



# Research Report

## 1-1/2" Cantilevered Floor Trusses Parallel or Perpendicular to Foundation Wall

DRR No. 1604-03

### Structural Building Components Association

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#### 1. Code Compliance Process Evaluated:<sup>1</sup>

- 1.1. Use of cantilevered sill plates with metal plate connected wood trusses to align with varying thicknesses of exterior sheathing.
- 1.2. For the most recent version of this report, visit [drjengineering.org](http://drjengineering.org). For more detailed state professional engineering and code compliance legal requirements and references, visit [drjengineering.org/statelaw](http://drjengineering.org/statelaw). DrJ is fully compliant with all state professional engineering and code compliance laws.

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<sup>1</sup> While the information in this report is believed to be accurate, DrJ cannot and does not warrant the accuracy, correctness, or completeness of any interpretation, research, analysis, or recommendation for a particular use. The report is to be accepted "AS IS" and DrJ makes no representation or warranty, express or implied, of any kind or description in respect thereto, and that any actions taken in reliance on this report shall be an end-user responsibility.

The scope of this research report is as defined herein. This examination, report, and any opinions herein have been conducted and prepared in accordance with standard practice guidelines within the engineering profession, based on the information readily available to DrJ as referenced herein. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through the codes and standards (e.g., *IRC*, *WFCM*, *IBC*, *SDPWS*, etc.), to undertake review of test data, related research, and analysis, and references such. Also, DrJ may rely upon proprietary research, testing, and analysis, and references such.

DrJ reserves the right to supplement or revise this research report, based on new scientific, testing, or analytical information that becomes available to DrJ. Updates may also be made based on any peer review or critique of any DrJ report.

The most recent version of any DrJ research report will be found at [drjcertification.org](http://drjcertification.org).

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### 2. Applicable Codes and Standards:<sup>2</sup>

- 2.1. 2009, 2012 and 2015 International Building Code (IBC)
- 2.2. 2009, 2012 and 2015 International Residential Code (IRC)
- 2.3. ANSI/AWC – National Design Specification (NDS) for Wood Construction
- 2.4. ANSI/TPI 1 -2014 National Design Standard for Metal Plate Connected Wood Truss Construction

### 3. Evaluation Scope:

- 3.1. This research report addresses the general construction framing details for cantilevered sill plates supporting metal plate connected wood trusses installed parallel or perpendicular to the foundation walls where there is a potential for discontinuous planes between the exterior wall above the sill plate and the foundation insulation planes.
- 3.2. This report is based on the following assumptions:
  - 3.2.1. Exterior wall sheathing is any thickness to align the exterior face of the sheathing with the exterior face of the sheathing below. Exterior sheathing assumed to be 7/16" wood structural panel (WSP).
  - 3.2.2. Basement continuous insulation is installed on the exterior of the foundation and does not exceed 2".
  - 3.2.3. Floor system is bottom chord bearing metal plate connected wood trusses.
  - 3.2.4. The sill plate does not overhang the foundation by more than 1<sup>9</sup>/<sub>16</sub>".
- 3.3. Specific code compliance considerations, including insulation, water resistant barrier and air barrier, are outside of the scope of this research report.
- 3.4. Any code compliance issues not specifically addressed in this section are outside the scope of this evaluation.
- 3.5. For guidance on specific matters of code compliance, refer to the locally applicable building code and manufacturer's installation instructions for specified materials.

### 4. Application:

#### 4.1. General Requirements

- 4.1.1. All wall assembly components shall be approved, installed, and inspected in accordance with the applicable building code, approved construction documents, manufacturer installation instructions, and good practice.
- 4.1.2. This research report functions as the "manufacturer's recommendation" for metal plate connected wood trusses for situations where there is a sill plate cantilever of 1<sup>9</sup>/<sub>16</sub>" or less.
  - 4.1.2.1. Where [IRC Section R502.3.3](#) provides prescriptive information regarding floor cantilevers for sawn lumber and [IRC Section R502.7](#) provides prescriptive information for lateral restraint at supports for sawn lumber, it defers to manufacturer recommendations for engineered products in Exception 1:  
[R502.7 Exception 1](#) Trusses, structural composite lumber, structural glued-laminated members and I-joists shall be supported laterally as required by the manufacturer's recommendations.
  - 4.1.2.2. [IRC Section R502.7.1](#) provides prescriptive information for bridging yet also defers to manufacturer recommendations for engineered products in Exception 1:  
[R502.7.1 Exception 1](#) Trusses, structural composite lumber, structural glued-laminated members and I-joists shall be supported laterally as required by the manufacturer's recommendations.

#### 4.2. Terminology

- 4.2.1. **Band, Rim or Header Joist** – Not defined, but shown on [IRC Figure R502.2](#). In the case of sawn lumber and I-joists, it is a full depth framing member that provides lateral support for the ends of the joists perpendicular to the foundation.

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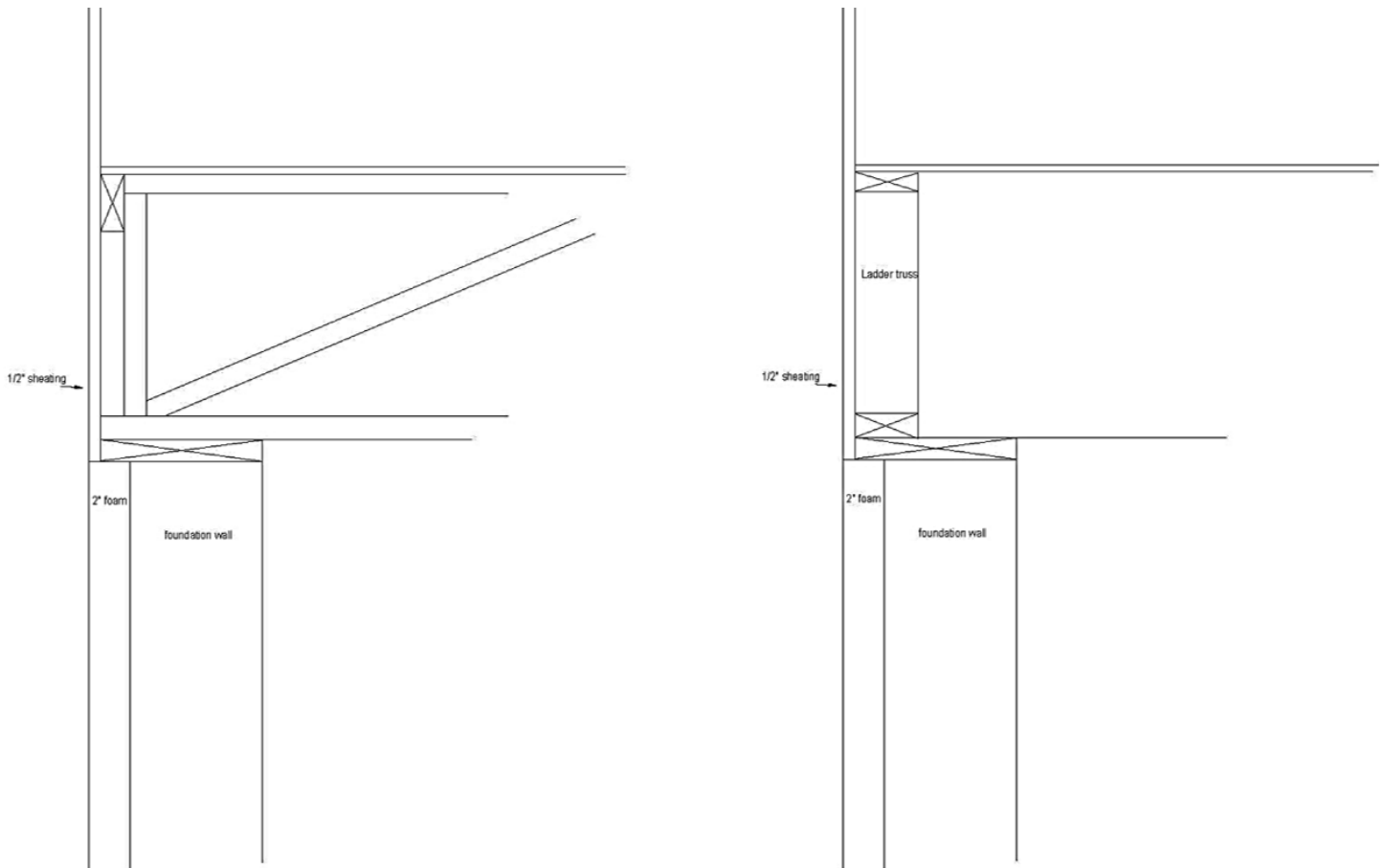
<sup>2</sup> Unless otherwise noted, all references in this research report are from the 2012 version of the codes and the standards referenced therein, including, but not limited to, ASCE 7, SDPWS and WFCM. This product also complies with the 2000-2009 versions of the IBC and IRC and the standards referenced therein. As required by law, where this research report is not approved, the building official shall respond in writing, stating the reasons this research report was not approved.

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- 4.2.2. **Bottom Chord Bearing** – (BCSI) Bearing condition of a truss that is supported on its bottom chord.
- 4.2.3. **Continuous Insulation** – ([IRC Chapter 2](#)) Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.
- 4.2.4. **Ribbon (Band)** – (BCSI) Framing member installed on the edge of the exterior perimeter, usually tying the ends of the floor trusses together. Note: structural sheathing, blocking panels, or a rim board may be required, in addition to the ribbon, to transfer all the lateral loads (see [BCSI-B7](#)).
- 4.2.5. **Sill Plate** – Not defined, but shown in [IRC Figure R502.2](#). It is attached to the foundation using anchor bolts and the floor system is, in turn, attached to the sill plate

### 5. Installation:

- 5.1. The connection of the trusses to the sill plate as close to the line of anchor bolts in the sill plate as practical to avoid any potential for parallel to grain bending in the sill plate when the connection is loaded in uplift.
- 5.2. **A cantilever of sill plate and floor truss (perpendicular) of  $1\frac{9}{16}$ " or less:**
  - 5.2.1. The bottom cord truss and sill plate equals 3" and transfers load into the truss bottom chord and into foundation, [Figure 1](#), allowing up to a  $1\frac{1}{2}$ " cantilever.
- 5.3. **A cantilever of sill plate and ladder truss (parallel) of  $1\frac{9}{16}$ " or less:**
  - 5.3.1. The ladder truss is  $3\frac{1}{2}$ " wide and 2" bears on the sill plate over the foundation, [Figure 1](#).
- 5.4. The difference between  $1\frac{1}{2}$ " and  $1\frac{9}{16}$ " in the cantilever is negligible. This situation also does not require any special truss design as do longer cantilever conditions



**Figure 1:** Truss Detail – Perpendicular to foundation & Parallel to foundation

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5.5. Connection of the trusses to the sill plate and the sill plate to the foundation are required per the applicable building code.

### 6. References:

6.1. *Building Component Safety Information (BCSI)*

6.2. Structural Building Components Association (SBCA)

6.3. The Truss Plate Institute (TPI)

6.4. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate as it undertakes its engineering analysis.

6.4.1. DrJ has reviewed and found the data provided by other professional sources are credible. This information has been approved in accordance with DrJ's procedure for acceptance of data from approved sources.

6.5. DrJ's responsibility for data provided by approved sources is in accordance with professional engineering law.

6.6. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., *IRC*, *WFCM*, *IBC*, *SDPWS*, etc.). This includes review of code provisions and any related test data that helps with comparative analysis or provides support for equivalency to an intended end-use application.

### 7. Findings:

7.1. Sill plates supporting metal plate connected wood truss floor systems as described in this report may be cantilevered up to 1<sup>9</sup>/<sub>16</sub>" without requiring design of the trusses for a cantilevered condition.

7.2. Truss to sill plate uplift connections, where required, are made per the applicable building code for the non-cantilevered condition. No addition design for the connection is required.

7.3. [IBC Section 104.11](#) and [IRC Section R104.11](#) ([IFC Section 104.9](#) is similar) state:

**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, at least 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*.<sup>3</sup>

### 8. Condition of Use:

8.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this report and the installation instructions shall be submitted at the time of permit application.

8.2. Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.

8.3. Design

8.3.1. Building Designer Responsibility

8.3.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer (e.g., Owner, Registered Design Professional, etc.) for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).

8.3.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with [IRC Section R301](#) and [IBC Section 1603](#).

8.3.2. Construction Documents

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<sup>3</sup> The last sentence is adopted language in the 2015 codes.

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**8.3.2.1.** Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.

### 8.4. Responsibilities

- 8.4.1.** The information contained herein is a product, engineering or building code compliance research report performed in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering procedures, experience and good technical judgment.
- 8.4.2.** DrJ research reports provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated section.
- 8.4.3.** The engineering evaluation was performed on the dates provided in this research report, within DrJ's professional scope of work.
- 8.4.4.** The actual design, suitability and use of this research report for any particular building is the responsibility of the Owner or the Owner's authorized agent, or the Building Designer.

### 9. Review Schedule:

- 9.1.** This research report is subject to periodic review and revision. For the most recent version of this report, visit [drjengineering.org](http://drjengineering.org).
- 9.2.** For information on the current status of this report, contact [DrJ Engineering](#).