Assessment of Alternate Materials and Methods of Construction

Presenter: Steve Thomas

Monday, September 11, 2017

2:00 PM – 3:30 PM
Assessment of Alternates

Today’s Agenda:

1. Define “Alternative”
2. Provide tools required to assess an alternative.
3. Discuss processes used to approve alternatives.
4. Talk about a few alternates

What is an alternate, anyway?

- Building Material
- Design
- Method
- Equipment
- Anything that is not specifically addressed in the code.
Why Alternates?

- Building codes lag behind creativity...
  - Product Development
  - Architectural Design Practices
  - Market Demands

Malls - Alternative Design until 1982

Section 104.11

- 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...
Section 104.11

- ...and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code...
- ...in quality, strength, effectiveness, fire resistance, durability and safety.

Prescriptive Assessment

- We need to assess the prescriptive requirements to derive intent.
- With intent we can find the performance equivalency.

Prescriptive v. Performance

- What is the difference between:
  1. Prescriptive
  2. Performance

Prescriptive Codes

- Generic occupancy groups
- Employ fixed values
  - Building Tabular Area
  - Occupant capacity
- Assume requirements describe acceptable risk
Prescriptive Codes

- History
  - Not necessarily based on current fire science or engineering principles
  - Often “consensus” based
  - Local changes to reflect local conditions
  - May provide for equivalencies
    - Alternate methods or materials

Prescriptive Code Examples

- 0.2” of width shall be provided for each occupant
- 2 exits or exit access doors shall be provided when the occupant load is greater than 10
- The wall shall be 1 hour rated when the fire separation distance is less than 10 feet.

Performance-based Codes

- State goals and compliance methods
- Identify non-specific performance criteria
- Cover buildings and facilities
  - Systems still prescriptive
    - Mechanical/Electrical
    - Fire protection
- Can reference prescriptive codes

Performance Codes

- SECTION 601
- SOURCES OF FIRE IGNITION
- 601.1 Objective.
  - To prevent unwanted ignition caused by building equipment and systems.
Distillation

- Distill the code to its very essence.
- Must get to the basic premise.

ICC – Evaluation Services, Inc.

- Provides product evaluation to ensure equivalency with the requirements of the building code.

ICC – Evaluation Services, Inc.

- Who are they?
- Can I trust them?
  - 80 Years Experience
  - ICBO-ES
  - BOCAI – ES
  - SBCCI – ES
  - NES

Evaluation Report Process

- How does it work?
  1. Manufacturer submits product
  2. Judged against Acceptance Criteria
  3. Report issued
Evaluation Report Process

- National Mall – Washington D.C.

Is this acceptable?
- It's only 2 weeks!!

Manufacturer submits product for evaluation.
Evaluation Report Process

- ICC-ES Engineering Staff determines proper Acceptance Criteria (AC) to use for evaluation.

Evaluation Report Process

- Currently 337 criteria available to judge products for code compliance.

Evaluation Report Process

- If no appropriate Acceptance Criteria (AC), then one must be created.

Evaluation Report Process

- Staff works with applicant to determine:
  - Code Equivalency
  - Appropriate Testing
  - Limitations on Use
Evaluation Report Process

- New AC is discussed in open public hearing.
- Reviewed by 9 building official members on the ICC-ES Evaluation Committee.

Leaders of the industry
- Testimony can be very lengthy.

AC is created
- Product is evaluated to the criteria in the AC.

Concrete pier is scoped within the AC.
Evaluation Report Process

1.3 Codes and Reference Standards

- References codes and Standards for product evaluation and testing

1.3.2 ASTM A 530, Standard Specification for Pipes, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized), Welded and Seamless, ASTM International.
1.3.4 ASTM C 39-95, Standard Practice for Making and Curing Concrete Test Specimens in the Field, ASTM International.
1.3.5 ASTM C 39-95, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, ASTM International.
1.3.6 ASTM C 177-01®, Air Content of Freshly Mixed Concrete by the Volumetric Method, ASTM International.

Evaluation Report Process

- Assurance that quality will be maintained

5.0 QUALITY CONTROL

5.1 A quality control manual complying with the ICC-ES Acceptance Criteria for Quality Control Manuals (AC18) shall be submitted.
5.2 Third-party follow-up inspections are not required under this acceptance criteria.

Evaluation Report Process

6.0 EVALUATION REPORT RECOGNITION

6.1 The evaluation report shall include the following statements:
6.1.1 The bearing capacity of the site soil shall be determined in accordance with IRC Sections R401.4 and R401.4.1. and attested to the code official upon completion.
6.1.2 Use of the pier foundation assemblies for soil conditions, erosion, water levels, or other factors that decrease the structural integrity of the pier foundation assembly, in the event of the foundation, is beyond the scope of this report.
6.1.3 In areas requiring frost protection, decks on pier foundation assemblies may be supported in place by an approved by the code official. See IRC, Section R401.4.1.4, Section 2.
6.1.4 Use of the pier foundation assemblies to resist lateral loads is beyond the scope of this report.
6.1.5 Use of the pier foundation assemblies to resist uplift loads is beyond the scope of this report.
6.1.6 Work in contact with the concrete pier and prestressed anchor bolt shall be pressure-conservatively treated in accordance with the IRC, Section R310.7.1 and R320, as applicable. Conformity of the concrete pier and prestressed anchor bolt with respect to the materials and products used in accordance with IRC Sections R310.7.1 and R320 shall be established based on the current IRC-2023 evaluation report on the wood treatment.
6.2 The evaluation report shall include the minimum spacing of the pier foundation assemblies, based on conditions of testing, as determined in Section 4.3 of the criteria.
### Evaluation Report Process

- Check to see results
- Assuming that there are any!!

### Diamond Piers

- NPS limitations
- 90mph EXP. C
- Soil Bearing Capacity?

### Diamond Pier Advantages...

### Evaluation Report

- Effective use of an Evaluation Report
Trus Joist Example

- First all-wood I-joist in 1969 – TJI Joist
- First patented engineered lumber product – Microllam LVL
- Used as a high-strength flange material for the TJI® joist product.

Wood I-Joist Theory

The radius of gyration (r) describes the way in which the area of a cross-section is distributed around its centroidal axis. If the area is concentrated far from the centroidal axis, it will have a greater value of r and a greater resistance to buckling.

I-Joist – Code Equivalency

- Structural Strength
- Bearing Area
- Load transference
- Durability

“Standard” Fire Performance?

- Is there some level of performance expectation?
Fire Performance Example

- ½” drywall can be an effective barrier.

I-Joist Acceptance Criteria

- References ASTM D 5055
- Structural Testing
- Web Material and Adhesives
- Also:
  - Hole Allowances
  - Fire Resistance (optional)
  - Insect Resistance (optional)

Is this the right report?

- Check for:
  - Report Holder
  - Subject
Check Report Holder - Subject

DIVISION: 06—WOOD AND PLASTICS
Section: 06170—Prefabricated Structural Wood

REPORT HOLDER:
TRUS JOIST, A WEYERHAEUSER BUSINESS
POST OFFICE BOX 9449
BOISE, IDAHO 83707-2449
(208) 429-3715
www.trusjoist.com

EVALUATION SUBJECT:
TJI® PREFABRICATED WOOD I-JOISTS

Is this the right report?

- Check for appropriate code.

Verify Code

1.0 EVALUATION SCOPE

Compliance with the following codes:
- 2015, 2012 and 2009 International Residential Code® (IRC)
- 2013 Abu Dhabi International Building Code (ADIBC)¹

¹The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

What was evaluated?

- What is the extent of the evaluation?

Properties evaluated:
- Structural
- Sound ratings
- Fire-resistance ratings
How is the product used?

- There may be some limits...
- Use as “board and batt” siding?

2.0 USES

TJI joists are prefabricated wood I-joists used as floor joists, roof rafters, blocking panels and rim joists, to support code-required loads. Prefabricated wood I-joists described in this report comply with Section 2303.1.2 of the IBC, for allowable stress design; and Section R502.1.4 of the IRC.

What do they look like?

3.0 DESCRIPTION

3.1 General:
TJI joists are prefabricated wood I-joists having wood or wood-based flanges and Performance Plus® oriented strand board (OSB) webs. Either the top and bottom flanges are parallel, forming a constant-depth joint; or the top flange has a single taper, forming a variable-depth joint. The web panels have the face grain oriented vertically, and the web-to-web connection is either butt jointed or serrated and glued to form a continuous web. The web-to-flange connection is a proprietary tongue-and-groove glued joint. Refer to Table 1 for TJI I-joist series and material descriptions. The TJI L65, TJI L90, TJI H100, TJI HD100, and TJI HS100, may also be trademarked as TJI L469, TJI L560, TJI H560, TJI HD560, and TJI HS560, respectively.

Material Specifications

3.2 Material Specifications:

3.2.1 Flanges: Flange material is either Micollam® laminated veneer lumber (LVL), Timberstrand® laminated strand lumber (LSL) or machine stress rated lumber (MSR). Micollam LVL and Timberstrand LSL are recognized in evaluation report ESR-1387. Table 1 of this report specifies flange widths and depths. Flange material and grades are as specified in the quality control manual that contains Weyerhaeuser manufacturing standards.

3.2.2 Webs: Web material is Performance Plus® OSB conforming to DOC Voluntary Product Standard PS2. Exposure 1, along with further requirements set forth in the quality control manual that contains Weyerhaeuser manufacturing standards. Web material thickness requirements are noted in Table 1 of this report.

3.2.3 Adhesives: Adhesives are of the types specified in the quality control manual that contains Weyerhaeuser manufacturing standards.

TJ Beam

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TJ Beam

- Consider it part of the evaluation report.

QUESTIONS...

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