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Reissued 05/2017
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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

SECTION: 06 12 19—SHEAR WALL PANELS

REPORT HOLDER:

TRUSSED, INC.

23447 CAJALCO ROAD
PERRIS, CALIFORNIA 92570

EVALUATION SUBJECT:

SMART COMPONENT LATERAL-LOAD-RESISTING PANELS AND PORTALS

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Section: 06 12 19—Shear Wall Panels

REPORT HOLDER:

TRUSSED, INC.
23447 CAJALCO ROAD
PERRIS, CALIFORNIA 92570
(877) 849-2557
www.smartcomponents.us

EVALUATION SUBJECT:

SMART COMPONENT LATERAL-LOAD-RESISTING PANELS AND PORTALS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2012, 2009 and 2006 *International Residential Code*® (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Seismic design coefficient and factors

2.0 USES

The Smart Component Lateral-Load-Resisting Panels and Portals may be used to resist vertical (gravity) loads and horizontal in-plane or out-of-plane wind and earthquake loads in wood-framed buildings, as alternatives to wood shear walls complying with IBC Section 2305, provided an engineered design, verifying compliance with Sections 3.0 and 4.0 of this report, is submitted to the building official for approval.

Design of multi-level stacked applications is within the scope of this report.

The Panels and Portals may be used as an alternative to walls constructed in accordance with Section R602 of the IRC, provided an engineered design is submitted to the building official in accordance with IRC Section R301.1.3, verifying compliance with Sections 3.0 and 4.0 of this report.

The seismic performance of Smart Component Panels and Portals described in this report, when designed and constructed in accordance with requirements described in this report, may be recognized as being equivalent to that of light-frame wood shear walls sheathed with wood structural panels as shown in ASCE/SEI 7-10 Table 12.2-1, Item A.15, for the 2012 IBC and IRC (ASCE/SEI 7-05 Table 12.2-1, Item A.13, for the 2009 and 2006 IBC and IRC).

3.0 DESCRIPTION

3.1 General:

The Smart Component configurations described in this section, constructed with the components described in Sections 3.2 and 4.5 of this report and designed in accordance with Section 4.2 of this report, were evaluated in accordance with the ICC-ES Acceptance Criteria for Lateral Force–Resisting Vertical Wood Truss Wall Assemblies (AC440) as permitted by ASCE/SEI 7 Sections 11.1.4 and 12.2.1. See Section 4.1 of this report. The Smart Component configurations are limited to those described in this section.

The specific design of the Smart Component Panels and Portals as part of the design of any building is beyond the scope of this report.

The information provided in the remaining sections of this report must be used by the building official and the registered design professionals (RDPs) responsible for the Smart Component design and for the overall building design, to verify that the Smart Components comply with this report. See Section 4.2 of the report for additional (and more detailed) requirements.

Jobsite Smart Component Panel and Portal elements (such as size and number of webs, vertical supports and metal plates and aspect ratio) could vary within a specific configuration. Therefore, the components described in Section 3.2 and the conditions specified in Section 4.5 of this report, must be complied with in order for the Smart Component Panels and Portals that are designed by the RDP authorized by Trussed Inc., for a specific project, to satisfy the seismic design coefficients and factors noted in Section 4.1 of this report.

The Smart Component Lateral-Load-Resisting Panels and Portals are prefabricated metal-plate-connected wood trusses that must be designed and manufactured under a quality control program in accordance with ANSI/TPI 1, which is referenced in IBC Section 2303.4.6 and IRC Sections R502.11 and R802.10.

Three Smart Component configurations evaluated for seismic performance are described in this report. Narrow Panels are single-panel vertical trusses. Multi-segmented Panels consist of interconnected multiple single-panel vertical trusses placed adjacent to each other in the same wall plane. In each case, the boundary vertical truss chords are fabricated with an integral concentric hold-down

assembly installed in between wood chord members (a sandwiched vertical post chord assembly). Portals have a moment frame configuration and consist of one or two Narrow Panels connected to a horizontal truss, or a header. Portals may have sills below window openings. Representative details of each configuration type are shown in Figure 1.

3.2 Components:

Components of the Smart Component Panels and Portals, including wood members, hold-downs, anchor rods and truss connector plates, must be determined by an RDP authorized by Trusses, Inc., who is responsible for the panels and portals design, and must comply with code-prescribed performance requirements including strength and drift, and component performance characteristics noted in this section and Section 4.5. Wood member sizes must also accommodate metal connector plates noted in Section 3.2.5 of this report, to transfer member forces.

Proprietary components must comply with an ICC-ES acceptance criteria as evidenced by an ICC-ES evaluation report, as noted in this section. All components must comply with the specifications set forth in the Smart Component design and this evaluation report.

3.2.1 Structural Wood Members: Visually and mechanically graded, solid-sawn members, including their structural design properties, must comply with material standards referenced in the IRC and IBC. Minimum nominal member sizes must be 2-by. End post members must not contain unsound knots or knots greater than $^1/_2$ inch (12.7 mm) in diameter within the T2 concentric hold-down through-bolt location. Framing members must be of the species and grades permitted by the evaluation reports on the hold-down devices and metal plate connectors.

3.2.2 Concentric Hold-down Devices: Proprietary concentric hold-down devices must be Hardy Frame/Z4 T2 Ties used for sandwiched connections, as recognized in ICC-ES ESR-3105. Variables contributing to total displacement Δ_a in Equation 4.3-1 of ANSI/AF&PA SDPWS-2008 (for the 2012 and 2009 IBC and IRC) or d_a, in Equation 23-2 of the 2006 IBC (for the 2006 IBC and IRC), such as deformation of the hold-down (tie-down) device when tested on a steel jig; fastener slip; wood shrinkage; and anchor bolt/rod elongation, must be checked by the RDP responsible for the Smart Component Panel and Portal design. Use with lumber species and grades must be in accordance with ESR-3105.

3.2.3 Anchor Rods: Anchor rods, including their structural design properties, must comply with standards referenced in the IBC. Nuts must comply with the minimum grades and styles specified for the anchor rod grade used. Couplers must comply with the same specification as the nuts for proof stresses of the rod, and with IFI 128.

3.2.4 Shrinkage Compensating Devices: Optional shrinkage compensating devices and their corresponding structural design properties must comply with the ICC-ES Acceptance Criteria for Shrinkage Compensating Devices (AC316) as evidenced by an ICC-ES evaluation report.

3.2.5 Metal Connector Plates: Metal connector plates, including their corresponding structural design properties, must comply with ICC-ES evaluation report ESR-1311 (MT20HS) or ESR-1988 (MT18HS and MT20). Use with wood members other than those specifically described in ESR-1311 and ESR-1988 is beyond the scope of this report.

3.2.6 Bottom Plates, Steel Bottom Tracks and Shear Connectors: Wood bottom plates and steel bottom tracks, including their structural design properties, must comply with the IBC/IRC. Shear connectors, including their corresponding structural design properties, must comply with an ICC-ES evaluation report, the IBC or the IRC.

3.2.7 Bearing Plates: Steel bearing plates, including their design properties, must comply with the appropriate standards referenced in the IBC or the IRC.

4.0 DESIGN AND INSTALLATION

4.1 Seismic Design Coefficients and Factors:

Smart Component Panels and Portals may be used as lateral-load-resisting elements within a seismic-force-resisting system using the following seismic design coefficients and factors, when the the structural design and construction comply with the provisions noted in this report:

COEFFICIENT OR FACTOR	ASCE/SEI 7
Response modification coefficient, *R*	6.5
System overstrength factor, Ω_o	3
Deflection amplification factor, C_d	4

The building height must be limited to the lesser of 65 feet (19.8 m) or whatever is listed in Section 503 of the IBC, for structures assigned to Seismic Design Category (SDC) C, D, E or F, as set forth in ASCE/SEI 7 Table 12.2-1 for light framed wood walls sheathed with wood structural panels rated for shear resistance. In SDCs A, B and C, building height is only limited by Section 503 of the IBC. This includes mutli-level stacked applications.

The recognition of the seismic design coefficients and factors and height limitations is based on evaluation of data submitted as required by Section 6.0 of this report.

4.1.1 Redundancy Factor, ρ, for Seismic Design Categories D through F: The redundancy factor, ρ, for Smart Component Panels and Portals must be determined in accordance with Section 12.3.4.2 of ASCE/SEI 7. Smart Component Panels and Portals are considered equivalent to “Shear Walls or Wall Piers” with height-to-length ratio of greater than 1.0 as set forth in ASCE/SEI 7 Table 12.3-3.

4.2 Design:

4.2.1 Verification Requirements: The following must be used by the registered design professionals (both the RDP authorized by Trussed, Inc., and the project RDP responsible for the building design) and building officials to verify compliance with the code and this report.

The design of the structures incorporating Smart Component Panels and Portals must be based on the design procedure that has been validated in accordance with AC440, which includes empirically derived (from testing) seismic design and detailing requirements and additional code-complying methods such as those noted in the IBC, IRC, NDS, SDPWS and ANSI/TPI-1, as appropriate. The design procedure must address the permitted WTWA configurations noted in Sections 3.2 and 4.5 of this report, and must include the effects of connections to the supported structure, supporting structure and foundation, connections to other WTWA’s, and the cumulative effects of both overturning strength demands and overturning stiffness. The design must ensure that truss joints, consisting of metal connector plates noted in Section 3.2.5 of this report attached to wood members (chords and webs), are the primary yield mechanism, and joint details must be consistent with those tested and qualified under AC440.

The portal header bottom chord must meet the unbraced length requirements of ANSI/TPI 1.

At critical locations (those expected to have ductile/yielding performance), the Joint Stress Index (JSI–metal connector plate stress ratio) must be greater than the Combined Stress Index (CSI–wood member stress ratio). Calculations for members available upon request.

Weak and strong axis buckling calculations must be based upon the NDS and ANSI/TPI 1.

All Smart Component Panels and Portals must be designed in accordance with ANSI TPI 1, IBC Section 1604.4, IRC, Section R301.1.3 and other applicable portions of the IBC or IRC, using Smart Component proprietary design software by CompuTrus/MiTek. Smart Component design drawings and engineered details must be signed and sealed by an RDP authorized by Trussed, Inc., and responsible for the Panel and Portal design.

Lateral and vertical loads (structural demand) must be determined by the project RDP responsible for the building design, in accordance with the IRC, IBC and ASCE/SEI 7. Demand loads must include, but are not limited to, vertical (gravity; tension or uplift due to wind; or vertical seismic) loads, and horizontal in-plane or out-of-plane (if applicable) lateral seismic and/or wind design loads. Distribution of lateral loads to shear-resisting elements such as the Smart Component Panel or Portal, based upon flexible and/or rigid diaphragm analysis in accordance with ASCE/SEI 7, must be determined by the RDP. The RDP responsible for the building design must specify installation conditions, including connections to the surrounding structure to provide a continuous load path, location restrictions, and size limitations.

Each project must have a design for each Smart Component Panel or Portal, to accommodate an individual project's lateral wind and earthquake loads and vertical loads and installation conditions, which must be provided by the RDP responsible for the building design. All applicable project lateral and vertical loads must be included for each floor level of the structure. Continuous load paths, including collectors and foundations, must be provided by the project RDP responsible for the building design in accordance with ASCE/SEI 7 Section 12.1.3. The Smart Component Panels and Portals must be integrated into the continuous load path as determined by the RDP responsible for the building design, in compliance with the provisions of IBC Section 1604.4 and IRC Section 301.1. Panels and Portals must be analyzed by the RDP authorized by Trussed, Inc., as responsible for the Panel and Portal design, using allowable stress design (ASD) capacities permitted by the IBC or IRC and ANSI/TPI 1, and using the proprietary Smart Component software to determine the resistance of the Smart Components.

Where the stability against overturning resulting from lateral loads in accordance with allowable stress design load combinations set forth in IBC Section 1605.3 or IRC Section R301 is not sufficient to prevent tension or uplift, the connection of the anchoring system described in Section 3.2 of this report to the Smart Components Panel or Portal must be designed by the RDP authorized by Trussed, Inc., to stabilize the Panel or Portal.

The ASD capacities must be evaluated for concentric anchoring systems (with sandwich post vertical boundary members as illustrated in Figure 1), including hold-down device capacity, wood member net section tension capacity, wood member compression capacity for both perpendicular and parallel-to-grain directions, and threaded anchor rod, to ensure that the resulting critical values of the anchoring system do not limit the lateral design capacity of the Smart Component Panel or Portal. Sandwich post vertical boundary members must be designed in accordance with the current NDS and ANSI/AF&PA SDPWS design specifications.

The RDP authorized by Trussed, Inc., must design the Smart Component elements for:

1. The project's horizontal and vertical demand loads, which must be determined by the RDP responsible for the building design, in accordance with the IRC, IBC, ASCE/SEI 7, and ANSI/TPI 1 for all chord and web members and the truss plate connectors.
2. Horizontal drift or deflection resulting from applied loads.

Contributions from hold-down device deflection and fastener slip, anchor rod elongation, and wood deformation are included in the calculated deflections by the Smart Component proprietary design software for the Smart Component Panels and Portals.

Smart Component systems drifts (deflections), due to earthquake loads, must be determined by the RDP authorized by Trussed, Inc., as responsible for the Panel and Portal design, in accordance with Section 12.8.6 of ASCE/SEI 7, and must not exceed the allowable story drift values specified in Table 12.12-1 of ASCE/SEI 7 and by IBC Section 1604.3 or the IRC, as appropriate. Smart Component Panel and Portal story drifts (deflections) due to wind loads at ASD levels must not exceed h/180, where h is the story height. More restrictive story drifts (deflections) may need to be considered by the designer where brittle wall finishes are involved or when specified by the RDP responsible for the building design.

Deflections resulting from out-of-plane loads must comply with limits set forth in IBC Section 1604.3.1 or Section R301.7 of the IRC, as appropriate.

If required, the lateral load capacity and/or anchor rod elongation and wood deformation at boundary members must be reduced to comply with drift limits while at the same time satisfactorily resisting the project demand loads. Where multiple Panels and Portals are combined in a wall line, or are combined with other lateral-force-resisting systems, design lateral loads must be proportioned by relative stiffness based on calculations as required in accordance with IBC Section 1604.4 by the RDP responsible for the building design. Combinations with lateral-force-resisting systems of unknown stiffness are prohibited.

Smart Component Panels and Portals may have shear wall aspect ratios greater than those specified in Section 4.3.4 of ANSI/AF&PA SDPWS-2008 (2012 and 2009 IBC) or Table 2305.3.4 of the 2006 IBC, and any implied aspect ratios in the IRC Section R602.10.

The supporting concrete, masonry, steel beams, or wood structure, along with anchorage and connectors, must be designed by the RDP for the building design in accordance with the IBC or IRC, to resist all imposed loads, including effects of overturning on bearing capacity and member capacity; and to determine contributions of deflection on story drift.

4.2.2 Anchorage to Concrete or Masonry: Anchorage to concrete or masonry design strengths, embedment length and anchorage details must be determined by the RDP responsible for the building design in accordance with Chapter 19 or 21 of the IBC, and Chapter 3, 4 or 6 of the IRC, as applicable.

4.2.3 Connections: Connections of the Panels and Portals to the supporting structure and to supported structures must be designed in accordance with the IBC or IRC and applicable referenced standards to resist all loads, including lateral loads and tension and compression loads resulting from overturning. The design responsibility must be shared between the RDP responsible for the building design and the RDP authorized by Trussed, Inc.

4.3 Installation:

Narrow Panels, Segmented Panels and Portals may be supported on concrete or masonry foundations, wood floor framing members or steel beams.

Smart Component Panels and Portals must be installed in accordance with the manufacturer's instructions and the building plans and specifications approved by the building official. Locations within the building must comply with the approved plans and specifications. Construction documents, consisting of plans, details, and specifications complying with IBC Section 1603 or IRC Section R106, and IBC Section 2303.4 or IRC Sections R502.11, R602.10 and R802.10, must be prepared to substantiate all installation and erection requirements. At a minimum, the construction documents must include the following information:

a. A description of how the panels and portals will be installed at the project site.

b. Building Component Safety Information (BCSI) requirements by TPI and the Structural Building Component Association (SBCA) for product handling and storage.

c. Panel and Portal design drawing information as required by the IBC, IRC and ANSI/TPI 1, and Sections 3.2 and 4.5 of this report.

d. Methods to connect Panels and Portals to the supported structures and supporting structure, including the foundation, must be detailed and must comply with the standards referenced in the IBC, IRC and ANSI/TPI 1, as applicable.

4.4 Special Inspection under the IBC and IRC:

Smart Component Panels and Portals are prefabricated items. Smart Components themselves do not require special inspection. Periodic field special inspections of anchorage attachments and other fastening of components within the seismic-force-resisting system must be provided in accordance with IBC Section 1706.2 or 1707.3, with the exception of those structures that qualify under Section 1704.1. Continuous or periodic inspection of anchorage to concrete or masonry must comply with the applicable portions of IBC Section 1704. The special inspections must be described in a statement of special inspection, which must be prepared by the RDP responsible for the building design and included in the construction documents, in accordance with 2012 IBC Section 1704.3, 2009 IBC Section 1704.1.1, or 2006 IBC Section 1704.1.1.

4.5 Configuration and Truss Drawing requirements:

In addition to the component requirements prescribed in Section 3.0 of this report, the configurations described in Section 3.1 and Figure 1 of this report must comply with the following:

a. Maximum aspect ratio for narrow panels is 6:1.

b. Maximum aspect ratio for segmented panels is 5:1.

c. Maximum aspect ratio for portal legs is 4.9:1.

d. Truss plate connection details, chord and web member sizes must be provided for each design on the truss design drawings.

e. The limits on the angles between diagonal column webs and vertical wood members must be 45 +/- 22.5 degrees.

f. Lengths of column web members (diagonal web members) are limited to 42 inches (1067 mm).

g. Portal headers supported by trusses must be top chord bearing at the columns.

h. Metal truss plate sizes must be limited to those listed in the appropriate MiTek evaluation reports and noted in Section 3.2.5 of this report, and are specified on the truss design drawings.

i. Hold-down device locations and sizes must be specified on the truss design drawings and must comply with Section 3.2.2 of this report.

j. Connection details for all support conditions must be provided in the construction document details.

5.0 CONDITIONS OF USE

The Smart Component Panels and Portals described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Panels and Portals must be installed in accordance with this report and all applicable code requirements, the manufacturer's instructions and the building plans and specifications approved by the building official.

5.2 This evaluation report addresses only those Smart Component Panels and Portals constructed with configurations as described in Sections 3.1 and 4.5, using components noted in Section 3.2, and designed and installed in accordance with Sections 4.1 through 4.4 of this report.

5.3 The design must comply with Sections 3.1 and 4.2 of this report.

5.4 The capacity of Smart Component Panels and Portals must conform to generally accepted engineering practices and design methodologies referenced in the IRC, IBC, SDPWS, ASCE/SEI 7, and/or ANSI/TPI 1. Specific capacity and configuration must be determined to satisfy a specific project design and are outside the scope of this report.

5.5 Drifts due to earthquake loads determined in accordance with Section 12.8.6 of ASCE/SEI for each story must not exceed the allowable story drift limits specified in Table 12.12-1 of ASCE/SEI 7. In multi-level stacked applications, the drift of any one component must be amplified by the ratio of the component height plus the floor depth below to the level's height.

5.6 Calculations and details prepared by the RDP authorized by Trussed, Inc., must be submitted to the building official for approval. These calculations and details must justify that the design stresses in all members and connections, for the Smart Component Panels and Portals, are within code-allowable limits as set forth in this report. Smart Component design drawings and any related Smart Component details complying with this report, and calculations, must be prepared in accordance with ANSI/TPI 1 and applicable portions of the IRC, IBC, SDPWS, or

ASCE/SEI 7, using the Smart Component proprietary design software by CompuTrus/MiTek, and must be prepared, signed and sealed by an RDP authorized by Trussed, Inc.

5.7 Calculations and details prepared by the RDP responsible for the building design, confirming that connections to the surrounding structure and the foundation anchorage are in compliance with the requirements of this report, must be submitted to the building official for approval.

5.8 Design of multi-level stacked applications is within the scope of this report.

5.9 Design of the structural members (concrete members, masonry members, foundations, steel or wood beams, anchorage, and connections) supporting the Smart Component Panels and Portals is outside of the scope of this report.

5.10 Smart Component Panels and Portals containing engineered wood framing members are beyond the scope of this report.

5.11 Smart Component Panels and Portals containing preservative-treated wood or fire-retardant-treated wood framing members are beyond the scope of this report.

5.12 Manufacture and quality assurance of Smart Components Panels and Portals must comply with ANSI/TPI 1 Chapter 3 (as referenced by the pertinent building code). Smart Component fabricators must be licensed by Trussed, Inc. A current list of licensees is available upon request from Trussed, Inc.

5.13 The current version of the Smart Components proprietary software (7.6.4) must be listed on the Smart Component design drawings. Manufacture of Smart Component Panels and Portals must be by Trussed, Inc., licensees and must comply with Chapter 3 of ANSI/TPI 1. Chapter 3 of TPI 1 contains provisions for quality standards to be used in monitoring the manufacturing processes of metal-plate-connected wood trusses, and must be used in conjunction with a manufacturing quality assurance procedure and a truss design from each manufacturing location. These provisions must be included in the in-plant quality assurance program for Smart Component Panels and Portals. Smart Component Panels and Portals must comply with the minimum manufacturing quality requirements specified in Chapter 3 of TPI 1, so that design assumptions are met. Trussed, Inc., licensees, and its inspection agency must establish methods that document the application of these quality assurance procedures throughout the manufacturing process. The Trussed, Inc., licensee's methods must be subject to periodic inspections at each manufacturing location.

5.14 Quality criteria for lumber must comply with ANSI/TPI 1, Section 3.4.

5.15 Panels and Portals must be protected by a weather-resistant exterior wall envelope.

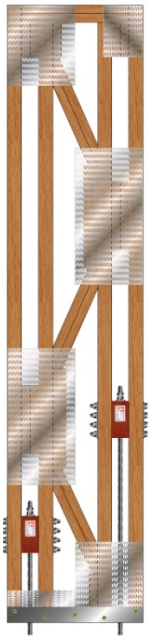
6.0 EVIDENCE SUBMITTED

Test data and calculations in accordance with the ICC-ES Acceptance Criteria for Lateral Force–Resisting Vertical Wood Truss Wall Assemblies (AC440), dated June 2013.

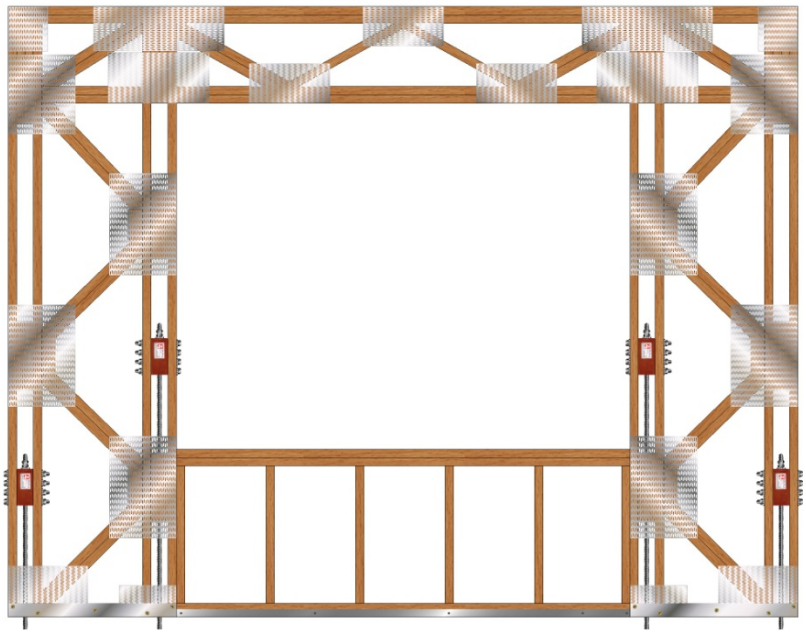
7.0 IDENTIFICATION

Smart Component Panels and Portals must be identified in accordance with IBC Sections 1704.2 and 2303.4 and IRC Sections R502.11, R602.10, and R802.10, as applicable. In addition, the identification must include the Trussed, Inc., licensee name and address (city and state).

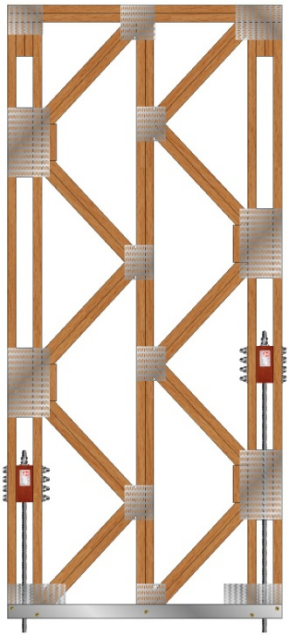
Narrow Panel



Portal with Sill



Multi-Segmented Panel



Portal

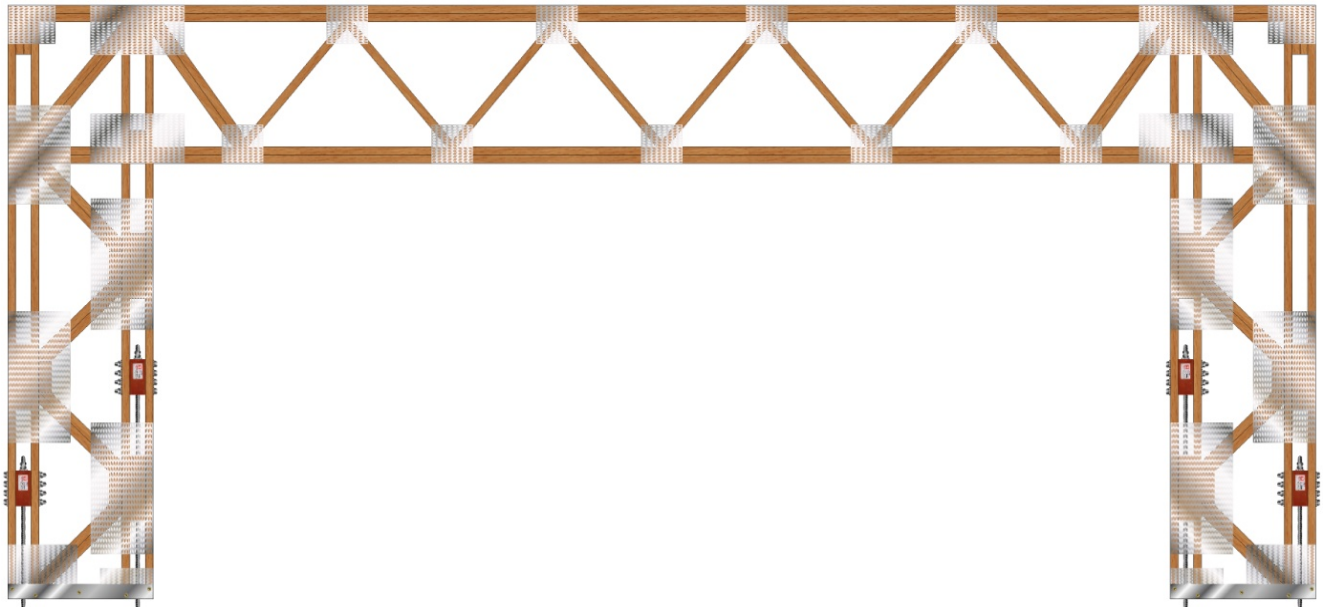


FIGURE 1—SMART COMPONENT ELEMENTS