STRUCTURAL REPORT AND CALCULATIONS FOR

RAILSET ASSEMBLIES

AVERVE

215 Ledroit Street, Suite A, Laguna Beach, CA 92651

PREPARED BY

Costa and Associates/STRUCTURAL ENGINEERS

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March 21, 2016

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FOR
RAILSET ASSEMBLIES

APPENDIX C THROUGH E WILL
BE SUBMITTED UPON REQUEST

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Costa & Associates
STRUCTURAL ENGINEERS

March 21, 2016

Mr. Michael Dobija
Averve
215 Ledroit Street
Suite A
Laguna Beach, CA 92651

RE: Railset Assemblies
PROJECT NO.: 113033.03

Dear Mr. Dobija:

The following report and accompanying calculations supersede our June 19, 2015 report. The report has been amended and expanded herein to include both wall and ceiling assemblies.

At your request, the report and calculations have been prepared, for the Railset System Assemblies. The intent of these calculations is to demonstrate that Railset System Assemblies constitute viable secondary structural systems for the support of various types of decorative finishes. The calculations show that the system, in its various configurations has the capacity to resist both the weight of finishes and the Code's minimum seismic out-of-plane loads generated from the mass of the finishes plus that of the railset system's self-weight. As a minimum the system, when installed under the guidelines provided herein, has the capacity to 1) support the self-weight of the Railset System and applied finishes and 2) sustain and transmit to the supporting structure the code mandated 5^{PSF} out-of-plane lateral load for partitions.

As for any secondary framing system, the Railset System, in all its applications, is dependent of the existing building components for support. The adequacy of the building components (partition walls etc.) and connections thereto must be verified by the project's professional in charge (architect or engineer of record) to be capable of supporting the additional loads superimposed by the Railset System.

These calculations, while demonstrating the adequacy of the system, are not project-specific. Variations in configuration and weight of finishes are possible but must be independently verified by the project's architect or structural engineer. Please contact Costa & Associates for any assistance that may be required.

GENERAL SYSTEM DESCRIPTION

The main component of the Railset System is the Mainrail. The Mainrail consists of 6063 T-5 extruded aluminum member available in 10 ft lengths. A detail of the Mainrail and its properties are shown on Appendix A of this report. The Mainrail system is assembled with the Mainrails placed at regular spacing and in orthogonal orientation to form a 2-D frame (Layout). The finishes are applied directly to the rails using cleats or other fastening systems. For system installation, a shop pre-assembled frame is installed on existing wall or ceiling surface, extension are then added at the jobsite to the required extents. All frame assembly components are connected together with the Averve Railset component hardware (Appendix A) with M4x8MM, M4x10MM and M4x16MM stainless steel screws, as required. The 8MM length screw fits into the

back of the rail screw boss. The 10MM length is for attachments to the rail's edge screw boss. The 16MM length would be used to fasten the vertical rails to create the "I" Beam Post configuration. The assemblies considered and analyzed in this report are illustrated in Appendix B.

WALL ASSEMBLIES

The wall applications of the system considered by this report are as follows:

Direct Wall Mount– In this case the system layout is applied directly to an existing building wall or partition. The wall mount clip (Railset Wall Mount) is used at regular intervals along the rails for attachment. The Railset Wall Mount clips slide along the horizontal rails to provide easy adjustment for connecting directly to wall studs.

Cavity Wall Mount– This is similar to the direct wall frame except that it is offset several inches from the building wall as required to form a cavity or chase for pipes, conduits, etc. The offset is created by a "standoff" as illustrated in Appendix B. The standoff connects to a rail that is mounted on the wall surface with the Railset Wall Mount clip.

I-Beam Post Wall– Consists of a freestanding vertical post configured with three Mainrail components screwed together to function compositely as an I-beam. The post wall frame uses a layout similar to the direct wall frame except that the vertical rails have a much larger span capacity and are generally attached to the building structure at top and bottom only without intermediate support to the building walls.

Post Wall– A post wall consisting of a double rail is feasible with connectors spaced at regular intervals. This application requires study for each specific case.

There are two basic layouts considered in the calculations, as shown on Appendix B, Layout 1.0 and 2.0. These layouts can be deployed to all three applications listed above, Direct Wall Frame, Cavity Wall Frame, and Post Wall Frame.

Each layout has been checked for the following Load conditions:

1. Dead load of 5 psf (weight of finishes), plus the self-weight of the frame plus a 5 psf seismic out-of-plane load.
2. Dead load of 10 psf (weight of finishes), plus the self-weight of the frame plus a 5 psf seismic out-of-plane load.

Finishes applied to the wall are (as for any wall assembly) self-bracing and in-plane lateral loads need not be considered in most cases provided the system is installed under these guidelines with the top and bottom rails attached to the building structure (structural wall or braced partition).

Following are the descriptions of the two basic layouts considered by these calculations:

Layout 1.0

This layout consists of shop assembled frames 3'-6" wide x 10'-0´high with horizontal rails at 4'-0" spacing maximum. Horizontal Expansion Rails spanning 4'-6" maximum between the pre-assembled frames. For the Direct Wall Frame (only), the Horizontal Expansion Rails can extend to 10'-0" in length. The bottom rails are attached to the floor deck with standard L-brackets spaced at maximum 32" on center. The horizontal rails are attached to the building walls with standard wall mount clips at 32" maximum. The wall clips slide along the horizontal rails to provide adjustment for connecting to walls studs. A minimum of two wall clips shall be employed at each pre-assembled frame and a minimum of two wall clips at each extension rail.

Layout 2.0

This layout consists of shop assembled frames 3'-6" wide x 10'-0´high with horizontal rails at 2'-0" spacing maximum. Horizontal expansion rails spanning 4'-6" maximum between the pre-assembled frames. For the Direct Wall Frame (only), the Horizontal Expansion Rails can extend to 10'-0" in length. The bottom rails are attached to the floor deck with standard L-brackets spaced at maximum 32" on center. The horizontal rails are attached to the building walls with standard wall mount clips at 32 inches maximum. The wall clips slide along the horizontal rails to provide adjustment for connecting to walls studs. A minimum of two wall clips shall be employed at each pre-assembled frame and a minimum of two wall clips at each extension rail.

CEILING ASSEMBLIES

The ceiling applications of the system considered by this report are as follows:

Direct Ceiling Mount Frame – In this case the system layout is applied directly to an existing building ceiling framing. The wall mount clip (Railset Wall Mount) is used at regular intervals along the rails for attachment to the ceiling joists. The Railset Wall Mount clips slide along the transverse rails (perpendicular to the joist span) rails to provide easy adjustment for connecting directly to the ceiling joists.

Cavity Ceiling Mount Frame – This is similar to the direct wall frame except that it is offset several inches from the building ceiling as required to form a cavity or chase for pipes, conduits, etc. The offset is created by a "standoff" as illustrated on sheet of Appendix B. The standoff connects to a rail that is mounted on the wall surface with the Railset Wall Mount clip.

As for the wall assemblies, there are two basic layouts considered in the calculations, Layouts 1.0 and 2.0. In the case of ceiling mounts, the "Parallel Rails" are oriented parallel with the ceiling joist span and the "Perpendicular Rails" are oriented perpendicular to the joists. These layouts can be deployed to both the Direct Ceiling Mount and the Cavity Ceiling Mount.

Each layout has been checked for the following Load conditions:

1. Dead load of 5 psf (weight of finishes), plus the self-weight of the frame.
2. Dead load of 10 psf (weight of finishes), plus the self-weight of the frame.

Finishes applied to the ceiling are self-bracing and lateral in-plane lateral loads need not be considered in the Direct Ceiling Mount. For the Cavity Ceiling Mount, in-plane lateral loads need not be considered provided the End Rails are attached directly to the building structure (wall or braced partition). Assemblies that are totally suspended and hanging more than 6 inches without any lateral support require additional lateral bracing.

OTHER CONSIDERATIONS

Attachment to structure is the responsibility of the project's Engineer of Record. The following reactions are provided as a guideline. Specific values should be evaluated for each application.

- For wall assemblies the system carries vertically the load of the finishes as well as that of the system's self-weight. The maximum vertical reaction at the vertical rail to the supporting floor is 440 lbs. An exception to this is where a horizontal extension rail longer than 4'-6" is used, the building wall will carry a portion of the vertical load
- For wall assemblies the maximum horizontal reactions at each L-bracket (at 32" maximum on center) are 150 lbs. acting along the plane of the assembly and 150 lbs. acting perpendicular to the plane of the assembly.
- For wall assemblies the maximum reaction at each Railset Wall Mount wall bracket (at 32" maximum on center) is 60 lbs. acting perpendicular to the wall and 60 lbs. acting horizontally along the wall plane.
- For ceiling assemblies the Railset framing relies entirely on the existing ceiling framing for support. The maximum vertical reaction to the Railset Wall Mount clip to the ceiling joist is 130 lbs.

Connections to the support structure should be of sheet metal screws to metal studs (metal joists for ceilings), wood screws to lumber studs or ceiling joists and expansion anchors to concrete or masonry construction. Sheet metal screws and expansion anchors should have ICC product approvals.

We hope this report and calculations have met your needs. Please do not hesitate to call if you have any questions or if we can be of any additional service.

Respectfully submitted,

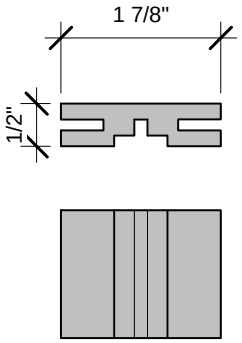
Orlando Costa, SE
Principal
Costa & Associates | Structural Engineers

OC:lg
Distribution: Addressee,e-mail

APPENDIX A

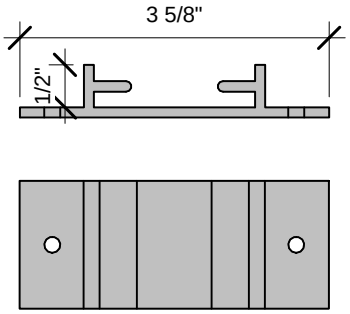
Railset System Components

AVERVE RAILSET COMPONENTS



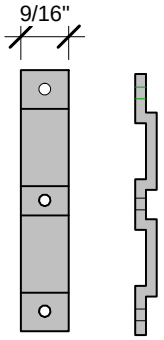
- RAILSET RAIL PROVIDES THE STRUCTURE OF THE WALL SYSTEM
- MATERIAL: 6063 T5 ALUM.
- AREA: .637 SQ. IN.

1 | RAILSET RAIL



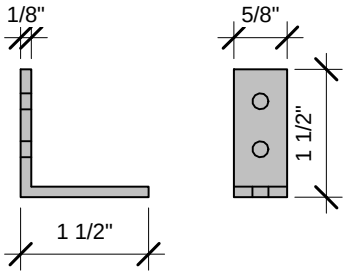
- WALL MOUNT SLIDES ON THE RAILS TO ALIGN WITH WALL STUDS.
- THEN WALL MOUNT IS FASTENED TO STUD USING CONTRACTOR PROVIDED SCREWS
- MATERIAL: 6063 T5 ALUM.
- THICKNESS: .188"
- AREA: .644 SQ. IN.

4 | RAILSET WALL MOUNT



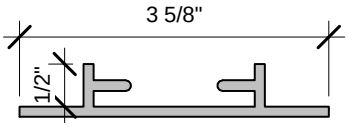
- ALIGNMENT BRACKET FASTENS TO RAILS USING 3 (M4 X 8") SCREWS WITH LOCK WASHERS
- MATERIAL: 6063 T5 ALUM.
- THICKNESS:.125"
- AREA: .444 SQ. IN.

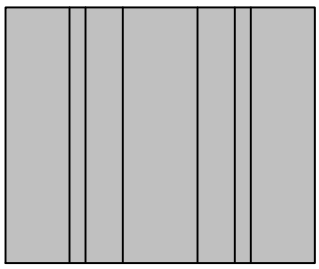
2 | RAILSET ALIGNMENT BRACKET



- L BRACKET FASTENS TO RAILS USING 2 (4M X 10) SCREWS WITH LOCK WASHERS
- MATERIAL: 6063 T5 ALUMINUM
- THICKNESS: .125"
- AREA: .164 SQ. IN.

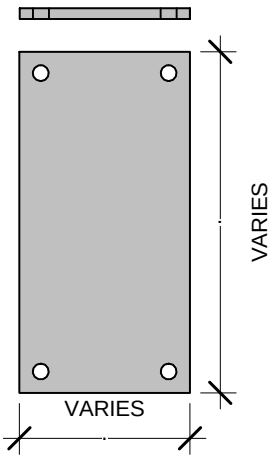
5 | RAILSET L BRACKET





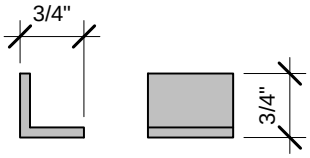
- SPICE FASTENS TO ASSEMBLY USING 1 (4M X 10") SCREW
- MATERIAL: 6063 T5 ALUMINUM
- THICKNESS: .188"
- AREA: .644 SQ. IN.

3 | RAILSET SPLICE



- WIDTH OF PLATE IS DETERMINED BY THE REQUIRED DEPTH OF THE POST
- PLATE FASTENS TO RAILS USING 2 SCREWS ON EACH RAIL 4M X 10.
- MATERIAL : 6063 T5 ALUM.
- THICKNESS: .125"

6 | RAILSET POST MOUNT RAIL CONNECTION PLATE



- ANGLE SLIDES INTO BOTTOM OF RAIL
- SECURES TO FLOOR WITH CONTRACTOR PROVIDED METHOD
- MATERIAL : 6063 T5 ALUM.
- THICKNESS: .118"

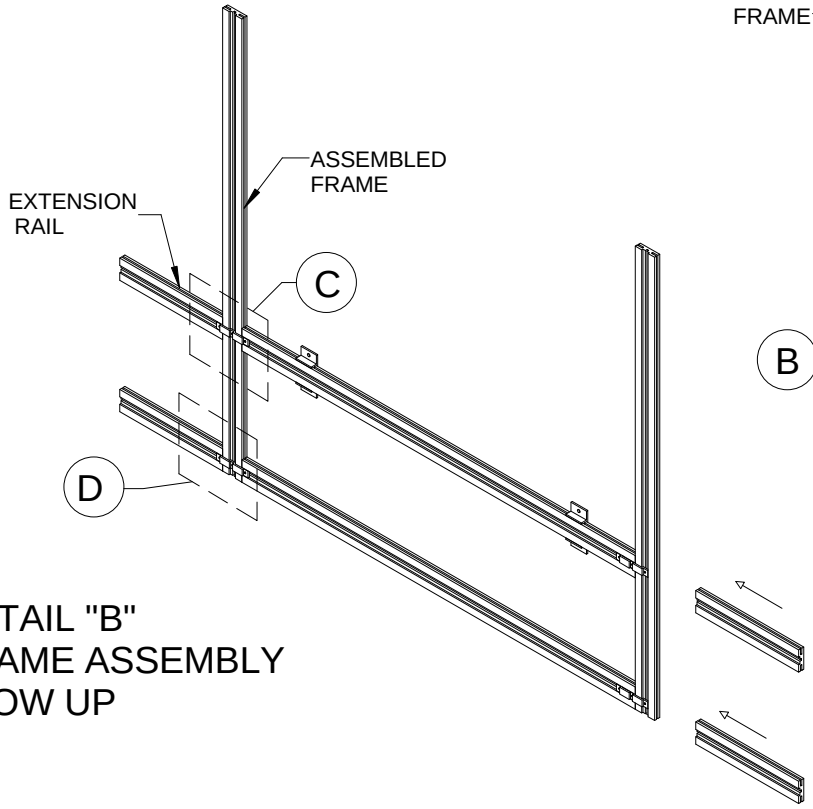
7 | RAILSET CUSTOM 90 DEGREE ANGLE

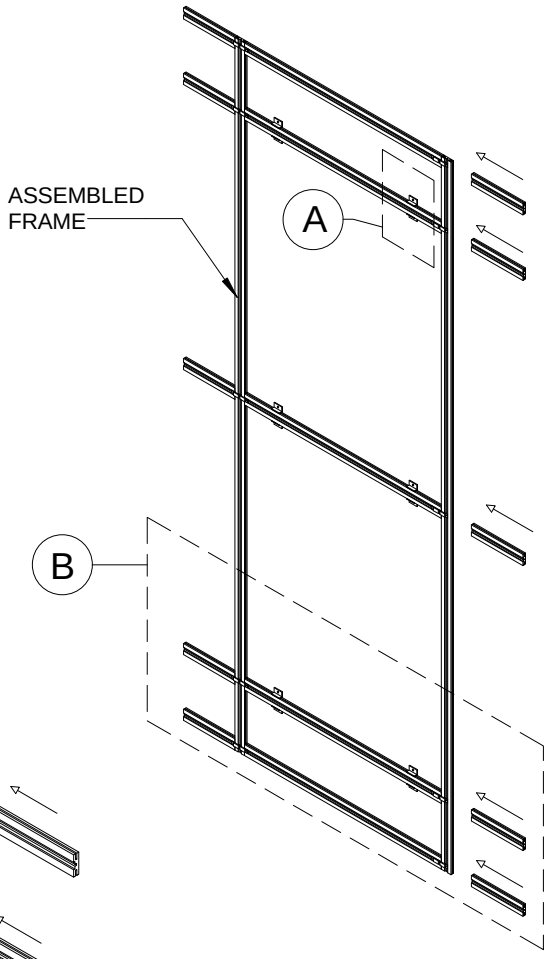
APPENDIX B

Railset Assemblies

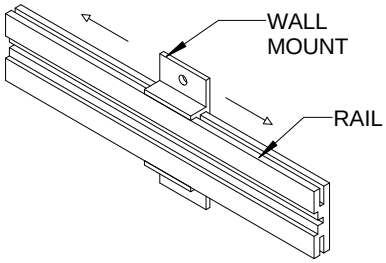
AVERVE, RAILSET (SHEET 1 OF 5) LAYOUT 1.0
DIRECT MOUNT FRAME

NOTE:
SEE DIRECT MOUNT RAIL
LAYOUT OPTIONS FOR:SS
1) CLEAT & CLIP PANELS
2) GLUE UP DECORATIVE PANELS

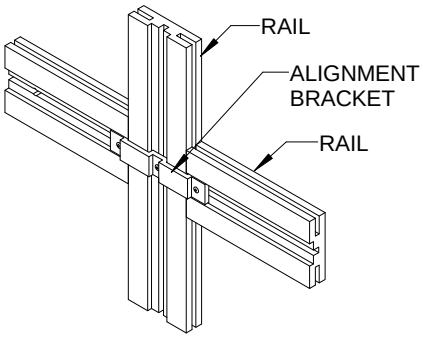




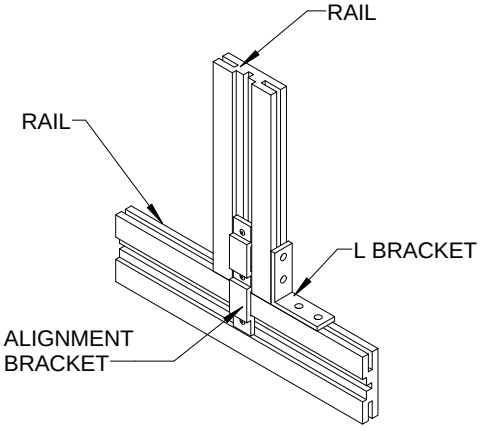
DETAIL "B"
FRAME ASSEMBLY
BLOW UP



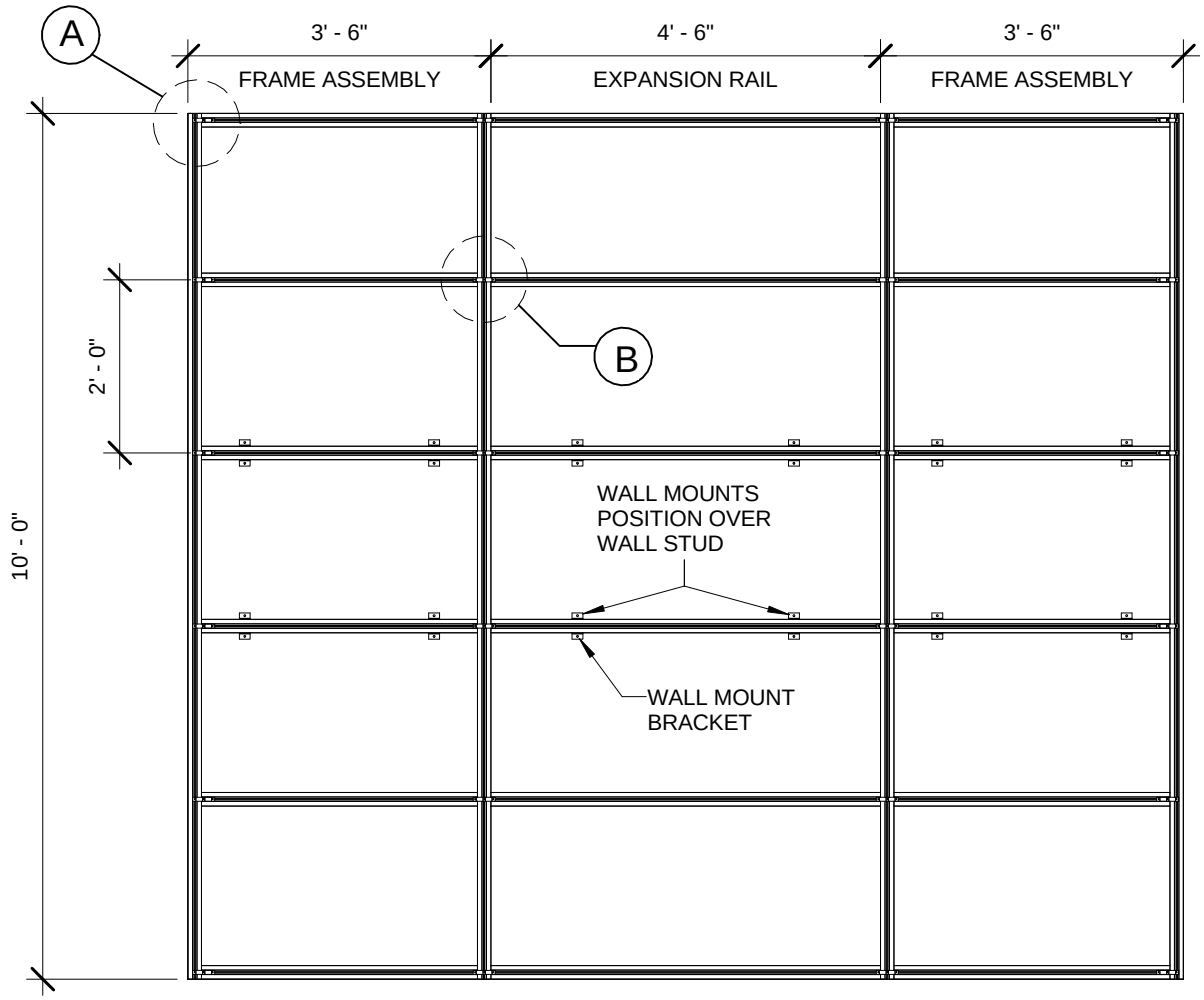
DETAIL "A"
WALL MOUNT



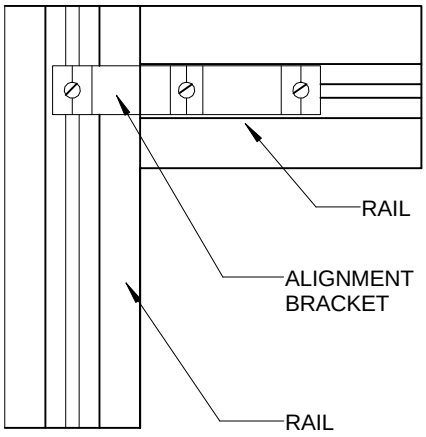
DETAIL "C"
RAIL MIDWALL
INTERSECTION



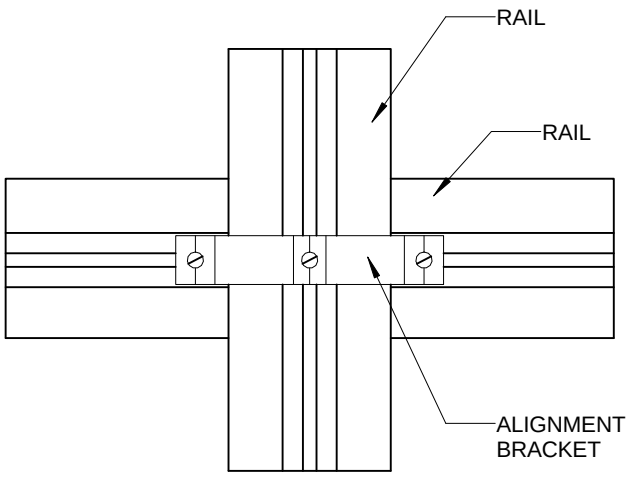
DETAIL "D"
RAIL EDGE
INTERSECTION



ELEVATION, FRAME LAYOUT FOR PANEL ATTACHMENT



DETAIL "A"



DETAIL "B"

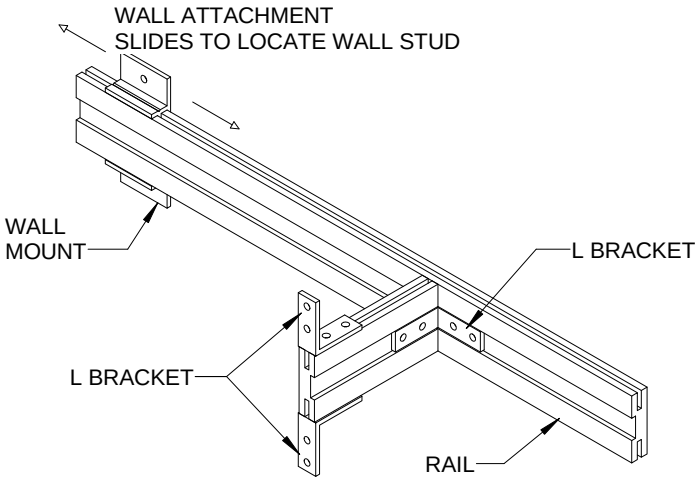
AVERVE RAILSET, DIRECT WALL MOUNT (SHEET 2 OF 5)
CLEAT & CLIP PANELS

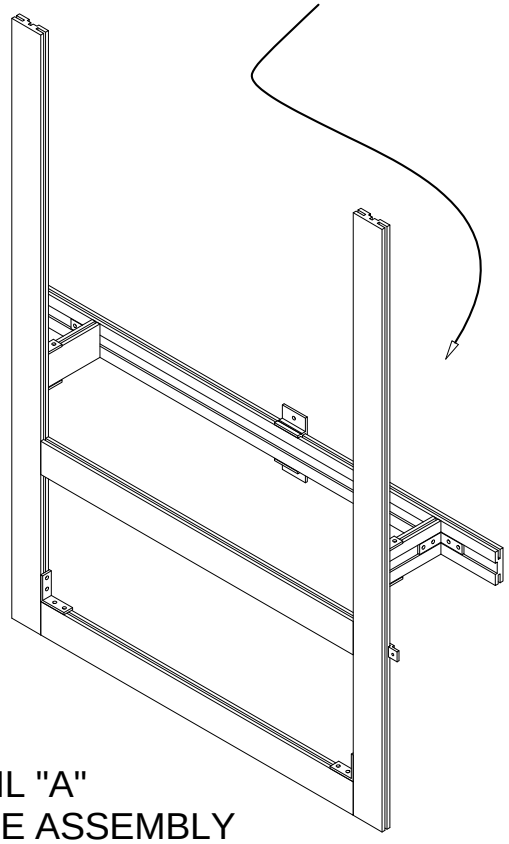
LAYOUT 2.0

AVERVE, RAILSET (SHEET 5 OF 5)
CAVITY WALL FRAME

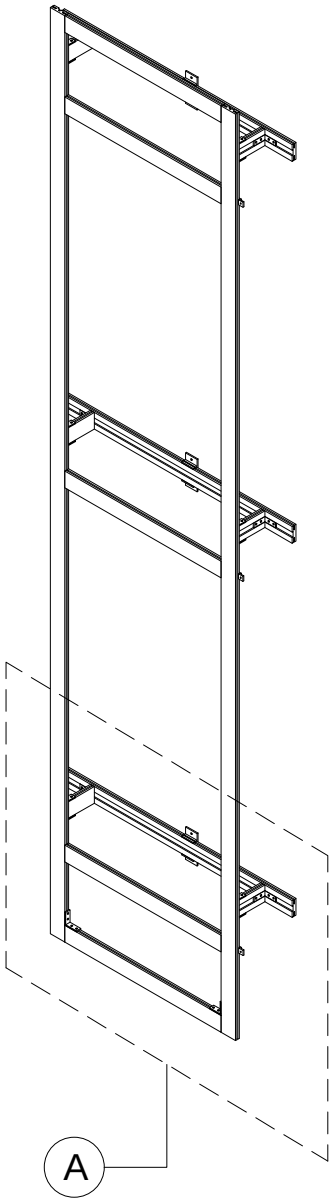
CAVITY WALL

NOTE:
THIS DRAWING REPRESENTS THE PRE-ASSEMBLED CAVITY WALL FRAME. THE PANEL APPLICATION FRAME FACE WITH FRAME & EXPANSION RAIL ASSEMBLY IS SAME AS IN SHEETS 1 - 3





DETAIL "A"
FRAME ASSEMBLY
BLOW UP

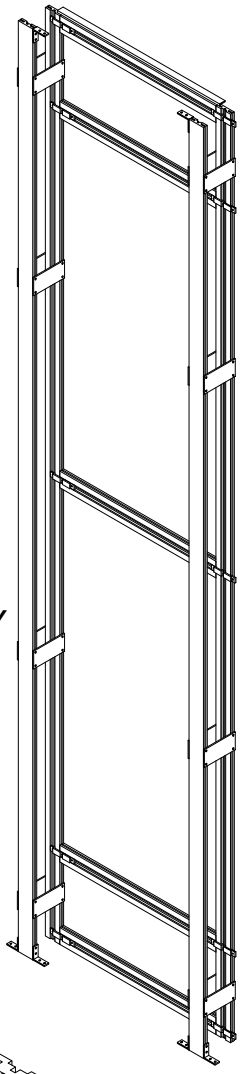


PRE-ASSEMBLED
CAVITY WALL FRAME

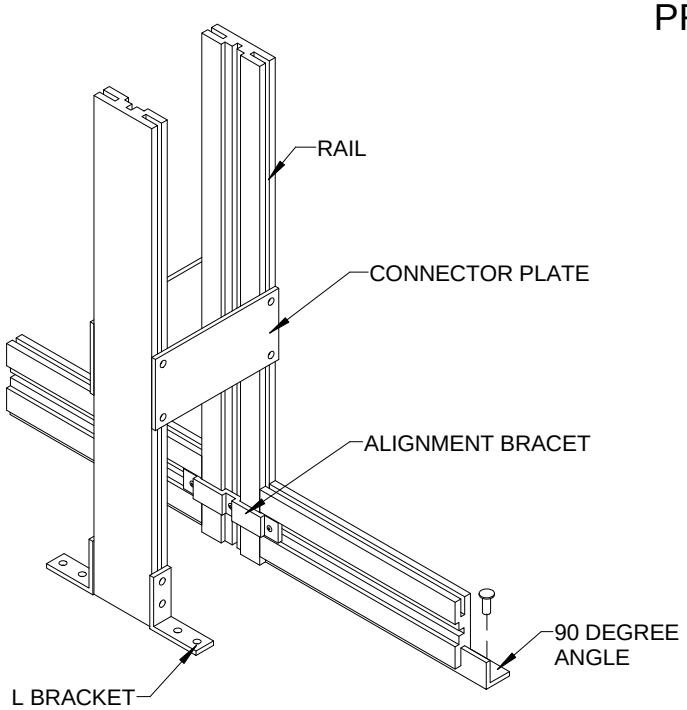
AVERVE, RAILSET (SHEET 4 OF 5)
POST WALL FRAME

NOTE:
THE DRAWING REPRESENTS
OPTIONS FOR A PRE-ASSEMBED
POST FRAME, THE PANLE APPLICATION
FRAME FACE WITH FRAME & EXPANSION
RAILS
ASSEMBLY IS SAME AS IN SHEET 1-3

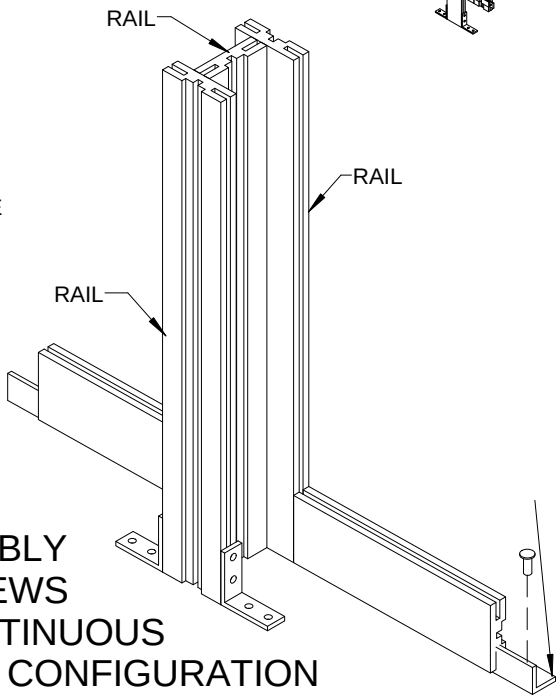
POST WALL (RAIL "I" BEAM)



DETAIL "A"
CONNECTOR PLATE
POST ASSEMBLY



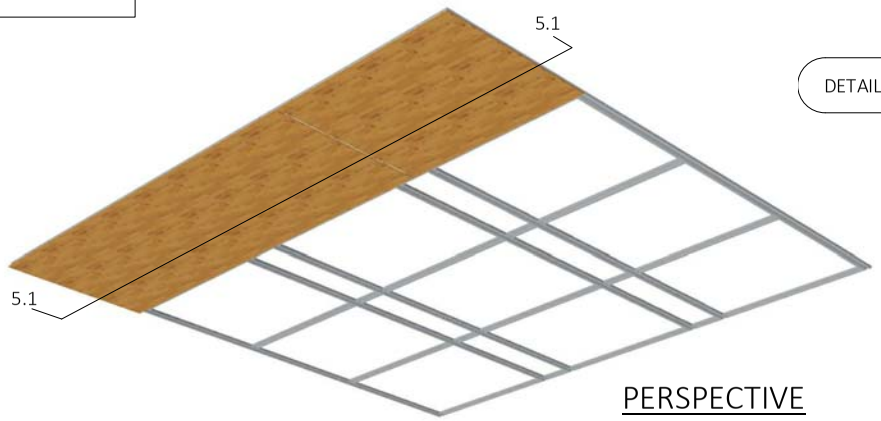
BACK VIEW
OF MIDWALL
FRAME POST
PRE-ASSEMBLY



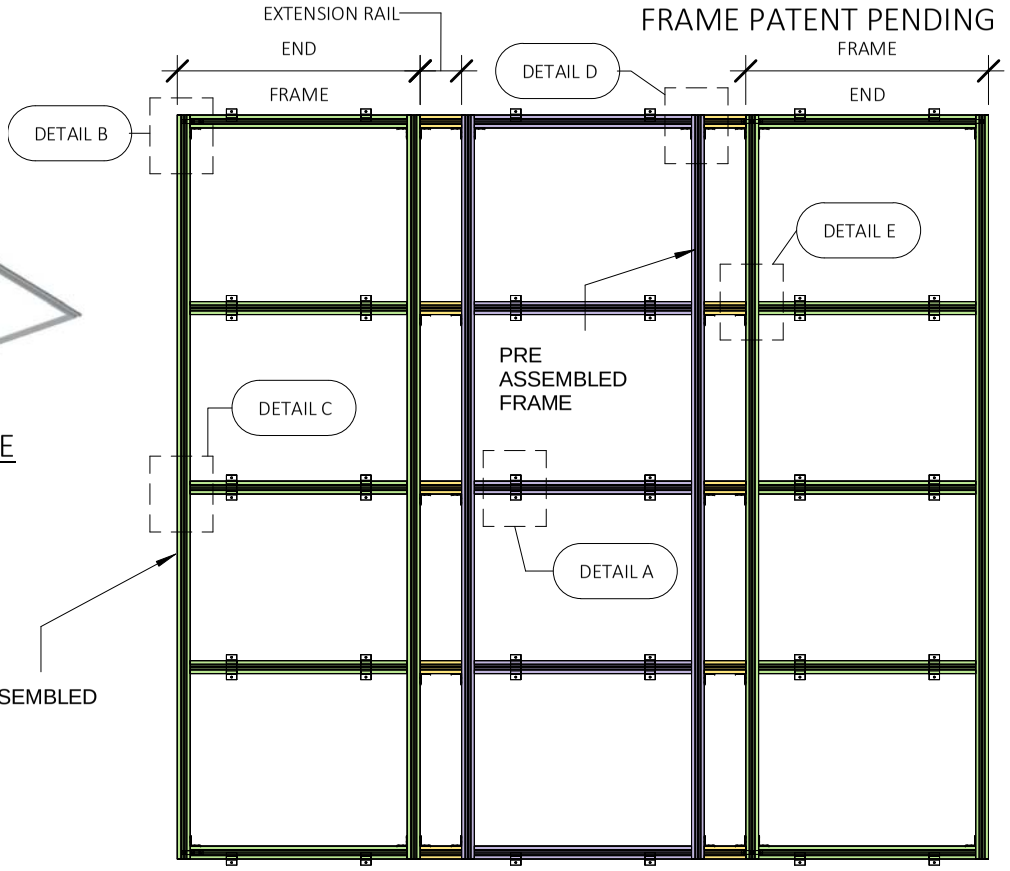
"I" BEAM POST ASSSEMBLY
USING M4 X 10 SS SCREWS
ASSEMBLE THREE CONTINUOUS
RAILS IN A VERTICAL "I" CONFIGURATION

5.0 CEILING RAILSET FRAME

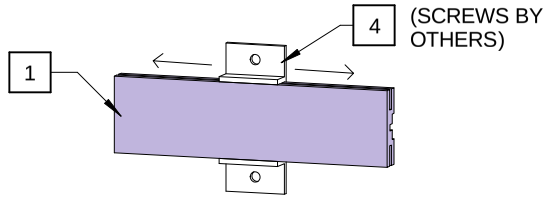
RAILSET CEILING
FRAME PATENT PENDING



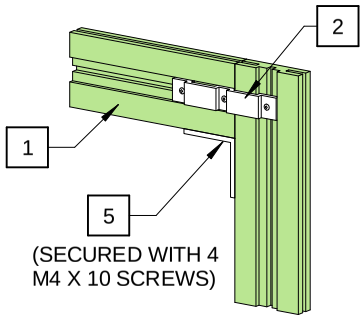
PERSPECTIVE



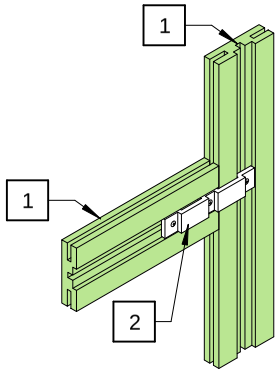
ELEVATION



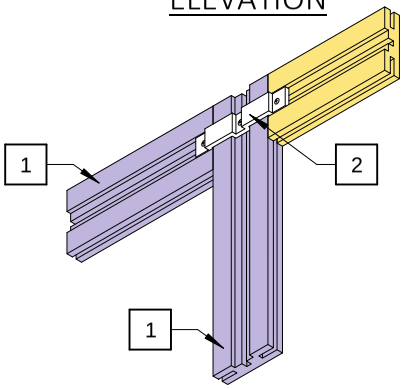
DETAIL A



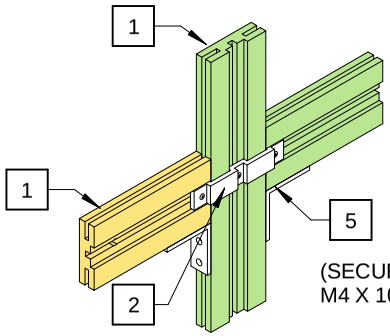
DETAIL B



DETAIL C



DETAIL D



DETAIL E