DrJ™ CERTIFICATION

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Technical Evaluation Report

TER 0811-01

Seismic Design Parameters for Smart Components® Lateral Load Resisting Panels & Portals

Trussed, Inc.

Product:

Smart Components® Lateral Load Resisting Panels and Portals

Issue Date:

November 1, 2008

Revision Date:

September 30, 2020

Subject to Renewal:

October 1, 2020

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COMPANY INFORMATION:

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

SECTION: 06 12 19 - Shear Wall Panels

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1 PRODUCT EVALUATED[1]

1.1 Smart Components® Lateral Load Resisting Panels and Portals

2 APPLICABLE CODES AND STANDARDS[2,3]

2.1 *Codes*

2.1.1 *IBC—12, 15, 18: International Building Code®*

2.1.2 *IRC—12, 15, 18: International Residential Code®*

2.1.3 *CBC—10, 13, 16: California Building Code*

2.2 *Standards and Referenced Documents*

2.2.1 *AISI S100: North American Specification for the Design of Cold-formed Steel Structural Members – General Provisions*

2.2.2 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*

2.2.3 *ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic*

2.2.4 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

2.2.5 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*

2.2.6 *IFI 128: Hex Coupling Nuts*

2.2.7 *TPI 1: National Design Standard for Metal-plate-connected Wood Truss Construction*

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[1] Building codes require data from valid research reports be obtained from *approved sources*. Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the *building official*. DrJ is an ISO/IEC 17065 ANSI-Accredited Product Certification Body – Accreditation #1131.

Through ANSI accreditation and the IAF MLA, DrJ certification can be used to obtain product approval in any *jurisdiction* or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "certified once, accepted everywhere."

Building official approval of a licensed *registered design professional* (RDP) is performed by verifying the RDP and/or their business entity complies with all professional engineering laws of the relevant *jurisdiction*. Therefore, the work of licensed RDPs is accepted by *building officials*, except when plan (i.e. peer) review finds an error with respect to a specific section of the code. Where this TER is not approved, the *building official* responds in writing stating the reasons for disapproval.

For more information on any of these topics or our mission, product evaluation policies, product approval process, and engineering law, visit drjcertification.org or call us at 608-310-6748.

[2] Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein (e.g., *ASCE 7, NDS, ASTM*). This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

[3] All terms defined in the applicable building codes are italicized.

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3 PERFORMANCE EVALUATION

3.1 This TER examines test data and related generally accepted engineering analysis that support the development of seismic design parameters (SDPs) for Smart Components®. The SDPs are used in evaluating the ductility and resistance of Smart Components® as lateral seismic loads are applied.

3.2 Smart Components® lateral load resisting panels and portals comply with *IBC* Section 1613 and *ASCE 7* Section 12.2.

3.2.1 Table 1 provides SDPs and factors that conform to the requirements in *ASCE 7* Section 12.2.1 and Table 12.2-1 for design of wall assemblies in buildings that require seismic design in accordance with *ASCE 7* (i.e., all seismic design categories).

3.2.2 The basis for equivalency testing is outlined in *ASCE 7* Section 12.2.1.1:

> Use of seismic force-resisting systems not contained in Table 12.2-1 shall be permitted contingent on submittal to and approval by the Authority Having Jurisdiction and independent structural design review of an accompanying set of design criteria and substantiating analytical and test data. The design criteria shall specify any limitations on system use, including Seismic Design Category and height; required procedures for designing the system's components and connections; required detailing; and the values of the response modification coefficient, R; overstrength factor Ω_0; and deflection amplification factor, C_d.

3.2.3 The Smart Components® SDP evaluation uses the approach found in the document entitled "Establishing Seismic Equivalency for Proprietary Prefabricated Shear Panels"[4] and "Seismic Design Coefficients: How they are determined for light-frame components"[5] using code defined accepted engineering procedures, experience, and good technical judgment.

3.3 The load resistance capacity of Smart Components® is outside the scope of this TER.

3.3.1 The design of Smart Components® is performed in accordance with standard metal connector plate design methods as defined in *IBC* Section 2303.4 and *ANSI/TPI 1*.

3.3.2 Each Smart Components® is uniquely designed to resist the seismic design specifications and loading conditions provided by the building designer (i.e., Registered Design Professional) for the construction project. Smart Components® design drawings (SCDD) are created that provide all the design information and details needed to meet the resistance to seismic loading conditions and deflection (a.k.a. drift) criteria. This design process follows accepted engineering practice and, therefore, is compliant with any relevant provisions of *ASCE 7*, *SDPWS*, *IRC*, *IBC*, and *ANSI/TPI 1*.

3.4 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

3.5 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ's professional scope of work.

4 PRODUCT DESCRIPTION AND MATERIALS

4.1 Smart Components® are prefabricated, metal plate connected wood trusses that are used to resist lateral loads in braced wall panel and portal applications (Figure 1). Smart Components® are placed within braced wall lines and used in conventional light-frame construction.

4.2 The three types of Smart Components® recognized in this TER:

4.2.1 Portal frame as shown in Figure 2 and portal frame with sill as shown in Figure 3.

4.2.2 Narrow panel (single-panel) vertical trusses as shown in Figure 4.

4.2.3 Multi-segmented panels composed of multiple single-panel vertical trusses adjacent to each other and interconnected in one wall plane as shown in Figure 4.

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[4] http://www.structuremag.org/wp-content/uploads/2014/08/C-StructuralPerformance-Nelson-Aug081.pdf

[5] http://www.sbcmag.info/article/2014/seismic-design-coefficients-how-they-are-determined-light-frame-components

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4.3 *Materials*

4.3.1 *Framing Members:*

4.3.1.1 Visually and mechanically graded, solid-sawn lumber and engineered lumber is defined and shall be used in accordance with engineering principles defined in *NDS* and *ANSI/TPI 1*.

4.3.1.2 Minimum nominal member sizes must be 2".

4.3.1.2.1 Post members must not have knots larger than ½" diameter at the hold-down through-bolt location.

4.3.1.2.2 Lumber must be of the species and grades as defined in the code compliance reports of the hold-down devices, metal connector plates and any related connecting devices.

4.3.1.2.3 Lumber design values correspond with the grade noted on the SCDD and are derived through ASTM consensus standards administered by lumber rules-writing agencies and approved by the American Lumber Standard Committee.

4.3.1.3 Preservative-treated and fire-resistant lumber can be used with Smart Components®, where the lumber design values, metal connector plate design values, and conditions of use in trusses are provided by the preservative-treated and fire-resistant lumber manufacturer through an ISO/IEC 17065 code compliance report and in concert with *ANSI/TPI 1*.

4.3.1.4 Engineered wood members can be used with Smart Components®, where the engineered wood design values, metal connector plate design values, and conditions of use in trusses are provided by the preservative-treated and fire-resistant lumber manufacturer through an ISO/IEC 17065 code compliance report and in concert with *ANSI/TPI 1*.

4.3.2 *Concentric Hold-Down Devices:*

4.3.2.1 Concentric hold-down devices shall be Hardy Frame Z4 T2 Connectors or equivalent and shall be in accordance with the product's code evaluation report.

4.3.2.2 It is the responsibility of the building designer to ensure that all displacements are accounted for, including, but not limited to the following:

4.3.2.2.1 Hold-down device

4.3.2.2.2 Wood shrinkage

4.3.2.2.3 Fastener slip

4.3.2.2.4 Anchor bolt or threaded rod elongation

4.3.2.3 Total displacement calculations shall be computed in accordance with *SDPWS* Equation 4.3-1.

4.3.3 *Anchor-Rods:*

4.3.3.1 Steel anchor rods and their design properties shall be in accordance with the standards referenced by *IBC* Chapter 35.

4.3.3.2 Nuts must meet minimum grade and style specified for the anchor rod grade used. Couplers must comply with IFI 128 and also meet the same specification as the nut for the proof stresses of the anchor rod.

4.3.4 *Shrinkage Compensating Device:*

4.3.4.1 Optional shrinkage compensating devices shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the codes noted in Section 2.

4.3.4.2 The design properties, performance and installation requirements shall be in accordance with an ISO/IEC 17065 code compliance report.

4.3.5 *Metal Plate Connectors:*

4.3.5.1 The Smart Components® design uses metal plate connector manufacturer published design values, which have been incorporated into the referenced metal plate connector manufacturer's design software program.

4.3.5.1.1 Metal plate connector design properties shall be developed in accordance with *ANSI/TPI 1*.

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4.3.5.1.2 Metal plate connector design properties, engineering performance, and calibration of engineering performance to design software results shall be in accordance with an ISO/IEC 17065 code compliance report and *ANSI/TPI 1*.

4.3.5.1.3 Metal plate connector installation shall be in accordance with *ANSI/TPI 1* Chapter 3.

4.3.6 *Bottom Plates, Sheet Metal Sill Tracks, and Shear Connectors:*

4.3.6.1 Bottom plates shall be in accordance with *NDS*, *IBC* Section 2308.6.7.1,[6] and *IRC* Section R602.11.

4.3.6.2 Sheet metal sill tracks are used for placement of anchorage, installation, and separation of the Smart Components® from concrete foundations. The specification of sheet metal bottom tracks shall be in accordance with *AISI S200* and *S201*.

4.3.6.3 Base shear connector design properties and base shear connection design shall be specified by the building designer. This design shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the codes listed in Section 2 and any appropriate ISO/IEC 17065 code compliance reports.

4.3.7 *Bearing Plates:*

4.3.7.1 Steel bearing plates shall be designed and supplied in accordance with the standards referenced in the applicable building code.

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[6] 2012 *IBC* Section 2308.3.2.1

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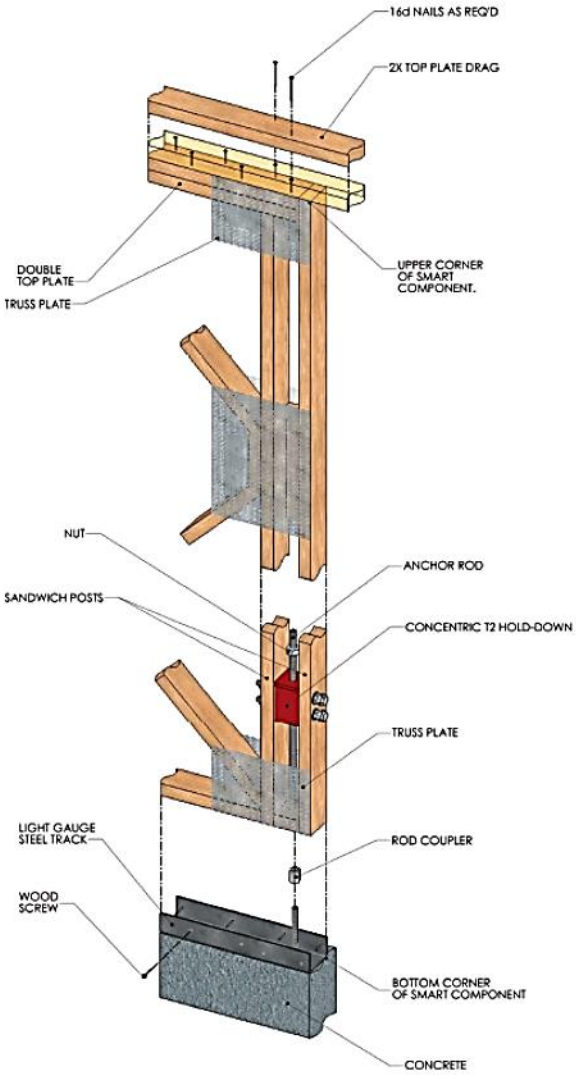

FIGURE 1. SMART COMPONENTS® DESIGN DETAIL



FIGURE 2. SMART COMPONENTS® PORTAL FRAME

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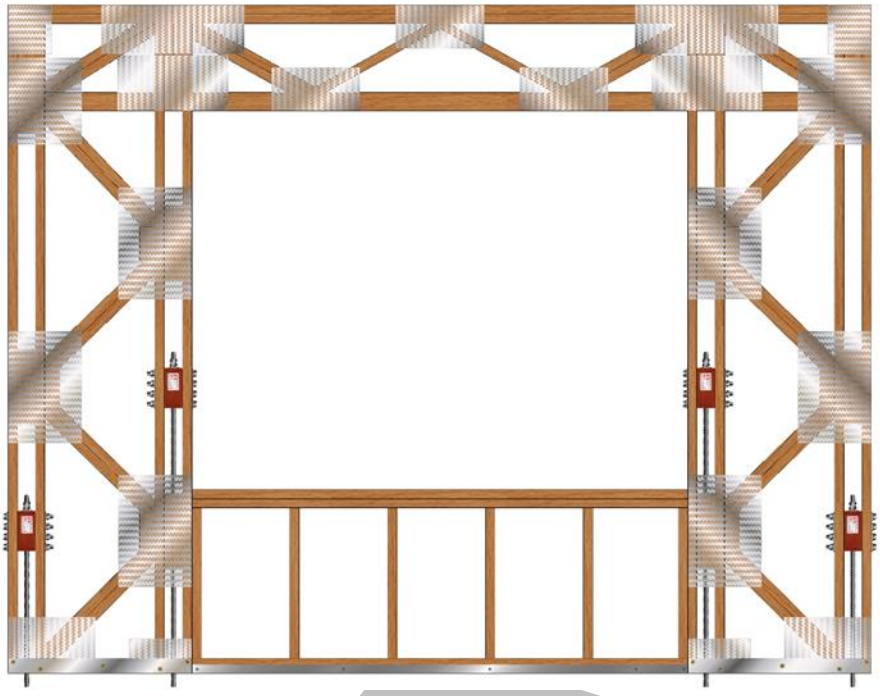

FIGURE 3. SMART COMPONENTS® PORTAL FRAME WITH SILL

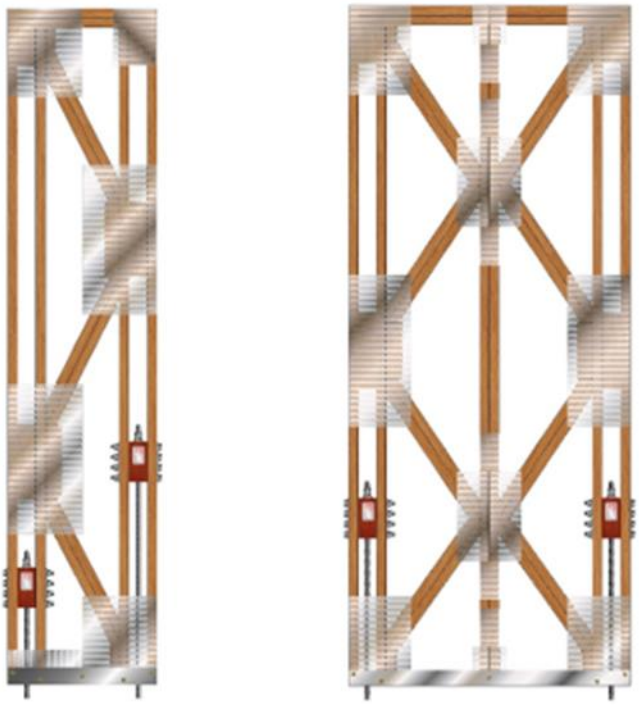

FIGURE 4. SMART COMPONENTS® NARROW & MULTI-SEGMENTED WALL PANELS

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5 APPLICATIONS

5.1 *Seismic Design Parameters*

5.1.1 Smart Components® may be used in accordance with the SDPs set forth in *ASCE 7* Table 12.2-1. Smart Components® SDPs – R, Ω_0, and C_d – are equivalent to those listed in *ASCE 7* Table 12.2-1 per Section 12.2.1 for light-framed wood walls sheathed with wood structural panels rated for shear resistance.

5.1.2 Smart Components® SDPs are listed in Table 1, which have been verified through accredited third-party testing and analysis for use when the braced wall panel or portal is designed and manufactured in accordance with the provisions of Section 3, Section 5.2, and Section 5.3.

TABLE 1. SMART COMPONENTS® SEISMIC DESIGN PARAMETERS

Seismic Design Parameters (SDPs)	*ASCE 7*
Response Modification Coefficient, *R*	6.5
System Overstrength Factor, Ω_0	3
Deflective Amplification Factor, C_d	4

5.1.2.1 Building height for Seismic Design Categories C, D, E, and F are limited to 65 feet or less as defined in *IBC* Section 503 and *ASCE 7* as appropriate.

5.1.2.2 For Seismic Design Categories A, B, and C building heights, *IBC* Section 503 applies generally.

5.1.2.3 Smart Components lateral load resisting structural elements/systems redundancy factor shall be in accordance with *ASCE 7* Section 12.3.4.2 and is considered equivalent to shear walls or wall piers with height-to-length ratios of greater than 1.0 per *ASCE 7* Table 12.3-3.

5.2 *Smart Components Design*

5.2.1 Smart Components® are designed in accordance with *IBC* Section 104.11, *IRC* Section R104.11, and *IRC* Section R301, specifically R301.1.1 and R301.1.3.

5.2.2 Smart Components® are used as vertical and lateral load resisting structural elements/shear walls in accordance with *IBC* Section 2305.3.

5.2.3 Smart Components® are used as alternatives to braced wall panels, braced wall lines, and continuously sheathed braced walls in conventional light-frame construction in accordance with *IBC* Section 2308.6[7] and *IRC* Section R602.

5.2.4 All applicable project lateral and vertical loads are defined by the building designer for each floor level of the structure. The loads supplied provide an individual project's lateral in-plane and out-of-plane wind and earthquake loads.

5.2.5 Each Smart Components® is uniquely designed to resist the seismic design specifications and loading conditions provided by the building designer for the construction project.

5.2.6 The Truss Designer designs Smart Components® for the project's horizontal and vertical demand loads using *ANSI/TPI 1* design methods using standard truss industry engineering practice. Additional considerations include, but are not limited to the following:

5.2.6.1 The truss joints (metal plate connectors) being the primary yield mechanism to achieve seismic resistance ductility.

5.2.6.1.1 At locations expected to have ductile and yielding performance, the Joint Stress Index must be greater than the Combined Stress Index.

5.2.6.1.2 Calculations for individual members are available upon request.

5.2.6.2 Portal header bottom chord must be in accordance with unbraced length requirements of *ANSI/TPI 1*.

5.2.6.3 Weak and Strong axis buckling calculations must be in accordance with *NDS* and *ANSI/TPI 1*.

[7] 2012 *IBC* Section 2308.3

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5.2.6.4 Sandwich post vertical boundary members must be designed to carry tension and compression loads in accordance with *NDS* and *SDPWS* design specifications.

5.2.7 ASD capacity checks are also made for concentric hold-down connections, lumber net section tension capacity, and lumber compression capacity both perpendicular and parallel to grain.

5.2.8 Threaded anchor rod capacity is also analyzed to determine if the rods control the lateral design capacity of the Smart Components®.

5.2.9 The Component Designer calculates the Smart Components® lateral load based drift/deflection.

5.2.10 Contributions from hold-down rod elongation, shrinkage, and wood deformation are added to the calculated deflections found on the SCDD.

5.2.11 Seismic drift limits are checked and the Smart Components® stiffness is adjusted to maintain acceptable overall drift/deflection performance.

5.2.12 Smart Components® may have shear wall aspect ratios greater than those specified in *SDPWS* Section 4.3.4 or *IBC* Section 2305 and any implied aspect ratios of *IRC* Section R602.10. See Section 5.3.7 of this TER.

5.2.13 Deflections resulting from out-of-plane loads must comply with *IBC* Section 1604.3.1 or *IRC* Section R301.7.

5.3 *Building Design Requirements*

5.3.1 The design of structures encompassing Smart Components® Panels and Portals must be in accordance with accepted building design, truss design (Section 5.2) and general engineering practice.

5.3.2 Building design that utilizes the unique lateral load resistance attributes of Smart Components® shall include but is not limited to, seismic design and detailing requirements associated with relevant *IBC*, *IRC*, *NDS*, *SDPWS*, and *ANSI/TPI 1* sections.

5.3.3 The building designer shall specify the type of Smart Components® to be used. Typical examples are shown in Section 4.1 and Section 4.2.

5.3.4 Building design and engineering considerations shall include, and are not limited to the following.

5.3.4.1 Lateral and vertical loads shall be defined and demand loads must consider:

5.3.4.1.1 Gravity

5.3.4.1.2 Tension or uplift due to wind

5.3.4.1.3 Vertical load impact on seismic loads

5.3.4.1.4 Horizontal in-plane or out-of-plane lateral seismic and/or wind loads

5.3.4.1.5 Distribution of lateral loads to shear-resisting elements and the specification of installation conditions including connections to the surrounding structure to provide a continuous load path, location restrictions, and size limitations

5.3.4.2 External to the Smart Components® design, ASD capacities must be evaluated for the effects of:Concentric anchoring systems

5.3.4.2.1 Hold-down device attachment capacities

5.3.4.2.2 Related lumber attachments and their net section tension capacity

5.3.4.2.3 Related lumber attachments and compression capacity for both perpendicular and parallel-to-grain directions

5.3.4.2.4 Threaded anchor rod to the anchoring system and other related connections

5.3.4.2.5 Review of the effects of connections to the rest of the supported structure including foundation

5.3.4.2.6 Placement of other panels or portals

5.3.4.2.7 Overturning strength demands and overturning stiffness as defined by the building design overall

5.3.4.3 Smart Components® shall be designed in accordance with *ANSI/TPI 1*, *IBC* Section 1604.4, and *IRC* Section R301.1.3 using Smart Components® proprietary design software.

5.3.4.4 SCDDs and any related engineered details must be signed and sealed by a RDP authorized by Trussed, Inc. and responsible for the Smart Components® design.

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5.3.4.5 The building designer shall ensure that the overall drift/deflection performance do not exceed values specified in *ASCE 7* Table 12.12-1 and *IBC* Section 1604.3.

5.3.4.6 Story drifts due to wind loads at ASD levels must not exceed h/180, where h equals the story height. More restrictive story drifts may need to be considered where brittle wall finishes are installed or when specified by the RDP.

5.3.5 Each project must have a design for each panel or portal in order to accommodate site-specific lateral wind and earthquake loads and installation conditions. Continuous load paths must be provided by the RDP in accordance with *ASCE 7* Section 12.1.3.

5.3.6 Where the stability against overturning resulting from lateral loads in accordance with allowable stress design load combinations 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 4.2 must be designed by the building designer.

5.3.7 Smart Components® may have shear wall aspect ratios greater than those specified in *SDPWS* Section 4.3.4 or *IBC* Section 2305 and any implied aspect ratios of *IRC* Section R602.10 as follows:

5.3.7.1 Maximum aspect ratio for narrow panels is 6:1

5.3.7.2 Maximum aspect ratio for multi-segmented panels is 5:1

5.3.7.3 Maximum aspect ratio for portal frame legs is 4.9:1

5.3.8 Deflections resulting from out-of-plane loads must comply with *IBC* Section 1604.3.1 or *IRC* Section R301.7.

5.4 *Anchorage*

5.4.1 Adequate embedment length and anchorage details must be determined by a RDP in accordance with *IBC* Section 1901.3 and 1905 or Chapter 21, and *IRC* Chapter 3, Chapter 4, or Chapter 6 as applicable.

5.5 *Connections*

5.5.1 Connections of Smart Components® panels and/or portals to the surrounding structure must be designed to resist all lateral, tension and compression loads in accordance with *IBC* Section 2308 and *IRC* Section R602.

5.6 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

6 INSTALLATION

6.1 Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.

6.2 Smart Components® may be supported on concrete or masonry foundations, wood floor framing members, or steel beams.

6.3 Smart Components® shall be installed in accordance with the manufacturer's instructions and the building plans approved by the building official.

6.4 *Installation Procedure*

6.4.1 *General:*

6.4.1.1 Secure steel sill track to wood floor framing, steel beams, concrete, or masonry foundations as required. Steel sill tracks are optional when Smart Components® are installed on wood floor framing members.

6.4.1.2 If an additional (third) anchor bolt is required, locate and drill hole in portal sill plate.

6.4.2 *Sill Track on Concrete:*

6.4.2.1 (1) Thread coupler on to embedded rod

6.4.2.2 (2) Insert panel/column into sill track

6.4.2.3 (3) Thread ATR into coupler

6.4.2.4 (4) Tighten T2 nut to fully seat component into sill track

6.4.2.5 (5) Fasten sill track to panel/column with furnished screws

6.4.2.6 (6) Do not use nut/washer with drift pins

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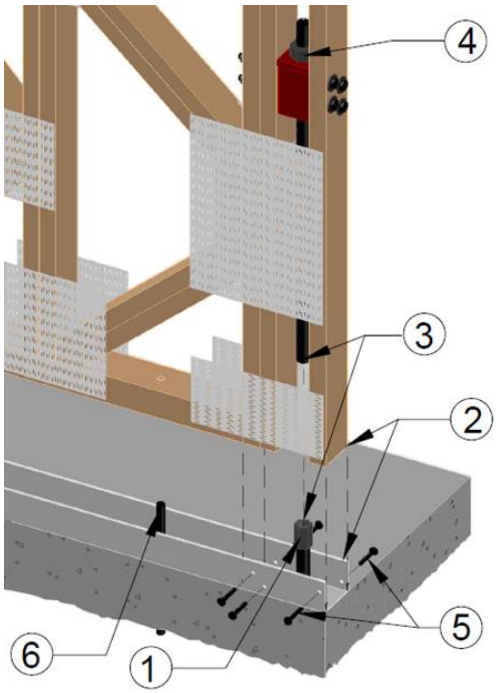

FIGURE 5. INSTALLATION ON CONCRETE

6.4.3 *Sill Track Attached to Smart Components:*

6.4.3.1 (1) Remove sill track

6.4.3.2 (2) Thread coupler to ATR (within structural panel)

6.4.3.3 (3) Fully seat and fasten sill track to panel/column with furnished screws

6.4.3.4 (4) Place Smart Components® over embedded rod

6.4.3.5 (5) Thread coupler (at bottom of ATR) on to embedded rod

6.4.3.6 (6) Tighten T2 nut

6.4.3.7 (7) Do not use nut/washer with drift pins

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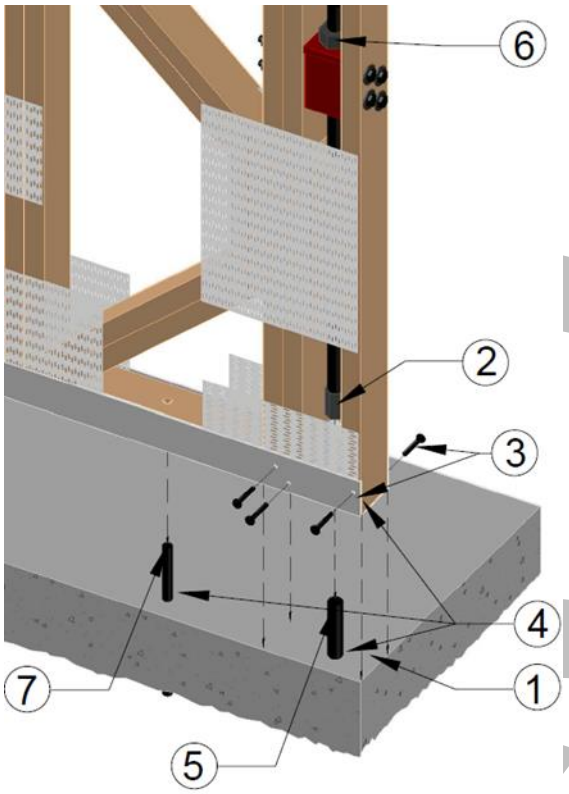

FIGURE 6. INSTALLATION OF SILL PLATE ATTACHED TO SMART COMPONENTS®

6.4.4 NOTE: In both installation processes, ensure Smart Components® is plumb and braced once it is stood up and sill track is secured to the floor.

7 TEST ENGINEERING SUBSTANTIATING DATA

7.1 Smart Components Equivalency Testing in accordance with *ASTM E2126*, performed by CEL Consulting, Lab #J1025-1068 and Project #50-51996J.

7.2 Smart Components Testing in accordance with *ASTM E2126*, performed by CEL Consulting, Project #50-52753C.

7.3 DrJ engineering analysis of CEL test data. DrJ engineering analysis of SDP calculations. DrJ engineering comparative engineering analysis of SDPs to wood structural panel SDP derivations.

7.4 Grundahl, K., and Lawless, D., May 2014, “Seismic Design Coefficients: How they are determined for light-frame components,” *SBC Magazine*, pp. 18-22.

7.5 Some information contained herein is the result of testing and/or data analysis by other sources which conform to *IBC* Section 1703 and relevant professional engineering law. DrJ relies on accurate data from these sources to perform engineering analysis. DrJ has reviewed and found the data provided by other professional sources to be credible.

7.6 Where appropriate, DrJ’s analysis is based on design values that have been codified into law through codes and standards (e.g., *IBC, IRC, NDS®,* and *SDPWS*). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, and concrete), DrJ relies upon the grade mark, stamp, and/or design values provided by raw material suppliers to be accurate and conforming to the mechanical properties defined in the relevant material standard.

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8 FINDINGS

8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, the product(s) listed in Section 1.1 are approved for the following:

8.1.1 Smart Components® provide equivalency and are suitable alternatives to light-framed wood walls sheathed with wood structural panels rated for shear resistance and comply with the applicable sections of the codes listed in Section 2 for the following design and application needs.

8.1.2 SDPs in accordance with *ASCE 7*.

8.1.3 Performance as lateral load resisting structural elements/shear walls in Types III and V construction in accordance with *IBC* Section 2305.3.

8.1.4 Performance as an alternative to braced wall panels, braced wall lines, and continuously sheathed braced walls in conventional light-frame construction and buildings of Types III and V construction in accordance with *IBC* Section 2308.6 and *IRC* Section R602.10.4.

8.2 *IBC* Section 104.11 (*IRC* Section R104.11 and *IFC* Section 104.9 are similar) states:

> **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code…Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.

8.3 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this evaluation, they are listed here.

8.3.1 No known variations

9 CONDITIONS OF USE

9.1 The Smart Components® described in this report shall comply with, or are suitable alternatives to, what is specified in those codes listed in Section 2, subject to the following conditions:

9.1.1 This TER applies to only those Smart Components® panels and portals constructed as is described in Section 4.1 and Section 4.2 using the materials described in Section 4.2, designed in accordance with Section 5, and installed in accordance with Section 6.

9.1.2 The capacity of Smart Components® shall conform to accepted engineering practice and *ANSI/TPI 1* design methods following standard truss industry engineering practice.

9.1.2.1 Smart Components® are designed for a specific project's horizontal and vertical demand loads using *ANSI/TPI 1*.

9.1.2.2 The configuration and design of an individual Smart Components® is determined based upon the project design loads and related requirements and specifications as provided by the building designer.

9.1.3 Story drifts due to earthquake loads shall not exceed those specified in *ASCE 7* Table 12.12-1.

9.1.3.1 In applications where Smart Components® are stacked on multiple levels, the building design shall consider the effect of floor framing on the overall story drift. One method to accomplish this is to increase the drift of any one component by the ratio of the component height plus the depth of the floor above to the specific height of the component at the level (i.e., story) being designed.

9.1.4 Calculations and details justifying that the design stresses in all members are within code allowable limits shall comply with the local building code requirements or be submitted to the code official for approval upon request.

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9.1.5 Design of the structural members (concrete or masonry foundations or steel or wood beams) supporting the Smart Components® is the responsibility of the building designer and is outside of the scope of this report.

9.1.6 Smart Components® are manufactured by a Trussed Inc. licensed fabricator who has a current and valid certification by:

9.1.6.1 An approved third-party quality assurance/inspection agency that certifies the level of quality meets or exceeds the minimum requirements of *ANSI/TPI 1*.

9.1.7 In the absence of certification:

9.1.7.1 Truss design drawings, details and specifications are prepared in accordance with *IBC* Section 2303.4 through Section 2303.4.7 and signed and sealed by a RDP.

9.1.8 Metal connector plates must have a current and valid ISO/IEC 17065 code compliance report that is in compliance with the requirements of *ANSI/TPI 1*.

9.1.9 Smart Components® must be protected with weather-resisting cladding cover on all exterior walls of the building envelope.

9.2 Smart Components® do not require special inspection. Periodic field special inspections of anchorage attachments and fastening of components within seismic-force-resisting systems must be in accordance with *IBC* Section 1704. Where special inspection or testing is required by *IBC* Section 1705, the RDP in responsible charge shall prepare a statement of special inspections in accordance with Section 1704.3.1 for submittal by the applicant in accordance with Section 1704.2.3.

9.3 Where required by the *building official*, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of *permit* application.

9.4 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

9.5 Design loads shall be determined in accordance with the building code adopted by the *jurisdiction* in which the project is to be constructed and/or by the building designer (e.g., *owner* or *registered design professional*).

9.6 At a minimum, this product shall be installed per Section 6 of this TER.

9.7 This product is manufactured under a third-party quality control program in accordance with *IBC* Section 104.4 and 110.4 and *IRC* Section R104.4 and R109.2.

9.8 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the *owner* or the owner's authorized agent. Therefore, the TER shall be reviewed for code compliance by the *building official* for acceptance.

9.9 The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the *building official's* inspection, and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10 IDENTIFICATION

10.1 The product(s) listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.

10.2 Additional technical information can be found at smartcomponents.us.

11 REVIEW SCHEDULE

11.1 This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjcertification.org.

11.2 For information on the current status of this TER, contact DrJ Certification.

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