


DIAPHRAGM CLIP CLINCHING

1. Each diaphragm clip must be clinched to the roof panel rib. The clinching tool is available from Metl-Span. Do not attempt to use other tools.
2. Align the tool to be centered on the clip's clinching channel.
3. Fully raise the operating handle and slide the tool onto the panel rib.
4. Check that the tool's top pad fits on top of the panel rib and the tool's blade fits behind the clip's clinching channel.

DIAPHRAGM CLIP CLINCHING (CONT.)

C817.607.1

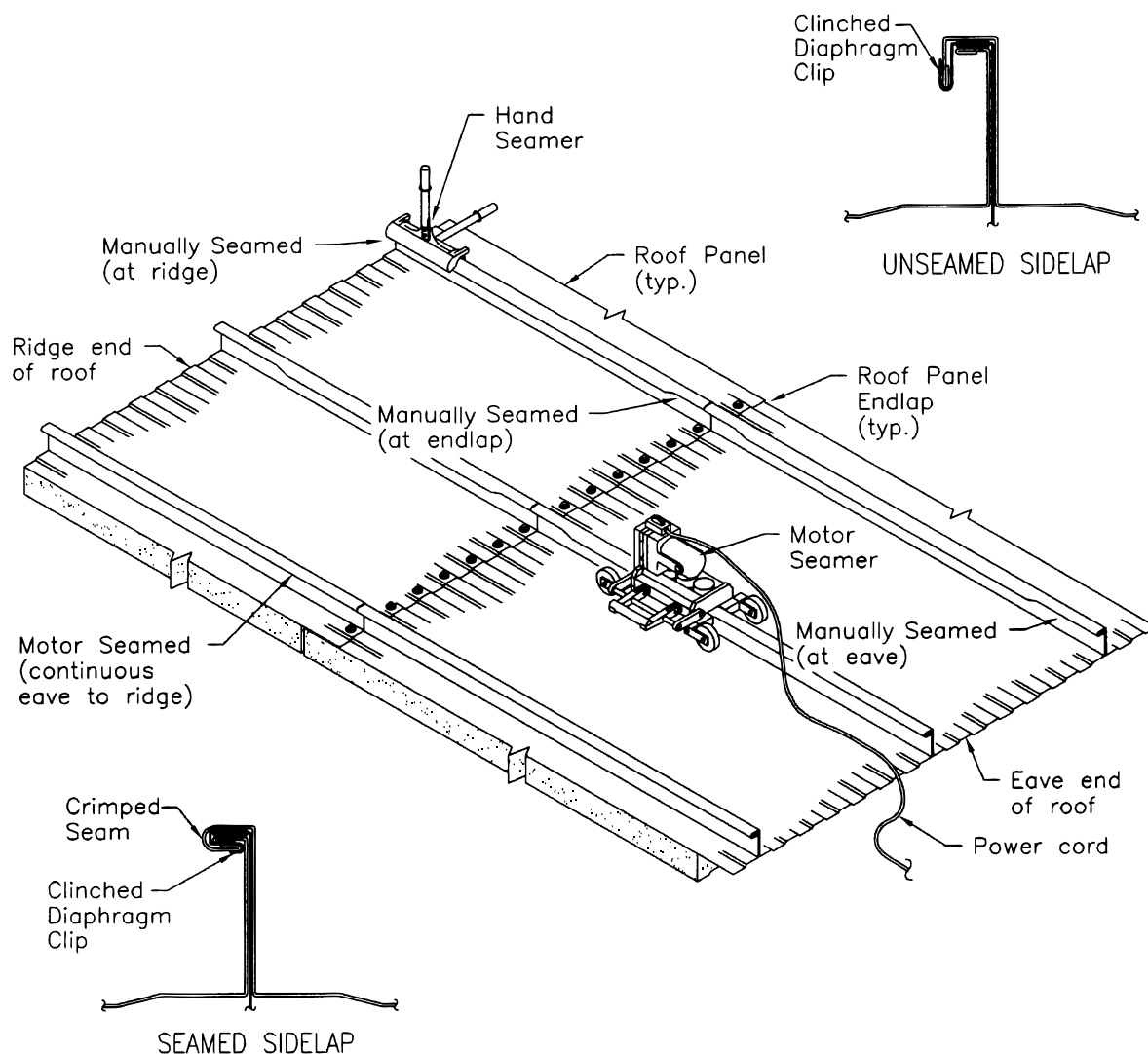


DIAPHRAGM CLIP CLINCHING (continued)

1. When the clinching tool is aligned with the clip and is engaged on the panel rib, push the operation handle down until the stop hits the tool's end bar. This clinches the clip to the panel rib.
2. To disengage the clinching tool, fully raise the tool's operating handle and slide the tool away from the panel rib.
3. Check the clinched clip to assure that the panel rib's lip is in the clip's channel and that both clinches are fully formed to 1/8" deep.

ROOF PANEL SEAMING

C817.608



ROOF PANEL SEAMING (with Diaphragm Clip)

1. Do not seam the roof panel until after the diaphragm clips have been clinched.
2. Use only the Metl-Span manual seamer and motor seamer which have been factory adjusted for use with the diaphragm clips.
3. Using the manual seamer, seam (crimp) the panel ribs at the eave end, endlaps, and ridge end, then using the motor seamer seam the panel ribs continuously from eave to ridge.
4. If the motor seamer stalls (spins) at the diaphragm clips, use the manual seamer to seam the panel rib at each clip location before seaming with the motor seamer.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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