

# Metal Stud Crete®

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Composite Concrete Panel System

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# Quality Control And Fabrication Manual

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

# Metal Stud Crete® Composite Wall System

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## **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®** should 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®**.

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## 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” or 2½” 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 ICC approval and must meet the allowable capacity of Table I of ICC ESR-2511. 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 to 40 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 or e-mail:

**Metal Stud Crete®**  
[info@metalcrete.com](mailto:info@metalcrete.com)  
(818) 606-4703  
[www.metalcrete.com](http://www.metalcrete.com)

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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., and ICC ESR-2511, 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.

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

- A. ICC Evaluation Service 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 5,000 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 ICC approval and must meet the allowable capacity of Table I, ICC ESR-2511.) 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 2012 – 2015 IBC.

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## VII. **Screws:**

Shall be galvanized self-drilling, self-tapping sheet metal screws as specified by the design engineer. (Note: Screws must have a current ICC approval and must meet the allowable capacity of Table I of ICC ESR-2511.)

## 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 by the Panel Engineer, and shown on the Shop drawings of each panel.

## 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 usually 3,000 psi or greater. 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. Always lift panels from the concrete, never from the studs or track.

## XII. **Shims/Leveling Pads/Grouting:**

Leveling pads/shims, if required, 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 or Panel Engineer 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 using a City Approved inspector or at pre-approved manufacturing locations having PCI or APA QC plant procedures in place.

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- B. Panels fabricated at offsite manufacturing locations shall require special inspection under Section 1701.7 of the code by a quality control agency.
- 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) 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 or Panel Engineer.

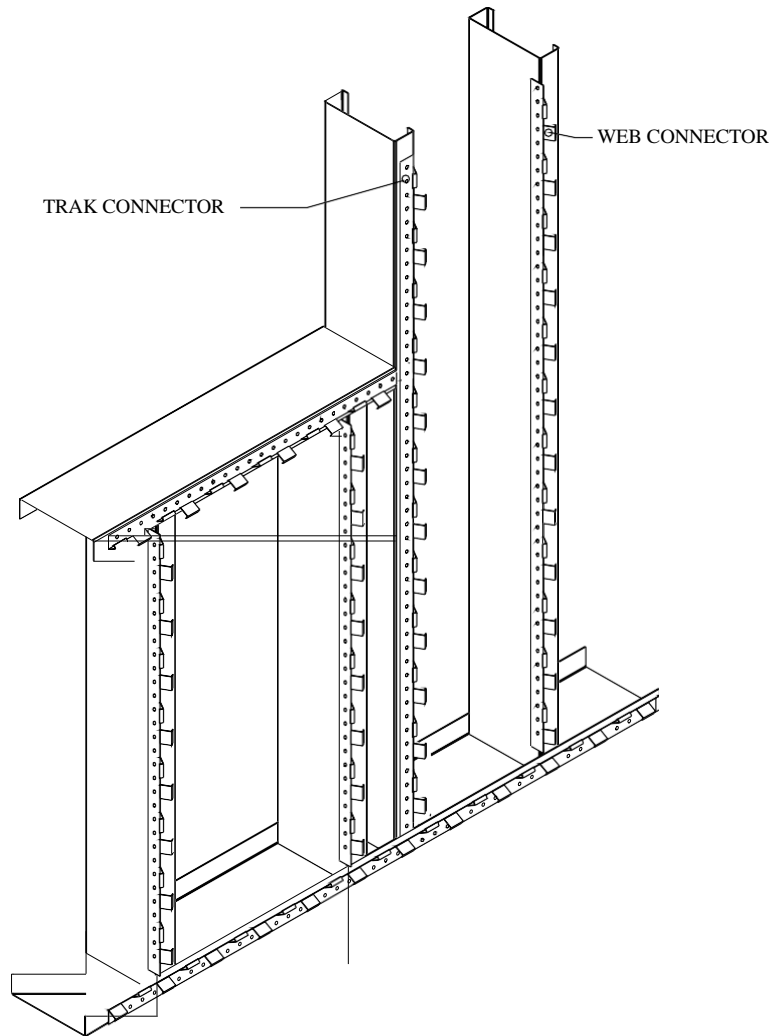


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## Step A –Steel Wall Framing Components

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



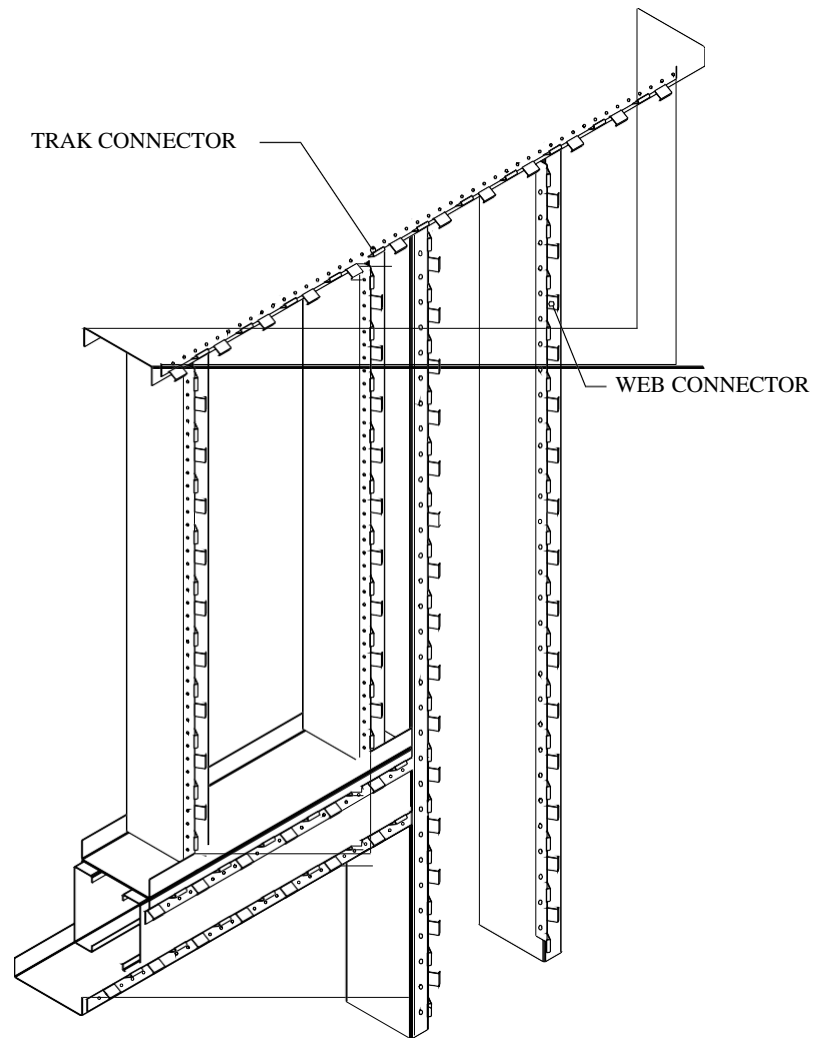
TYPICAL SILL DETAIL

# Metal Stud Crete® Composite Wall System

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## 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

# Metal Stud Crete® Composite Wall System

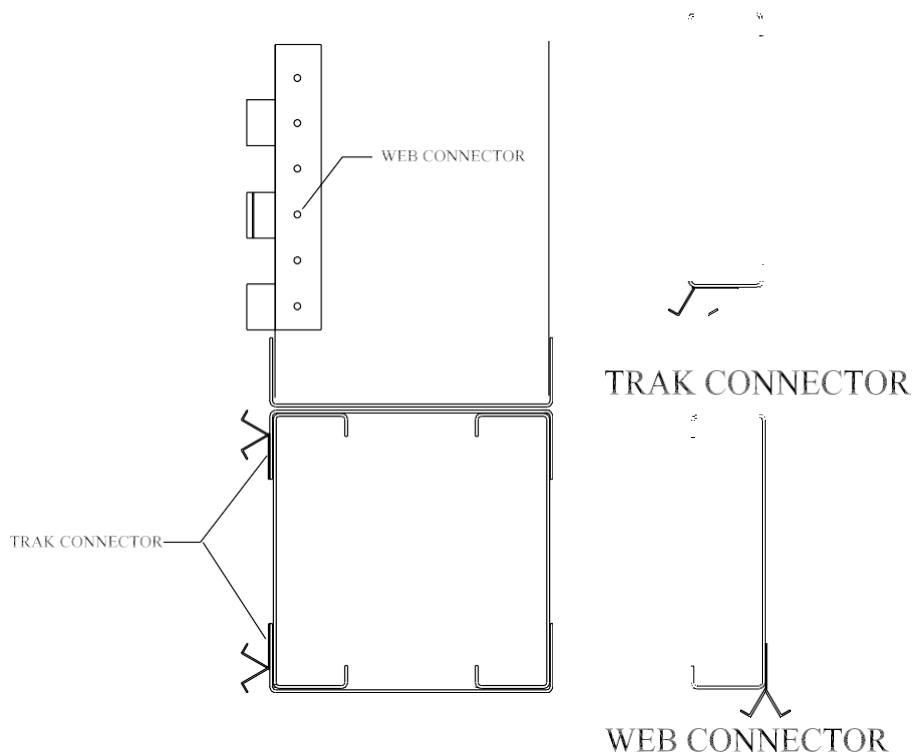
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## Step B – MSC Strip Attachment

- 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 ICC approval and must meet the allowable capacity of Table 1 of ICC ESR-2511.)

**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.).



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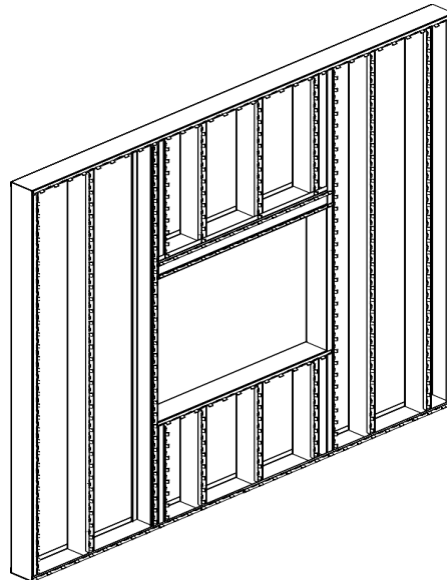
## Step C – Framing Assembly

- 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.).

- Steel studs need to be ¼” shorter than panel height to allow for thickness of track, and seating of track.
- Use zinc spray to touch up steel studs and track where cut, before starting framing process.
- Always attach *MSC* connectors to the framing members before assembling the framing.
- 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 and seating of studs in track.
- 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

# Metal Stud Crete® Composite Wall System

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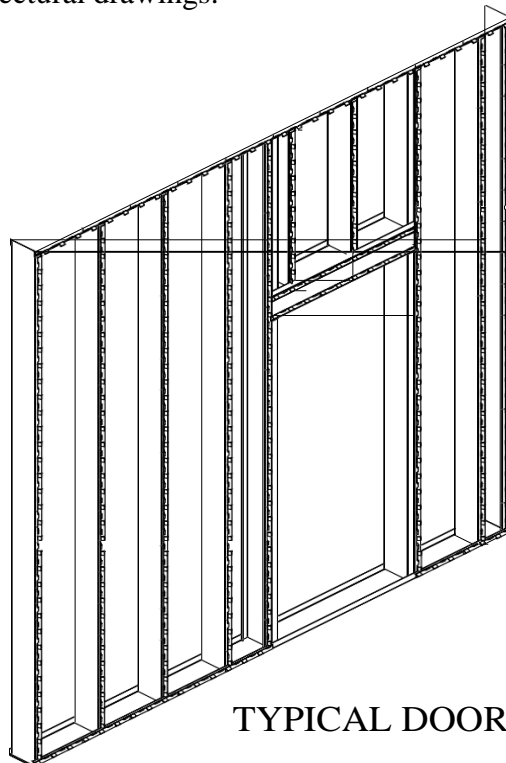
## Step C - Framing Assembly (Continued)

- Steel studs need to be ¼” shorter than panel height to allow for thickness of track.
- Use 2” spray to touch up steel studs and track where cut, before starting framing process.
- Always attach MSC connectors to the framing members before assembling the framing.
- 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.



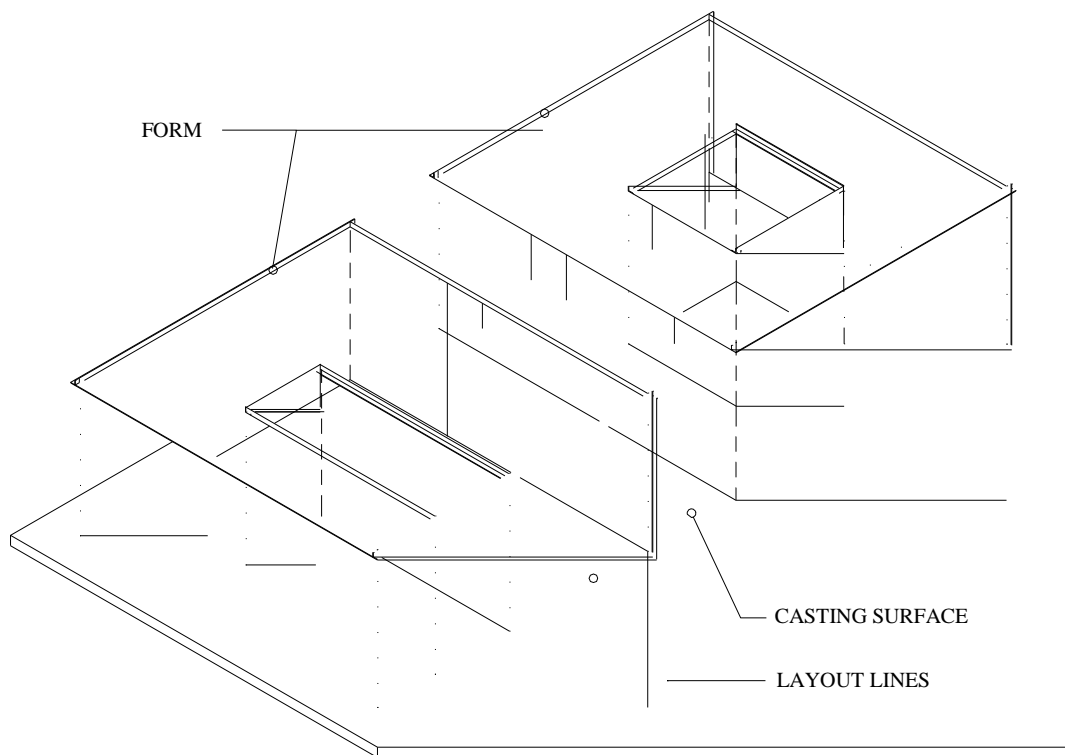
TYPICAL DOOR DETAIL

# Metal Stud Crete® Composite Wall System

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## 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.
- For concrete columns and beams use rigid 4” thick, the depth of the steel studs as form work. Wedge the foam between the studs to create the bulkhead.
- Clamp down the steel framing to the form work using wide mouth vice grips, or use a wood or metal leg attached to both the form work and framing with a screw.
- Strong back the studs over the top of the framing, using the web of a spare stud screwed to the top of the stud flanges of the framed panel. This keeps the studs square for dry wall application.
- Coat inside face of form and the entire casting surface with an approved release agent.



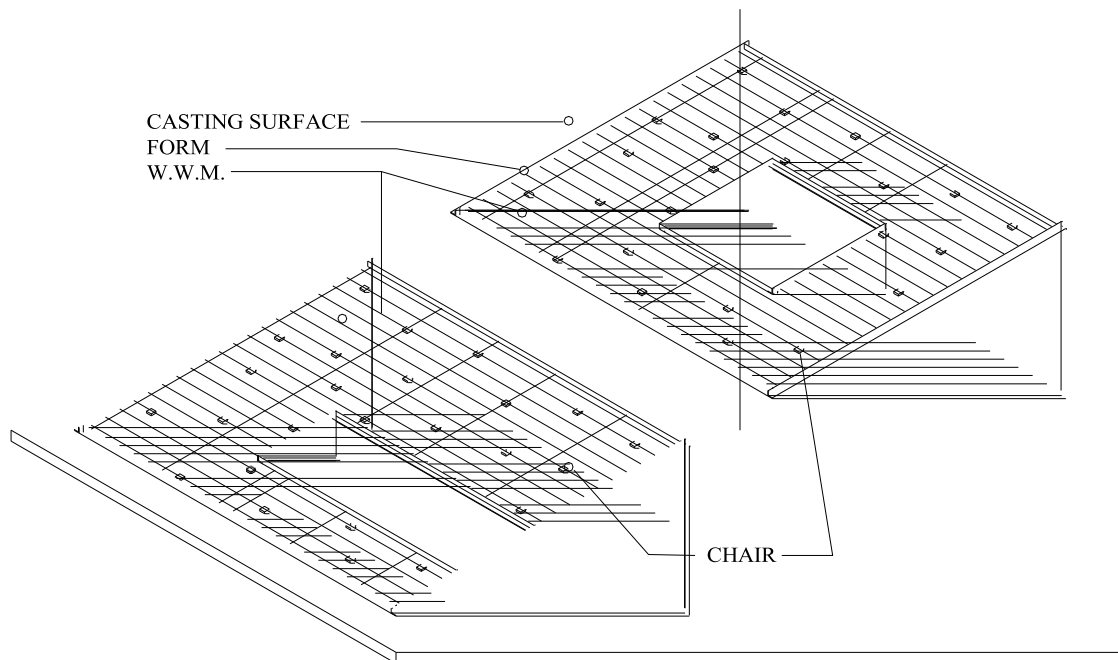
**NOTE: Metal Frame wall panel dimensions are rarely if ever the same as the concrete form dimensions. Always refer to the shop drawings for specific dimensions.**

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## 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 Panel Engineer.
- Note: WWM may also be wired to the *MSC* shear connectors or the knock outs in the studs instead of using chairs. This is advised on integral color or sandblasted panels.
- Never walk on the placed reinforcement.
- When pouring concrete between the studs, walk on 2" x 12" wood planks.
- Tie up rebar cages with wire, either attached to the steel studs with a screw or use a wooden bridge over the top of the opening. Cages need to be covered by concrete on the face by at least 2".



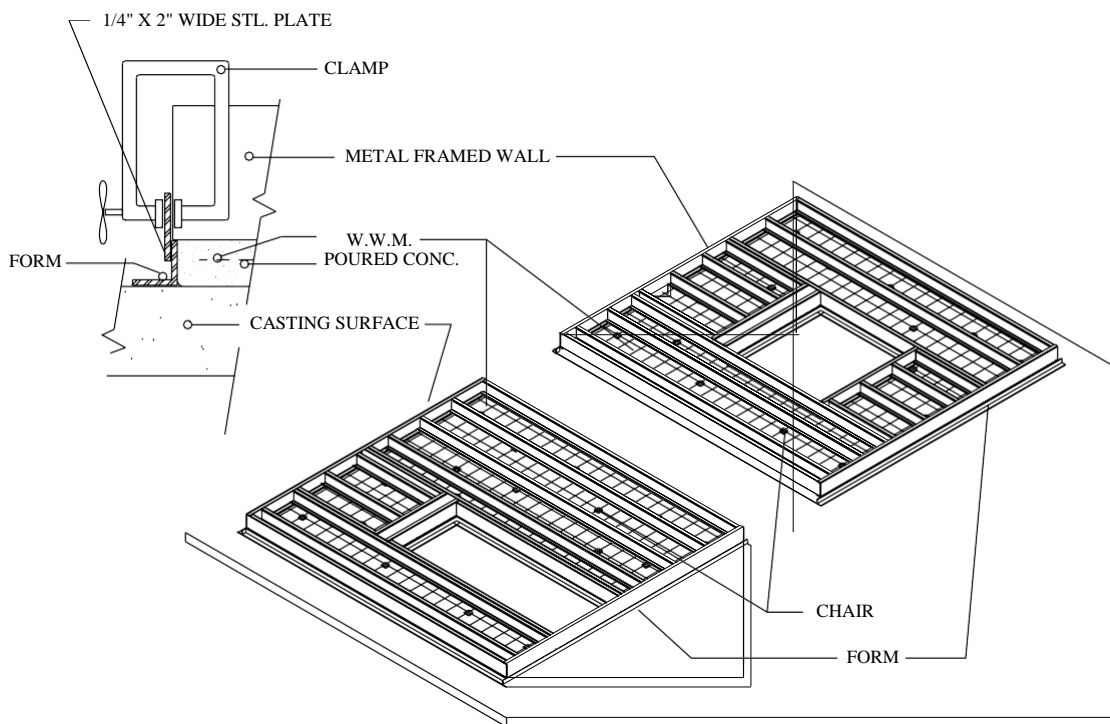
**NOTE: Metal Frame wall panel dimensions are rarely the same as the concrete form dimensions. Always refer to the shop drawings for specific dimensions.**

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## Step F Option 1 – 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 with a stinger or vibrating table, don't over vibrate.
- 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 using a Wet Mop or rag. Walk out on to the framing using wooden planks, do not let concrete dry on the stud flanges this will interrupt drywall application.



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

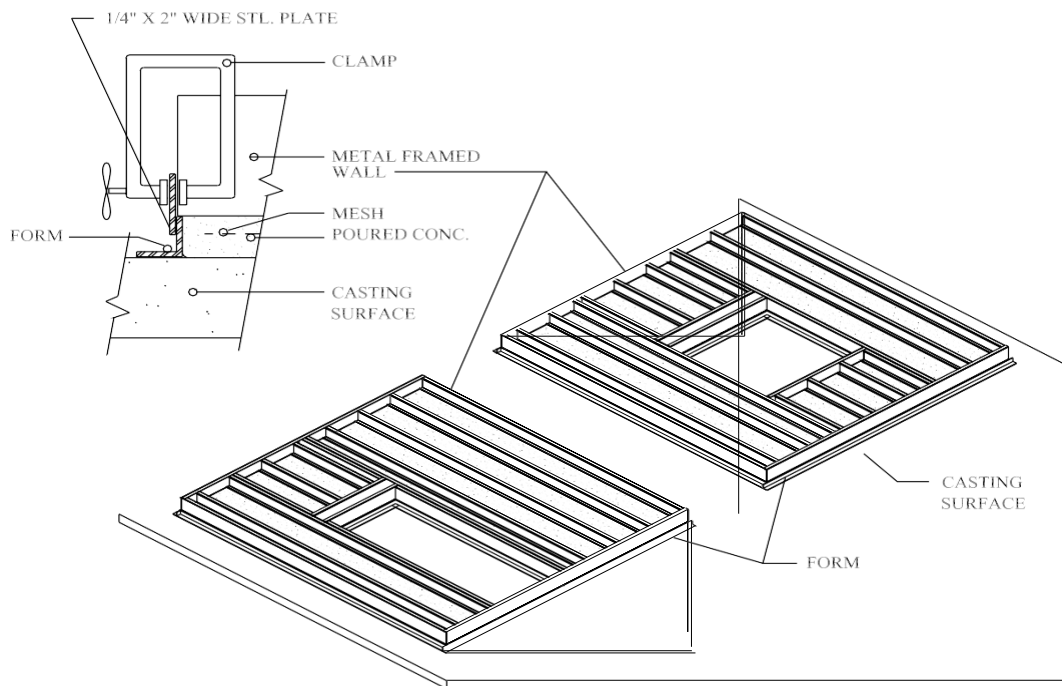


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## Step F Option 2 – Concrete Placement (Alternate)

- 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 with a stinger or vibrating table or vibrate framing from the top using a 6" steel channel with a vibrator attached. Drag the steel channel with the vibrator in motion over the top of the framing until the *MSC* shear connectors are embedded in the wet concrete then clamp down the framing to the form work.
- 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. Using a Wet Mop or rag walk out on to the framing using wooden planks, do not let concrete dry on the stud flanges this will interrupt drywall application.



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

# Metal Stud Crete® Composite Wall System

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## **STEEL STUD FABRICATION AND CASTING PRODUCTION TIPS**

### **SITE CAST OR PRECAST**

Always order steel studs (-1/4" shorter than the height dimension shown on shop drawings order lengths -1/8" +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. 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 to achieve a slump of 7 to 8 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. To minimize vibration; you can vibrate the framing from the top not the casting surface, use stingers sparingly. Always lift the panels from the concrete, never from the studs or track. Always lift the panels from the casting surface or form 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.

### **WHEN CASTING USING THE MSC ½' AIR SPACE CONNECTOR**

When returning concrete around openings, over the top track, or the sides of panels, place the Air Space [ track connector ] on the top track or the side web, and attach using self-tapping screws. Then to maintain the constant ½" space and thermal break, attach ½" blue rigid foam to the stud track or web on the areas where the concrete returns. Attach the rigid foam on either side of the connector using double sided tape. The rigid foam stays in place as a lost form.

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# Metal Stud Crete® Composite Wall System

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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.

When using a flatbed trailer to ship, place wooden planks 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.

Wooden dunnage using 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" beyond the panel width is recommended when shipping or storing horizontally.

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.

# Metal Stud Crete® Composite Wall System

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## **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 where the steel studs are 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. Shims should be placed under the bottom track directly under a stud. 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 superstructure, 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)

When erecting panels on a concrete slab where the panels are bearing on the slab, first apply two rows of caulking onto a clean slab parallel to the bottom track of the panel, to create a seal between the bottom of the panel and the slab. This will alleviate any water from getting into the building in case of flooding from the exterior side.

## Production Data

### Precasters:

**Project Name**

**Fabricator's  
Name**

**Q. C. Agency**

Reviewed and Approved:

Date Reviewed:

By: \_\_\_\_\_  
CBSI

\_\_\_\_\_

By: \_\_\_\_\_  
Fabricator

\_\_\_\_\_

By: \_\_\_\_\_  
Quality Control Agency

\_\_\_\_\_