Metal Stud Crete®

Composite Concrete Panel System

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(626) 334-6100 ext 229, FAX (626) 334-6106
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Quality Control And Fabrication Manual

Information for the use of **Metal Stud Crete®** products in the manufacture and erection of **Metal Stud Crete®** panels

Metal Stud Crete® Composite Wall System

WARNING

The user of **Metal Stud Crete**® products is required to read these instructions before proceeding.

Failure to read, understand and follow these instructions can lead to dangerous and hazardous working conditions.

If these instructions are not clear to you before proceeding with construction, call **Metal Stud Crete**® for clarification. Onsite technical assistance by an authorized agent of **Metal Stud Crete**® must be utilized prior to proceeding with construction.

Quality Control and Fabrication Manual

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IMPORTANT! These instructions and information must be provided to, read, understood and followed by the qualified personnel on this project responsible for the following activities:

1) The use of **Metal Stud Crete®** products for the manufacture of panels;
(2) The contractors responsible for the manufacture, erection, bracing and bracing removal from the ***MSC*** panels and;
3) All persons responsible for Safety in connection with the manufacture, erection, bracing and bracing removal activities.

Additional copies of the instructions for this project may be obtained from **Metal Stud Crete®**.

Metal Stud Crete®

The **Metal Stud Crete®** ***(MSC)*** Composite Wall Panel System is used for single and multiple story buildings in load bearing and non-load bearing applications. The precast composite concrete and steel stud wall panels consist of approximately 2" of concrete structurally attached to galvanized steel studs.

MSC modifies a common galvanized steel stud utilizing a patented ***"composite MSC shear connector"***. These structural "web" or "trak" ***MSC*** shear connectors are attached to the galvanized steel studs and track using a galvanized self-drilling, self-tapping sheet metal screw as specified by the structural engineer. (Note: Screws must have a current ICBO approval and must meet the allowable capacity of Table I of ICBO ES Report No. 5446.) After the steel wall frame components have been assembled with the ***MSC*** shear connectors attached to that frame, the ***MSC*** shear connector portion of the wall is then embedded into wet concrete. After curing, the concrete, studs and track become a composite section.

Precast panels may be manufactured on-site or off-site in transportable dimensions up to 12 feet wide by 30+ feet long. The panels weigh approximately 35 lbs. per square foot.

Enclosed are the quality control procedures and the sequence of a typical **fabrication** process for **Metal Stud Crete®**.

For any additional technical information or for further details on **Metal Stud Crete®**, call, write or e-mail:

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QUALITY CONTROL PROCEDURES FOR FABRICATORS

Metal Stud Crete® ***(MSC)*** composite panels may be fabricated at the jobsite or at pre-approved manufacturing locations. The fabricator is responsible for compliance with the following requirements of the Quality Control and Fabrication Procedure.

I. Shop Drawings:

A. Shop drawings shall be submitted at least fourteen (14) days before program date for commencement of manufacture of formwork for panels.

B. All reinforcement and other details indicated on the contract drawings shall be included in the shop drawings.

C. Shop drawings shall be drawn clearly and to scale, and shall include the following information:

1. Plans indicating the number and location of panels.
2. Dimensions and profiles of each member.
3. Reinforcement details.
4. Lifting, bracing and fixing insert details.
5. Connection and cast-in assemblage details.
6. Special details including openings and embedments.
7. Full lifting and handling details for each panel.
8. Temporary bracing of panels during construction.

II. Proprietary Metal Stud Crete® Shear Connector:

Only proprietary patented shear connector strips may be used which must be identified with **Metal Stud Crete®**, Composite Building Systems, Inc. U.S. Patent No. 5,414,972, stamped on the leg of the connector.

A. 18-gauge (0.047 inch) (1.19 mm) steel complying with ASTM A-653 Grade 33.

B. Galvanized coating must comply with ASTM A-924.

C. Spacing of screws shall adhere to specific project engineering design and shall not exceed 6” o.c. in any case.

D. Each connector strip must be identified with **Metal Stud Crete®**, Composite Building Systems, Inc. U.S. Patent No. 5,414,972, stamped on the leg of the connector.

III. Steel Studs and Track: *(must be specified by Engineer of Record)*

A.	ICBO ES approved.	
B.	Minimum gauge:	20-ga. (0.0346 inch).
C.	Minimum depth:	3-5/8", 1-5/8" flange.
D.	Maximum stud spacing:	24" o.c.

IV. Concrete:

A. Shall have a minimum thickness of 2" and a minimum compressive strength of 2,500 lbs. per square inch at 28-days.

B. Shall comply with Section 1903 of the Code.

C. Concrete protection for reinforcement must comply with Section 1907.7 of the Code.

D. Concrete material must be in strict accordance with the Engineer of Record's specifications. The Engineer of Record shall dictate the design mix, strengths and other concrete elements.

E. Admixes, additives or other modification chemicals must be in strict conformance with design specifications.

V. Connection of *MSC* Connector to Studs and Concrete:

The **Metal Stud Crete®** shear connector strip must be fixed to the stud section using galvanized self-drilling, self-tapping sheet metal screws as specified by the Engineer of Record. (Note: Screws must have a current ICBO approval and must meet the allowable capacity of Table I of ICBO ES Report No. 5446.) The screw spacing shall not exceed 6" o.c. The engineering design for the screw size and spacing must account for the pull-out (lifting), shear and tension load requirements specific to the project.

VI. Steel Reinforcement:

Concrete panels must be reinforced in accordance with the structural design and the steel reinforcement must comply with the 1997 UBC.

VII. Screws:

Shall be galvanized self-drilling, self-tapping sheet metal screws as specified by the design engineer. (Note: Screws must have a current ICBO approval and must meet the allowable capacity of Table I of ICBO ES Report No. 5446.)

VIII. Metal Framing:

Metal framing must be in accordance with the Engineer of Record's plans, specifications and industry standards.

IX. Panel Pick Points/Temporary Panel Bracing:

These items must be designed and fabricated by Dayton/Richmond Concrete Accessories, a Dayton Superior Company. Contact Technical Product Assistance telephone (562) 946-5504, (800) 745-3701.

X. Forming:

Forms must be square to ensure panels are straight and true. Bulkhead forms for door and window openings must be properly anchored to remain rigid and in place during the placement of concrete.

XI. Lifting of Panels:

Cured panels may be lifted out of their forms when test results indicate that minimum concrete lifting strength has been achieved. When lifting panels out of forms, the top or bottom and at least one side of form work is typically removed to facilitate lifting from the casting surface.

XII. Shims/Leveling Pads/Grouting:

Leveling pads/shims shall be placed under the bottom track directly under each load bearing stud location wherever the bottom track is not in contact with the supporting slab. The Engineer of Record shall specify the approved shim/leveling pad material and the approved grouting material necessary to fill all voids under the bottom track.

XIII. Inspections:

It is the responsibility of the fabricator to confirm that any and all requirements for project quality control are met.

A. The panels may be fabricated at the job site or at pre-approved manufacturing locations.

B. Panels fabricated at offsite manufacturing locations shall require special inspection under Section 1701.7 by the quality control agency, Precast/Prestressed Concrete Institute (NER-QA105).

C. Other approved quality control agencies shall conduct special inspections offsite under Code Section 1701.6.2 as required by the building official.

D. The fabrication of panels at the job site will be governed by the building official and, if required by the building official, special inspection will be in accordance with Section 1701.6.2 of the Code.

E. The Special Inspector as part of the periodic inspection, if required by the building official, shall observe the taking of concrete test specimens, the placing of reinforced concrete, and the assigned work relevant to ensuring conformance with the approved drawings and specifications.

F. The Special Inspector shall confirm the correct connection (i.e., screw or clinching) per the engineering design and specifications including, but not limited to, size and spacing of each connecting device.

G. The Special Inspector shall furnish inspection reports to the building official, the engineer or the Architect of Record, and other designated persons.

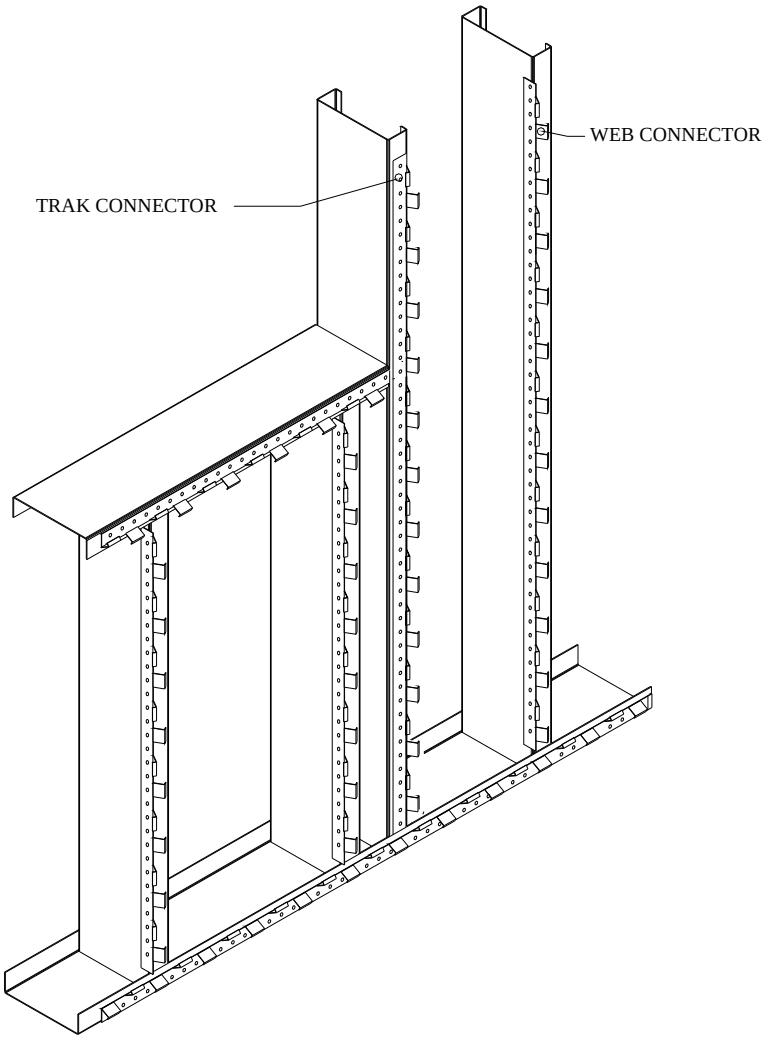
H. The Special Inspector shall submit a final signed report to the building official, stating that the work requiring special inspection was in conformance with the approved plans and specifications and the applicable workmanship provisions of the Code.

XIV. Installation:

Panels are to be installed as per approved design drawings and specifications of the Engineer of Record.

Step A –Steel Wall Framing Components

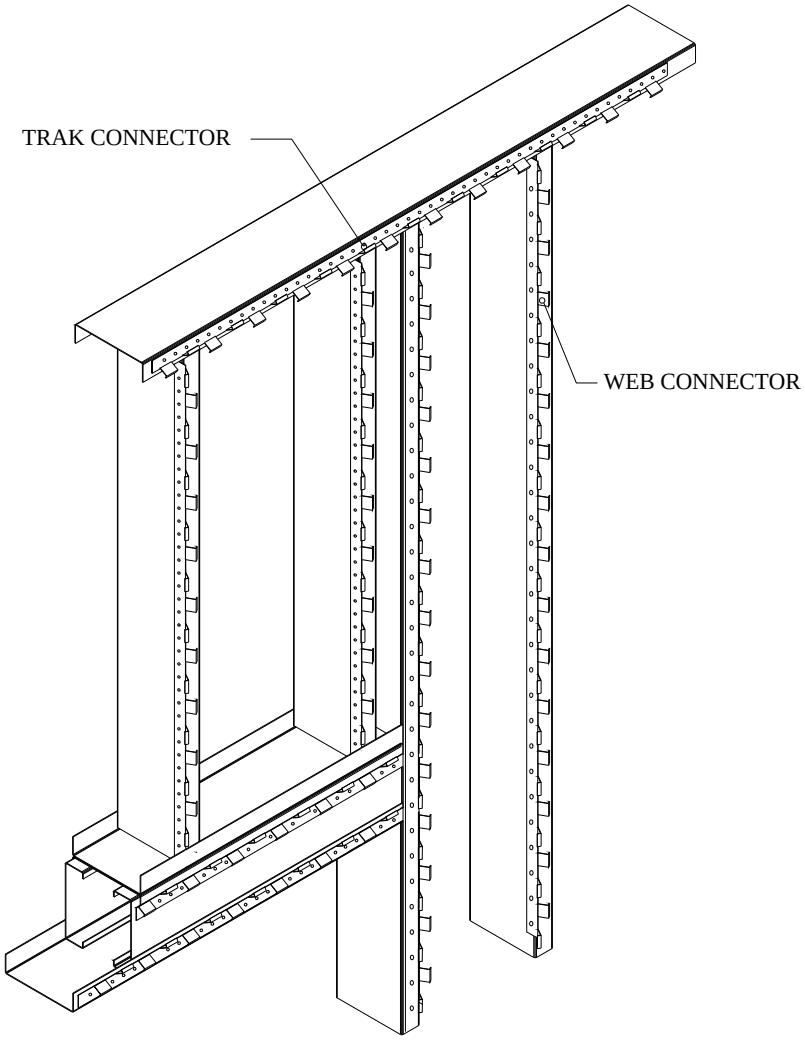
- Separate framing materials according to details from engineered shop drawings (i.e., studs, header, cripple material, track and web connectors).



TYPICAL SILL DETAIL

Step A – Steel Wall Framing Components (Continued)

- Separate framing materials according to details from engineered shop drawings (i.e., studs, header, cripple material, track and web connectors).

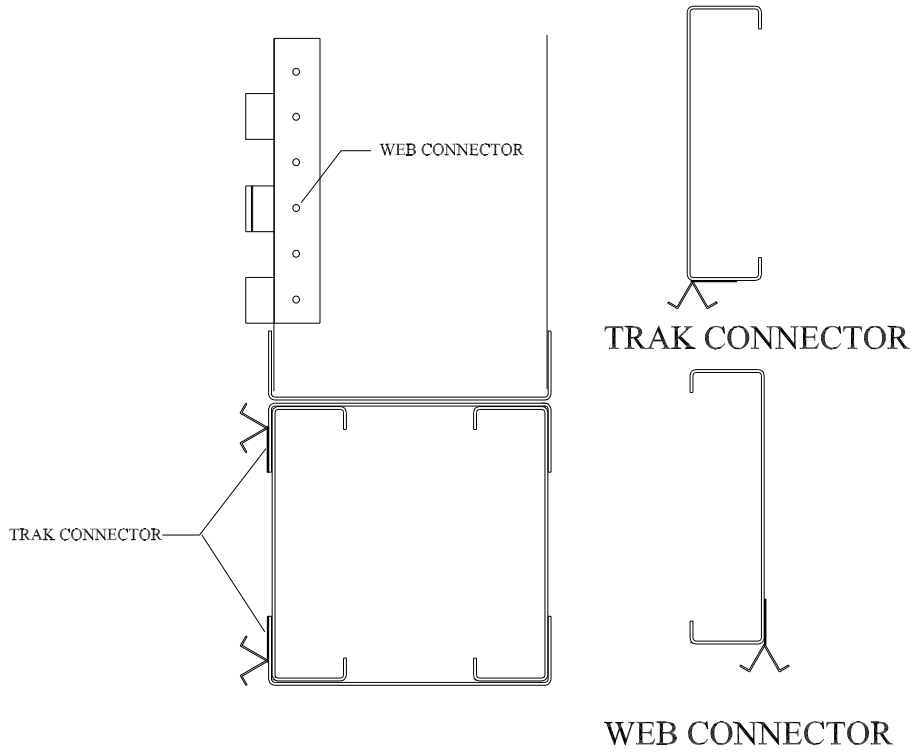


TYPICAL HEAD DETAIL

Step B – MSC Strip Attachment

- Attach the appropriate ***MSC*** shear connectors to the studs, top and bottom tracks, headers, king studs and cripples. Attach ***MSC*** shear connectors with galvanized self-drilling, self-tapping sheet metal screws in accordance with size, type and spacing as designed by the structural engineer. (Note: Screws must have a current ICBO approval and must meet the allowable capacity of Table 1 of ICBO ES Report No. 5446.)

NOTE: ***MSC*** web shear connectors are to be used on vertical field framing members (excluding end studs).
MSC trak shear connectors are to be used on end studs, horizontal framing members and framing members around openings (windows and doors, etc.).



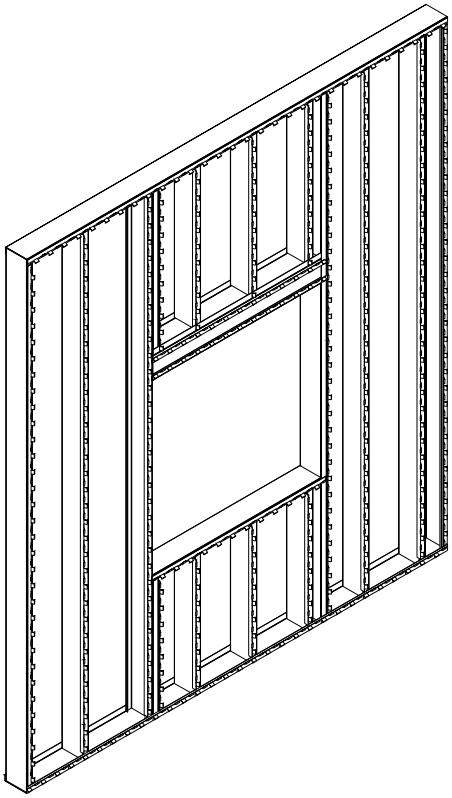
Step C – Framing Assembly

- Layout wall framing members (see Typical Window Detail below as example).
- Attach web and trak ***MSC*** shear connectors to wall framing members prior to actual wall assembly. All framing members in contact with the concrete portion of the wall panel must have ***MSC*** shear connectors attached.

NOTE: ***MSC*** web shear connectors are to be used on vertical field framing members (excluding end studs).

MSC trak shear connectors are to be used on end studs, horizontal framing members and framing members around openings (windows and doors, etc.).

- Insert studs into top and bottom track members after attachment of the appropriate ***MSC*** shear connectors.
- Verify that ***MSC*** shear connector screws do not interfere with framing layout.
- Insert header and sill framing members after attachment of the appropriate ***MSC*** shear connectors.
- Insert cripples after attachment of the appropriate ***MSC*** shear connectors.
- Using an indelible marker, identify the top, bottom and sides of the framed wall including the number of the panel that corresponds with the shop drawings and/or architectural drawings.



TYPICAL WINDOW DETAIL

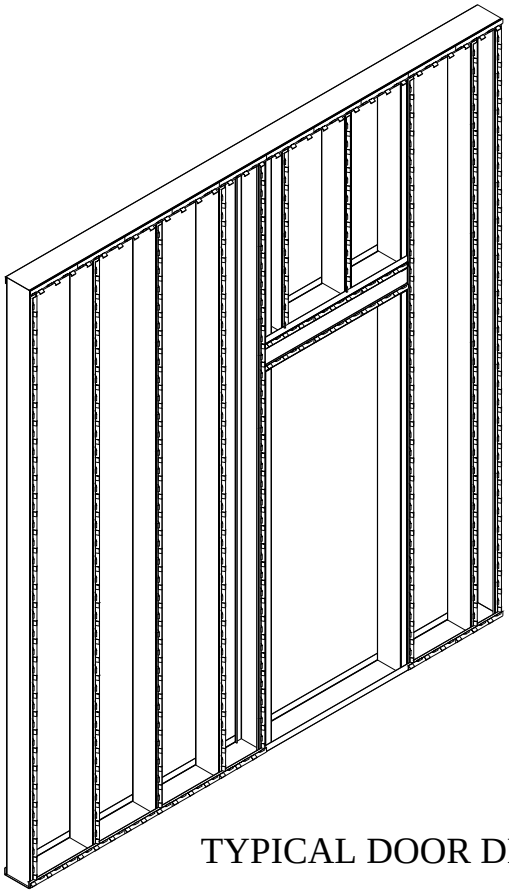
Step C - Framing Assembly (Continued)

- Layout wall framing members (see Typical Window Detail below as example).
- Attach web and trak ***MSC*** shear connectors to wall framing members prior to actual wall assembly. All framing members in contact with the concrete portion of the wall panel must have ***MSC*** shear connectors attached.

NOTE: ***MSC*** web shear connectors are to be used on vertical field framing members (excluding end studs).

MSC trak shear connectors are to be used on end studs, horizontal framing members and framing members around openings (windows and doors, etc.).

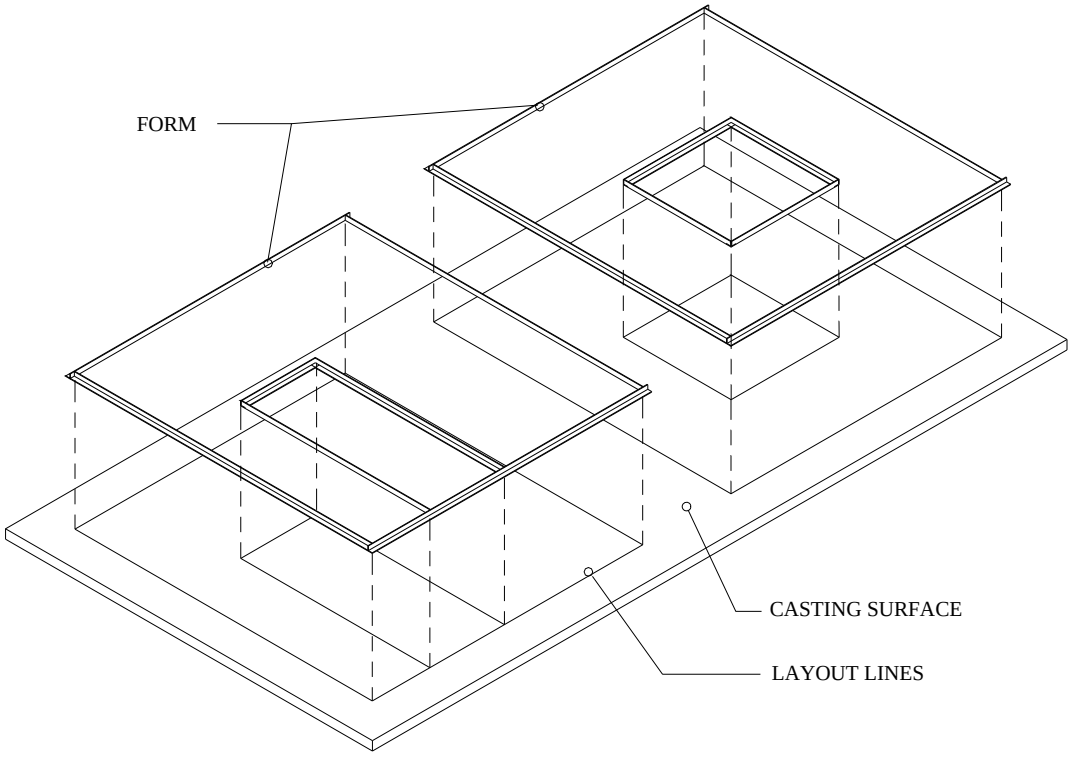
- Insert studs into top and bottom track members after attachment of the appropriate ***MSC*** shear connectors.
- Verify that ***MSC*** shear connector screws do not interfere with framing layout.
- Insert header and sill framing members after attachment of the appropriate ***MSC*** shear connectors.
- Insert cripples after attachment of the appropriate ***MSC*** shear connectors.
- Using an indelible marker, identify the top, bottom and sides of the framed wall including the number of the panel that corresponds with the shop drawings and/or architectural drawings.



TYPICAL DOOR DETAIL

Step D – Preparation of Casting Surface

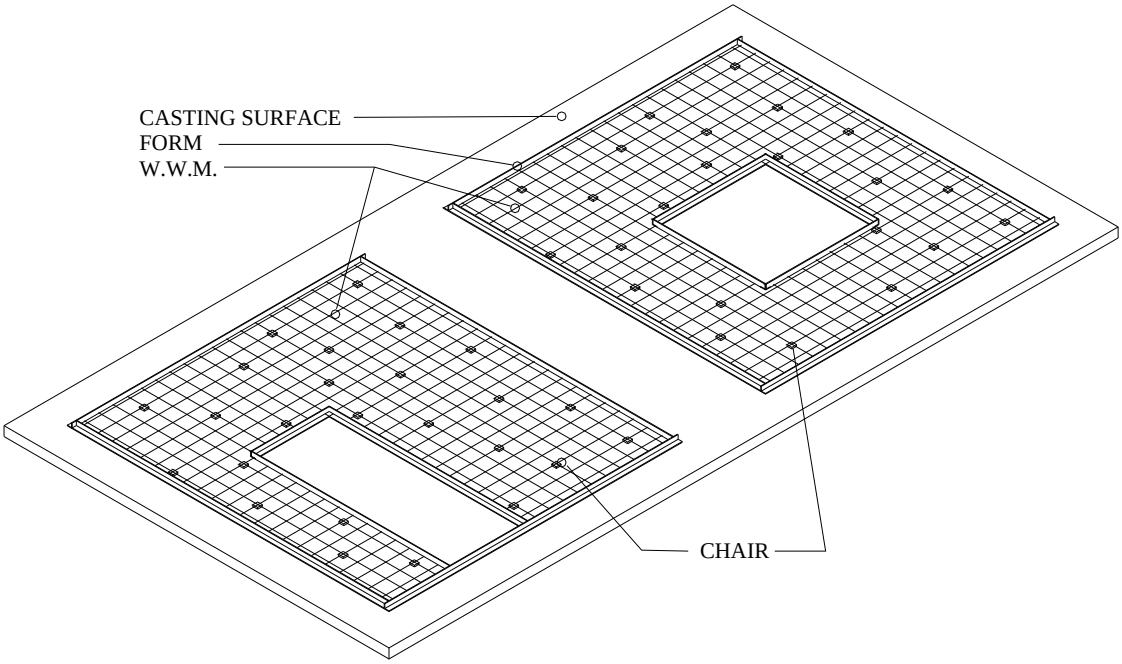
- Layout panel perimeter and openings on the form bed per shop drawings.
- Place and secure forms (metal or wood) to the form bed per layout.
- Place reveal strips, etc. where applicable per the shop drawings.
- Caulk joint between form and casting surface with silicone sealant to eliminate possible concrete seepage under forms. Smooth sealant with finger and allow to set.
- Coat inside face of form and the entire casting surface with an approved release agent.



NOTE: Metal Frame wall panel dimensions are rarely if ever the same as the concrete form dimensions. Always refer to the shop drawings for specific dimensions.

Step E – Placement of Panel Reinforcement

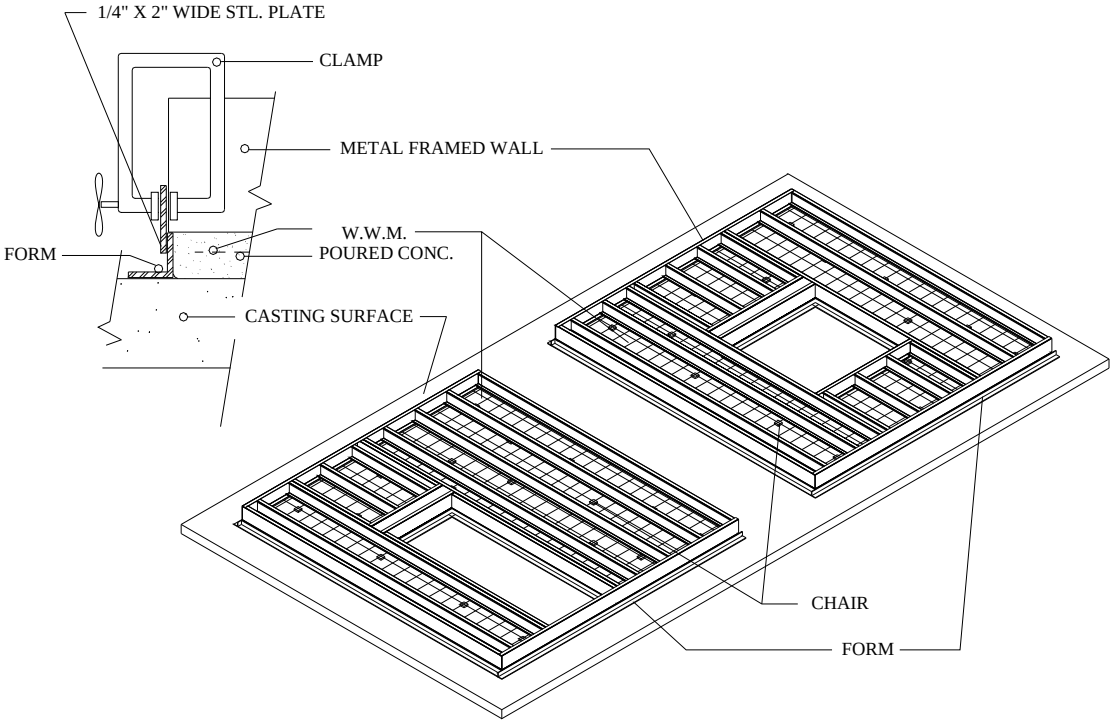
- Install galvanized Welded Wire Mesh (W.W.M.) or rebar per the shop drawings**. Note: Chairs for W.W.M. and rebar must be randomly placed. Do not line up adjacent chairs!**
- Carefully install panel pick and temporary brace points as designed by the Engineer or Dayton/Richmond Concrete Accessories (per Item IX on Page 4).
- Note: WWM may also be wired to the ***MSC*** shear connectors instead of using chairs. This is advised on integral color or sandblasted panels.



NOTE: Metal Frame wall panel dimensions are rarely the same as the concrete form dimensions. Always refer to the shop drawings for specific dimensions.

Step F <u>Option 1</u> – Concrete Placement

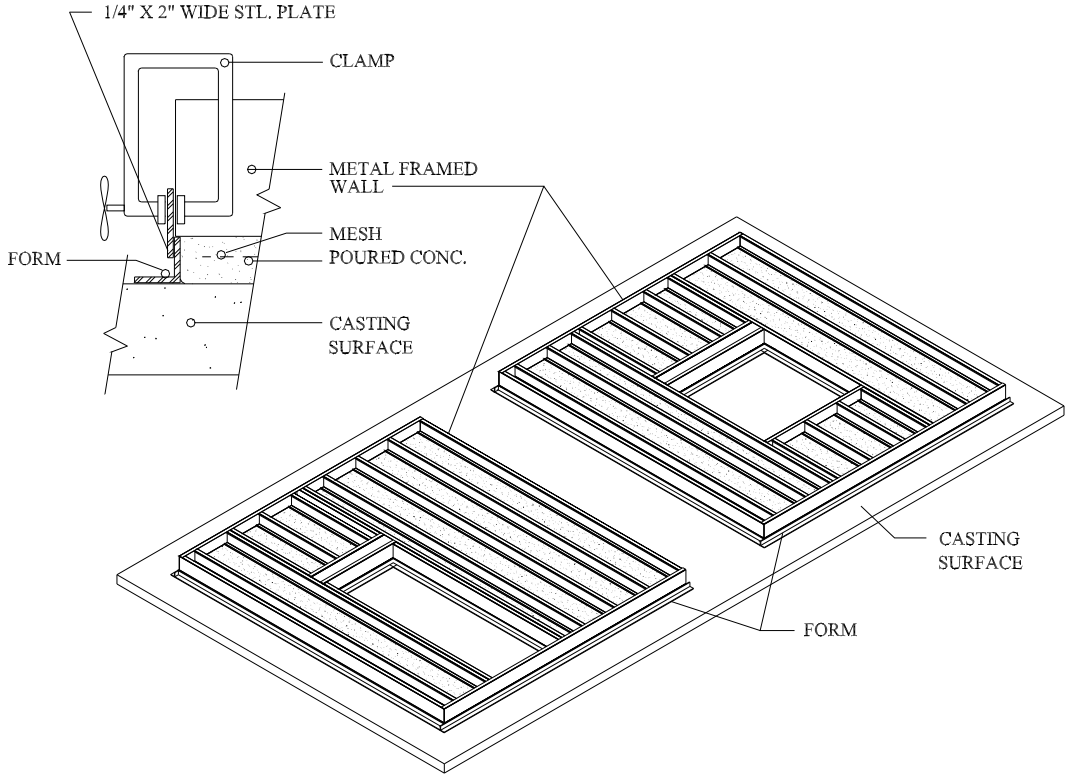
- Place concrete into form between studs. Concrete must cover all of the angled tabs of the ***MSC*** shear connectors.
- Properly vibrate wet concrete.
- Thicken concrete at pick and brace points per shop drawings after vibrating concrete, but before the initial set.
- Clamp embedded metal-framed wall to form or casting surface at 6 feet ± O.C. until concrete has set.
- Wipe excess concrete off of all exposed framed wall components.



NOTE: Metal Frame wall panel dimensions are rarely the same as the concrete form dimensions. Always refer to the shop drawings for specific dimensions.

Step F <u>Option 2</u> – Concrete Placement (Alternate)

- Place concrete into form and screed concrete slightly thicker than the depth of the form.
- Place metal frame over form with ***MSC*** shear connectors facing down.
- Thoroughly embed ***MSC*** shear connector tabs into concrete with a back and forth pushing motion.
- Properly vibrate wet concrete or vibrate framing from the top until the ***MSC*** shear connectors are embedded in the wet concrete.
- Thicken concrete at pick and brace points per shop drawings after vibrating concrete, but before the initial set.
- Clamp embedded metal-framed wall to form or casting surface at 6 feet ± O.C. until concrete has set.
- Wipe excess concrete off of all exposed framed wall components.



NOTE: Metal Frame wall panel dimensions are rarely the same as the concrete form dimensions. Always refer to the shop drawings for specific dimensions.

STEEL STUD FABRICATION AND CASTING PRODUCTION TIPS

SITE CAST OR PRECAST

Always order steel studs (-1/4" from the height dimension shown on shop drawings + 0"). This will allow 1/8" for the thickness of the top and bottom track and 1/8" for the inside roll of the tracks. The vertical studs should then seat into the tracks and the outside height dimension of the panel should now be the same as the shop drawing height. ***MSC*** connectors should be attached to the light gauge framing members before assembling the panels.

The light gauge steel framing sits on the formwork around the perimeter of the panel. Allowing for the thickness of the formwork, the formwork should be set, to hold the concrete back 1/4" from the outside edge of the framing, this will serve to create a 1/2" caulk joint between adjacent panels or the slab. It also serves to chair up the framing during casting. Clamp down the frame to the formwork and also keep weight on the frame while the concrete is setting to keep the frame from riding up in the form. On smaller panels the concrete can be placed in the form first then the frame placed on top of the form. On larger panels it may be necessary to pump concrete between the stud bays to encapsulate the ***MSC*** connectors. Use SCC concrete or a 5 or 6 slump with a very plastic mix and use 4,000 to 5,000 psi concrete with a very minimal vibration as aggregates tend to move away from the steel framing in a straight line when overly vibrated. This over vibration causes a different texture on the surface, or an appearance of a color variation or an outline of the framing or mesh, on the concrete surface when the concrete is sandblasted. Adjust your concrete mix for temperature changes to avoid shrinkage cracks. Panels may need to be covered when exposed to high outside temperatures. If you have to vibrate; vibrate the framing from the top not the casting surface, use stingers sparingly. Always lift the panels from the casting surface or truck bed horizontally (top and bottom pick points) before rotating the panel to the vertical pick points.

Contact your concrete supplier for the correct design mix to meet the current temperature condition, slump and curing requirements of this thin concrete section.

Metal Stud Crete®
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STORING AND TRANSPORTING METAL STUD CRETE® PANELS

Sometimes it is necessary to store panels prior to erection at the job site. In all cases the goal will be to prevent the thin concrete from bowing. New thin concrete prior to complete curing (usually 28 days) is very flexible and susceptible to temperature changes.

Storing *MSC* Panels at the Precast Yard:

It is best to keep the panels away from direct sunlight exposure on the face. This means storing the panels vertically with the concrete facing north to keep the east west sun off the face, or cover the panels. Storing the panels vertically keeps the load on the steel studs which are then in tension and will tend to keep the concrete from bowing.

Transporting Panels:

Any bowing accumulated from weather exposure during storing will disappear when the panels are in transit and are loaded horizontally with dunnage placed between the panels. Any remaining bowing not removed from transporting the panels horizontally will disappear when the panels are erected to the structure, or when they again have a vertical load on the studs.

Wooden dunnage 6" x 10" blocks placed on the concrete inside the steel stud bays at 4' or 6' centers with a 2" x 6" board spanning the dunnage the width of the panels and extending at least 2" above the stud height is recommended.

When using a flatbed trailer to ship, place wooden 2' x 6' the width of the trailer at 4' centers under the first panels set on the trailer. Make sure the first panels placed on the trailer are level, then proceed with the wooden dunnage on the second and third panels. It is not recommended to stack more than 3 panels high. Panels may also be transported vertically on a special A-frame or low boy trailer.

Plastic or cushioned protectors placed on top of the dunnage will protect the concrete from marring. This is recommended especially on colored or textured panels with an architectural finish.

Storing Panels on Job Site:

Storing panels vertically is recommended, but if it is not practical then they may be stored horizontally using the same method as described under Transporting Panels. Be sure that sufficient dunnage is placed to keep the panel weight evenly distributed so as not to have the ends of the panels unsupported. Select a level area on the job site to place wooden 2" x 6" boards at 4' centers and lay the first panel down so its weight is evenly distributed, then proceed with the dunnage placed between panels as described in Transporting Panels. Covering the panels may help to keep the sun off of the concrete surfaces. It's the change of temperature, heat to cold and back again, that causes the concrete to flex in different directions when the panels are not vertically loaded or attached to a structure.

MSC **PANEL ERECTION GUIDELINES**

MSC panels may be erected on a concrete slab, footing, stem wall, concrete frame or steel frame structure. Panels are always erected in the vertical position hanging from the top picks.

When erecting panels on flat horizontal surfaces like a concrete slab, the critical element is that the surface must be level to 1/8" in 10 feet. If there are high spots in the slab these should be ground level. Shimming, using tilt-up type shims, may be used to keep panels level. The first panel erected should be erected on the highest point then the other panels should be erected going out to either side from the first panel. If shims are required, it will create a void under the panels that will have to be grouted solid.

Panels may be shimmed between panels or panels may be screwed together or not attached to each other at all depending on their final intended use, load bearing or non load bearing (see engineering erection drawings). Care should be taken to plumb and align panels so they are square at the top, as well as vertically square and that the studs on the inside line up with the adjacent panels.

When erecting panels on to a steel or concrete frame super structure, there will be connection hardware cast into beams on the inside of the ***MSC*** panels. This panel hardware will marry up to hardware already attached to the structure by others. Connection of the panel hardware to the structure will be by welding or bolting the companion pieces together (see engineer's erection drawings, detail sheet or individual panel drawings for the type of connection hardware specified).

Production Data

Precasters:

Project Name	Fabricator's Name	Q. C. Agency

Reviewed and Approved: Date Reviewed:

By:_____ _____
CBSI

By:_____ _____
Fabricator

By:_____ _____
Quality Control Agency