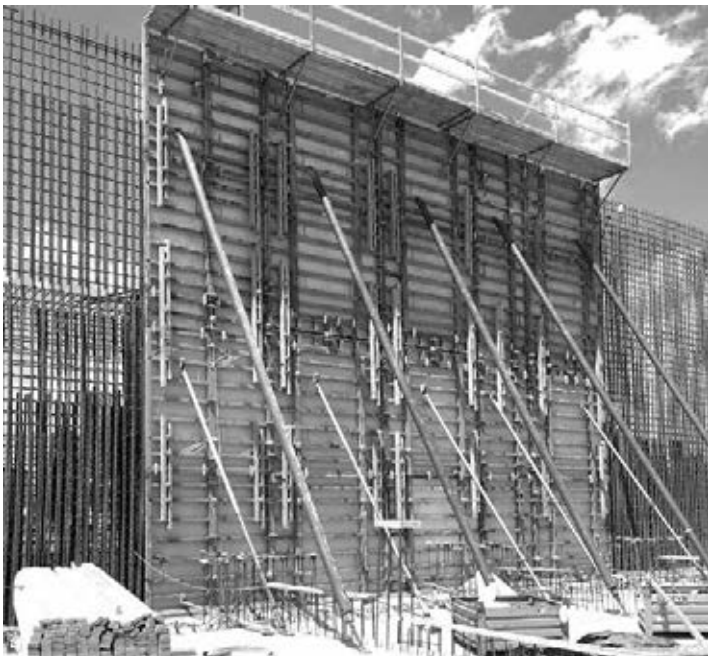
meva

Imperial

Technical Instruction Manual
May 2017



Introduction

Imperial is a crane set modular formwork system suitable for use on civil, commercial, industrial and highway projects.

The panels are composed of strong, durable steel frames and a high grade alkus composite facing that provides an excellent concrete finish. Panels are connected with the MEVA assembly lock which results in fast and efficient assembly with no nuts and bolts.

A complete formwork assembly including accessories weighs about 18 psf. Panels are designed for a maximum lateral concrete pressure of 2025 psf when properly supported.

Imperial panels are available in 4 different heights (12', 8', 4', and 2') and in 8 different widths (8', 4', 3'-6", 3', 2'-6", 2', 1'-6", and 1'). All panels are entirely symmetrical, which simplifies assembly. In addition, 4' wide multi-purpose panels are available in each height. These panels have multi-adjustment profiles for placing ties or column clamps and are ideal for forming 90° corners, columns, pilasters, and connections to existing walls.

Available accessories include pilaster panels, aluminum fillers (1", 2", and 3"), inside (12"x12") and outside corners, push-pull props, and walkway brackets. Threaded nuts built into the panels allow for easy attachment of accessories.

Please check here for the most up to date manual: http://www.mevaformwork.com/en/web-services/down-loads.php

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Safety Rules & Recommendations:

- This manual contains information and instructions on how to use MEVA equipment in a safe and efficient manner. All construction personnel involved with the use of this equipment ("User") must be familiar with the contents of this manual.
- The user is responsible for identifying and complying with all applicable government regulations, codes, and ordinances pertaining to the use of this equipment.
- MEVA equipment must be erected, used, and dismantled in accordance with this manual, safe practices, and all applicable industry standards developed and published by the American Concrete Institute (ACI), the American National Standards Institute (ANSI) and the Occupational Safety and Health Administration (OSHA). Additional workplace safety precautions should be taken where necessary.
- Most examples shown are standard applications that will occur in practice most often. For applications not covered in this manual, please contact your MEVA representative for advice.
- Many of the details in this manual show specific conditions and situations during different stages of assembly and are therefore not always complete. Any equipment or safety accessories not shown in the details must still be used in accordance with all applicable rules and regulations.
- In order to assure proper fit and load capacity, do not combine this equipment with components of other manufacturers unless directed by a MEVA representative.
- The user must inspect all equipment before each use. Never use equipment that is damaged, deformed, or weakened due to wear or corrosion.
- Never oil or wax MEVA assembly locks.
- The user must ensure the stability of all components during all phases of construction.
- For gang formwork, the user should always establish the number and location of lift points to equalize load on lift brackets and ensure that no individual component is overloaded.
- It is the user's responsibility to adjust the pour rate and placement methods in accordance with ACI 347 for the concrete mixture and the specific jobsite conditions at the time of placement so that the specified maximum lateral concrete pressure is never exceeded.
- Certain applications will result in a maximum lateral concrete pressure lower than the system panel capacity. Refer to specific sections of this manual, MEVA application drawings, or consult your MEVA representative.
- When stripping gang formwork, never use the crane to break the concrete bond. Instead, use suitable tools such as pry bars or wood wedges. Secure the lift brackets prior to removal of ties, anchors, and/or bracing.

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The Imperial Panel

Fig. 4.1
Imperial Panel.
Fig. 4.2
The steel frames are manufactured of closed profiles which are welded in mitered joints. These profiles are provided with a groove and an integrated protection for the forming face.
Fig. 4.3
Tie hole with conical anchor sleeve (see page 13).
Fig. 4.4
Pioneering panel connection with MEVA assembly lock (see page 7).
Fig. 4.5
The tie-off bar allows safe working on the formwork. Under no circumstances should panels be lifted or moved using these tie-off bars. Tie-off bars should only be used with suitable Positioning Device Systems as described in OSHA 1926-502(e), supplied by others.
Fig. 4.6
The cross stiffeners are also made of closed profiles.
Fig. 4.7
Fast and safe attachment of accessory parts at the multi-function profile with Dywidag-threaded nuts.
Fig. 4.8
The bump notch is designed to facilitate shifting and lifting of panels (especially large size panels).
Fig. 4.9
Transportation holes are used to attach the lifting hook 60, allowing stacked panels to be moved at ground or slab level (see pages 57 & 58).
8 transportation holes all around the panel permit easy preassembly of gangs.

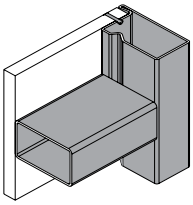


Fig. 4.2

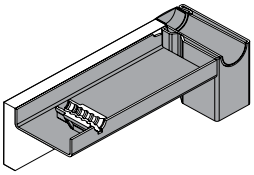


Fig. 4.3

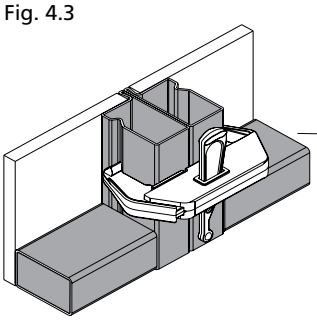
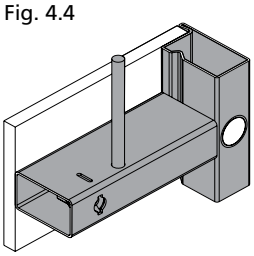


Fig. 4.4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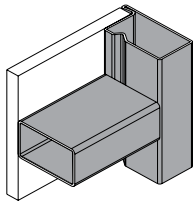
Fig. 4.6

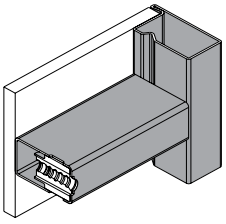
Fig. 4.7

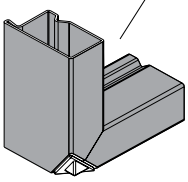
Fig. 4.8

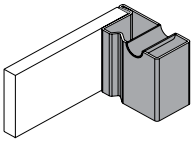
Fig. 4.9

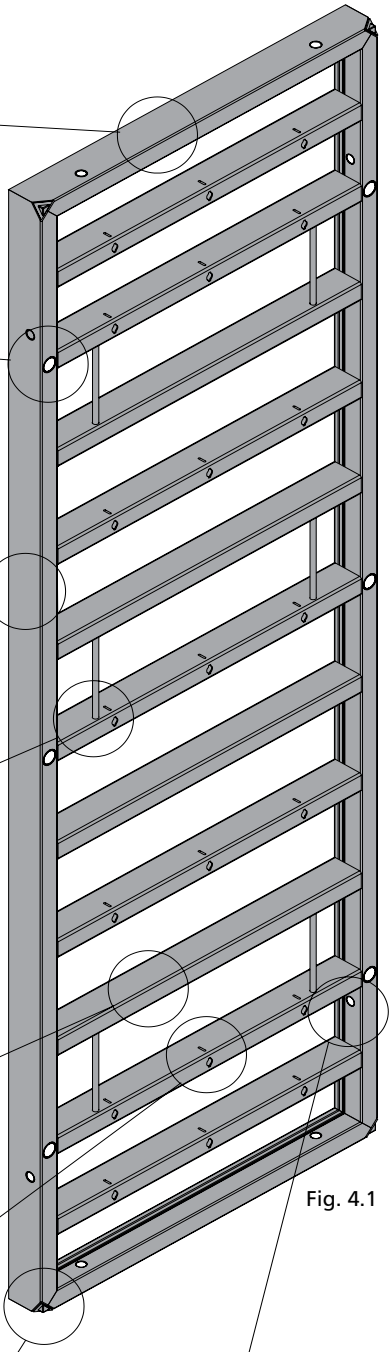
Fig. 4.1

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Multi-purpose Panels

The multi-purpose panels are ideal for forming 90° corners, columns, pilasters, bridge abutments and connections to existing walls.

The panels are provided with multi-adjustment profiles where column clamps or ties are mounted (Fig. 5.1).

The 12′ panels have 3 multi-adjustment profiles, the 8′ panels have 2 multi-adjustment profiles and the 4′ and 2' panels have 1 multi-adjustment profile.

Plug the unused tie holes with Plug D36.

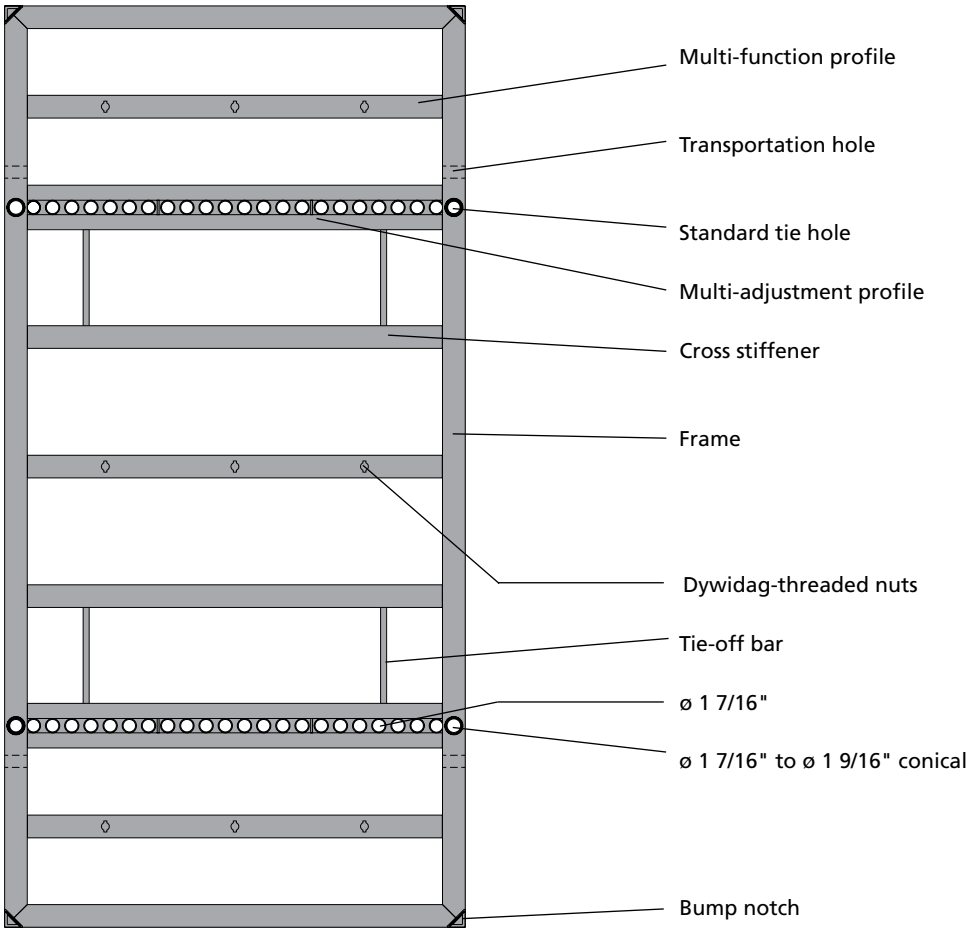


Fig. 5.1

Description	Ref.-No.
I-multi-purpose panels	
12′ x 4′	**23-300-25**
8′ x 4′	**23-302-25**
4′ x 4′	**23-304-25**
2′ x 4′	**23-305-25**
Plug D36	**29-902-65**

The alkus Sheet

The poly-propylene and aluminum composite forming face has all the positive properties of plywood plus important advantages: longer life span, greater load-bearing capacity, better nail-holding ability, fewer and easier repairs, 100 % recyclability.
Besides the obvious advantages, such as considerably reduced cleaning effort, minimum consumption of release agent and an excellent concrete finish, alkus offers substantial ecological benefits. Substituting plastic for wood saves valuable timber resources. Also, the release of highly toxic dioxin is avoided, which is released in the process of burning plywood (that is bonded with phenolic resin). Used or damaged alkus plastic sheets can be recycled into the same product. It is 100% recyclable, and the manufacturer guarantees reacceptance.

Frame profile + plywood face

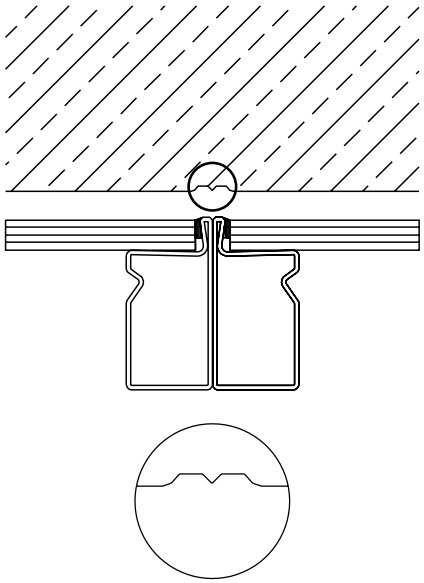


Fig. 6.1: Negative impression in the concrete when using panels with a conventional plywood face

Frame profile + alkus sheet

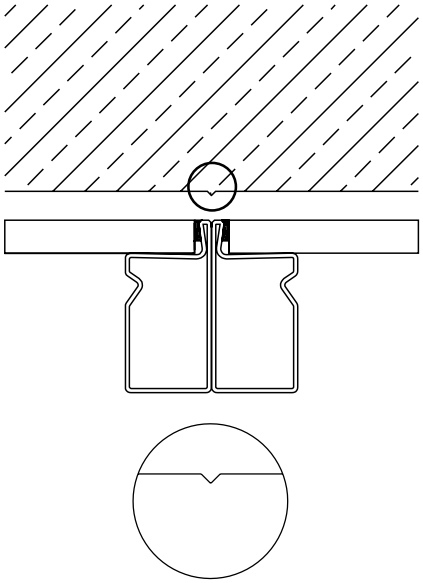


Fig. 6.2: Smooth and even concrete surface as there is no projecting profile of the panel frame

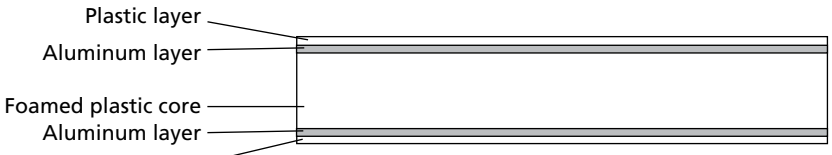


Fig. 6.3: Composite alkus plastic sheet structure

Panel Connection

The panels are connected quickly and efficiently with the M-assembly lock regardless of their orientation (Fig. 7.1, 7.2). The lock can be attached on the frame at any position, and its 5-point contact not only draws the panels together but aligns them as well. Only a few hammer blows are needed to create a safe connection with perfect alignment. Since the lock weighs only 6.6 lbs. it can be handled easily.

Standard lock requirements are shown in Figure 7.4. Additional locks are required for columns and outside corners (refer to respective sections for details).

Panels with aluminum or wood fillers in between are connected with the uni-assembly lock 28, which can accommodate a maximum filler width of 6" (Fig. 7.5).

Fig. 7.1 M-assembly lock

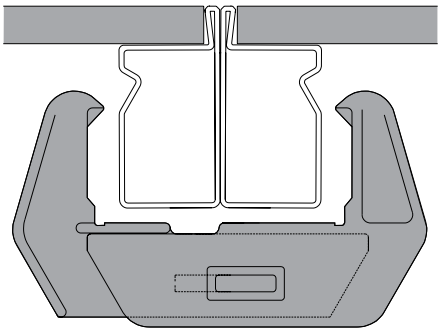


Fig. 7.2 M-assembly lock

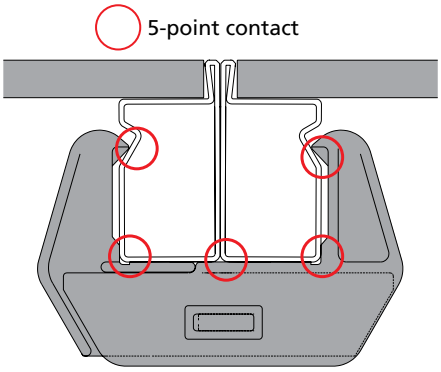


Fig. 7.3 M-assembly lock

Standard Lock Requirements	
Panel Edge Length	Number of Locks
12'	3
8'	2
4' thru 1'-6"	2
1'	1

Fig. 7.4

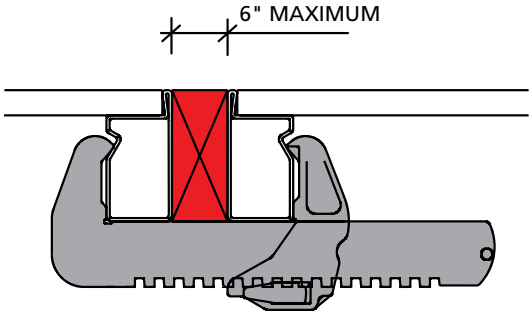
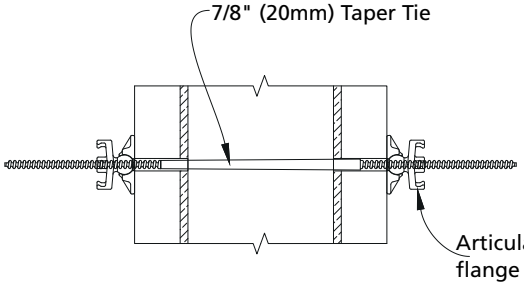


Fig. 7.5 Uni-assembly lock 28

Description	Ref.-No.
M-assembly lock	29-400-71
Uni-assembly lock 28	29-400-90

Tie Systems

Description	Ref.-No.
Articuated flange nut 20/140	**29-900-05**
7/8" (20mm) Taper Tie Stock Sizes	
16/41 - 16" Taper length, 41" Overall	**2-500-78-16/41**
24/49 - 24" Taper length, 49" Overall	**2-500-78-24/49**
32/57 - 32" Taper length, 57" Overall	**2-500-78-32/58**
42/63 - 42" Taper length, 63" Overall	**2-500-78-42/63**
52/78 - 52" Taper length, 78" Overall	**2-500-78-52/78**

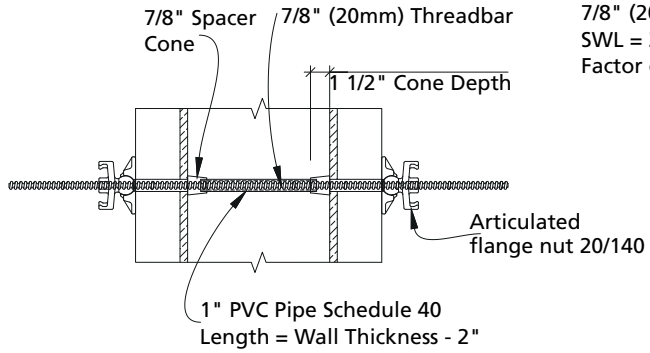


7/8" (20mm) Taper Tie
SWL = 32.5 KIPS
Factor of Safety = 2:1

NOTE: When using taper ties in walls over 15' high, the max. lateral concrete pressure is 1900 psf

Fig. 8.1 - 7/8" (20mm) Taper Tie, 1 1/4" to 1"

Description	Ref.-No.
Rental	
7/8" (20mm) Threadbar 18"	**2-500-B20F-18**
7/8" (20mm) Threadbar 42"	**2-500-B20F-42**
7/8" (20mm) Threadbar 54"	**2-500-B20F-54**
7/8" (20mm) Threadbar 72"	**2-500-B20F-72**
Articuated flange nut 20/140	**29-900-05**
7/8" Batter Washer	**2-500-B20F35210**
Purchase	
7/8" (20mm) Plastic Spacer Cone	**2-500-B20F86010**
1 1/4" Strip. Tool for 7/8" Spacer Cone	**2-500-B20F86015**
1" PVC Schedule 40 Pipe X 20ft	**2-500-2990246**

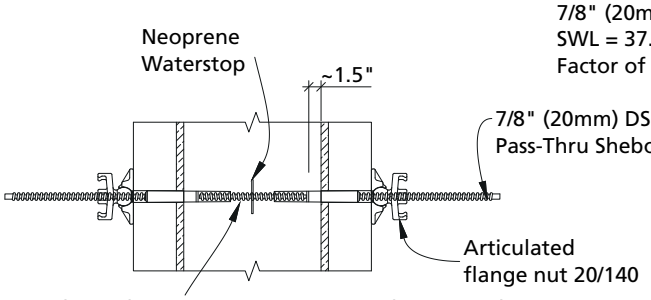


7/8" (20mm) Threadbar
SWL = 39.2 KIPS
Factor of Safety = 2:1

Fig. 8.2 - 7/8" (20mm) Threadbar

Description	Ref.-No.
Rental	
7/8" (20mm) Euro Shebolt 19"	**2-500-B20F38019**
Articuated flange nut 20/140	**29-900-05**
Purchase	
7/8" (20mm) Threadbar 19.5'	**2-500-B20F-19.5**
7/8" (20mm) Neoprene Waterstop	**2-500-B20F34500**

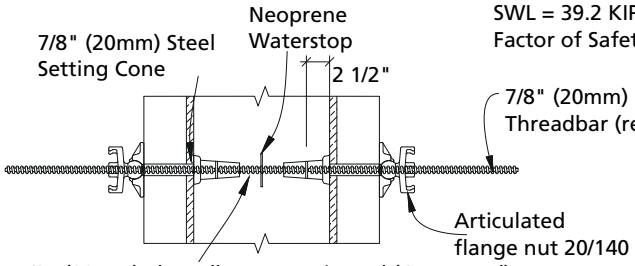
NOTE: Additional 3/4" of taper remaining beyond face of panel. Setback could be safely increased to 1 1/2" each side. Thread engagement = 2 1/2"



7/8" (20mm) Euro Shebolt
SWL = 37.5 KIPS
Factor of Safety = 2:1

Fig. 8.3 - 7/8" (20mm) Euro Shebolt

Description	Ref.-No.
Rental	
7/8" (20mm) Steel Setting Cone	**2-500-B20F-30340**
7/8" (20mm) Threadbar 18"	**2-500-B20F-18**
Articuated flange nut 20/140	**29-900-05**
Purchase	
7/8" (20mm) Threadbar 19.5'	**2-500-B20F-19.5**
7/8" (20mm) Neoprene Waterstop	**2-500-B20F34500**



7/8" (20mm) Steel Setting Cone
SWL = 39.2 KIPS
Factor of Safety = 2:1

Fig. 8.4 - 7/8" (20mm) Steel Setting Cone

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System Panel Sizes

High degree of flexibility

The formwork is extended in height using panels assembled vertically or horizontally on top of the lower panels. The wide range of panel heights and widths ensures:

- Economical height extension in 6" increments through combined horizontal and vertical assembly.
- Uniform joint grid.

Vertical joints:

For 2' and 4' high panels, you need just one 7/8" (20 mm) tie.

The 8' high panels require 2 ties and the 12' high panels require 3 ties.

In general, all tie positions predetermined by the system must be used.

Panel height: 12'

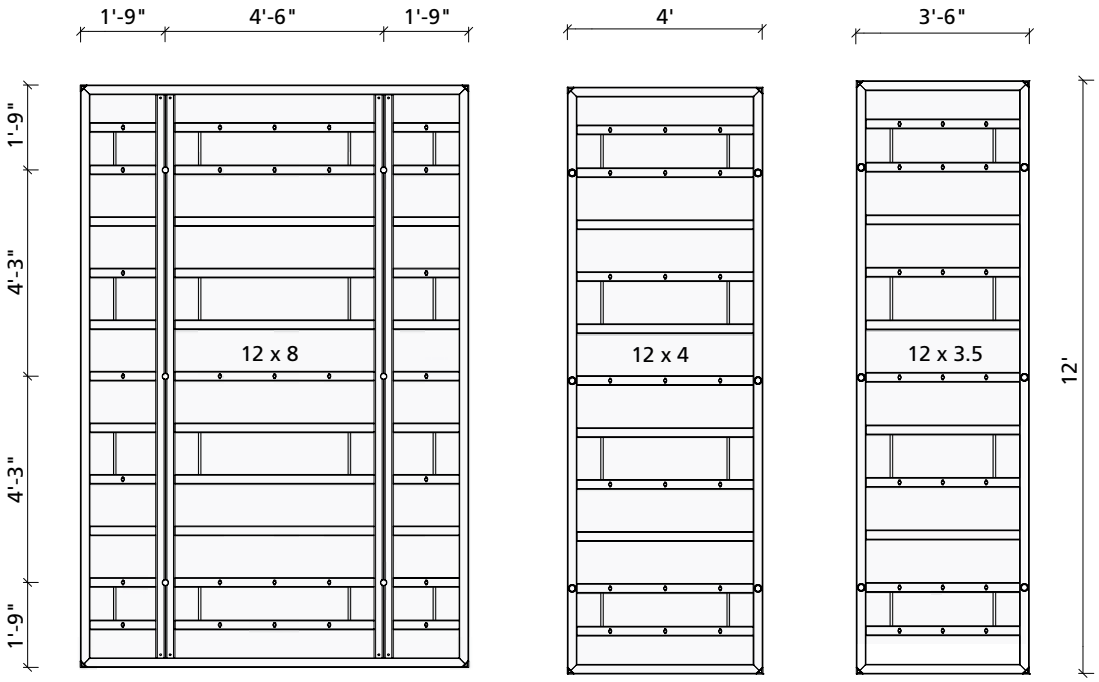

Fig. 9.1 Fig. 9.2 Fig. 9.3

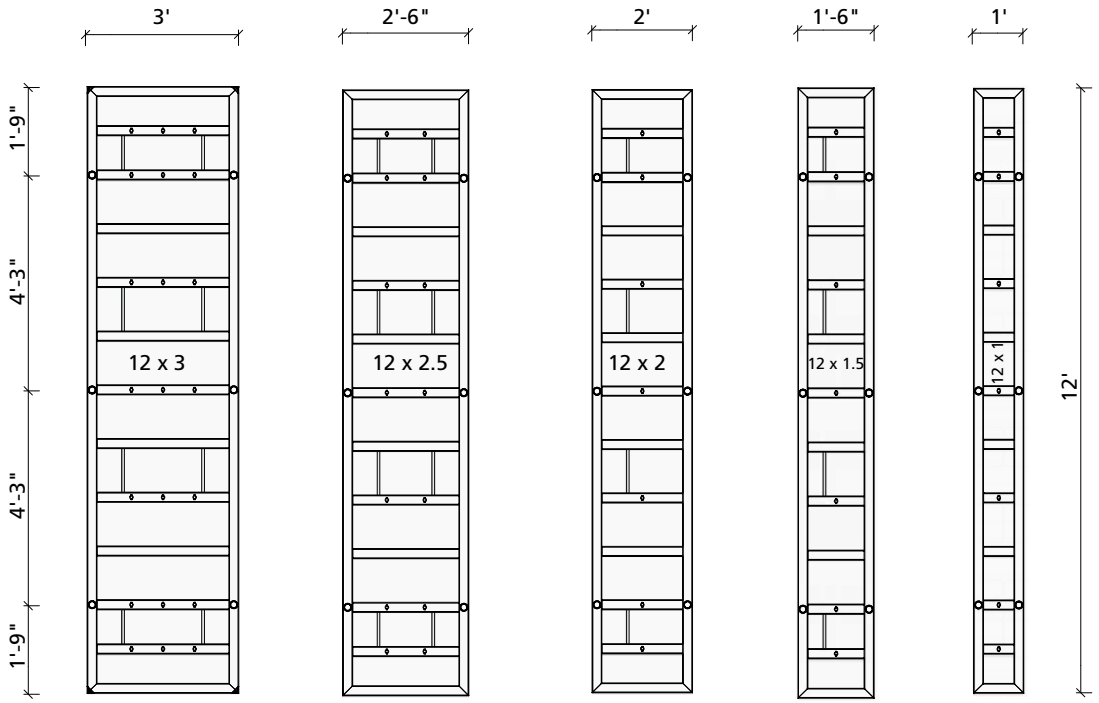

Fig. 9.4 Fig. 9.5 Fig. 9.6 Fig. 9.7 Fig. 9.8

System Panel Sizes

High degree of flexibility

The formwork is extended in height using panels assembled vertically or horizontally on top of the lower panels. The wide range of panel heights and widths ensures:

- Economical height extension in 6” increments through combined horizontal and vertical assembly.
- Uniform joint grid.

Panel height: 8’

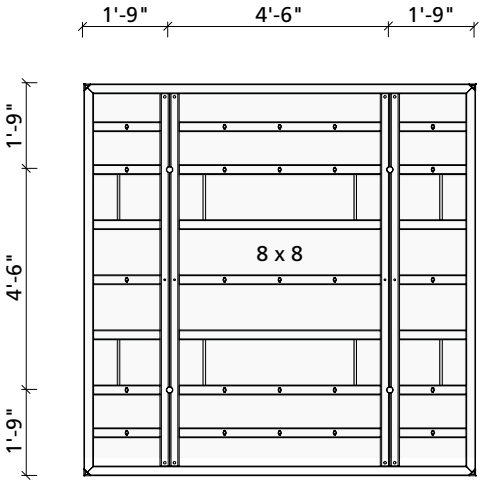

Fig. 10.1

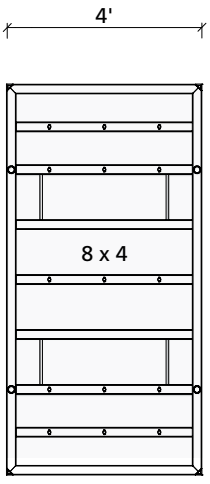

Fig. 10.2

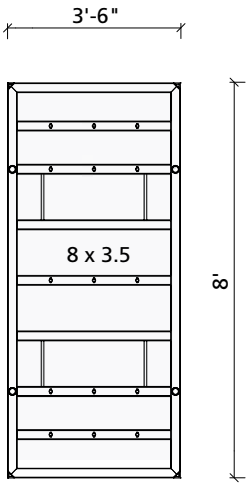

Fig. 10.3

Vertical joints:

For 2’ and 4' high panels, you need just one 7/8” (20 mm) tie.

The 8’ high panels require 2 ties and the 12’ high panels require 3 ties.

In general, all tie positions predetermined by the system must be used.

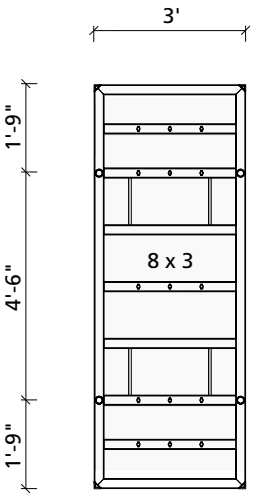

Fig. 10.4

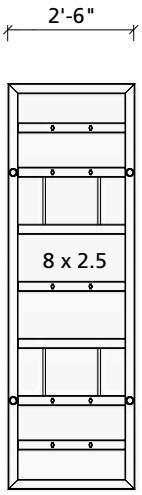

Fig. 10.5

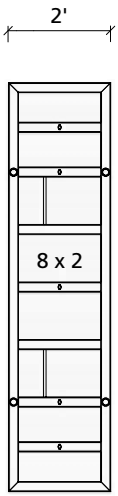

Fig. 10.6

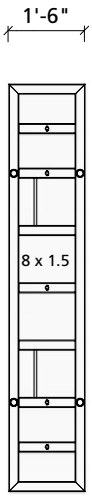

Fig. 10.7

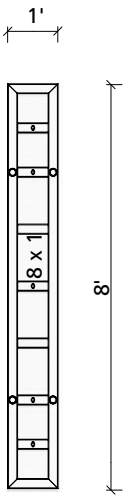

Fig. 10.8

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System Panel Sizes

High degree of flexibility

The formwork is extended in height using panels assembled vertically or horizontally on top of the lower panels. The wide range of panel heights and widths ensures:

- Economical height extension in 6” increments through combined horizontal and vertical assembly.
- Uniform joint grid.

Vertical joints:

For 2’ and 4' high panels, you need just one 7/8” (20 mm) tie.

The 8’ high panels require 2 ties and the 12’ high panels require 3 ties.

In general, all tie positions predetermined by the system must be used.

Panel height: 4’

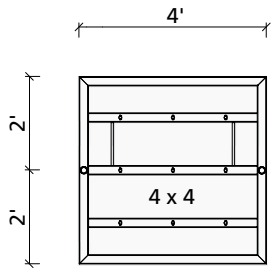


Fig. 11.1

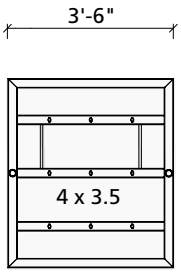


Fig. 11.2

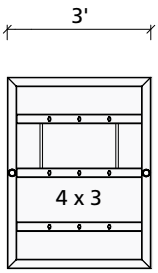


Fig. 11.3

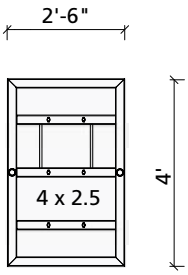


Fig. 11.4

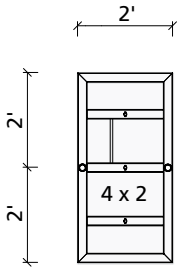
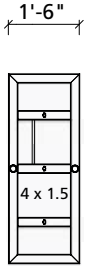


Fig. 11.5



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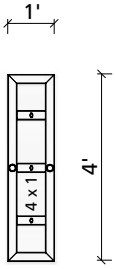

Fig. 11.7

Panel height: 2’

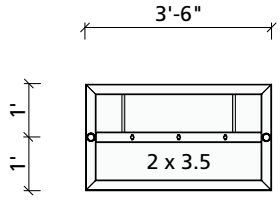

Fig. 11.8

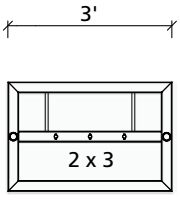

Fig. 11.9

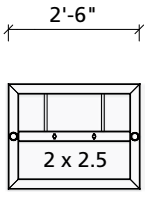

Fig. 11.10

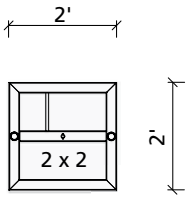

Fig. 11.11

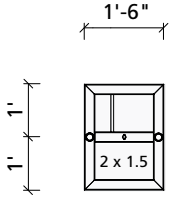

Fig. 11.12

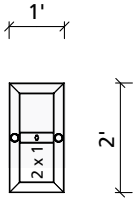

Fig. 11.13

System Panel Sizes

High degree of flexibility

The formwork is extended in height using panels assembled vertically or horizontally on top of the lower panels. The wide range of panel heights and widths ensures:

- Economical height extension in 6” increments through combined horizontal and vertical assembly.
- Uniform joint grid.

Vertical joints:

For 2’ and 4' high panels, you need just one 7/8” (20 mm) tie.

The 8’ high panels require 2 ties and the 12’ high panels require 3 ties.

In general, all tie positions predetermined by the system must be used.

Multi-purpose panels:

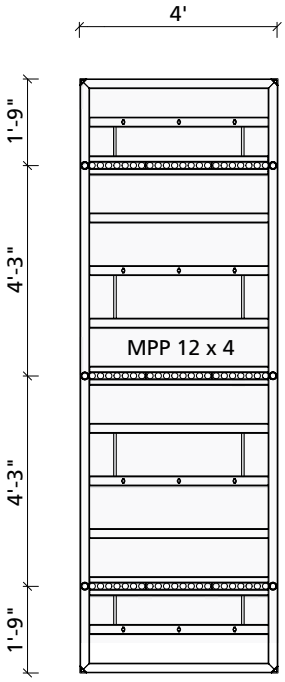

Fig. 12.1

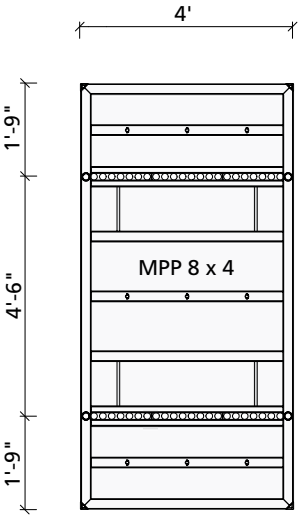

Fig. 12.2

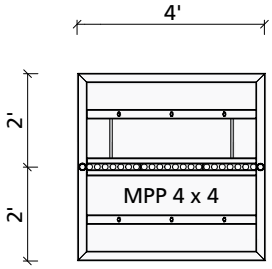

Fig. 12.3

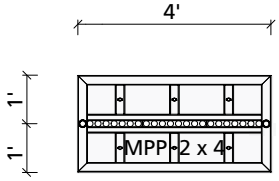

Fig. 12.4

Tie Placement

The conical anchor sleeves, where the ties can be inserted, are located inside the panel frame. The conical shape (Fig. 13.4) allows one or both sides of the wall to be inclined. In order to secure the formwork against uplift it has to be anchored to the foundation using shoe plates or other means.

Please note:
If two panels of different widths are assembled side by side, the ties should be placed through the panel with the larger width (Fig. 13.5). When using Uni-tie claws (used only with threadbars), the ties can be placed at the outside edge of the panels. For example; when forming bulkheads, or directly above the panels when forming foundations. Do not use ties as a means of supporting bulkheads, or in any other applications where shear load is applied, unless approved by MEVA.

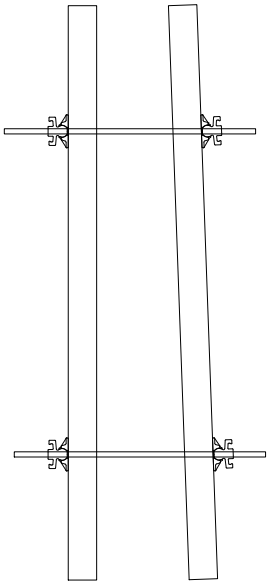

Fig. 13.1

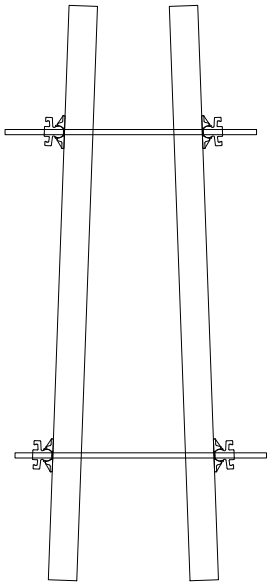

Fig. 13.2

Maximum Incline		
Tie System	Angle [α]	Ratio [x:12]
Taper Tie 1 1/4" to 1"	3°	5/8 : 12
7/8" Threadbar	7°	1 7/16 : 12

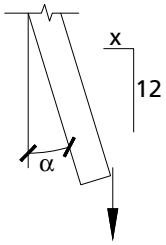

Fig. 13.3

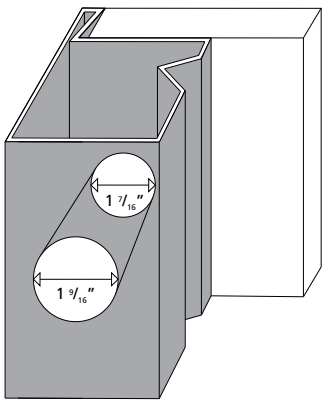

Fig. 13.4

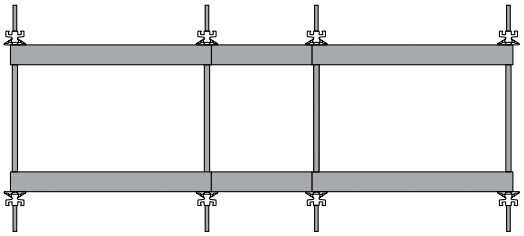

Fig. 13.5

Description	Ref.-No.
Plug D36.....	**29-902-65**
Spanner SW 36.....	**29-800-15**

Stacking Panels

For stacked panel conditions where the top of concrete is ≤ 1' above the panel below, it is not necessary to install ties in the top panel (Fig. 14.1), unless a walkway bracket is attached or the panel below is 2' or 4' high. If a walkway bracket is attached to the top panel, install ties in the upper tie holes.

For stacked panel conditions where the top of concrete is > 1' but ≤ 1'-6" above the panel below, it is not necessary to install ties in the bottom tie holes of the top panel (Fig. 14.2), unless the panel below is 2' or 4' high.

For stacked panel conditions where the top of concrete is > 1'-6" above the panel below (Fig. 14.3), and for all conditions where the panel below is 2' or 4' high, ties must be installed in all tie holes.

Vertical steel rails must be installed across stacked panel joints for lifting gang forms. See the "Gang Forming" section for additional information (Vertical rails shown in Figures on pages I-14 & I-15 are required for crane ganging only, and are not required for concrete pressures).

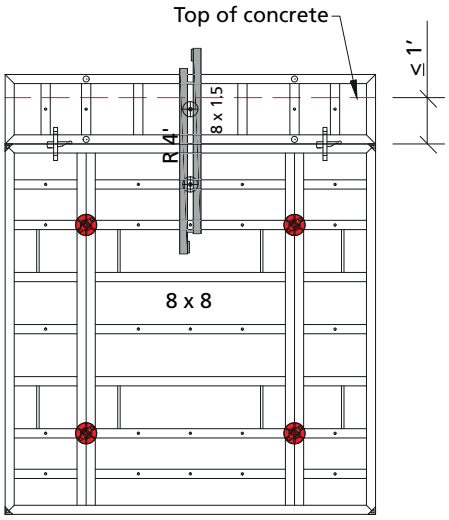

Fig. 14.1

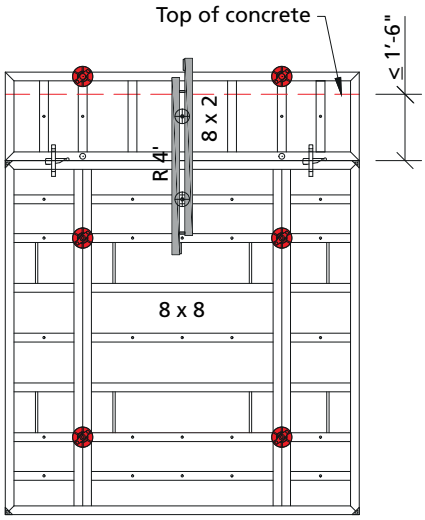

Fig. 14.2

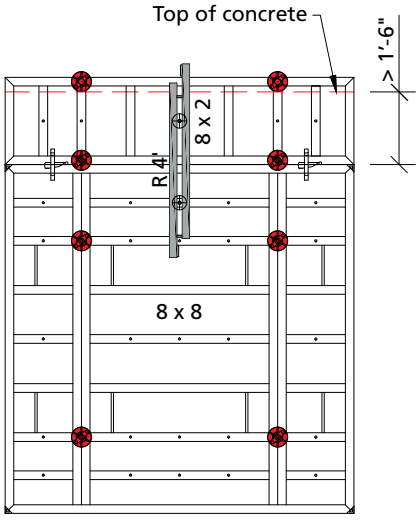

Fig. 14.3

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Stacking Panels - Typical Examples

These figures show typical examples of how panels can be stacked to achieve different formwork heights. For special applications not covered in these examples, or other manual sections, contact your MEVA representative.

Vertical steel rails must be installed across stacked panel joints for lifting gang forms. See the "Gang Forming" section for additional information (Vertical rails shown in Figures on pages I-14 & I-15 are required for crane ganging only, and are not required for concrete pressures).

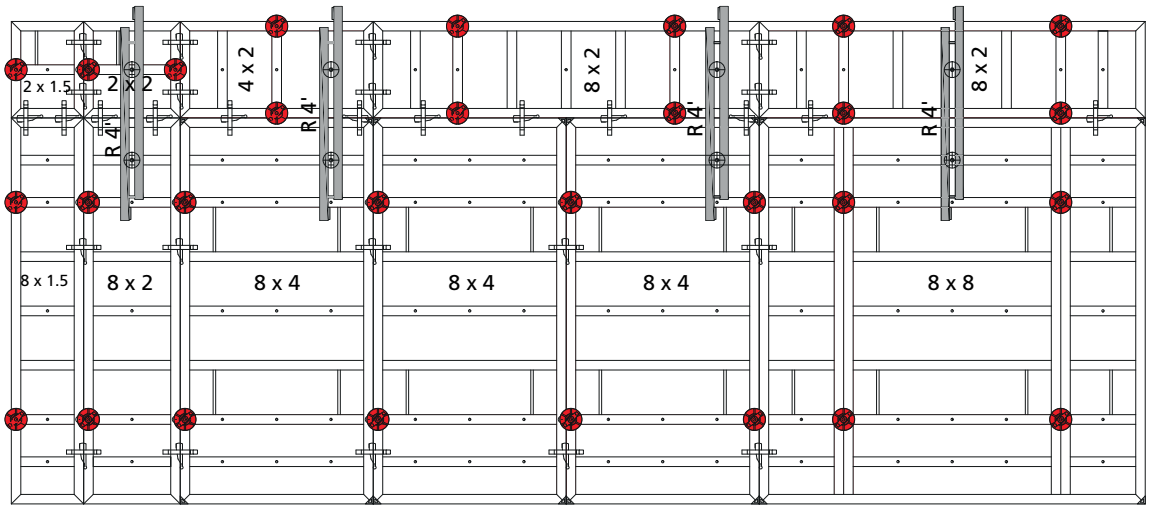

Fig. 15.1 Formwork 10' high

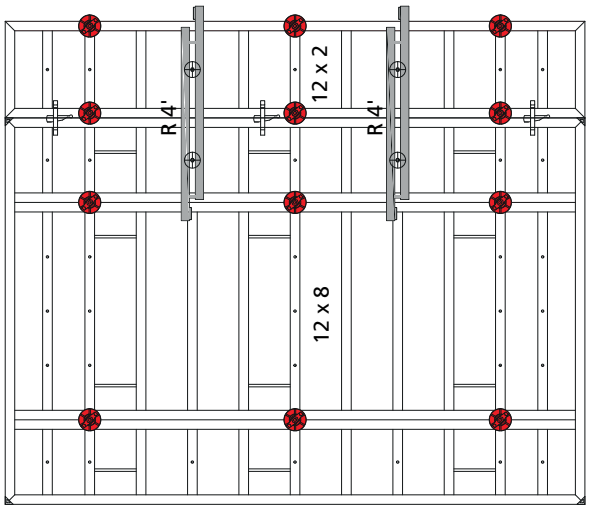

Fig. 15.2 Formwork 10' high using 12' panels

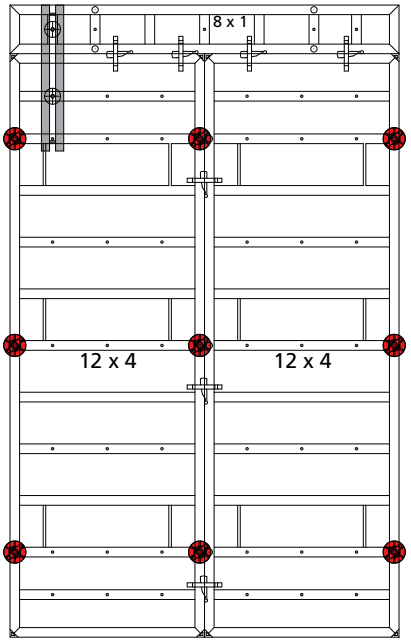

Fig. 15.3 Formwork 13' high

Stacking Panels - Typical Examples

These figures show typical examples of how panels can be stacked to achieve different formwork heights. For special applications not covered in these examples, or other manual sections, contact your MEVA representative.

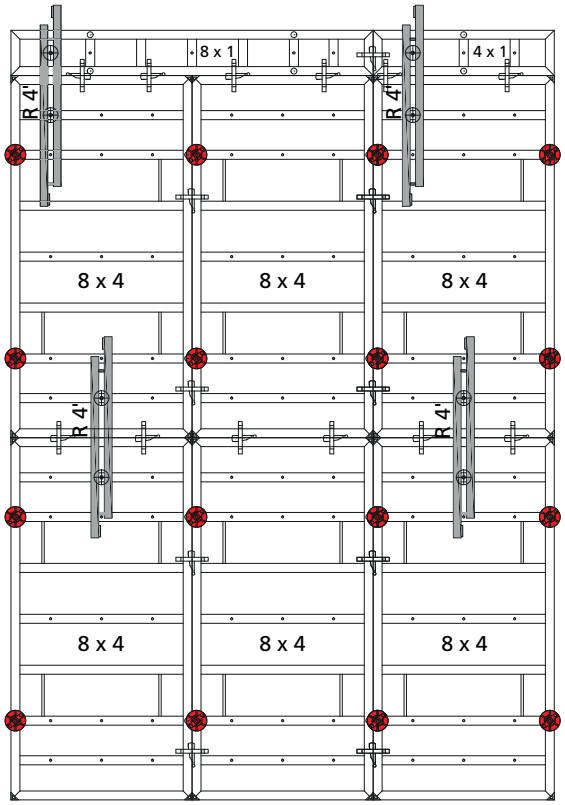

Fig. 16.1 Formwork 17' high

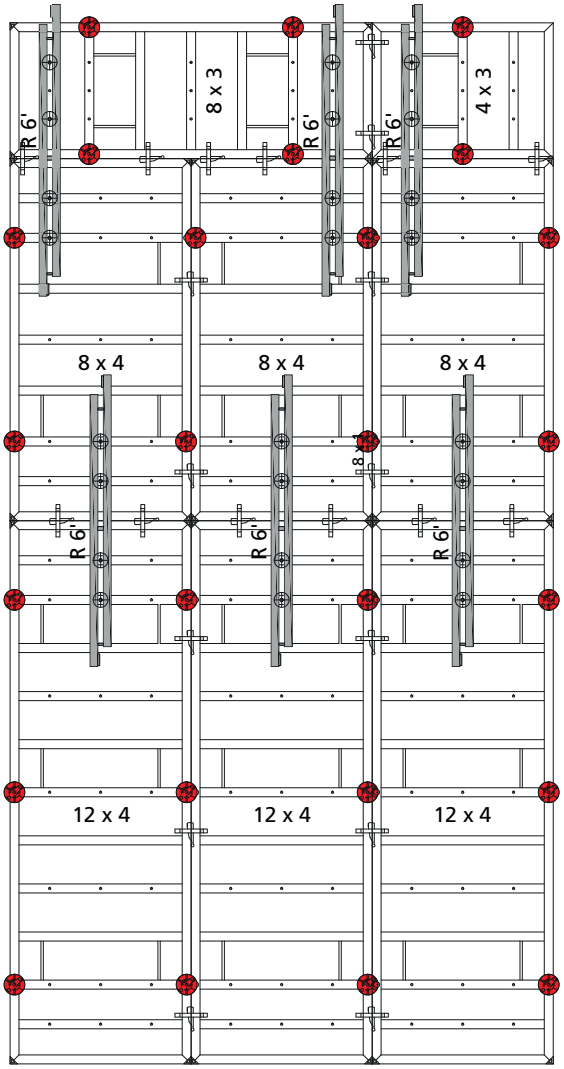

Fig. 16.2 Formwork 22' high

90° corners

Imperial Inside Corners

The Imperial inside corner is provided with tie holes, and consists of a steel frame and a replaceable steel face that is protected with a plastic coating (Fig. 17.1) or alkus facing. The width of each side is 1' (Fig. 17.2).
Imperial fillers (1", 2", and 3") are used to make adjustments for different wall thicknesses. Steel rails may be required depending on the filler/ tie configuration (see the "Fillers" section) and the wall thickness.
There are two ways to form 90° outside corners: with standard panels and outside corners, or with multi-purpose panels.

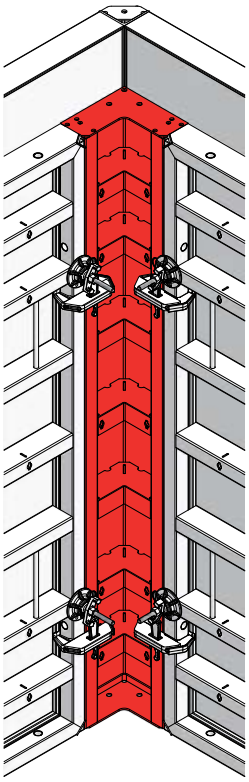

Fig. 17.1

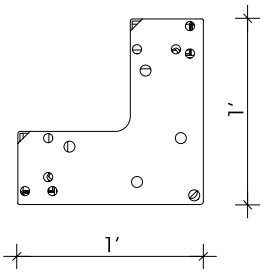

Fig. 17.2

Imperial Outside Corners

The outside corners (Fig. 17.3, 17.4) are connected to adjacent panels with assembly locks, but require more assembly locks than the standard panel connections. Steel rails may also be required. See the "Standard Panels and Outside Corners" section for specific requirements.

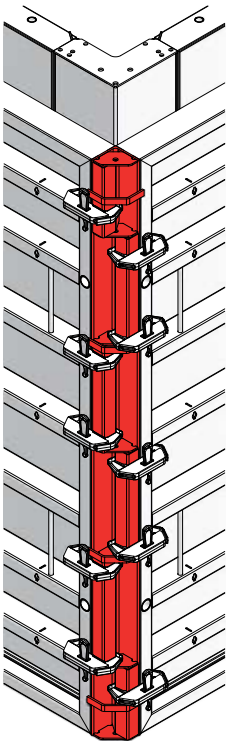

Fig. 17.3

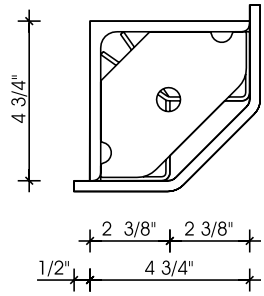

Fig. 17.4

Description	Ref.-No.
I-inside corners	
12' x 1'	**23-306-50**
8' x 1'	**23-306-60**
4' x 1'	**23-306-70**
I-outside corners	
12'	**23-306-00**
8'	**23-306-10**
4'	**23-306-20**
M-assembly lock	**29-400-71**
Uni-assembly lock 28	**29-400-90**

90° corners

Standard Panels and Outside Corners

The connection and rail support requirements for outside corner assemblies depend on the wall thickness.

For wall thicknesses ≤ 9", additional locks are required at the outside corner connections only (Fig. 18.1).

For wall thicknesses > 9" but ≤ 12", additional locks are required at the outside corner connections and at adjacent panel joints near the corner (Fig. 18.2).

For wall thicknesses > 12" but ≤ 21", additional locks are required at the outside corner connections and at adjacent panel joints near the corner (Fig. 18.3). Steel rails must also be mounted at all tie elevations except the top one with at least two flange screws each and bolted together at the corner with a flange screw 18 and flange nut 100. Rails are not installed on 2' high panels due to interference with lock installation on the outside corner. There must be at least one panel (1' or wider) adjacent to the outside corner panels and inside corner.
Flange screws securing rails to panels shall be tightened by turning with a hammer claw or bar until snug, followed by a few hammer blows (minimum 160 ft-lbs torque).

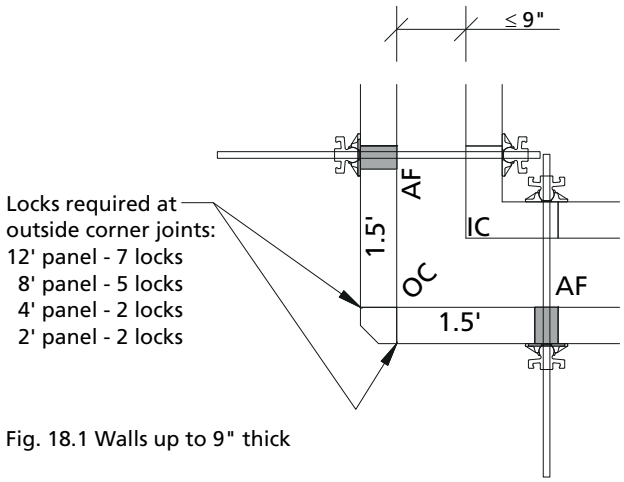

Fig. 18.1 Walls up to 9" thick

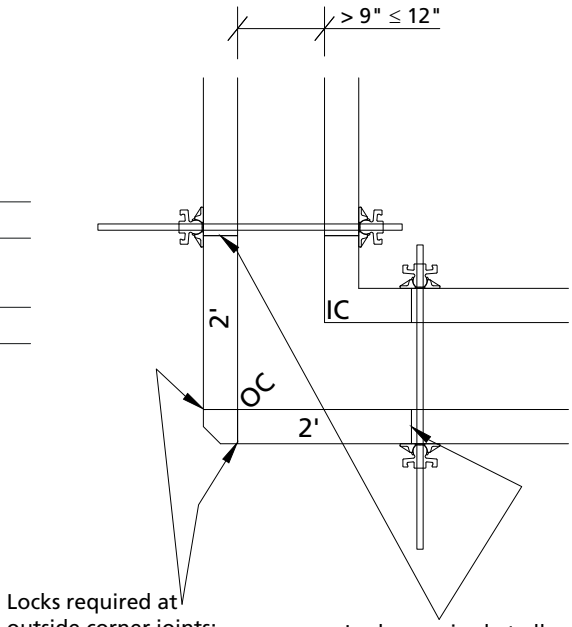

Fig. 18.2 Walls > 9" but ≤ 12" thick

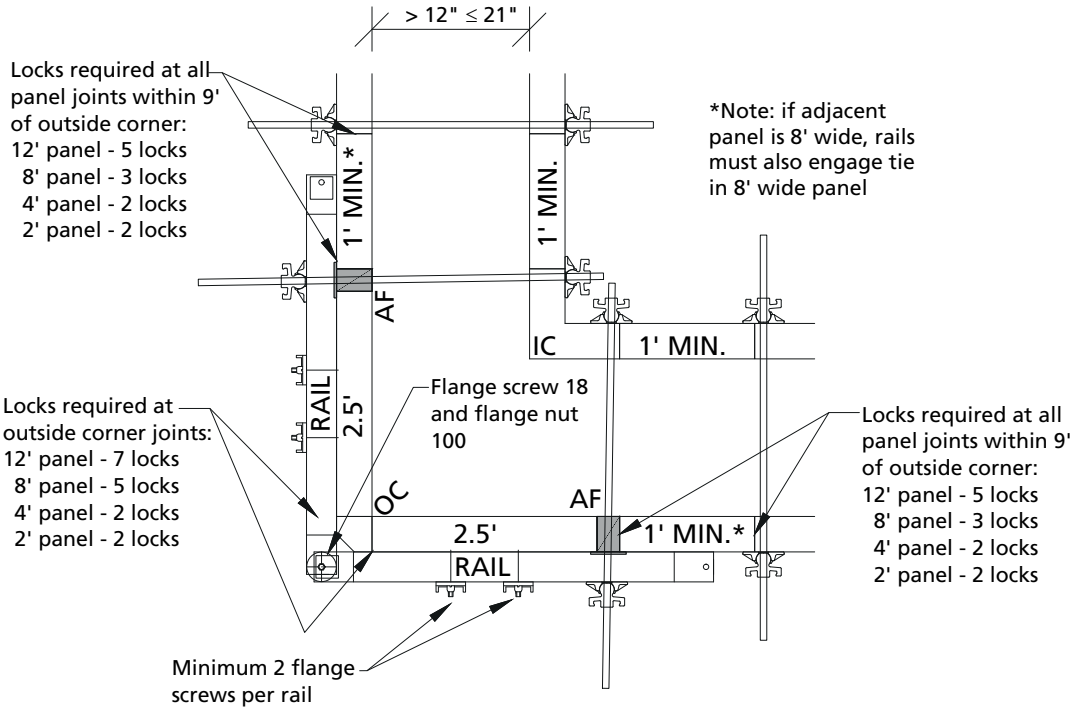

Fig. 18.3 Walls > 12" but ≤ 21" thick

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90° corners

Wall thicknesses > 21" but ≤ 27" also require steel rails at all tie elevations except the top one, and additional locks at the outside corners and nearby panel joints. At least three flange screws are required on each rail (Fig. 19.1), and the panels adjacent to the inside corner and outside corner panels must be at least 2.5' wide. Rails are not installed on 2' high panels.

An example corner elevation for walls > 21" but ≤ 27" thick is shown in Figure 19.2.

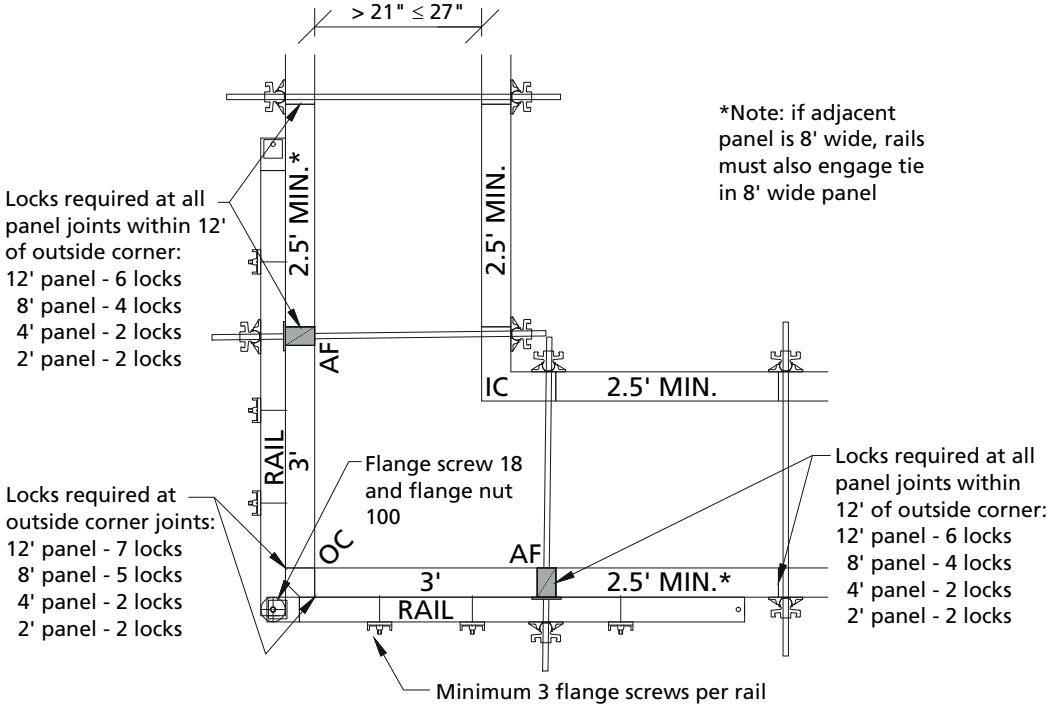

Fig. 19.1 Walls > 21" but ≤ 27" thick

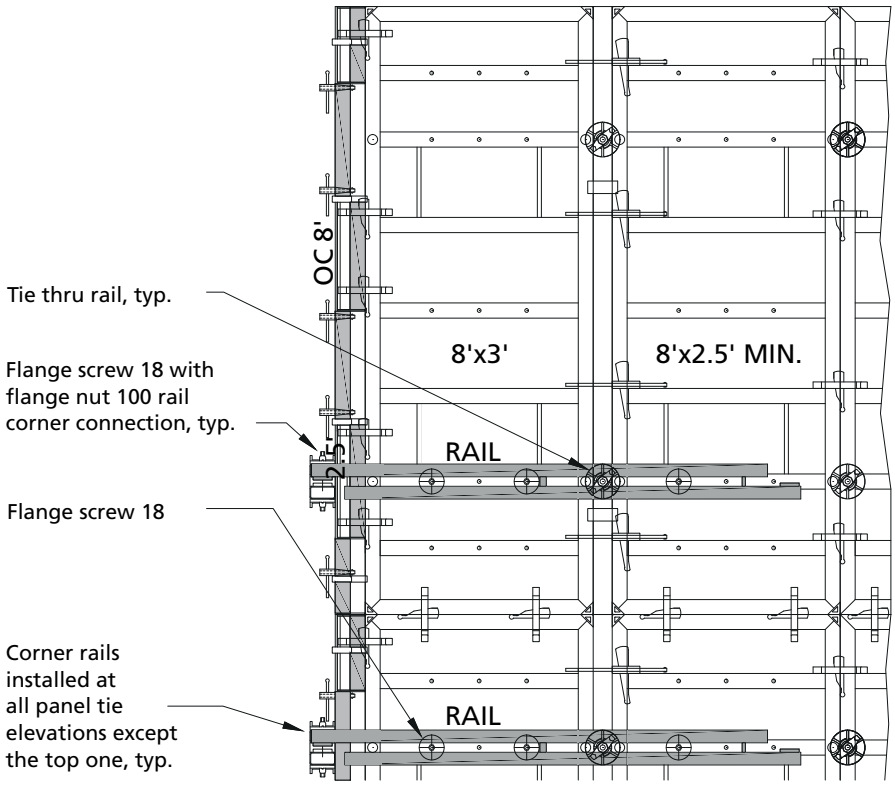

Fig. 19.2 Walls > 21" but ≤ 27" thick - example corner elevation

90° corners

Wall thicknesses > 27" but ≤ 36" require steel rails at all tie elevations except the top one, and additional locks at the outside corners and nearby panel joints as well. The rails must engage at least two ties on each side, and the panels adjacent to the inside corner and outside corner panels must be at least 2.5" wide (Fig. 20.1). Panels 2' high may only be used within 10' of the top of the wall.
The maximum allowable concrete pressure for this configuration is 1650 psf.

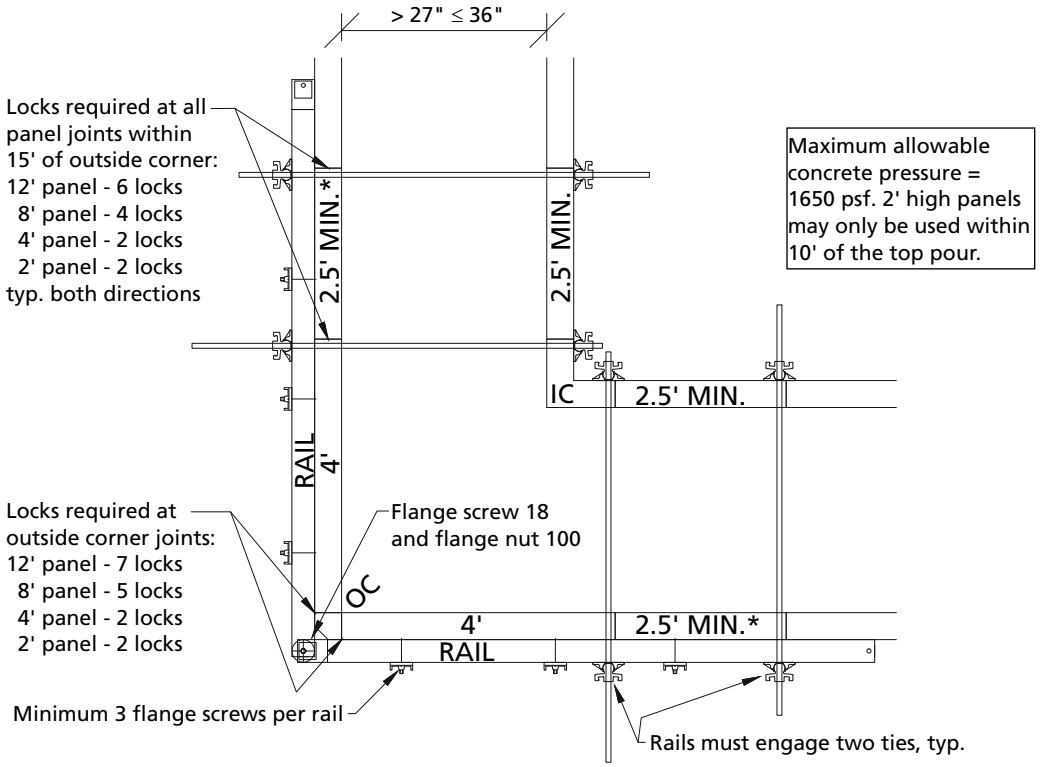

Fig. 20.1 Walls > 27" but ≤ 36" thick

Outside Corners Without Reinforcing Rails

When it is not possible or practical to install corner reinforcing rails for walls over 9" thick, configurations with locks only are possible at lower concrete pressures (Fig. 20.2).

Outside Corners with Locks Only (No Rail Reinforcing)

Wall-Thickness	Maximum Allowable Concrete Pressure	Distance from Outside Corner for Additional Locks on Panel Joints
≤ 15"	1900 psf	7'
≤ 21"	1500 psf	9'
≤ 27"	1250 psf	12'
≤ 33"	1050 psf	14'
≤ 36"	950 psf	15'

Fig. 20.2a

Panel Height	Required Number of Locks at Outside Corner Joints	Required Number of Locks at Panel Joints (for Distance from Outside Corner in **Fig. 20.2a**) for Walls ≤ 21" Thick	Required Number of Locks at Panel Joints (for Distance from Outside Corner in **Fig. 20.2a**) for Walls > 21" and ≤ 36" Thick
12'	9 locks	5 locks	6 locks
8'	5 locks	3 locks	4 locks
4'	3 locks	2 locks	2 locks
2'	2 locks	2 locks	2 locks

Fig. 20.2b

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90° corners

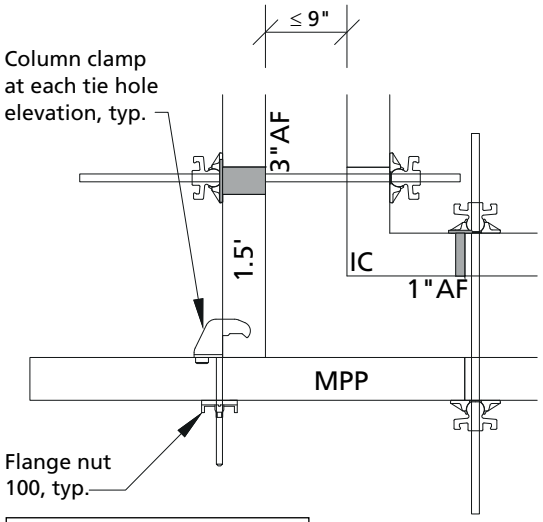
Multi-Purpose Panels
A multi-purpose panel (MPP) can be used to form a 90° outside corner by connecting a standard panel with column clamps. The column clamp is secured with a flange nut 100 or an articulated flange nut 15/120. This creates a tight, rigid connection. The MPP accommodates wall thickness changes in 2" increments. Thickness changes in 1" increments can be achieved using a 1" filler.

The maximum allowable concrete pressure and lock requirements for panel joints adjacent to the outside corner depend on the wall thickness.

For wall thicknesses ≤ 9", the maximum allowable concrete pressure is 2025 psf, and no additional locks are required at the panel joints adjacent to the corner (Fig. 21.1).

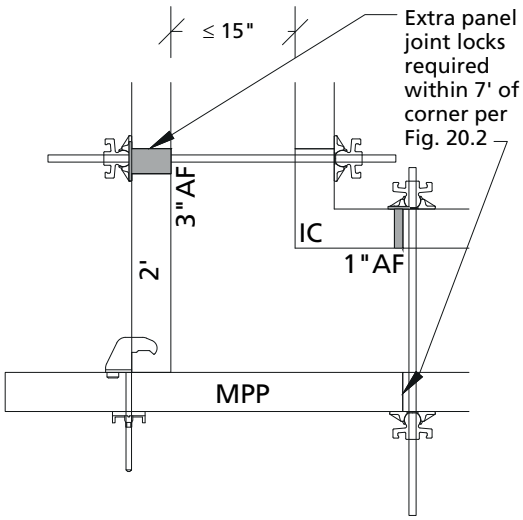
For wall thicknesses > 9", the maximum allowable concrete pressure must be reduced (Fig. 21.2 - 21.4). Additional locks are also required at the panel joints adjacent to the corner as shown in Fig 21.2.

At the maximum wall thickness of 26", the indexing stud of the column clamp will be installed in the last tie hole of the multi-adjustment profile (Fig 21.5).



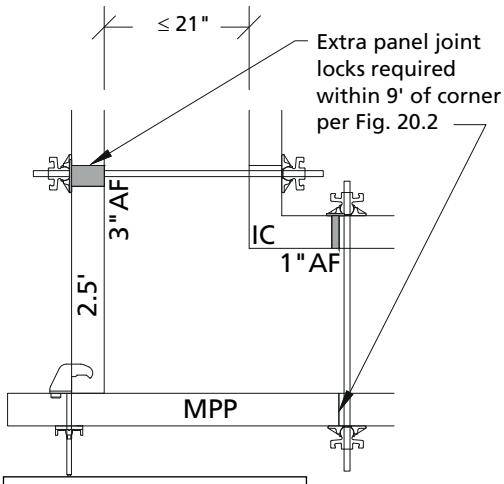
Maximum allowable concrete pressure = 2025 psf.

Fig. 21.1 Walls up to 9" thick



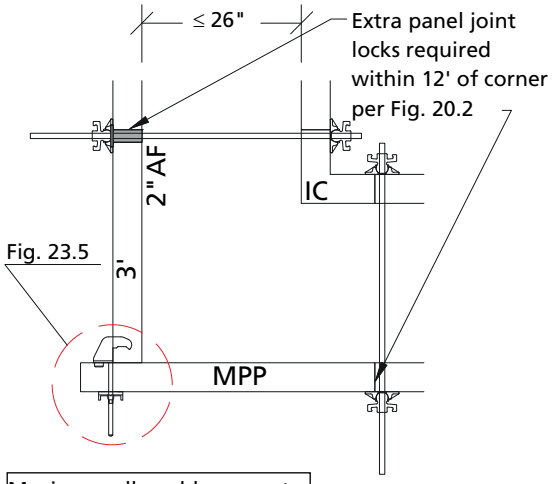
Maximum allowable concrete pressure = 1800 psf.

Fig. 21.2 Walls up to 15" thick



Maximum allowable concrete pressure = 1400 psf.

Fig. 21.3 Walls up to 21" thick



Maximum allowable concrete pressure = 1200 psf.

Fig. 21.4 Walls up to 26" thick

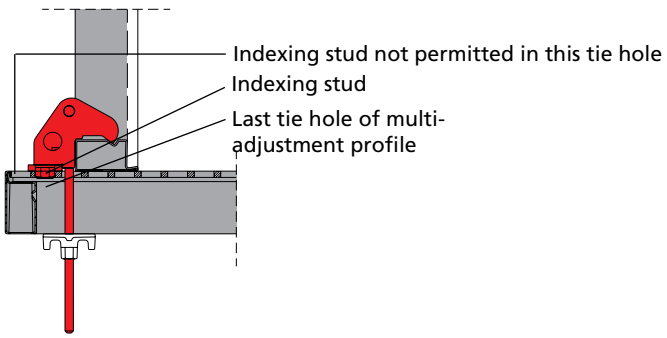


Fig. 21.5 Detail

Articulated Corners

Acute and obtuse angled corners are formed using Imperial articulated inside and outside corners. Steel rails are attached to the multi-function profile with flange screws at each tie hole elevation (Fig. 22.1 & 22.2). The rails at the outside corner must be attached to the panels with at least two flange screws each, one in the panel next to the AOC and one in the adjacent panel. These rails must also be bolted together at their intersection with a flange screw 18 and flange nut 100. Flange screws shall be tightened by turning with a hammer claw or bar until snug, followed by a few hammer blows.

If wood fillers are needed, the panel profiles are connected using Uni-assembly locks.

Side length of articulated outside corner (AOC): 5”

Side length of articulated inside corner (AIC): 1’

Adjustment range: 70° to 220° (Fig. 22.1-22.3).

Description	Ref.-No.
I-articulated outside corners	
12’x5”	**23-306-00**
8’x5”	**23-307-10**
4’x5”	**23-307-20**
I-articulated inside corners	
12’x1’	**23-307-50**
8’x1’	**23-307-60**
4’x1’	**23-307-70**

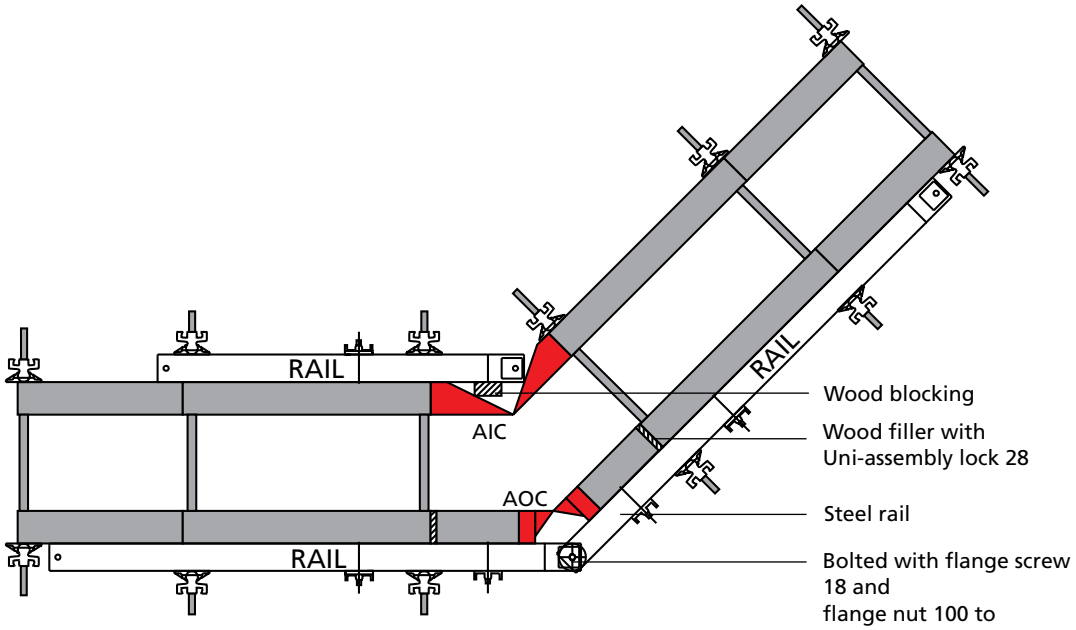


Fig. 22.1

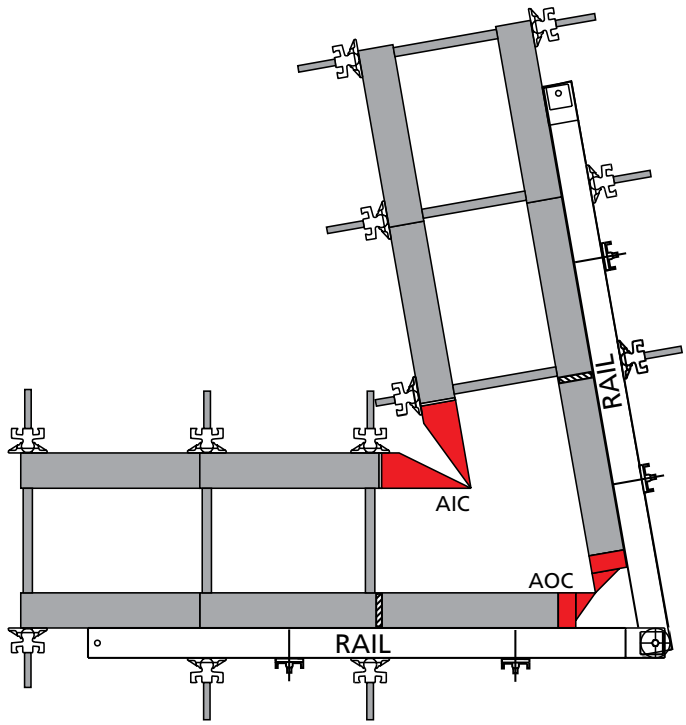


Fig. 22.2

Note:
See the "90° Corners" section for lock requirements at outside corners

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Articulated Corners

If the inside angle is >100°, steel rails and wood blocking have to be used on the inside (Fig. 23.1). To determine the fill distance (y) between the Imperial articulated outside corner and the first panel where a tie can be used, see the tables on pages 23 and 24.

Form the fill distance with the widest Imperial panel possible and a wood filler ≤ 6" wide (if needed). Always locate wood fillers next to a tied Imperial panel.

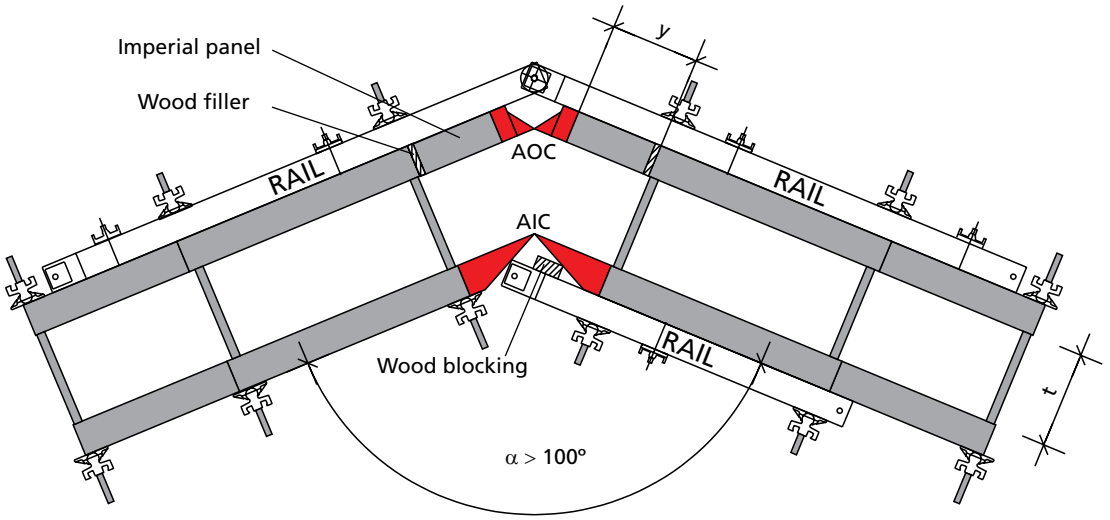

Fig. 23.1

Note:
See the "90° Corners" section for lock requirements at outside corners

Fill Distance, y (inches) for 8" - 15" Wall Thicknesses								
Angle, α (degrees)	Wall Thickness, t (inches)							
	8	9	10	11	12	13	14	15
70	18.4	19.9	21.3	22.7	24.1	25.6	27.0	28.4
75	17.4	18.7	20.0	21.3	22.6	23.9	25.2	26.5
80	16.5	17.7	18.9	20.1	21.3	22.5	23.7	24.9
85	15.7	16.8	17.9	19.0	20.1	21.2	22.3	23.4
90	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0
95	14.3	15.2	16.2	17.1	18.0	18.9	19.8	20.7
100	13.7	14.6	15.4	16.2	17.1	17.9	18.7	19.6
105	13.1	13.9	14.7	15.4	16.2	17.0	17.7	18.5
110	12.6	13.3	14.0	14.7	15.4	16.1	16.8	17.5
115	12.1	12.7	13.4	14.0	14.6	15.3	15.9	16.6
120	11.6	12.2	12.8	13.4	13.9	14.5	15.1	15.7
125	11.2	11.7	12.2	12.7	13.2	13.8	14.3	14.8
130	10.7	11.2	11.7	12.1	12.6	13.1	13.5	14.0
135	10.3	10.7	11.1	11.6	12.0	12.4	12.8	13.2
140	9.9	10.3	10.6	11.0	11.4	11.7	12.1	12.5
145	9.5	9.8	10.2	10.5	10.8	11.1	11.4	11.7
150	9.1	9.4	9.7	9.9	10.2	10.5	10.8	11.0
155	8.8	9.0	9.2	9.4	9.7	9.9	10.1	10.3
160	8.4	8.6	8.8	8.9	9.1	9.3	9.5	9.6
165	8.1	8.2	8.3	8.4	8.6	8.7	8.8	9.0
170	7.7	7.8	7.9	8.0	8.0	8.1	8.2	8.3
175	7.3	7.4	7.4	7.5	7.5	7.6	7.6	7.7
180	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

Description	Ref.-No.
I-articulated outside corners	
12'x5"	**23-306-00**
8'x5"	**23-307-10**
4'x5"	**23-307-20**
I-articulated inside corners	
12'x1'	**23-307-50**
8'x1'	**23-307-60**
4'x1'	**23-307-70**

Articulated Corners

If the inside angle is ≤ 100°, steel rails and wood blocking are not required on the inside (Fig. 24.1). To determine the fill distance (y) between the Imperial articulated outside corner and the first panel where a tie can be used, see the tables on pages 23 and 24.

Form the fill distance with the widest Imperial panel possible and a wood filler ≤ 6" wide (if needed). Always locate wood fillers next to a tied Imperial panel.

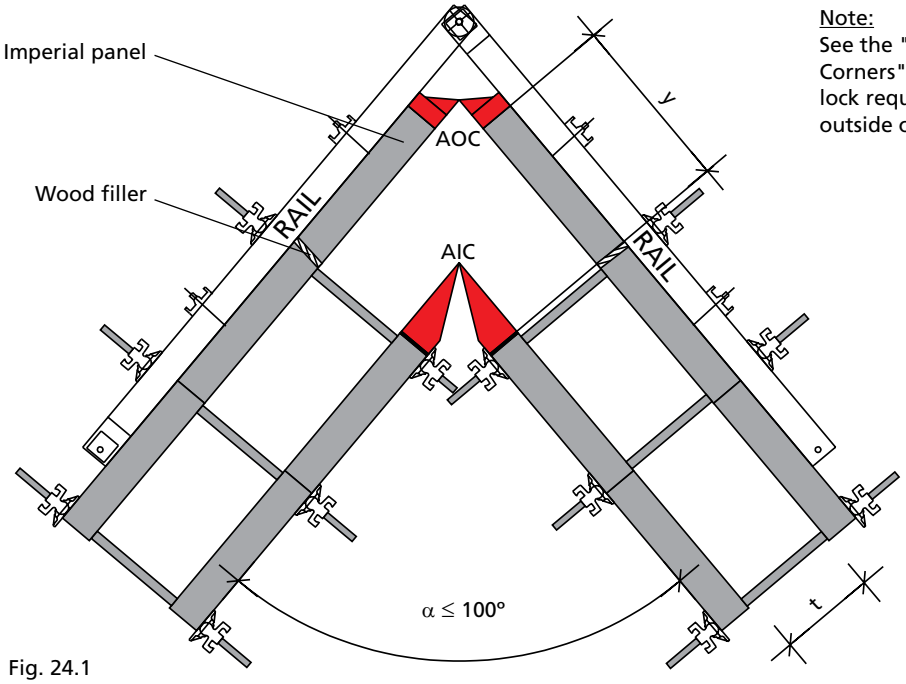

Fig. 24.1

Note:
See the "90° Corners" section for lock requirements at outside corners

Fill Distance, y (inches) for 16" - 24" Wall Thicknesses									
Angle, α (degrees)	Wall Thickness, t (inches)								
	16	17	18	19	20	21	22	23	24
70	29.9	31.3	32.7	34.1	35.6	37.0	38.4	39.8	41.3
75	27.9	29.2	30.5	31.8	33.1	34.4	35.7	37.0	38.3
80	26.1	27.3	28.5	29.6	30.8	32.0	33.2	34.4	35.6
85	24.5	25.6	26.6	27.7	28.8	29.9	31.0	32.1	33.2
90	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	31.0
95	21.7	22.6	23.5	24.4	25.3	26.2	27.2	28.1	29.0
100	20.4	21.3	22.1	22.9	23.8	24.6	25.5	26.3	27.1
105	19.3	20.0	20.8	21.6	22.3	23.1	23.9	24.6	25.4
110	18.2	18.9	19.6	20.3	21.0	21.7	22.4	23.1	23.8
115	17.2	17.8	18.5	19.1	19.7	20.4	21.0	21.7	22.3
120	16.2	16.8	17.4	18.0	18.5	19.1	19.7	20.3	20.9
125	15.3	15.8	16.4	16.9	17.4	17.9	18.5	19.0	19.5
130	14.5	14.9	15.4	15.9	16.3	16.8	17.3	17.7	18.2
135	13.6	14.0	14.5	14.9	15.3	15.7	16.1	16.5	16.9
140	12.8	13.2	13.6	13.9	14.3	14.6	15.0	15.4	15.7
145	12.0	12.4	12.7	13.0	13.3	13.6	13.9	14.3	14.6
150	11.3	11.6	11.8	12.1	12.4	12.6	12.9	13.2	13.4
155	10.5	10.8	11.0	11.2	11.4	11.7	11.9	12.1	12.3
160	9.8	10.0	10.2	10.4	10.5	10.7	10.9	11.1	11.2
165	9.1	9.2	9.4	9.5	9.6	9.8	9.9	10.0	10.2
170	8.4	8.5	8.6	8.7	8.7	8.8	8.9	9.0	9.1
175	7.7	7.7	7.8	7.8	7.9	7.9	8.0	8.0	8.0
180	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

Description	Ref.-No.
I-articulated outside corners	
12'x5"	23-306-00
8'x5"	23-307-10
4'x5"	23-307-20
I-articulated inside corners	
12'x1'	23-307-50
8'x1'	23-307-60
4'x1'	23-307-70

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Columns

Columns with Multi-Purpose Panels

Multi-purpose panels can be used to form columns of varying sizes up to 38" in 2" increments (Fig. 25.1, 25.2).

A column clamp is installed at each multi-adjustment profile and secured with a flange nut 100. To form columns with odd dimensions the column form should be furred out on the inside.

At the maximum column size the indexing stud on the column clamp will be installed in the last tie hole of the multi-adjustment profile (Fig. 25.3).

The maximum allowable concrete pressure is 2025 psf for column sizes ≤ 21" (with rectangular columns the longer side controls). For column sizes > 21", the maximum allowable concrete pressure must be reduced - see Fig. 25.4.

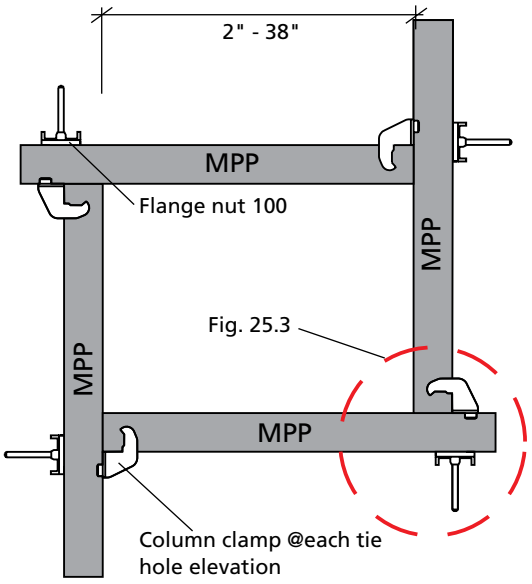

Fig. 25.1

Fig. 25.2

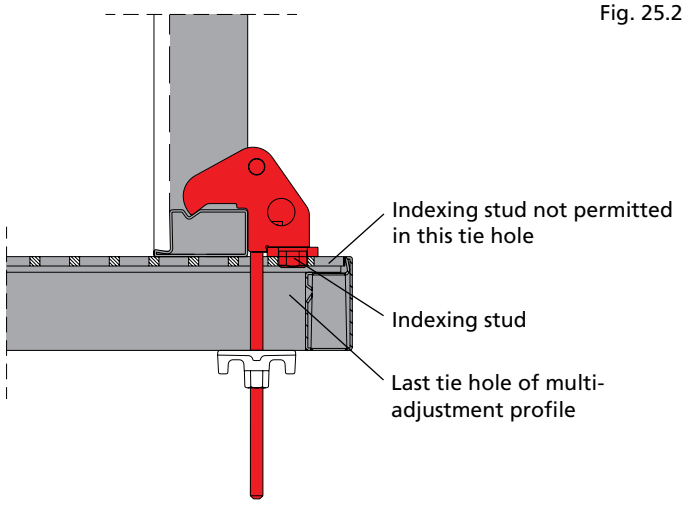

Fig. 25.3 Detail

Columns With Multi-Purpose Panels	
Column Size	Maximum Allowable Concrete Pressure
≤ 24"	1800 psf
≤ 27"	1600 psf
≤ 30"	1400 psf
≤ 36"	1200 psf
≤ 38"	1100 psf

Fig. 25.4

Columns

Columns with Standard Panels and Outside Corners

Columns can also be formed using standard panels and outside corners. To form columns with sizes in between the Imperial panel widths, the next largest panel size is used and the forms are furred out on the inside. Columns can only be formed with panels oriented vertically (panel cross members horizontal).

The outside corner connections require more assembly locks than standard panel connections. The connection requirements and maximum allowable concrete pressure depend on the column size (with rectangular columns the longer side controls) - see Fig. 26.1 - 26.2. An example elevation with 12' high panels & corners for columns > 18" is shown in Fig. 26.3.

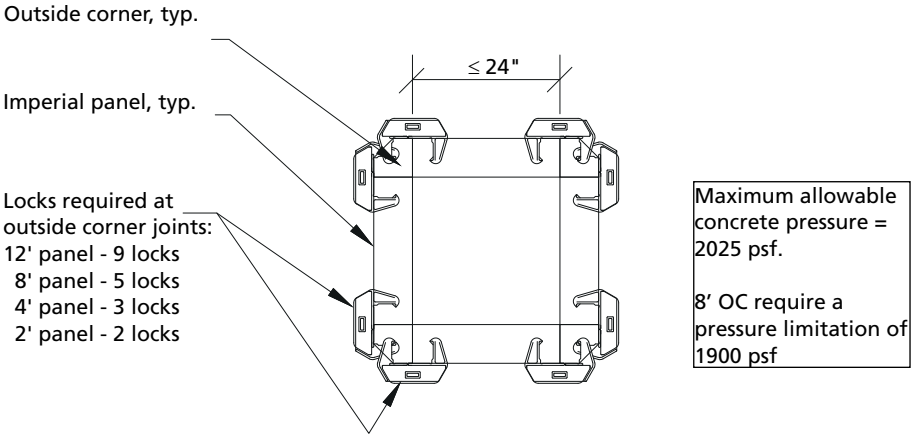

Fig. 26.1 Column sizes up to 24"

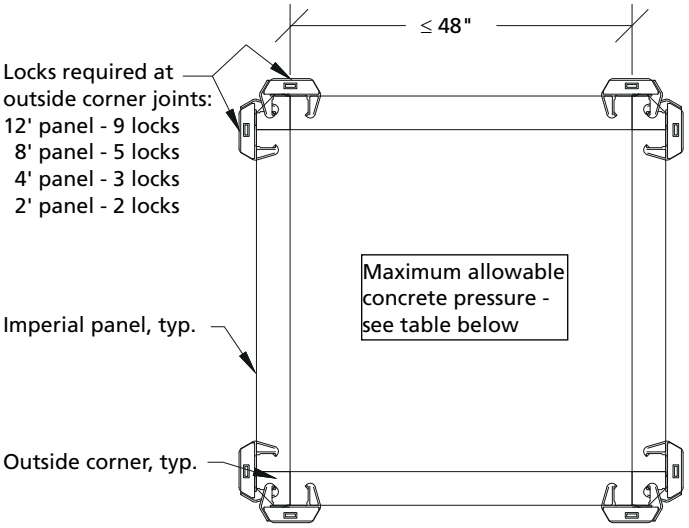

Fig. 26.2 Column sizes up to 48"

Columns With Standard Panels and Outside Corners	
Column Size	Maximum Allowable Concrete Pressure
≤ 24"	2025 (1900)* psf
≤ 30"	1800 (1500)* psf
≤ 36"	1500 (1250)* psf
≤ 42"	1250 (1050)* psf
≤ 48"	1100 (950)* psf

* Pressure when using 8' outside corners

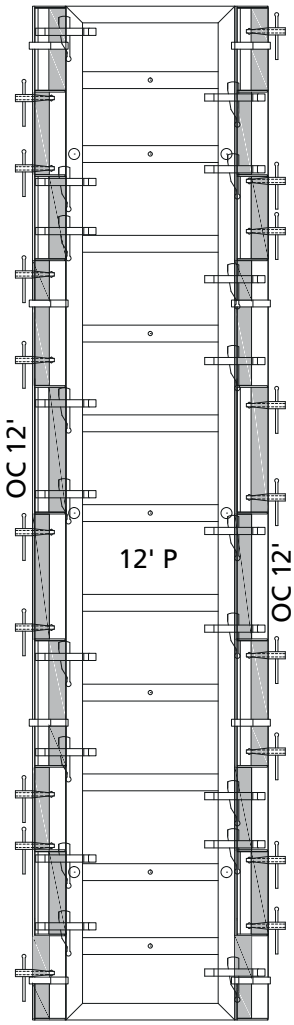

Fig. 26.3 Example 12' elevation

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Columns

Columns with Standard Panels and Outside Corners, & Strengthening Collars

For column sizes > 18" but ≤ 48", a maximum allowable concrete pressure of 2025 psf can be achieved by using steel rails as strengthening collars. Two steel rails are attached to panels on opposite sides of the column with flange screws and connected with external threadbar ties and articulated flange nuts. Immediately above another pair of steel rails with threadbar ties are placed in the opposite direction to form a collar (Fig. 27.1).

The collars are installed at all tie hole elevations of 8' and 12' panels. Collars are not installed on 2' high and 4' high panels due to interference with lock installation on the outside corner. Panels 2' high require 2 locks at each outside corner joint and may only be used within 10' of the top of the column. Panels 4' high require 3 locks on each outside corner joint and may only be used within 7' of the top of the column.

Elevation views of 8' and 12' high panels with strengthening collars are shown in Fig. 27.2. The lock positions on the 12' high corners are adjusted to work with the collars and result in different patterns along the left and right sides of each panel. The pattern on diagonally opposed corners is the same.

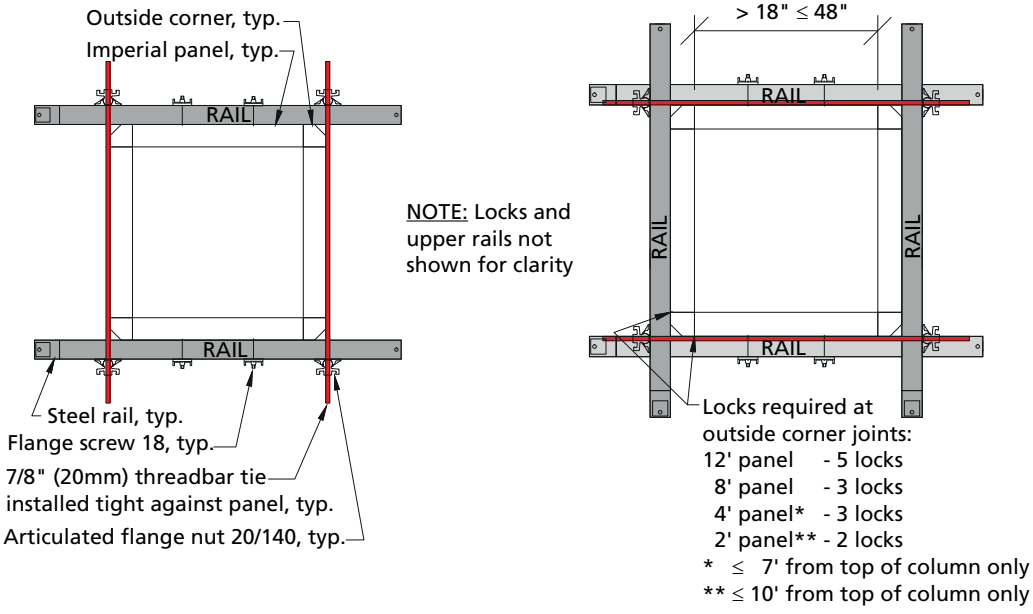


Fig. 27.1 Columns > 18" but ≤ 48" with strengthening collars - plan views

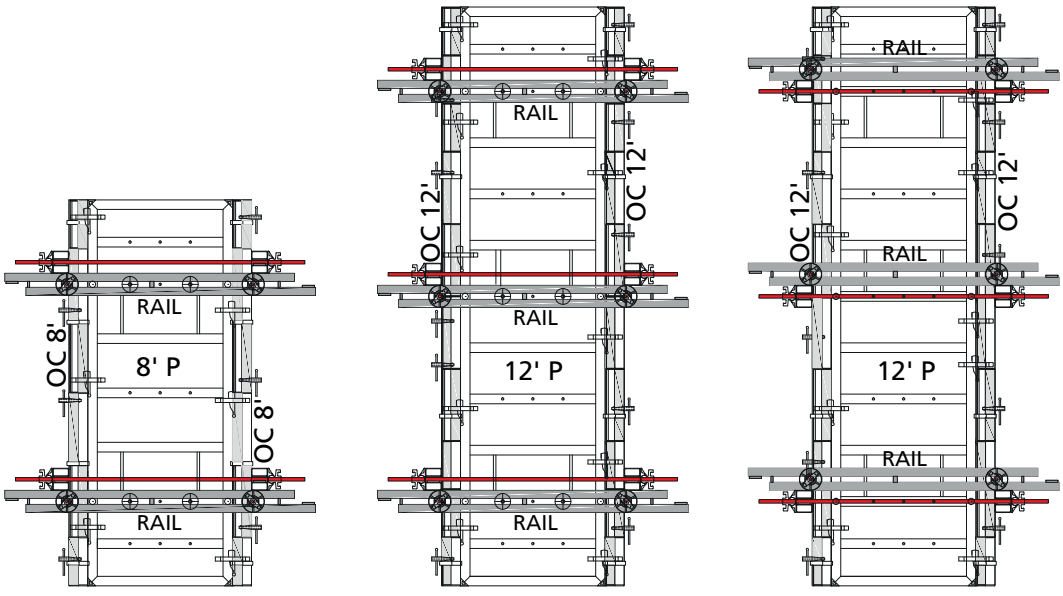


Fig. 27.2 Columns with strengthening collars - elevation views

Fillers

Imperial Fillers
Fillers that are 1", 2", or 3" wide can be formed using single Imperial aluminum fillers without additional steel rails (Fig. 28.1).

Job-Built Fillers
Fillers up to 6" wide can be formed using 4 3/4" deep lumber. Steel rails are required at each tie hole elevation (Fig. 28.2). Uni-assembly locks are used to connect the adjacent panels with the filler in between (Fig. 28.3).

Fillers wider than 6" can be formed using 3/4" plywood with 4" deep lumber and timber profiles (Fig. 28.4 & 28.5). The timber profiles are installed around the perimeter of the job-built filler area and have routed grooves to allow connection to the Imperial panels with M-assembly locks (Fig. 28.6). The plywood is fastened to the timber profiles with nails or screws.

Fillers between 8' wide panels require ties on both sides of the filler. Refer to the remainder of this section for additional filler information and requirements.

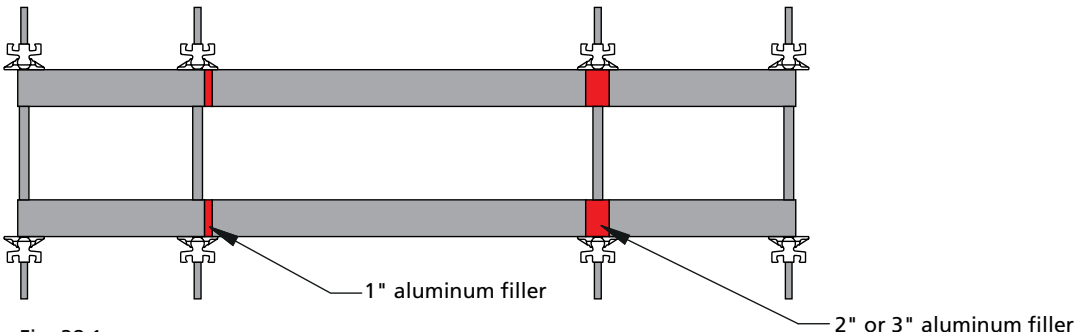


Fig. 28.1

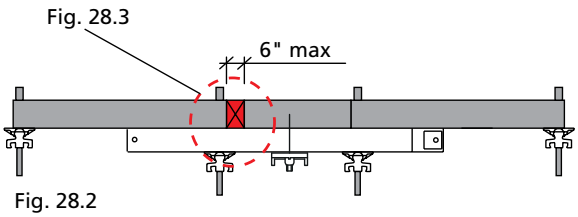


Fig. 28.3

Fig. 28.2

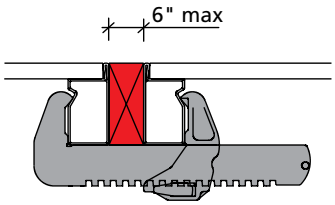


Fig. 28.3

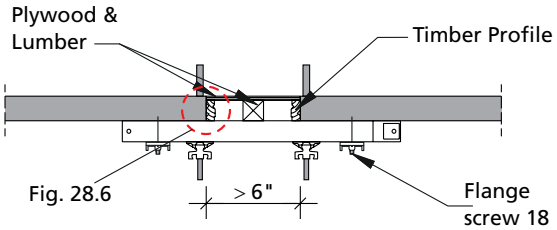
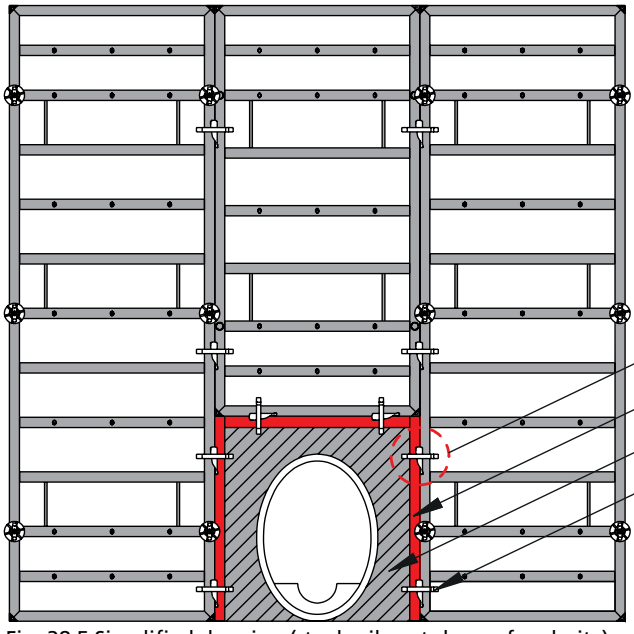


Fig. 28.6

Fig. 28.4



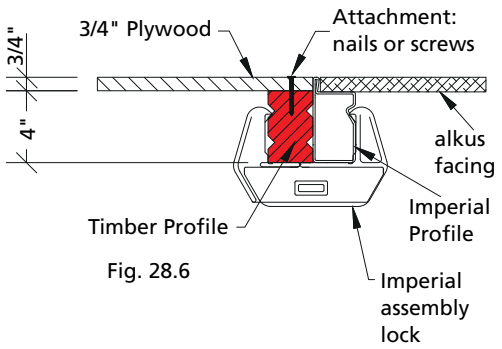


Fig. 28.6

Fig. 28.6
Timber Profile
Plywood & Lumber
M-assembly lock

Fig. 28.5 Simplified drawing (steel rails not shown for clarity)

Description	Ref.-No.
I-timber profiles	
8'.....	**2-500-2339950**

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Fillers

Fillers Up to 6" Wide

Fillers up to 6" wide formed with 4 3/4" deep lumber require steel rails at each tie elevation. The rails are installed either between two ties or cantilevered over one tie to support the filler and adjacent Imperial panel. The maximum Imperial panel size that can be supported depends on the rail configuration and the filler size.

For fillers > 3" but ≤ 6" wide, the maximum Imperial panel sizes that can be supported by the rail are shown in Fig. 29.1 & 29.2.

For fillers up to 3" wide, the maximum Imperial panel sizes that can be supported by the rails are shown in Fig. 29.3 & 29.4.

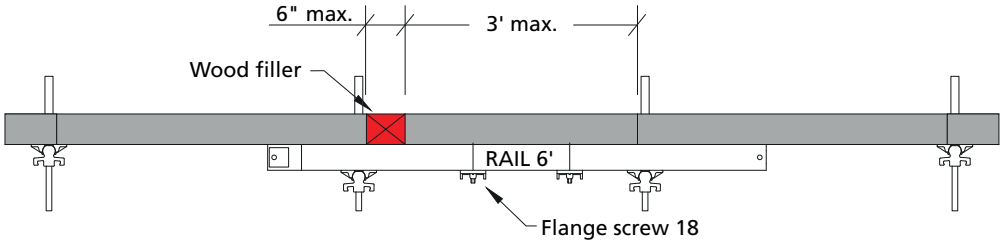


Fig. 29.1 Fillers > 3" but ≤ 6" wide, rails between two ties

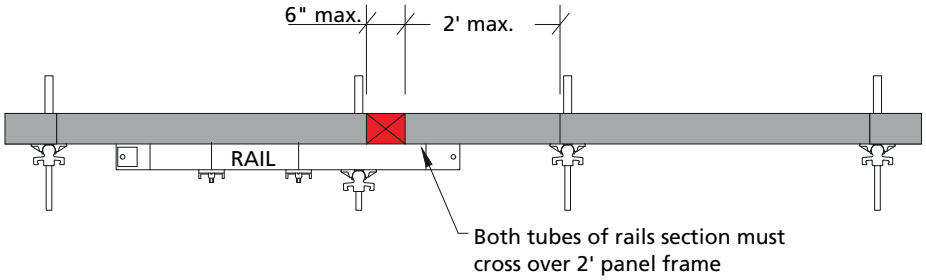


Fig. 29.2 Fillers > 3" but ≤ 6" wide, cantilevered rails

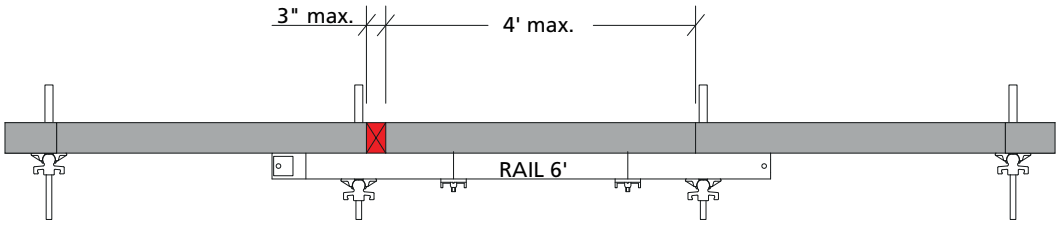


Fig. 29.3 Fillers up to 3" wide, rails between two ties

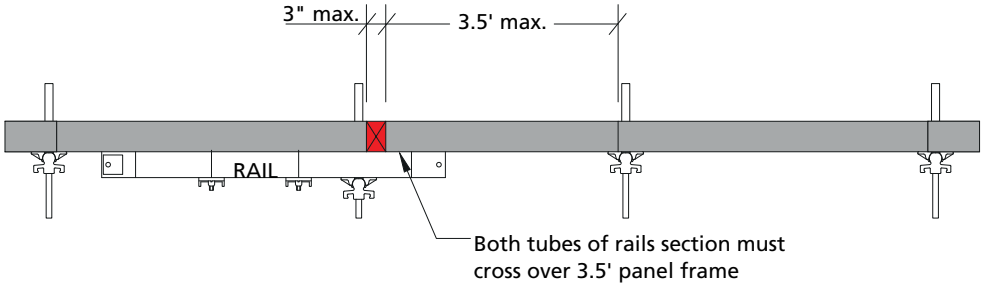


Fig. 29.4 Fillers up to 3" wide, cantilevered rails

Fillers

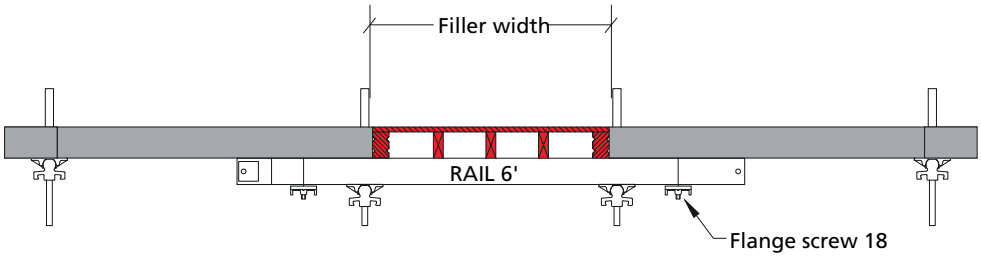
Fillers Over 6" Wide

Fillers over 6" wide require steel rails or walers at each tie hole elevation to support the filler. The maximum filler width can be determined using the tables in the following figures, and depends on the maximum lateral concrete pressure and the type of steel support.

For job-built fillers supported by rails, see Fig. 30.1.

For job-built fillers supported by 6" walers, see Fig. 30.2 .

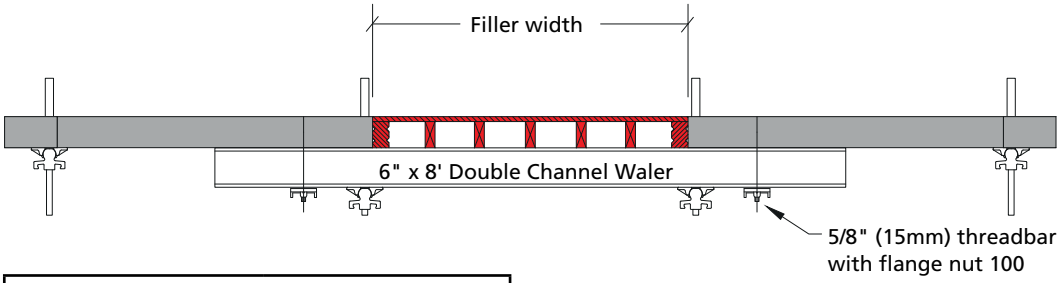
The job-built filler must be designed and constructed to resist the intended loads. Tensile load transfer must be considered when fillers are located near bulkheads or outside corners. Additional fasteners, bracing, or struts may be required.



Maximum Filler Width - Steel Rails ≤ 8' Long	
Concrete Pressure	Maximum Filler Width
2025 psf	29"
1600 psf	33"
1200 psf	38"

Steel Rails ≤ 8' long: Maximum allowable bending moment = 7.62 kip-ft, Ix = 5.3 In^4
(for 12' long steel rails: Maximum allowable bending moment: 10.74 kip-ft, Ix = 7.3 In^4)

Fig. 30.1 Rails supporting fillers over 6" wide



6" Waler Maximum Filler Width	
Concrete Pressure	Maximum Filler Width
2025 psf	42"
1600 psf	48"

6" Waler: Double C6x8.2, ASTM A36

Fig. 30.2 6" walers supporting fillers over 6" wide

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Intersections

Intersecting walls are formed using inside corners and standard panels (Fig. 31.1 - Fig. 31.5). Fillers are used to make adjustments for different wall thicknesses. Steel rails may be required depending on the filler configuration (see the "Fillers" section for additional information and requirements). It may be necessary to utilize threadbar ties in some corner locations when other tie systems are used so that they can be adjusted to eliminate interferences.

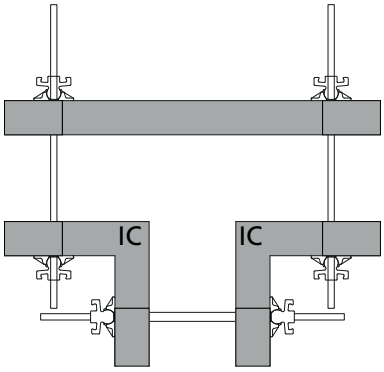


Fig. 31.1

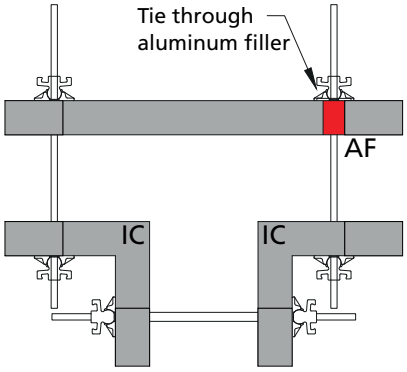


Fig. 31.2

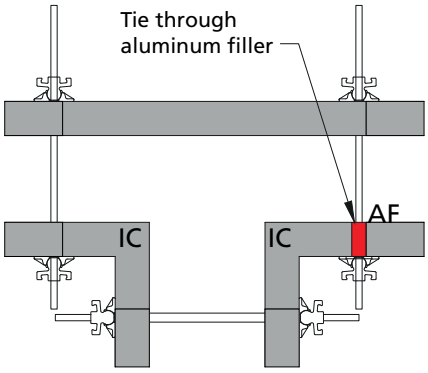


Fig. 31.3

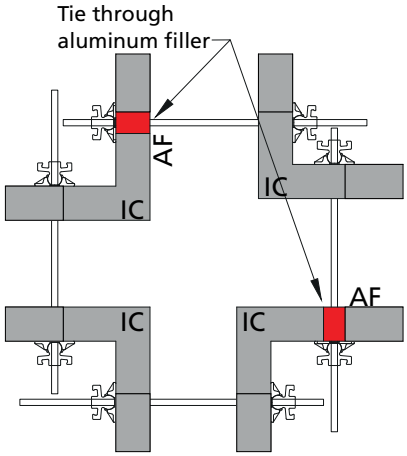


Fig. 31.4

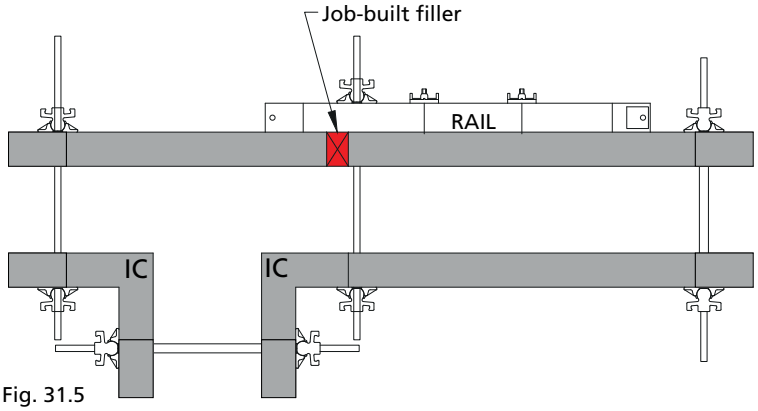


Fig. 31.5

Bulkheads

Bulkheads can be formed using either bulkhead brackets (Fig. 32.1), or steel rails/walers with column clamps and ties. Due to the increased tensile loads from bulkheads, additional locks are required at nearby panel joints for walls over 21" thick - see Fig. 32.2.

Bulkhead Brackets
Bulkhead brackets support loads from the bulkhead pressure and also contain integrated ties. Bulkhead brackets 40/60 can be used for walls up to 16" thick, and bulkhead brackets 60/23 can be used for walls up to 30" thick. The bulkhead bracket safe working load limits are as follows:

Shear/End Reaction = 5000 lb.

Tension = 6750 lb.

Bending Moment = 5091 ft-lbs.

Brackets may not be spaced closer together than the panel cross members.

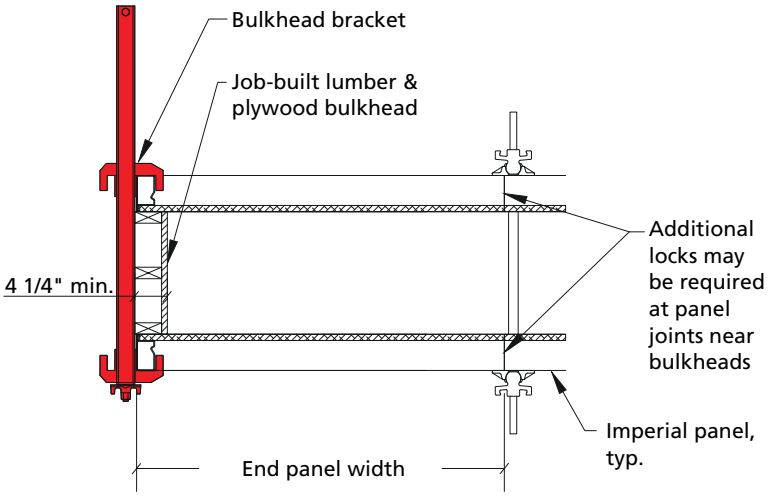


Fig. 32.1

Additional Locks Required for Panel Joints Near Bulkheads
Walls > 21" thick and ≤ 30" (joints within 13' of bulkhead)
12' panel - 5 locks
8' panel - 3 locks
4' panel - 2 locks
2' panel - 2 locks

Fig. 32.2

Bulkheads

The bulkhead brackets are installed as shown in Fig. 33.1 - Fig. 33.3 for vertical panels. The maximum wall thicknesses and vertical end panel widths are determined from the table in Fig. 33.4. The table is based on a concrete pressure of 2025 psf.

The job-built bulkhead must be designed and constructed to resist the intended loads.

Note:
For 8' wide panels, read off the 1' wide end panel column of the table in Fig. 33.4.

For horizontal panels, the user should verify the applied loads based on formwork pressure, wall width, and bulkhead bracket spacing.

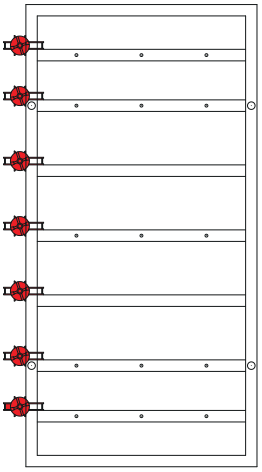


Fig. 33.1 Arrangement **A**

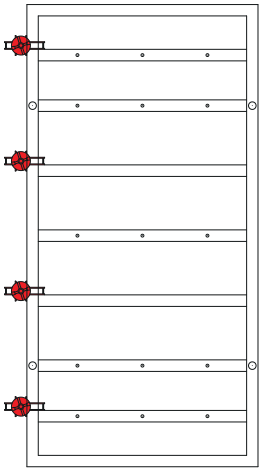


Fig. 33.2 Arrangement **B**

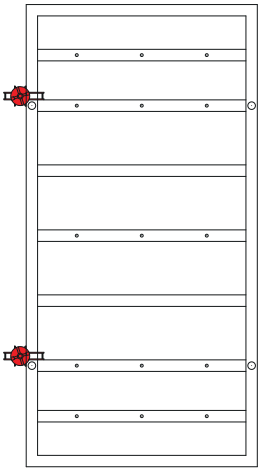


Fig. 33.3 Arrangement **C**

		End Panel Width					
Wall Thickness	4.0'	3.5'	3.0'	2.5'	2.0'	1.5'	1.0'
30"	A	A	A	A	A	A	A
28"	A	A	A	A	A	A	A
26"	A	B	B	B	B	B	B
24"	A	B	B	B	B	B	B
22"	A	B	B	B	B	B	B
20"	A	B	B	B	B	B	B
18"	A	B	B	B	B	B	B
16"	A	B	B	B	B	B	B
14"	A	B	B	B	B	B	B
12"	A	B	B	B	C	C	C
10"	A	B	B	B	C	C	C
8"	A	B	B	B	C	C	C

Fig. 33.4

Bulkheads

Rails, Column Clamps, & Ties

Rails are secured to the panels using column clamps and flange nuts (Fig. 34.1). The column clamp's safe working load in tension is 10083 lb on Imperial panels. Column clamps on vertical panels must be installed so that they straddle the panel cross members.

The ends of the vertical bulkhead panels are tied by installing taper ties or threadbars using Uni-tie claws so that the ties clear the bulkhead (Fig. 34.2).

Caution:

Never use taper ties or threadbars as a means of supporting bulkheads where shear loads would be applied.

Ties with uni-tie claws are not required on horizontal panels since they are tied internally.

Standard Rail Configuration

In the standard rail configuration, steel rails and ties are to be installed as shown in Figure 34.3. The maximum concrete pressures and wall thicknesses are determined from the table. Wood blocking may be needed to hold rail positions when installing on horizontal panels.

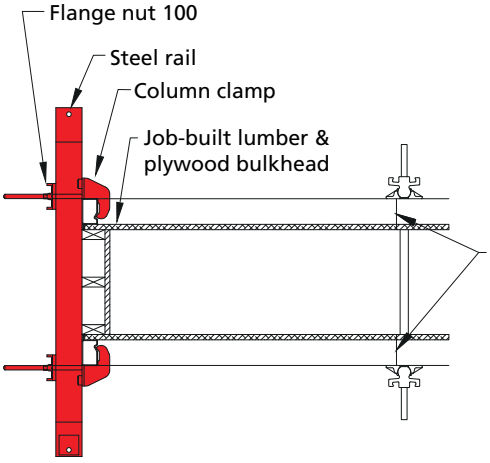


Fig. 34.1 Rails & column clamps

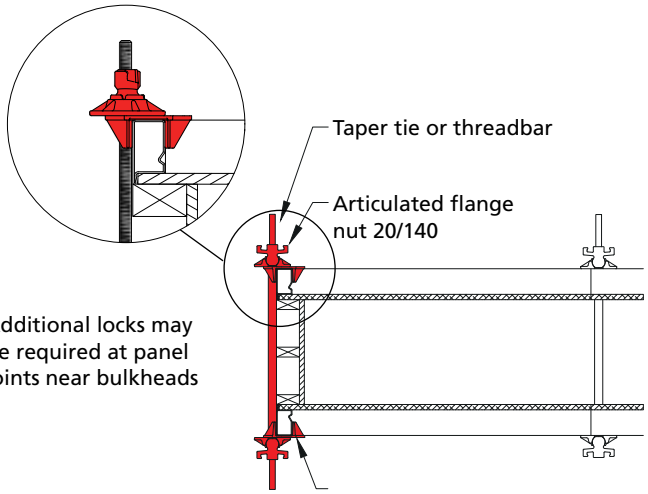
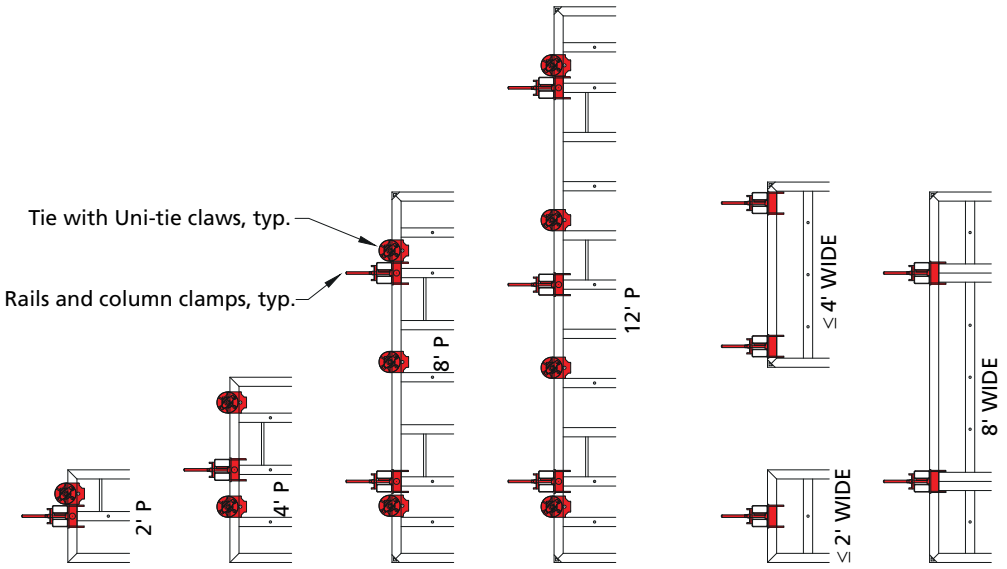


Fig. 34.2 End ties



Steel Rail Bulkhead Support - Standard Configuration	
Concrete Pressure	Maximum Wall Thickness
2025 psf	23"
1650 psf	26"
1000 psf	36"

Steel Rails ≤ 8' long: Maximum allowable bending moment = 7.62 kip-ft, Ix = 5.3 In^4

Fig. 34.3 Steel rail bulkhead support - standard configuration

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Bulkheads

Supplemental Rail Configuration

In the supplemental rail configuration, a wall thickness of 36" is possible at a concrete pressure of 2025 psf. The steel rails and ties are to be installed as shown in Fig. 35.1.

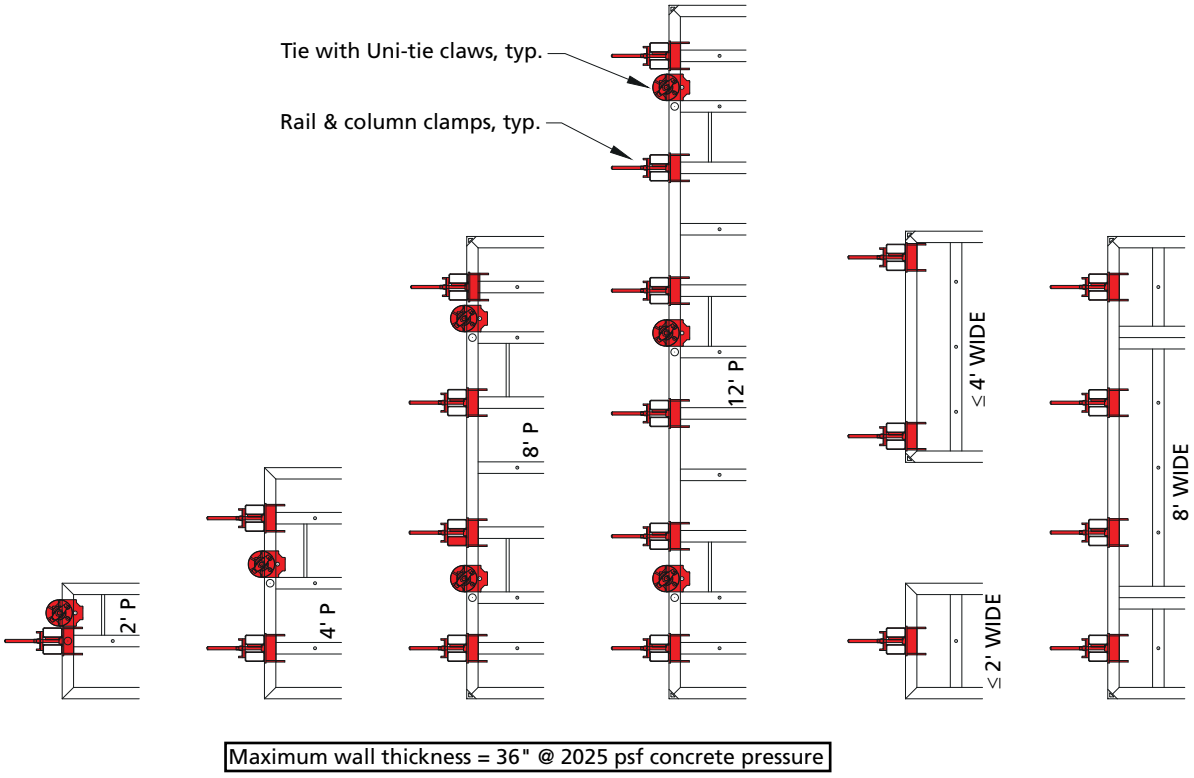

Fig. 35.1 Steel rail bulkhead supports - supplemental configuration

Due to the increased tensile loads from bulkheads, additional locks are required at nearby panel joints for walls over 21" thick - see Fig. 35.2.

Additional Locks Required for Panel Joints Near Bulkheads (Walls Over 21" Thick)	
Walls ≤ 31" thick (joints within 13' of bulkhead)	Walls ≤ 36" thick (joints within 15' of bulkhead)
12' panel - 5 locks	12' panel - 6 locks
8' panel - 3 locks	8' panel - 4 locks
4' panel - 2 locks	4' panel - 2 locks
2' panel - 2 locks	2' panel - 2 locks

Fig. 35.2

Adjoining Walls

These figures show example formwork details at adjoining walls. Details for lap conditions at a previous pour are shown in Figures 36.1 - 36.3.

The detail for formwork perpendicular to an existing wall is shown in Fig. 36.4. Three foot rails are used so that both tubes of the rail section support the filler.

Unbalanced forces on the formwork system must be considered when these conditions occur near a corner or bulkhead. Ties or anchors to the existing structure may be required. The existing structure may also need to be evaluated for imposed loads by the engineer of record.

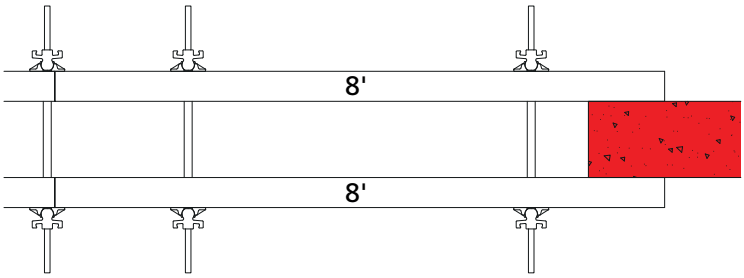

Fig. 36.1

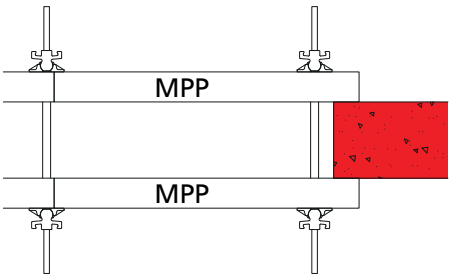

Fig. 36.2

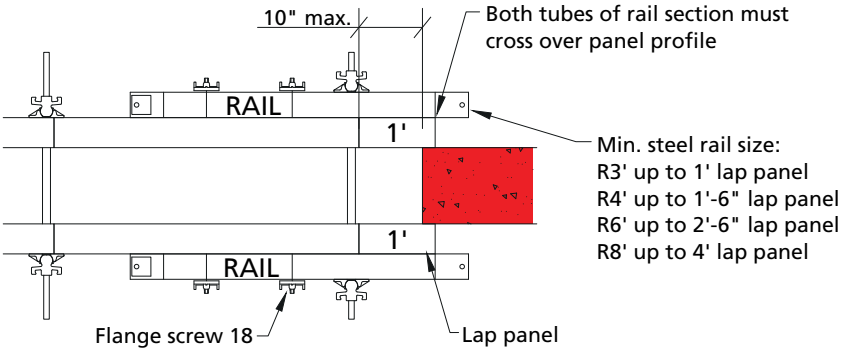

Fig. 36.3

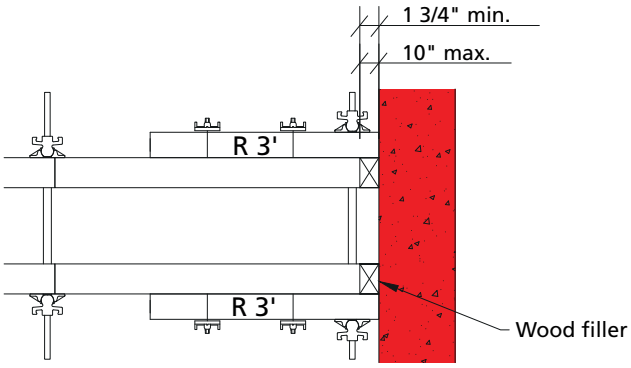

Fig. 36.4

Pilaster Panels

The pilaster panel (Fig. 37.1 and 37.2) is a combination of a hinged corner and a multi-purpose panel. It allows forming pilasters without having a tie going through the pilaster.
Using standard panels in combination with column clamps for the bulkhead allows forming pilasters with a depth from 4" to 1'-8" in 2" increments (Fig. 37.3).
At the maximum depth, the indexing stud of the column clamp will be installed in the last tie hole of the multi-adjustment profile (Fig 37.6).

A plywood and lumber bulkhead may also be used with either bulkhead brackets (Fig. 37.4) or rails with column clamps and ties (Fig. 37.5). The bulkhead must be designed and constructed to resist the intended loads. See "Bulkheads" section for additional information.
If standard panels and outside corners are used for the bulkhead, it is possible to form pilasters with a depth of 2'-6" (Fig. 37.7).
See the "90° Corners" section for assembly lock requirements.

Description	Ref.-No.
I-pilaster panel	
12'	**23-309-50**
8'	**23-309-60**
4'	**23-309-70**
I-column clamp	**23-311-00**
Bulkhead bracket 60/23	**29-105-60**
Flange nut 100	**29-900-20**

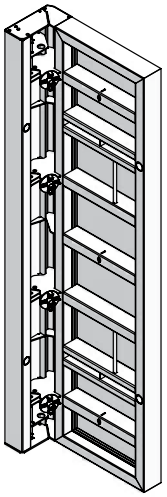

Fig. 37.1

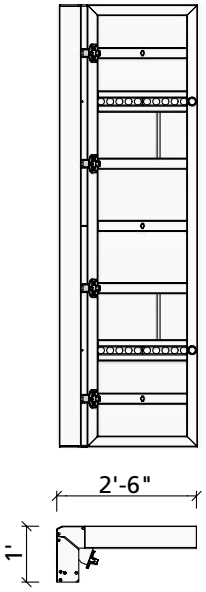

Fig. 37.2

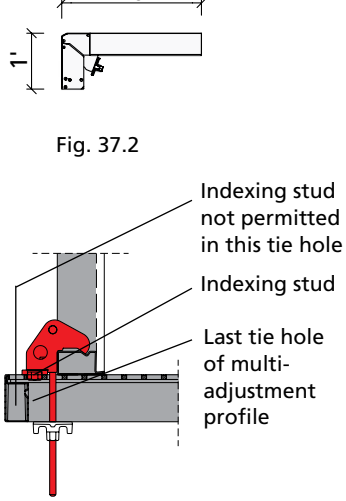

Fig. 37.6 Detail

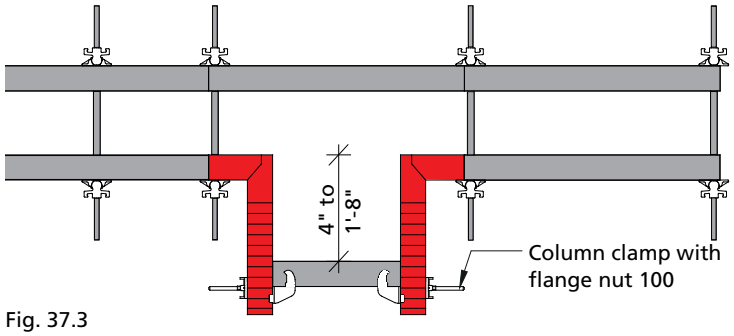

Fig. 37.3

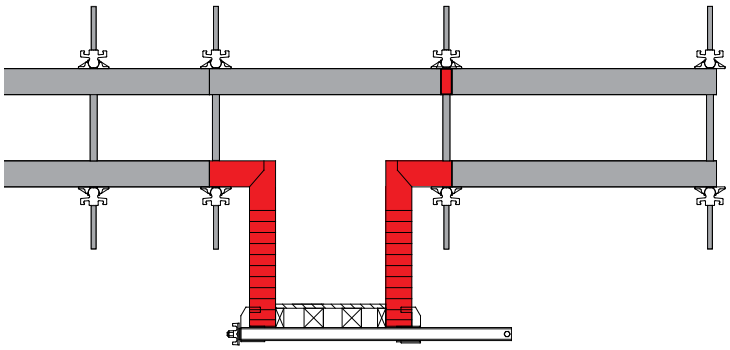

Fig. 37.4

see the "Bulkheads" section for max. widths

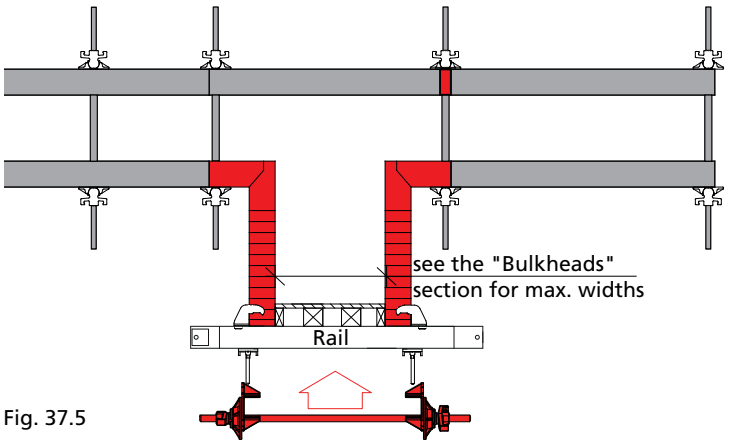

Fig. 37.5

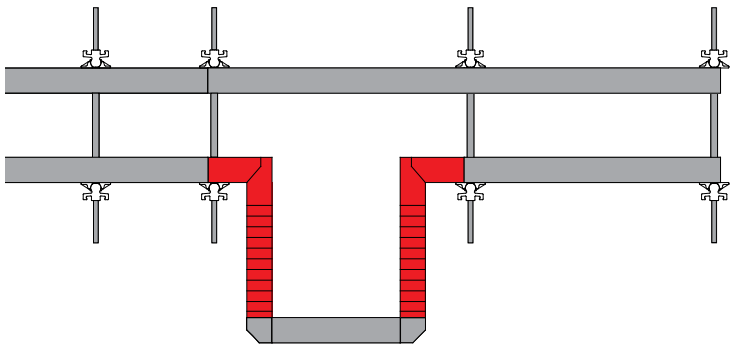

Fig. 37.7

Pilasters With Panels & Corners

Pilasters are easily formed using panels and inside corners. The pilaster face panel can be supported with either bulkhead brackets (Fig. 38.1) or steel rails (Fig. 38.2). In both cases hardwood blocking must be installed between the panel frame and the bulkhead bracket or rail at the face of each inside corner.

Multi-purpose panels with column clamps can be used to form the bulkhead face up to 2'-2" wide in 2" increments (Fig. 38.3). A job-built boxout can be added if necessary to reduce the pilaster depth.

Pilasters more than 12" deep can be formed with additional panels and ties (Fig. 38.4). Any of the methods above can also be used to form the pilaster face.

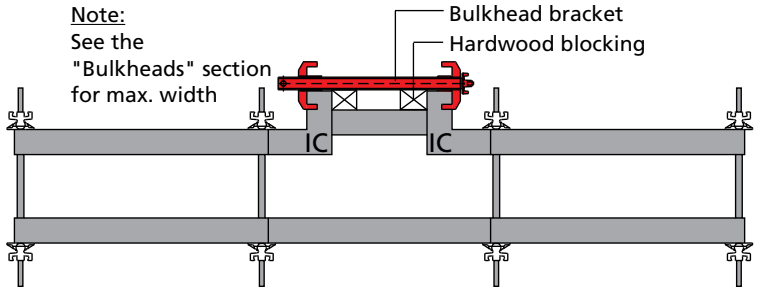

Fig. 38.1

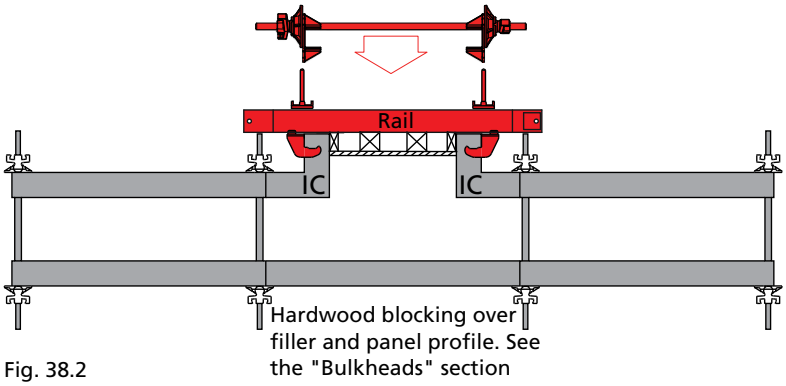

Fig. 38.2

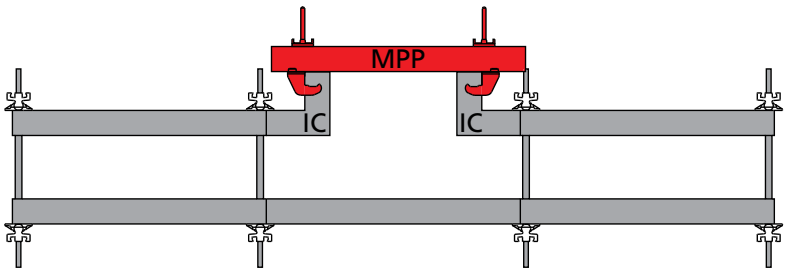

Fig. 38.3

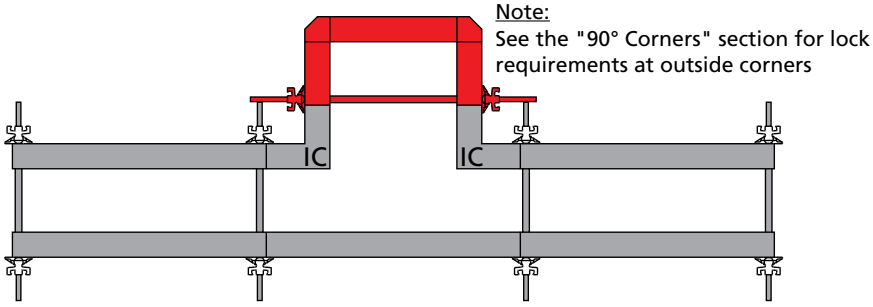

Fig. 38.4

Description	Ref.-No.
I-pilaster panel	
12'	**23-309-50**
8'	**23-309-60**
4'	**23-309-70**
I-column clamp	**23-311-00**
Bulkhead bracket 60/23	**29-105-60**
Flange nut 100	**29-900-20**

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Pilasters at Corners

Example formwork solutions for wall corners with pilasters are shown in Fig. 39.1 - Fig. 39.3.
Different pilaster sizes can be formed by using combinations of fillers and boxouts. Multi-purpose panels and fillers can be used to accomodate different wall thicknesses.

Refer to the "90° Corners" section for lock and rail requirements at outside corners, and for maximum allowable concrete pressure.

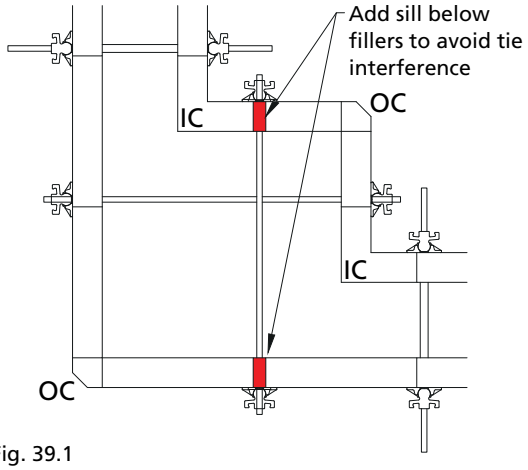

Fig. 39.1

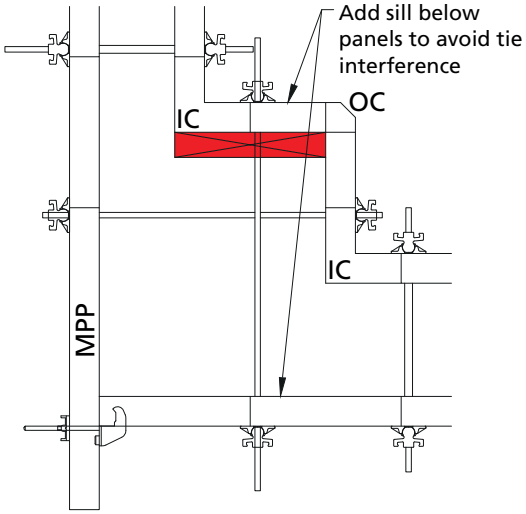

Fig. 39.2

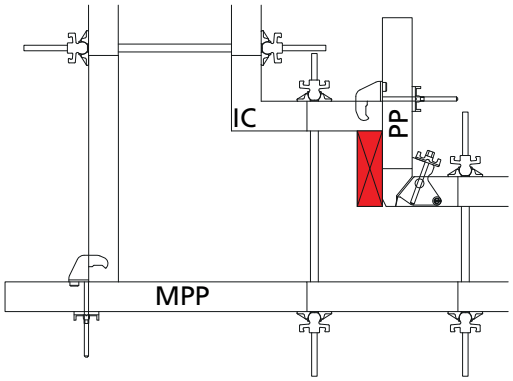

Fig. 39.3

Wall Offsets

Wall offsets up to 2" can be formed by offsetting the corresponding panels, and adding rails and wood blocking (Fig. 40.1).
Tensile load transfer must be considered when this detail is used near bulkheads or outside corners. Additional bracing, struts, or thru ties may be necessary.

Offsets between 2" and 20" can be formed using pilaster panels (Fig. 40.2).
A boxout is needed if the offset is less than 4", or for odd inch increments.

Offsets up to 33" can be formed using multi-purpose panels with corner brackets (Fig. 40.3).

Refer to the "90 Degree Corners" section for maximum concrete pressure based on outside corner conditions.

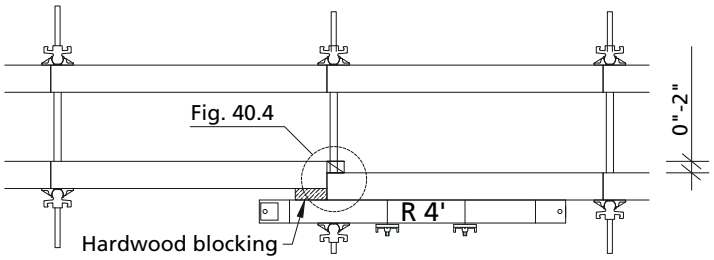

Fig. 40.1

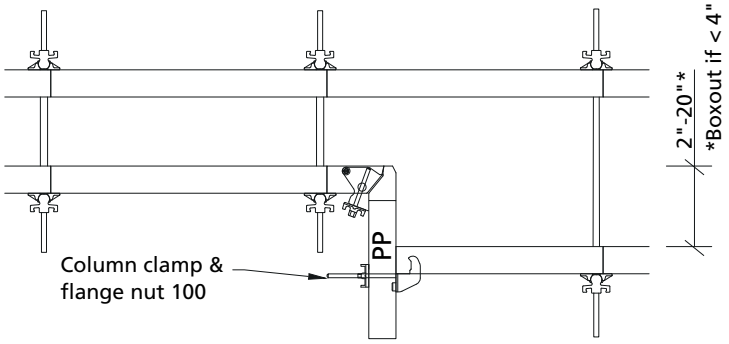

Fig. 40.2

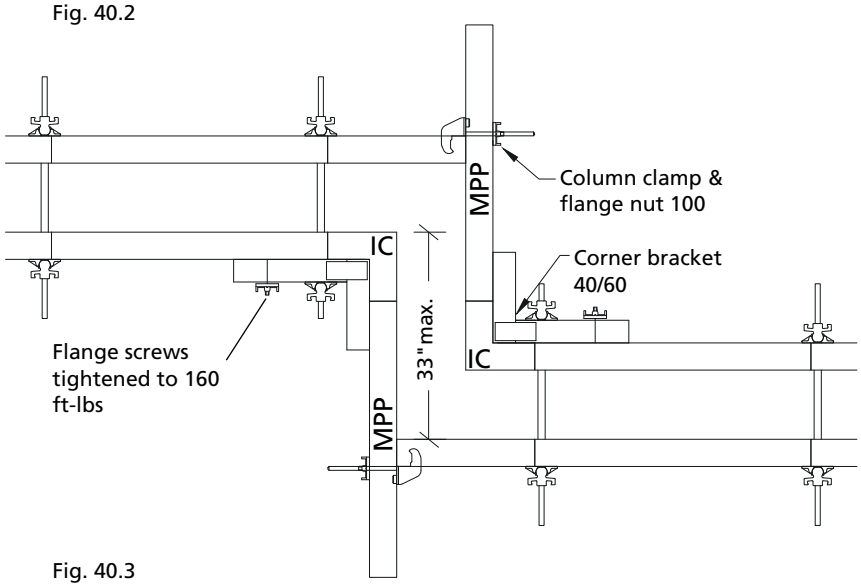

Fig. 40.3

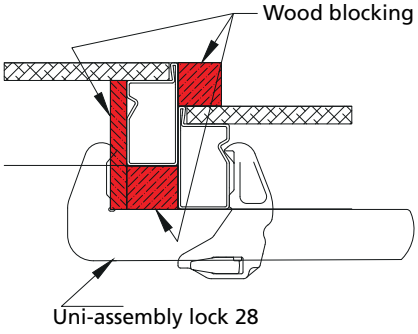

Fig. 40.4

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Vertical Offsets

The assembly lock can be attached at any position on the frame profile, so all panels can be safely connected even when offset from each other vertically (Fig. 41.1).

Job built fillers are used to transition between vertical and inclined panels (see the "Fillers" section for additional information and requirements). They must be designed and constructed to resist the intended loads.

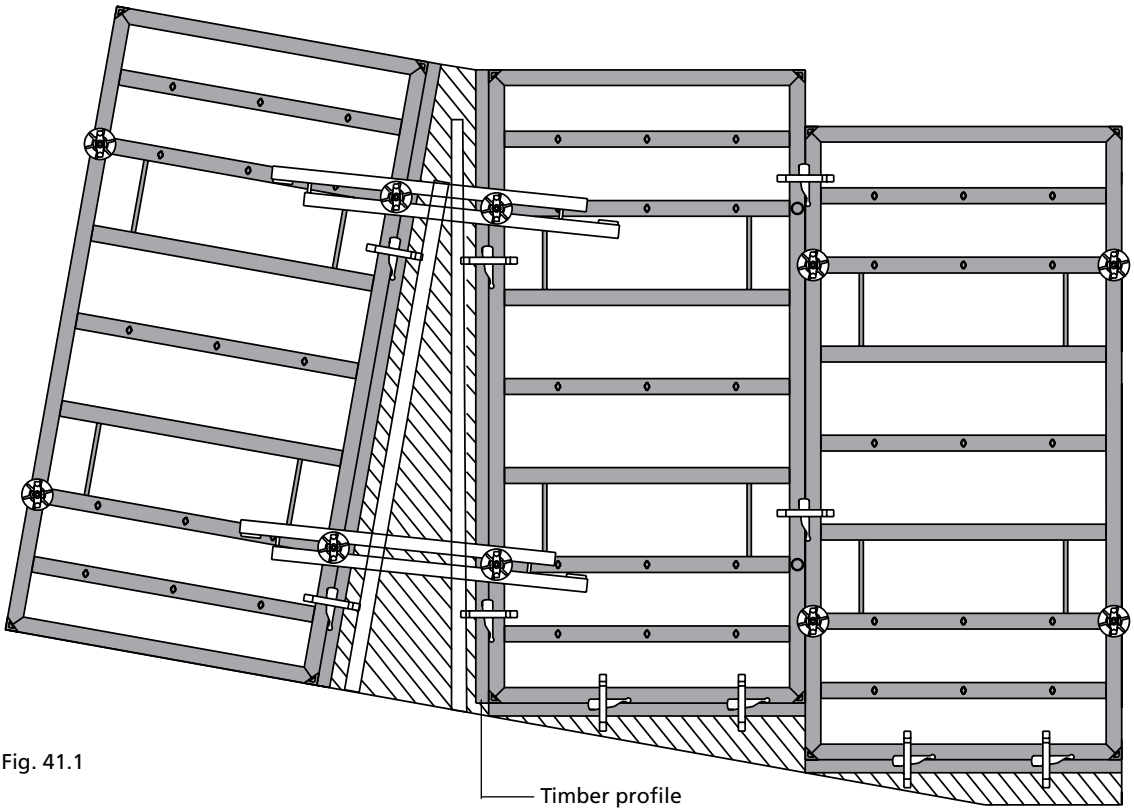

Fig. 41.1

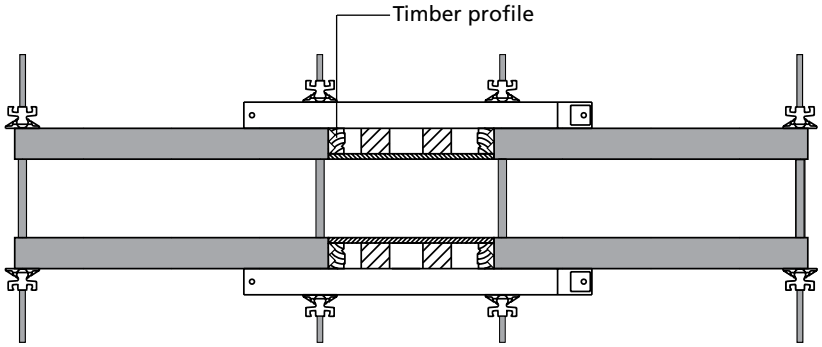

Fig. 41.2

Horizontal panels

A horizontal panel configuration is well suited for some applications such as basin walls in water treatment plants, foundations, and one-sided formwork (Fig 42.1). The bottom of the formwork can be tied using 5/8" ties with drive nuts. This method may only be used at a single panel edge, and is not permitted at panel joints and fillers.

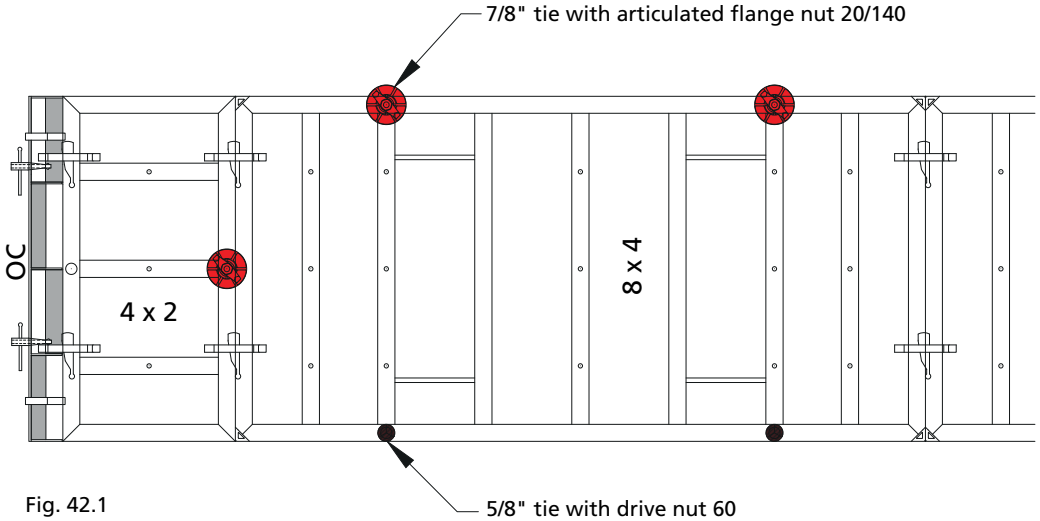

Fig. 42.1

Foundation spanners and foundation tape may be substituted for the bottom ties in single panels up to 4' wide (Fig. 42.2). For pour heights up to 4', the maximum spacing of the foundation spanners is 2'-3". For pour heights up to 3', the maximum spacing of the foundation spanners is 4'-3".

At the top of the formwork, ties can either be located in the panel tie holes as shown in Fig. 44.1, or above the panels using Uni-tie claws as shown in Fig. 42.2.

Multi-purpose panels are well suited for forming walls with starter walls or waterstop at the base (Fig. 42.3).

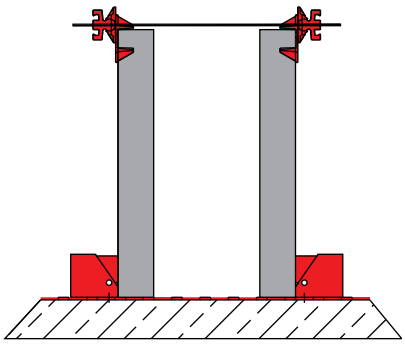

Fig. 42.2

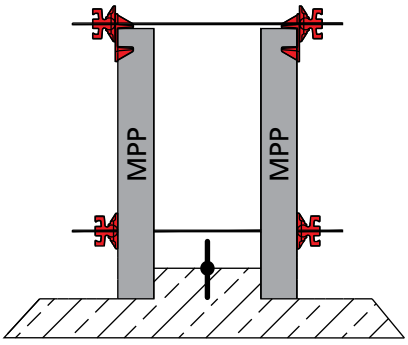

Fig. 42.3

Description	Ref.-No.
M-foundation spanner	29-307-60
Foundation tape	23-307-50

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Wall Braces

Wall braces and accessories are available for plumbing and aligning the formwork (Fig. 43.1). If braces are used to resist wind or other loads, the bracing system and anchorages must be designed by a competent person in accordance with all applicable governmental regulations, codes, and ordinances.

Wall braces are attached to the panels at the multi-function profiles using formwork prop connectors and flange screws (Fig. 43.2). Shoe plates must be installed and anchored at each brace location (Fig. 43.3). The allowable uplift on the shoe plate is 4000 lb when properly anchored. The base of the brace is anchored using the articulated foot plate (Fig. 43.4). If adequate foundations are not present to resist the required loads, temporary footings or deadmen will be needed.

Formwork must be kept stable at all times. Each individual wall form section must be supported by at least two braces.

Note:
When installing R160 and/or R250 make sure the inner tube is attached at the formwork prop connector.

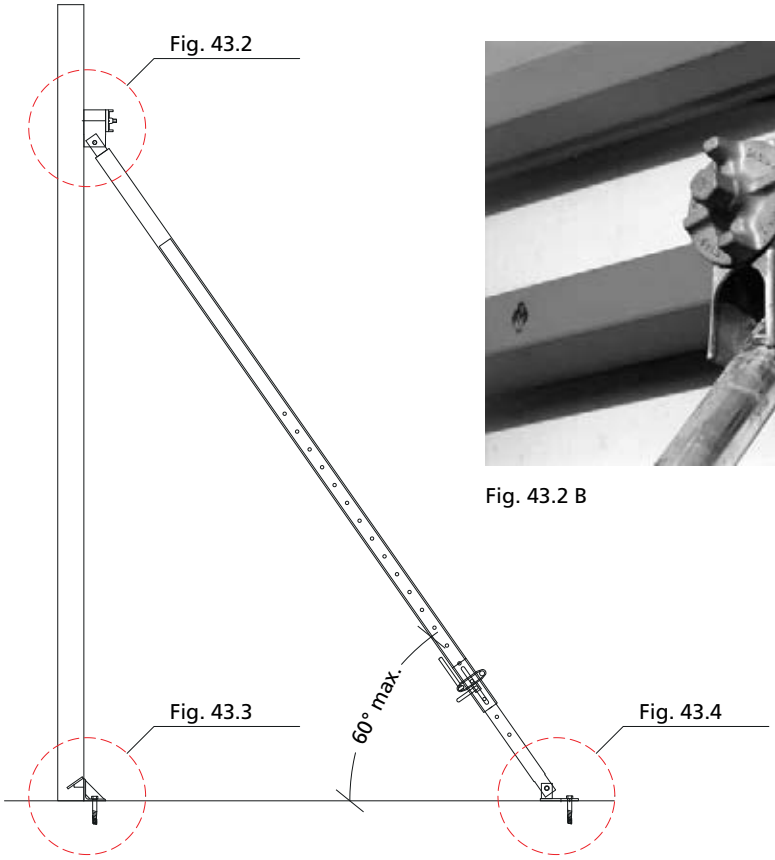

Fig. 43.1

Fig. 43.2 B

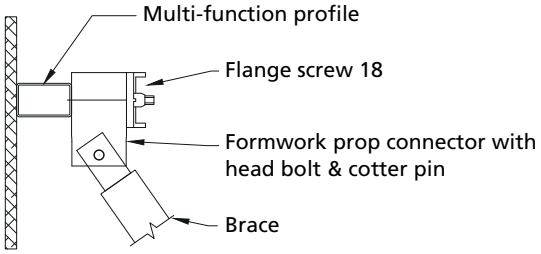

Fig. 43.2 A

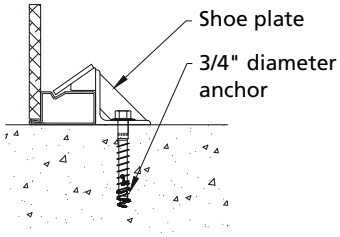

Fig. 43.3

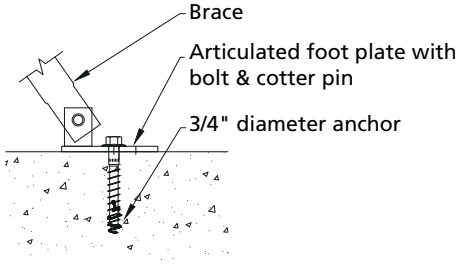

Fig. 43.4

Wall Braces

Information for the push-pull prop R brace type including load capacity and adjustment range is shown in Table 44.1.

Push-pull prop R				
Description	Adjustment range	Compression		Tension Safe working load [1,2] (lb)
		Length	Safe working load [1] (lb)	
R 160	4'-6" to 6'-6"	6'-6"	4491 [5620]	4491 [5620]
R 250	6'-3" to 10'-5"	6'-3"	4491 [5845]	4491 [5845]
		7'-1"	4491 [5845]	
		8'-9"	4491 [5620]	
		10'-5"	3372 [3372]	
R 460	11'-2" to 17'-0"	11'-2"	4491 [5620]	4491 [5620]
		12'-4"	4491 [5620]	
		14'-1"	4491 [4721]	
		14'-8"	4047 [4047]	
		15'-10"	3372 [3372]	
		17'-0"	2698 [2698]	
R 630	16'-9" to 24'-11"	16'-9"	4491 [6519]	4491 (7149) [7419]
		18'-4"	4491 [5395]	
		19'-6"	4491 [4721]	
		20'-8"	4047 [4047]	
		21'-8"	3597 [3597]	
		23'-3"	2923 [2923]	
		24'-11"	2473 [2473]	

[1] Primary value listed is based on application as brace installed at 60° to horizontal and accounts for Imperial panel connection with multi-function profile transverse working load limit of 3890 lb. Value in [brackets] is safe working load of brace alone.
[2] Tension value in (parentheses) is Imperial multi function profile pullout working load limit, included if applicable.

Table 44.1

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Wall Braces

Information for the SRL and RSK brace types including load capacity and adjustment range is shown in Tables 45.1 and 45.2.

Brace SRL				
Description	Adjustment range	Compression		Tension Safe working load [1] (lb)
		Length	Safe working load [1] (lb)	
SRL 120	3'-0" to 4'-11"	3'-0"	4491 [6744]	4491 [6744]
		4'-11"	4491 [6744]	
SRL 170	3'-11" to 7'-3"	3'-11"	4491 [6744]	4491 [6744]
		5'-11"	4491 [6744]	
		7'-3"	4491 [4496]	

[1] Primary value listed is based on application as brace installed at 60° to horizontal and accounts for Imperial panel connection with multi-function profile transverse working load limit of 3890 lb. Value in [brackets] is safe working load of brace alone.

Table 45.1

Brace RSK				
Description	Adjustment range	Compression		Tension Safe working load [1,2] (lb)
		Length	Safe working load [1] (lb)	
RSK 1	3'-0" to 4'-11"	3'-0"	4491 [8992]	4491 (7149) [8992]
		4'-11"	4491 [8992]	
RSK 4	8'-6" to 13'-1"	8'-6"	4491 [8543]	4491 (7149) [8992]
		9'-5"	4491 [7194]	
		10'-10"	4491 [5171]	
		11'-3"	4721 [4721]	
		13'-1"	2698 [2698]	

[1] Primary value listed is based on application as brace installed at 60° to horizontal and accounts for Imperial panel connection with multi-function profile transverse working load limit of 3890 lb. Value in [brackets] is safe working load of brace alone.
[2] Tension value in (parentheses) is Imperial multi function profile pullout working load limit, included if applicable.

Table 45.2

Form Walkways

Walkway Bracket
The walkway bracket contains an integral self-locking pin, and is mounted to a multi-function profile (Fig. 46.1 and 46.2). To mount the bracket: rotate it 45°, insert the pin into the profile hole, then turn it back to the vertical position. The bottom of the bracket is then secured to the panel with a flange screw (Fig. 46.3).

After bracket installation the walkway planking, guard-railing posts, and guardrails may be installed. Holes are provided in the walkway brackets and guardrail posts for fasteners. The guard-railing post 100 can accomodate guardrail sections up to 2 3/8" thick.

The walkway bracket 90 is capable of supporting a 25 psf applied uniform load at a 4:1 factor of safety against failure when spaced up to 8' on center (assuming adequate planking is utilized).

Walkway brackets may only be occupied when attached to adequately braced panels (or panels tied to braced panels) after guardrails and all other safety components and anchors are installed.

The guard-railing adapter is used to mount the guard-railing post 100 on the formwork opposite the walkway brackets (Fig. 46.2).

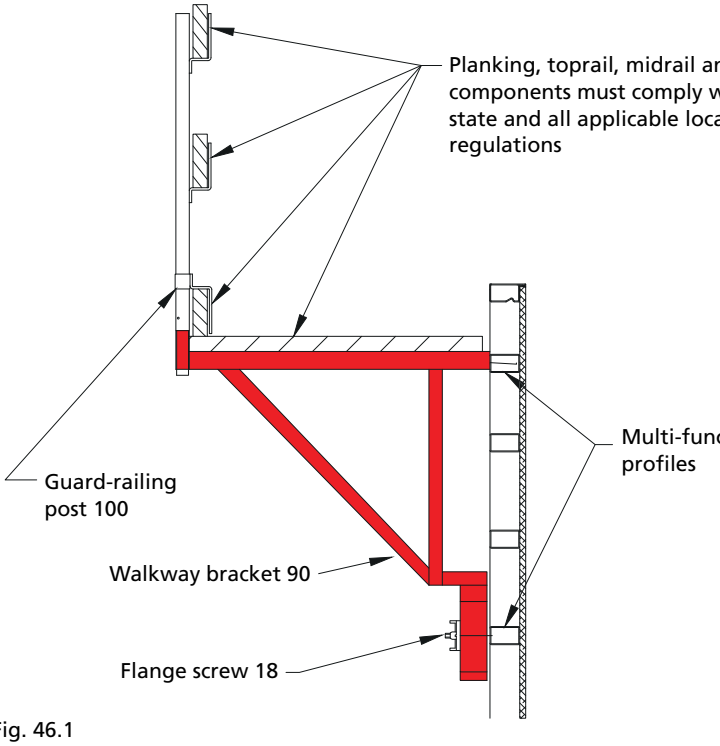

Fig. 46.1


Fig. 46.2


Fig. 46.3

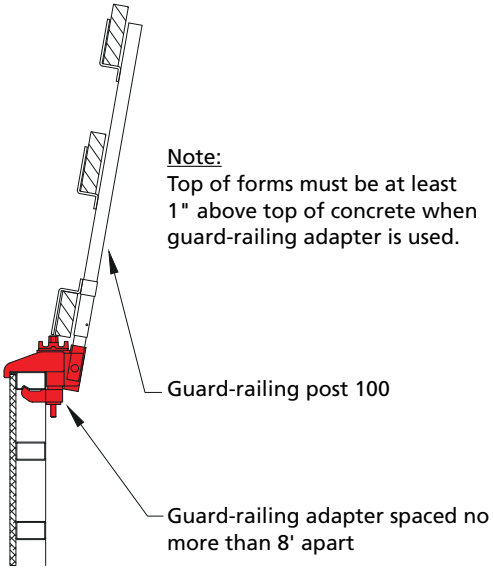

Fig. 46.2

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Crane Hook

The safe working load of a crane hook (Fig. 47.1) is 3,300 lbs (Safety factor: 5:1 against failure)
The handling is very simple:
Open the safety lever as far as possible (Fig. 47.2), then move the crane hook onto the panel profile until the claw engages completely in the groove. Push the safety lever down and toward the panel to lock the crane hook (Fig. 47.3).
When moving gangs (Fig. 47.4), make sure that each crane hook is attached at a panel joint or above a stiffener (when horizontally stacked). This prevents the crane hook from sliding.
Exeption: single vertical panels up to 4' wide.

Safety tips
Always check the crane hook before each use.
Do not overload the crane hook.
Do not use the crane hook to break concrete bond when stripping.

Safety regulations
When using our products the federal, state and local codes and regulations must be observed.

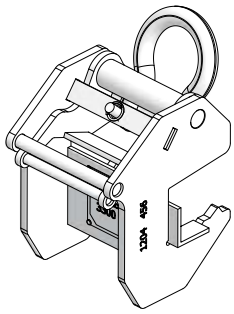

Fig. 47.1

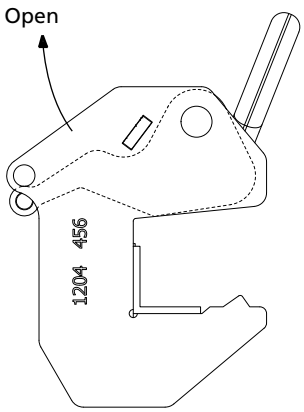

Fig. 47.2

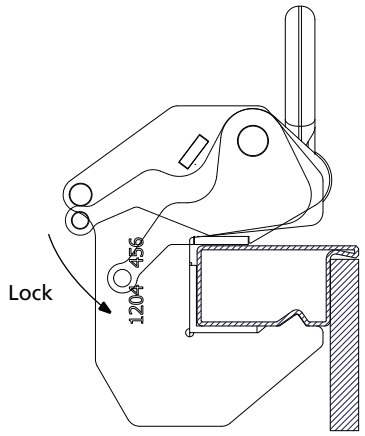

Fig. 47.3

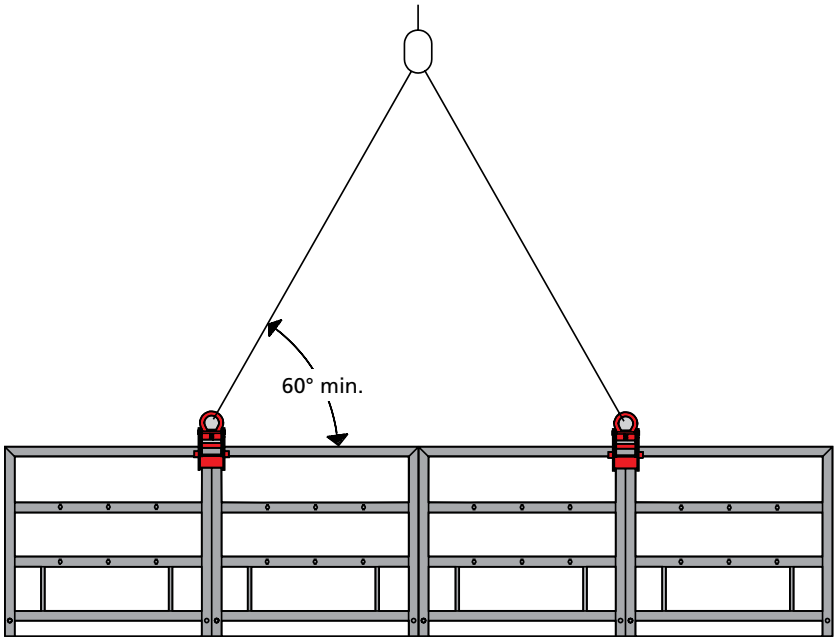

Fig. 47.4

Attention
If the reference dimension shown in Fig. 47.5 exceeds 2 13/32" the crane hook must be replaced immediately. Replace it even if only one side of the hook exceeds this dimension.

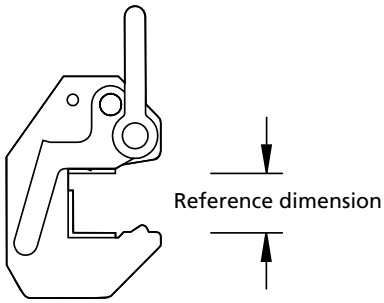

Fig. 47.5

Description	Ref.-No.
M-crane hook	29-401-25

Gang Forming

Each crane hook must be attached at a panel joint (Fig. 49.1) or above a cross member when the top panels are horizontal (Fig. 48.1). The number and location of crane hooks and the rigging arrangement must be established by the user so that no individual component is overloaded. Spreader beams with load equalizers are recommended for all but simple two-point lifts.

Vertical steel rails must be installed across stacked panel joints for lifting gang forms. The following rules must be observed:

1. Maximum average rail spacing is 8' for gangs up to 18' high. Maximum average rail spacing is 4' for gangs over 18' high. Rails should be installed on panels at both ends of each gang.

2. Both tubes of rail section must extend to 2nd cross member away from panel joint or beyond (Fig. 48.1). Flange screws must be installed in threaded holes closest to panel joint.

3. 4' long rails with (1) flange screw on each side of the panel joint may be used for gangs up to 18' high when connecting 12' and 8' high panels (Fig. 48.1). Longer rails are required when connecting 4' high and 2' high panels.

4. For gangs > 18' high, 6' long rails with (2) flange screws on each side of the panel joint must be used (Fig. 49.1), except at top horizontal panels ≤ 2'-0" wide.

5. 1' and 1.5' wide horizontal panels can only be located at the top or bottom for gang heights over 14'.

6. Maximum gang height for single lift is 26'. Higher walls must be set in multiple lifts, unless special analysis and design are performed.

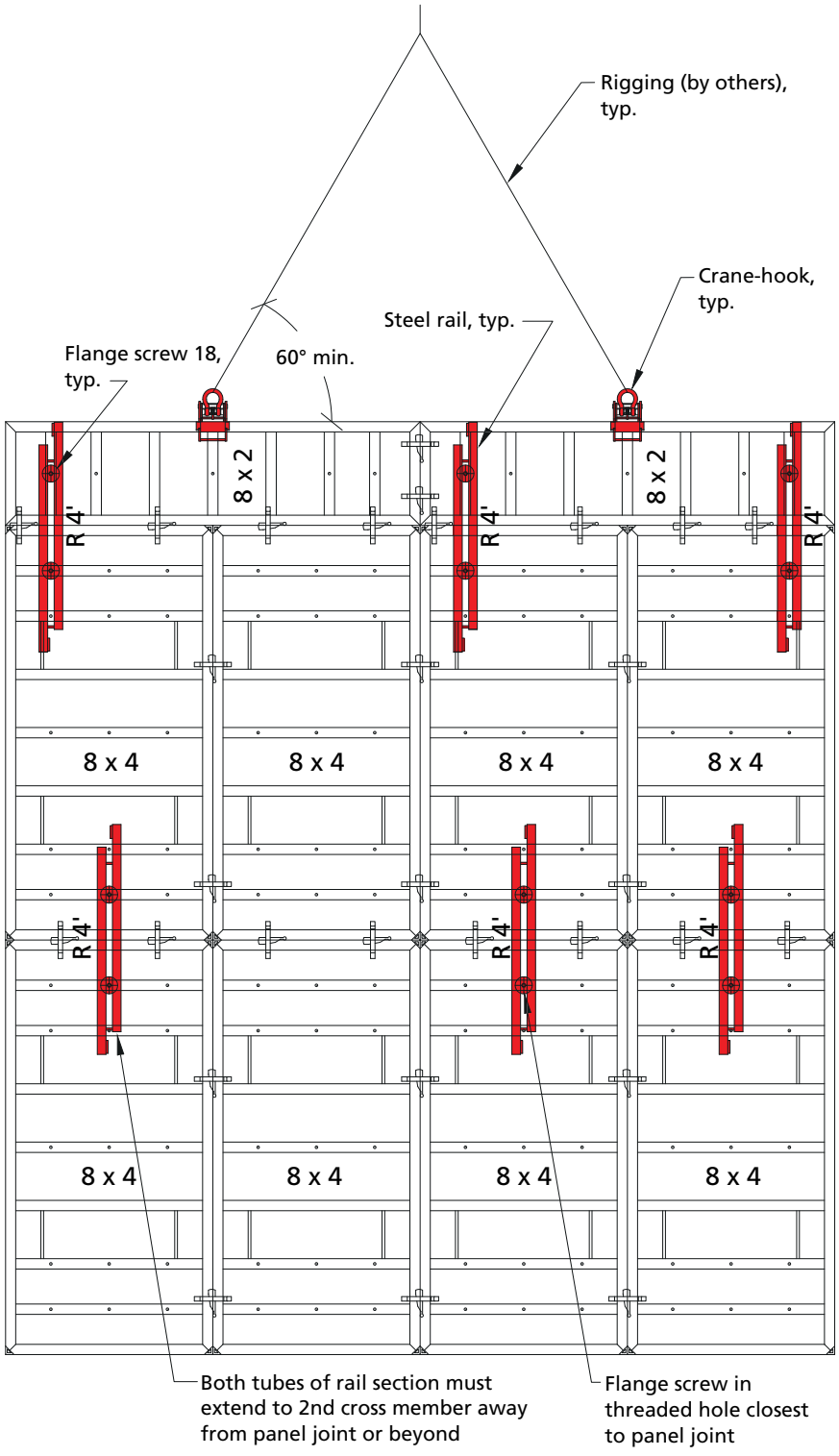

Fig. 48.1 Gang form with horizontal top panels

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Gang Forming

If rails required for lifting interfere with those needed for concrete placement, reconfigure/remove lifting rails after setting gangs, then reset to lifting configuration prior to stripping.

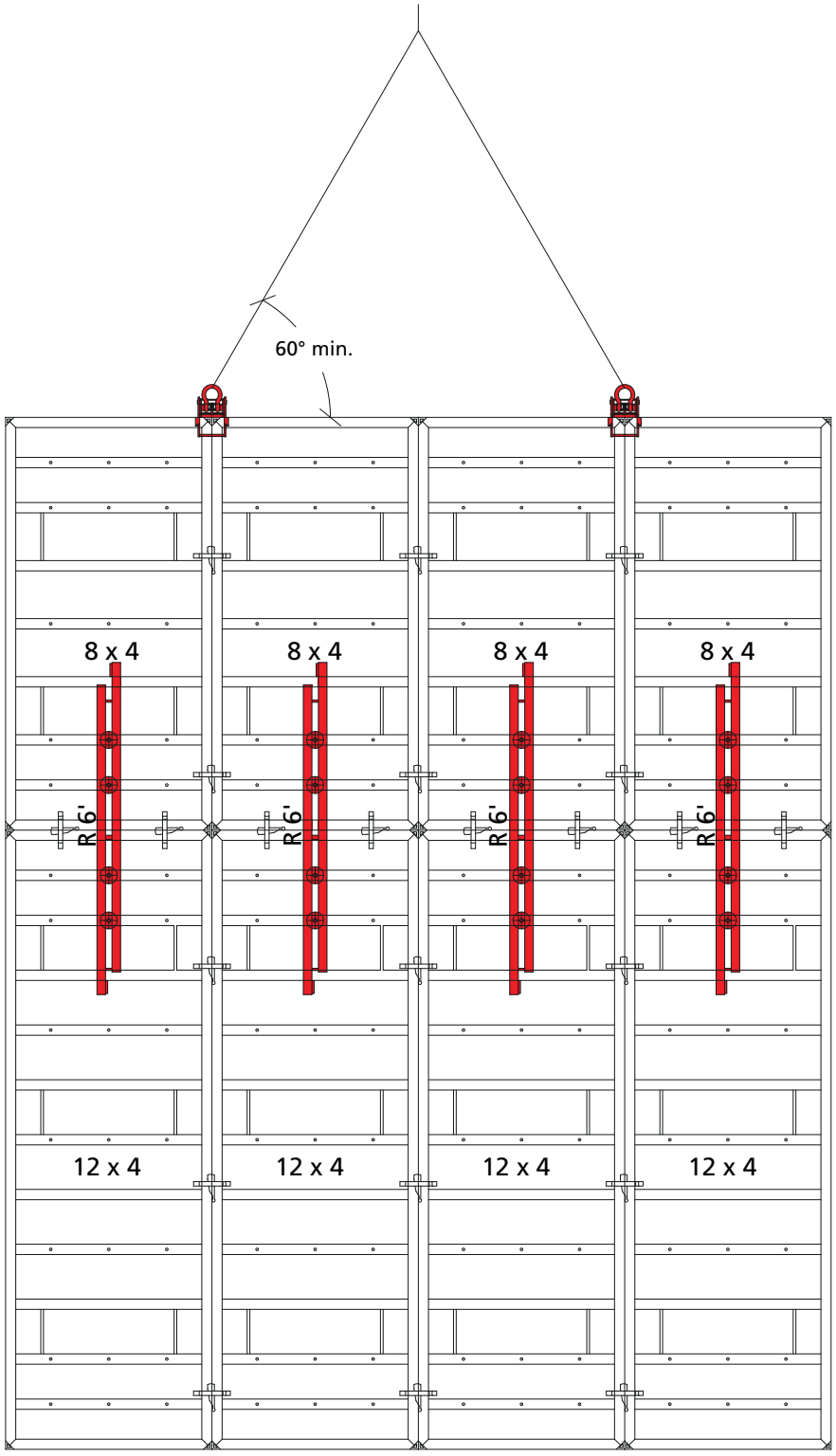

Fig. 49.1 Typical gang form

Adjustable Shearwall Bracket

Adjustable shearwall brackets are used to support formwork from the vertical face of previously cast concrete. The brackets are made with Imperial profiles welded to the top so that assembly locks can be used to connect the formwork to the brackets (Fig. 50.1 & 50.2).

The brackets are bolted to the concrete using anchor bolts with climbing cone inserts located at the desired elevation. Climbing cones with conical sleeves and anchor plates are set in the previous lift formwork with the positioning disk M24 (nailed to the form face) or a setting bolt (through the form face). After the forms are stripped the shearwall brackets are bolted to the climbing cones. The formwork may be set and connected to the brackets once the concrete has reached a minimum compressive strength of 2200 psi.

Brackets are designed for vertical load only. Formwork must be securely braced to prevent any lateral force on the bracket.

The safe working load of the shearwall bracket assembly is 3300 lb., which is limited by the anchor bolt shear combined with bending due to the climbing cone & positioning disk recess. Higher capacities are possible with other anchor configurations. The ultimate capacity of the bracket itself is 36,500 lb.

If post-installed anchors are to be used, they must be 1" diameter and designed to resist the intended loads. The anchor length must account for the required concrete embedment plus the bracket and washer thickness.

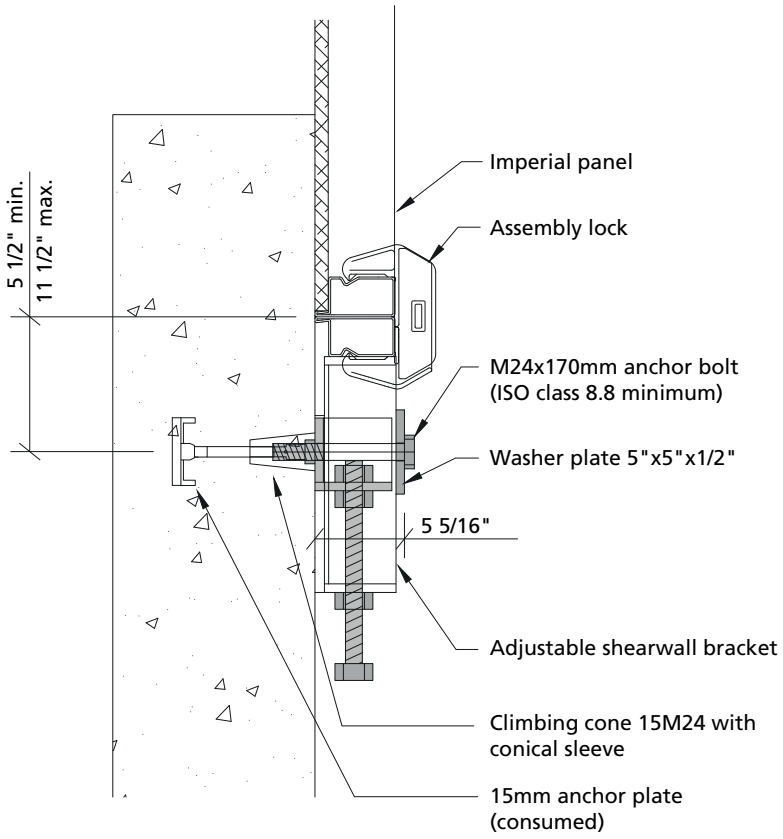

Fig. 50.1 Section view

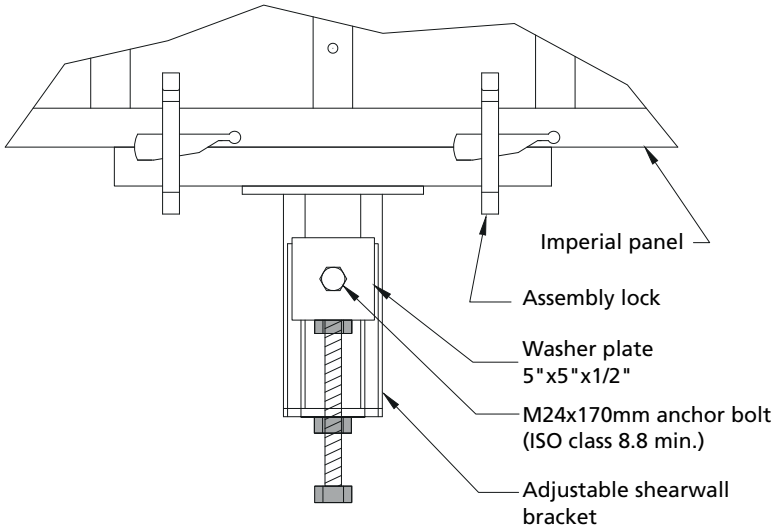

Fig. 50.2 Elevation view

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Stripping Corner

The stripping corner allows gangs for elevator shafts and core walls to be set and stripped without disassembling the gangs (Fig. 51.1). They can also be used to allow easy stripping of gangs adjacent to pilasters (Fig. 51.2). The stripping corner is designed with three pieces to permit inward movement (Fig. 51.4). Minimal crane time is required because the stripping corners turn all sides of the gang into one moveable unit. After resetting the gang for the next pour, the mechanism in the corners returns the gang form to the rectangular shape (Fig. 51.3).
The number and location of crane hooks and the rigging arrangement must be established by the user so that no components are overloaded (see "Crane Hook" and "Gang Forming" sections).

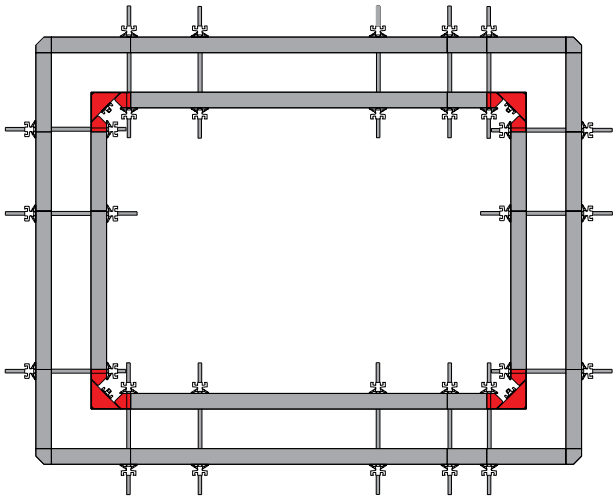

Fig. 51.1

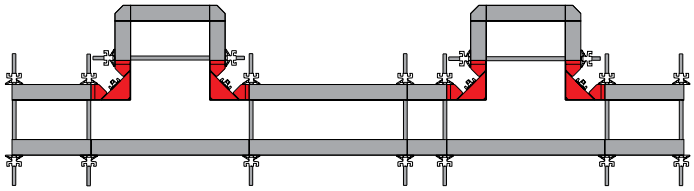

Fig. 51.2

Description	Ref.-No.
I-stripping corner	
8' x 1'	**23-309-10**
4' x 1'	**23-309-20**

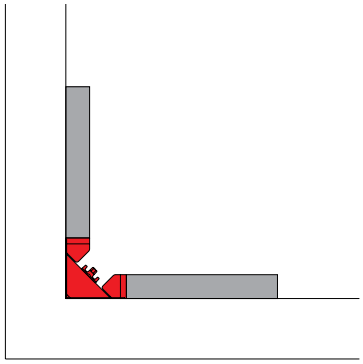

Fig. 51.3 Expanded (pouring) position

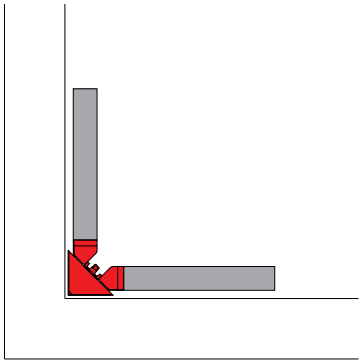

Fig. 51.4 Retracted (stripping) position

Assembly, Erection and Stripping

Planning Stage
Planning and preparation are the keys to a successful application of any formwork system.

To determine the amount of formwork material that will be needed, a number of influencing factors should be taken into account such as:

- movement of formwork on the site, including weight to be handled and capacity of lifting equipment
- project schedule
- construction joints (if specified) that define concrete placements
- pour plan & sequence, taking into account the number of corners, pilasters, etc. in each pour
- stripping requirements
- concrete placement method
- reinforcing steel placement method
- site conditions and accessibility
- coordination with other trades

Once all these aspects have been considered, the quantity of formwork can be determined.

During the planning stage some general aspects of the forming details should also be considered, such as incorporating stripping relief. Continuous formwork between two structural elements such as walls or pilasters should utilize stripping corners, pilaster panels, or job built fillers to facilitate stripping.

A safety plan should be developed to address all aspects of the formwork operation including assembly, erection, concrete placement, and stripping. Adequate fall protection must be provided as required by all applicable regulations & codes.

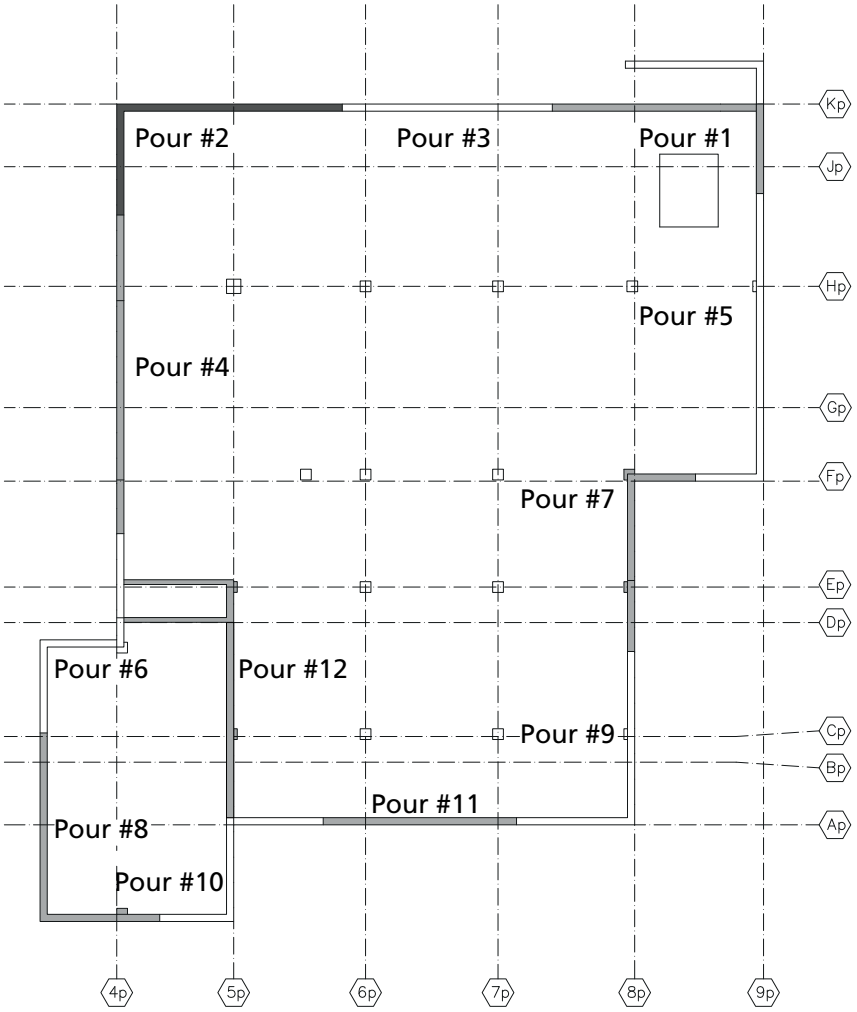

Fig. 52.1 Example wall pour plan

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Assembly, Erection and Stripping

General
The following assembly, erection, and stripping information is provided as a guide, and is not intended to be all-inclusive. The contractor is responsible for the safe usage of the formwork equipment in accordance with all applicable government regulations, codes, and ordinances. Refer to the appropriate sections of this manual for more detailed information on the components described.

Unloading and Assembly
The assembly area should be clean, level, and capable of supporting the expected load.

1. For unloading panels from a truck a stack at a time, use the lifting hook 60. The forms are usually delivered with the panels face-up.

2. Move one panel at a time onto dunnage face-up (Fig. 53.1). Dunnage should raise the panel at least 5 1/2" and be clear of the lift points to allow access for crane hooks.

3. Remove the lifting hook 60 and attach the crane hooks.

4. Lift the panel up, then lay it face down in the gang assembly area, arranging it with other panels needed for the gang (Fig. 53.2).

5. Install the assembly locks, steel rails, bracing, and walkway brackets (Fig. 53.3).

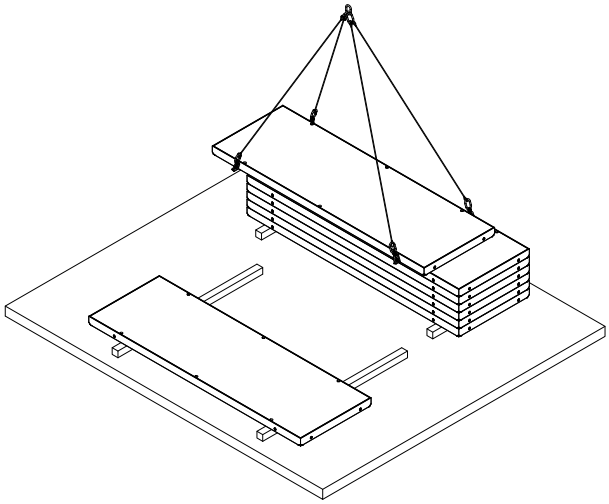

Fig. 53.1

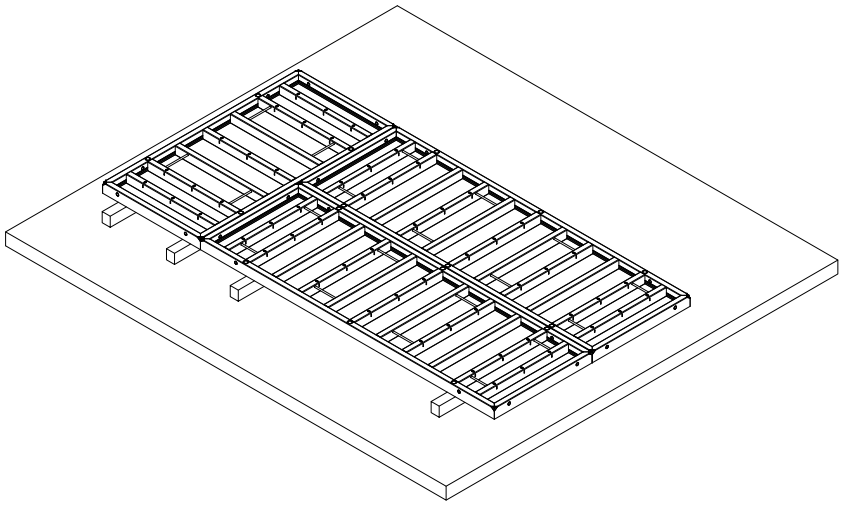

Fig. 53.2

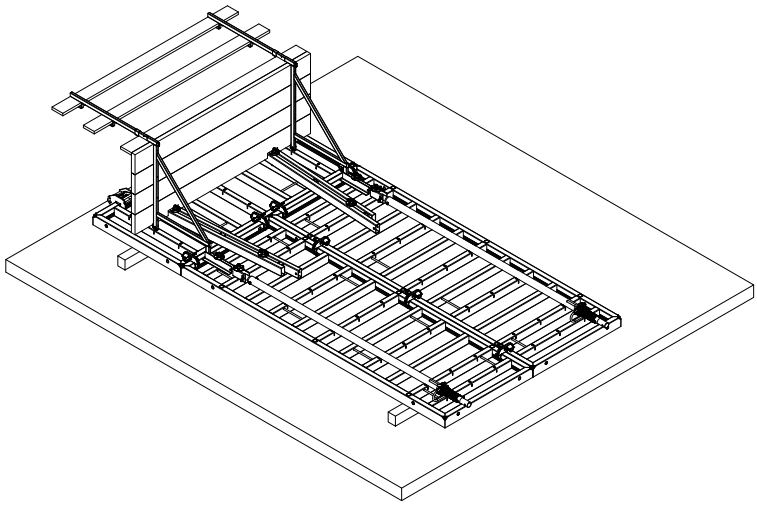

Fig. 53.3

Assembly, Erection and Stripping

Erecting the First Side

1. Determine the number and locations of crane hooks and the rigging arrangement based on the weight and configuration of the gang, ensuring that none of the components will be overloaded. Always use at least two crane hooks.

2. Lift the gang into the upright position and apply form release agent. Do not allow any personnel on or directly under any formwork while it is being moved or suspended.

3. Set the gang into position and immediately anchor the bracing foot plates and install and anchor the shoe plates (Fig. 54.1).

Caution: do not release crane support until the gang is secured. Unsecured formwork can fall over causing severe injury or death.

4. Remove the crane hooks.

5. Proceed with setting the other gangs along the first side (Fig. 54.2).

6. After all of the first side gangs for the planned pour are set, the reinforcing steel, blockouts, and other items to be embedded may be installed.

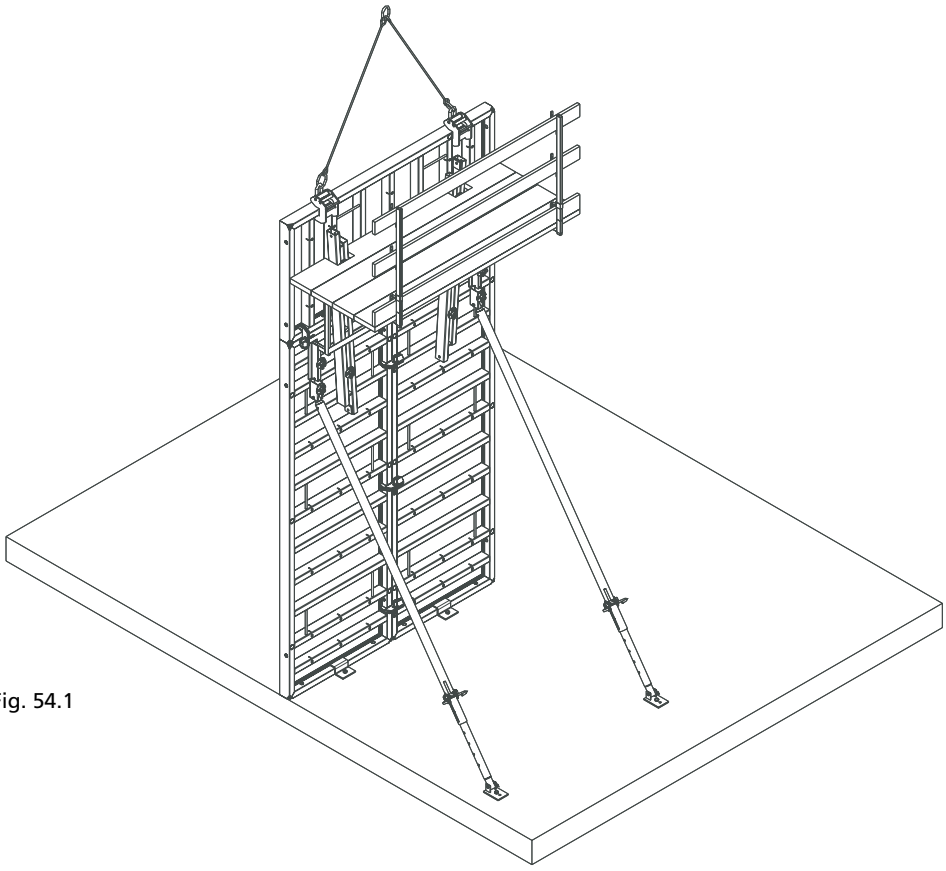

Fig. 54.1

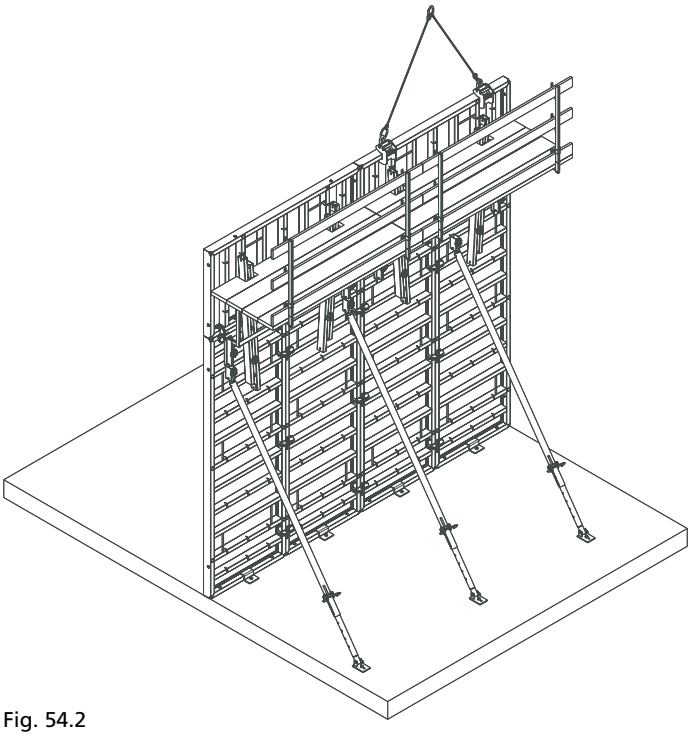

Fig. 54.2

Assembly, Erection and Stripping

Erecting the Second Side (Closing)

1. The second side formwork gangs are assembled the same way as the first side. Depending on the tie system, some tie components may need to be installed on the first (set) side prior to erecting any second side gangs:
1.1. For threadbar ties, insert the threadbar through the set side formwork extending to the required wall thickness. Install PVC sleeves and spacer cones over the threadbar.
1.2. For pass-through shebolts, install the set side shebolts with inner units.
1.3. For steel cone shebolts, install steel cones, inner units, and set side threadbar.
1.4. If taper ties or pass-through shebolts are used, spacers are recommended to maintain wall thickness and facilitate plumbing forms.

2. Lift the second side gang form, apply form release agent, and set into place (Fig. 55.1). Anchor braces and install and anchor shoe plates if being used on second side. Otherwise, install taper ties or remaining components of other tie systems and secure with flange nuts.

Caution: if braces are used on the first side only, do not release crane support until ties are installed and the formwork is secured on both sides.

3. Proceed with setting the other gangs along the second side in the same manner, connecting them with assembly locks (Fig. 55.2).

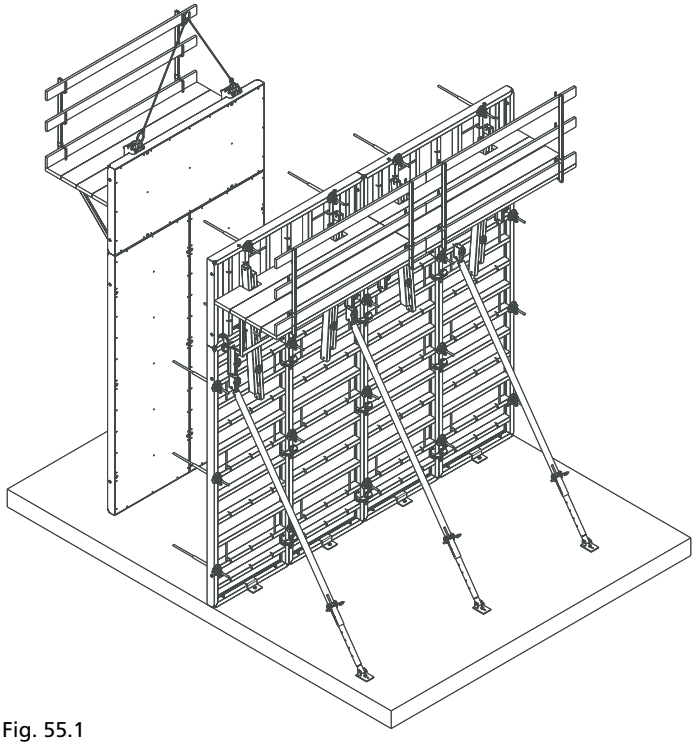

Fig. 55.1

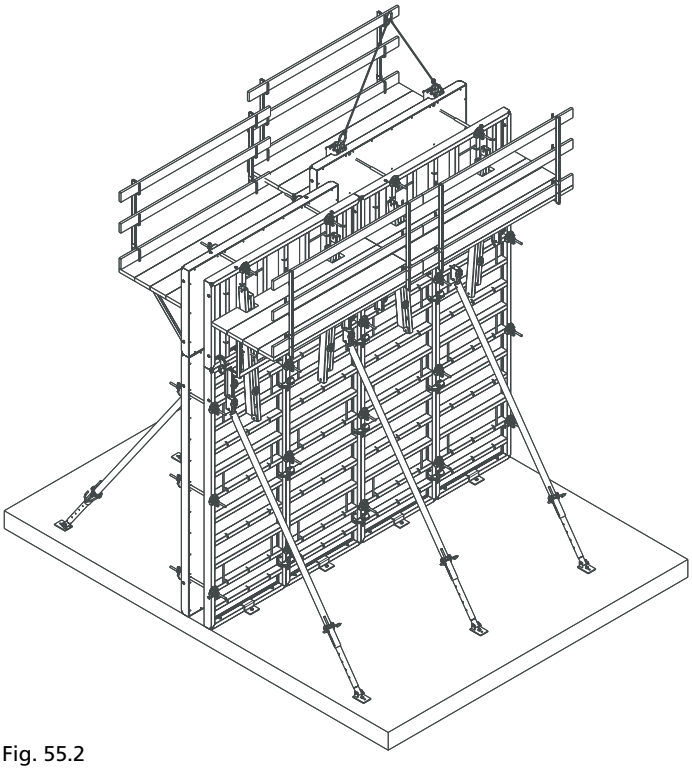

Fig. 55.2

Assembly, Erection and Stripping

Concrete Placement
Before placing concrete, the user should inspect all formwork to ensure proper placement and secure connections of ties and hardware. The maximum lateral concrete pressure shall be as indicated in this manual (or on MEVA formwork drawings if provided), taking into account all limiting factors and details of the formwork layout. Job built components incorporated into the layout may limit the pressure further.

It is the user's responsibility to adjust the pour rate and placement methods in accordance with ACI 347 for the concrete mixture and specific jobsite conditions at the time of placement so that the maximum lateral concrete pressure is not exceeded.

Stripping and Disassembly
Formwork shall not be stripped until the requirements of the project specifications have been met. If braces were installed on the first side only, strip the second side formwork first.
1. Remove all loose objects such as tools from the formwork.

2. Mount crane hooks to the gang to be stripped and remove slack from lift lines.

3. Remove ties only from the gang being stripped and the assembly locks connecting it to the adjacent gang(s).

4. Break bond to cast concrete using prybars and wedges or other stripping aids as required.

Caution: never use crane to break bond.

5. Lift gang and move to next pour (bracing required), temporary storage, or disassembly area (Fig. 56.1).

6. Proceed with stripping the remaining gangs (Fig. 56.2).

7. Clean formwork as required and apply form release agent before next use.

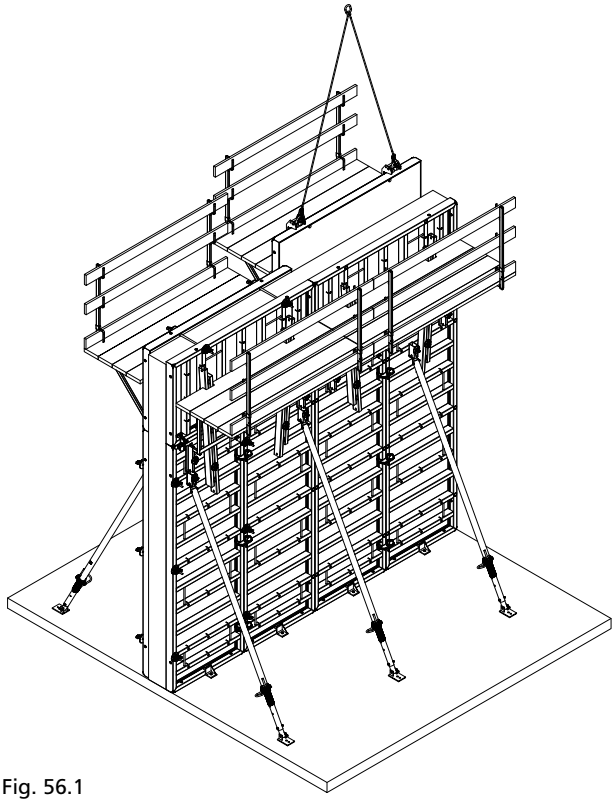

Fig. 56.1

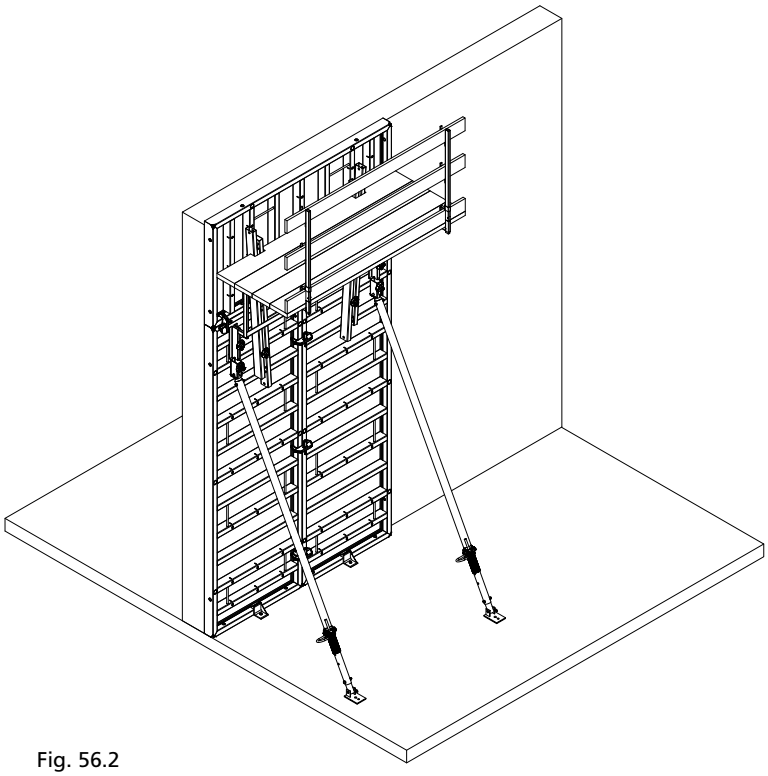

Fig. 56.2

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Lifting Hook 60

Lifting hook 60
The lifting hook 60 can be used with any four-rope crane device available on the construction site to transport stacks of panels (Fig. 57.1 and 57.3).

Always use 4 hooks at a time. The load capacity of the lifting hook is 2200 lb. The maximum stack height is 10 panels and the maximum stack weight is 4400 lb (use capacity of 2 hooks only).

Attention
Check to make sure the hooks are safely locked before lifting (Fig. 57.2).

Example stack possibilities:

(3) 12' x 8' panels
(4) 8' x 8' panels
(6) 12' x 4' Multi-purpose panels
(10) 8' x 4' panels

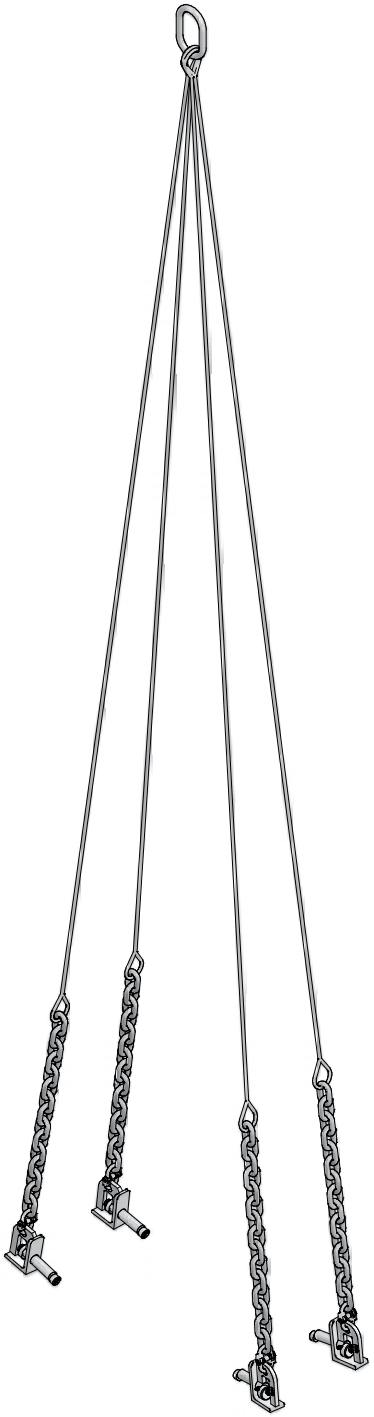

Fig. 57.1 Use MEVA **sale only** Crane Slings, or suitable lifting slings provided by others

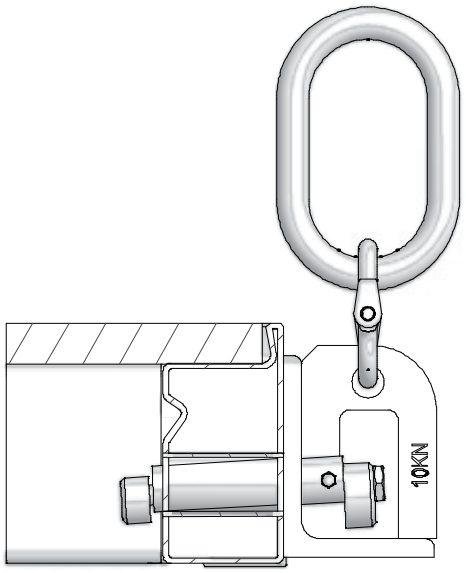

Fig. 57.2

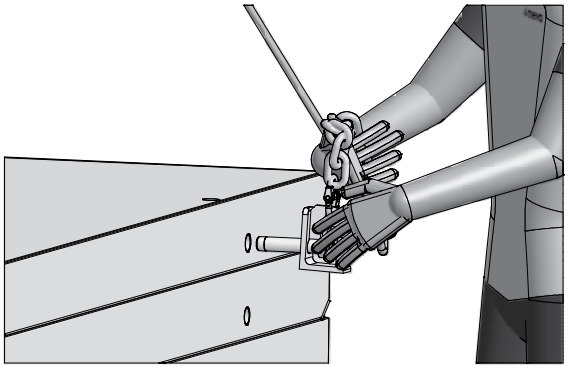

Fig. 57.3

Description	Ref.-No.
Crane slings 60	**29-401-45**
Lifting hook 60	**29-401-40**

Lifting Hook 60

Transport
When transporting several panels at a time, the stack must be secured against displacement using a tensioning belt or two Dywidag rods with flange nuts.

Maintenance
The eccentric part of the lifting hook must rotate under its own dead weight. If necessary, clean and grease the lifting hook. A drilled hole is provided for this; or it can be greased with a nipple.

Inspection
The lifting hook/crane slings must be regularly checked (at least once a year) by a competent person. In addition, the user must check it before each use for visible damage.

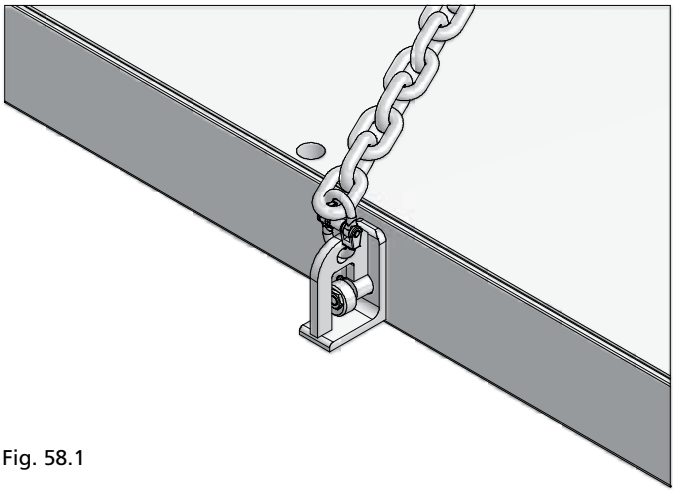

Fig. 58.1

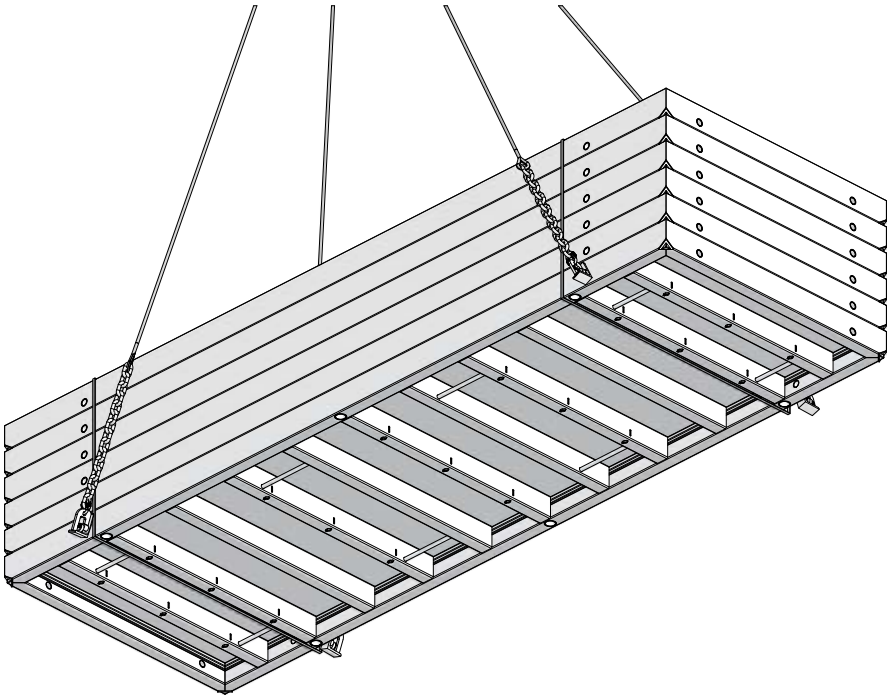

Fig. 58.2

Description	Ref.-No.
Crane slings 60	29-401-45
Lifting hook 60	29-401-40

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Related Products

Support frame STB for One - Sided Forming
The Imperial formwork – together with support frames – can also be applied when concrete has to be poured against an existing structure or embankments where ties cannot be used.
Support frames 300 are designed for wall heights up to 11'.
Support frames 450 with height extensions allow for wall heights over 30'.
Technical data sheets are available on request.

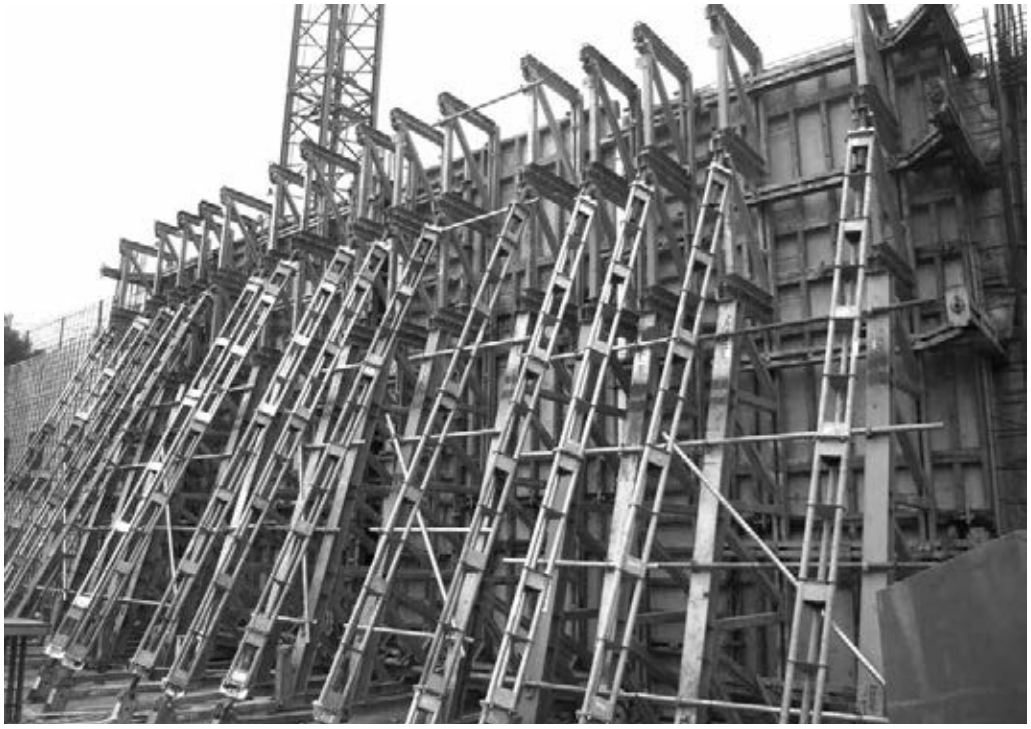

Fig. 59.1

Formwork Climbing system KLK 230
When forming high walls, facades, pillars, staircases or elevator shafts, Imperial formwork can be set and secured on the KLK 230.
Technical data sheets are available on request.

Attention:
The use of STB and KLK requires a detailed formwork planning!

Fig. 59.2

Transport

Transport units

Fig. 60.1
Panel stacks should not exceed 10 panels. Make sure that panels are secured before flying the stack.

Fig. 60.2
Corners can be stored in stacking racks.

Fig. 60.3 & Fig. 60.4
Fillers and walkway brackets can also be stored in stacking racks.

Fig. 60.5
Accessories such as assembly locks, flange screws, articulated flange nuts, ties, crane hooks, etc. can be stored in the MEVA storage boxes.

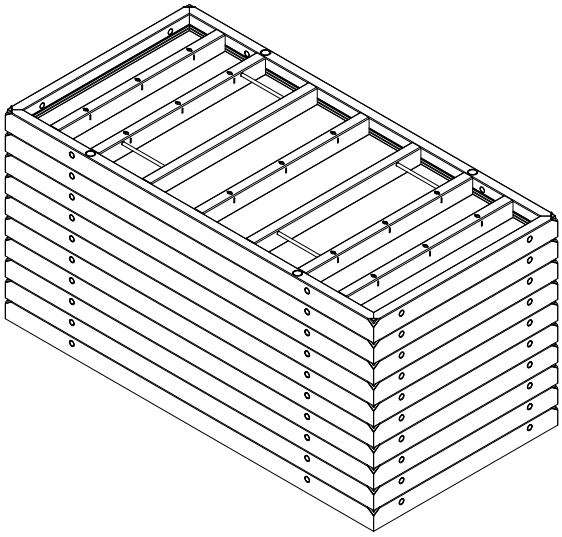

Fig. 60.1

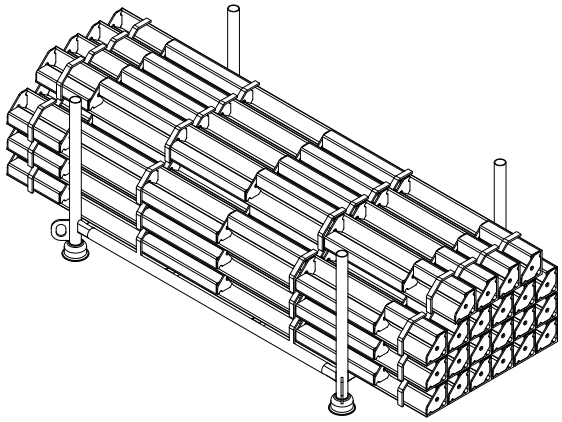

Fig. 60.2

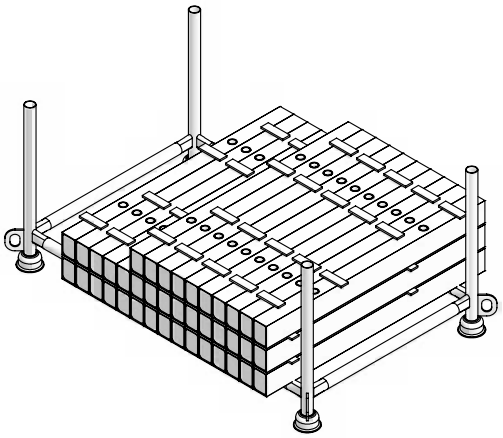

Fig. 60.3

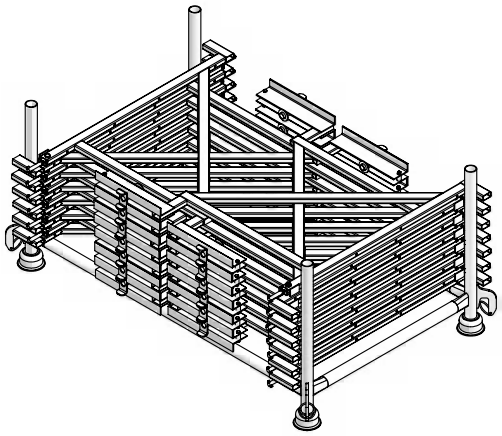

Fig. 60.4

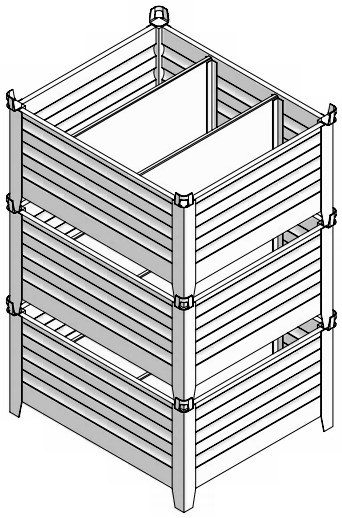

Fig. 60.5

Description	Ref.-No.
Stacking rack	27-000-20
Storage box	27-000-10

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Notes

Service

Rentals
We offer our customers the option of renting supplementary material during peak times. We also give prospective customers the chance to test MEVA formwork so they can see its benefits for themselves in actual use.

RentalPlus
Since MEVA started the flat rate for cleaning and repair of rented formwork systems in early 2000 more and more contractors experience the outstanding advantages. Ask our representatives about the details!

Formwork drawings
Of course, all offices in our technical department have CAD and BIM facilities. You get expert, clearly represented plans and work cycle drawings.

Special solutions
We can help with special parts, custom designed for your project, as a supplement to our formwork systems.