Is Your Plant Complying with IBC & IRC QC Building Code Requirements?

by Kirk Grundahl & Tony Piek

Learn if and when your plant will be required to hold special inspections per the IBC.

The purpose of this article is to provide WTCA's perspective on truss plant quality assurance and third party inspections with respect to the requirements developed by the International Code Council (ICC) within the International Building Code (IBC), the International Residential Code (IRC), and the International Accreditation Service (IAS).

On September 22, the City of Portland building department held a meeting and invited local component manufacturers, including WTCA's Oregon Chapter. The City of Portland's goal was to develop a process and city policy to ensure that component manufacturers meet a minimum level of quality for their products used in city construction projects. IBC Chapter 17, STRUCTURAL TESTS AND SPECIAL INSPECTIONS, was the central focus of these discussions. It was made clear at the meeting that there is a great deal of confusion over exactly how the IBC code requirements fit together in terms of structural building component quality control. The meeting reaffirmed the fact that WTCA must provide a concise evaluation of how truss manufacturers meet the general IBC QC and Chapter 17 requirements, keeping in mind that truss manufacturers have complied with the code for the last fifty years.

We will cover several topics in this article. In Part 1, we will summarize key issues component manufacturers need to be aware of in order to comply with the building code. Think if it like reading the end of the novel first. Part 2 will cover the meat of the novel: the background of Chapter 17 in the context of the entire IBC, Chapter 17 requirements specifically, and the place for in-plant quality control programs.

Part 1 - Summary of Key Issues

How do you know if you are complying with IBC/IRC 2003? Below is a summary.

1. The authority with jurisdiction (local building official) defines the quality requirements (e.g., third party inspections) for structural building components in the context of the IBC and IRC requirements.
2. An in-plant quality control program is required by the third party inspection agency's quality assurance program and per ANSI/TPI 1, which is referenced in the IBC and IRC. This includes an in-plant quality control process documented within a quality control manual.

Part 2 - Chapter 17 in the Context of the Entire IBC

Before we can get a solid grasp on Chapter 17 in IBC 2003, let's take a look at the big picture. Chapter 17 is a special section within the IBC. The scoping statement of the IBC is shown in Figure 1 below.

> 101.2 Scope. The provisions of this code shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.
>
> Exceptions:
> 1. Detached one- and two-family dwellings and multiple single-family dwellings (town houses) not more than three stories above grade plane in height with a separate means of egress and their accessory structures shall comply with the International Residential Code.

Figure 1.

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at a glance

- The approach that has been taken by the truss industry to comply with the building code requirements for the last fifty years still applies today.
- Special inspections may be required for a given constriction project.
- The International Accreditation Service (IAS) has developed an accreditation program for agencies providing the special inspections that are required for specific construction projects under Chapter 17 of IBC.
- The third party inspection agencies in our industry have IAS accreditation.

1. SECTION 105 - PERMITS - 105.1 Required. Any owner or authorized agent who intends to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be done, shall first make application to the building official and obtain the required permit.

2. SECTION 106 - CONSTRUCTION DOCUMENTS - 106.1 Submittal documents. Construction documents, special inspection and structural observation programs, and other data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.

3. SECTION 109 - INSPECTIONS - 109.1 General. Construction or work for which a permit is required shall be subject to inspection by the building official and such construction or work shall remain accessible and exposed for inspection purposes until approved. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection purposes. Neither the building official nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material required to allow inspection.

   a. 109.3 Required inspections. The building official, upon notification, shall make the inspections set forth in Sections 109.3.1 through 109.3.10.

      i. 109.3.1 Footing and foundation inspection…...

      ii. 109.3.2 Concrete slab and under-floor inspection…..

      iii. 109.3.3 Lowest floor elevation.

      iv. 109.3.4 Frame inspection. Framing inspections shall be made after the roof deck or sheathing, all framing, fireblocking and bracing are in place and pipes, chimneys and vents to be concealed are complete and the rough electrical, plumbing, heating wires, pipes and ducts are approved.

      v. 109.3.5 Lath and gypsum board inspection…..

      vi. 109.3.6 Fire-resistant penetrations…...

      vii. 109.3.7 Energy efficiency inspections…….

      viii. 109.3.8 Other inspections……

      ix. 109.3.9 Special inspections. For special inspections, see Section 1704.

      x. 109.3.10 Final inspection. The final inspection shall be made after all work required by the building permit is completed.

   b. 109.4 Inspection agencies. The building official is authorized to accept reports of approved inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

   c. 109.5 Inspection requests. It shall be the duty of the holder of the building permit or their duly authorized agent to notify the building official when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

Figure 2.

Truss Plant Compliance...

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After understanding the scope of the IBC code, we can now look at Chapter 17: STRUCTURAL TESTS AND SPECIAL INSPECTIONS. The interpretation of special inspection is crucial and was the topic of much discussion at the Portland meeting in September. The definition of special inspection is:

> "SPECIAL INSPECTION. Inspection as herein required of the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards (see Section 1704)."

It is our opinion that the key words in this definition are "to ensure compliance with approved construction documents." This means that the special inspection process applies to a specific construction project that has approved construction documents or is construction project specific. This also means that not every project will require a special inspection.

With this in mind, if we go back to the beginning of the IBC and look at Chapter 1, we find the provisions (see Figure 2 at left) that clearly lay out how the construction project process should function in terms of permits, construction documents, and general inspections. Remember, our goal is to understand how special inspections fit in the context of the entire IBC.

As you can see, any special inspection requirements for a project are part of the submittal process to gain a permit for the building to be constructed (section 106). This means, by definition, that a special inspection is called for by one of three parties, the owner, the registered design professional, or the building official that reviews the application for a permit. Furthermore, we can pull these inspection concepts out of Chapter 1, specifically as follows:

1. Per 109.3, the building official is the responsible party that will make the building construction inspections.
2. Per 109.3.4, the building official is responsible for providing the frame inspection.
3. Per 109.4, the building official is authorized to accept reports of an approved inspection agency.
4. As part of this frame inspection, those products that have quality assurance programs through an approved inspection agency should be allowed to place their products into the construction process as part of the alternative material and methods section of the code (see Figure 3 below).

a. 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 in quality, strength, effectiveness, fire resistance, durability and safety.

Figure 3.

5. That alternate product portion of the frame inspection is then taken care of by the acceptance of the inspection by the approved inspection agency and the building official then concentrates their inspection on the site construction elements that incorporate this alternative method of construction.
6. The use of trusses inside the IBC is further defined in Figure 4 below.

IBC 2003 - 2303.4 Trusses. Metal-plate-connected wood trusses shall be manufactured as required by TPI 1. Each manufacturer of trusses using metal plate connectors shall retain an approved agency to make unscheduled inspections of truss manufacturing and delivery operations. The inspection shall cover all phases of truss operations, including lumber storage, handling, cutting fixtures, presses or rollers, manufacturing, bundling and banding.

ANSI/TPI 1 - 2002 3.1.1 Truss Manufacturers and inspection agencies shall establish methods that document the application of these quality assurance procedures throughout the manufacturing process. The Truss Manufacturers' methods shall be subject to periodic audit for compliance with the requirements of this standard by an approved inspection agency, where required by local authorities having jurisdiction, or other means.

Figure 4.

Chapter 1 of IBC clearly defines that the manner in which the structural building components industry has transacted business since the 1950s remains unchanged in IBC 2003.

Diving Into Chapter 17 Specific Requirements

Chapter 1 section 106 defines when special inspections are needed; they are implemented in section 109.3.9. Once implemented, we can define what this section means to the component manufacturer.

The requirements for wood construction special inspections are defined in section 1704.6 as shown in Figure 5 below.

1704.6 reads - "Wood construction. Special inspections of the fabrication process of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704.2. Special inspections of site-built assemblies shall be in accordance with Section 1704.1."

1704.2 Inspection of fabricators. Where fabrication of structural load-bearing members and assemblies is being performed on the premises of a fabricator's shop, special inspection of the fabricated items shall be required by this section and as required elsewhere in this code.

1704.2.2 Fabricator approval. Special inspections required by this code are not required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection. Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved special inspection agency. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building official stating that the work was performed in accordance with the approved construction documents.

Figure 5.

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Truss Plant Compliance...

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1704.6 specifies that special inspections for building prefabricated wood structural items such as trusses need to meet 1704.2 requirements. 1704.2 can be broken down and summarized as:

1. Manufacturing of structural building components is performed on the premises of an approved fabricator.
2. An approved fabricator is one that has written procedural and quality control manuals and periodic auditing of fabrication practices by an approved special inspection agency.
3. An approved special inspection agency is one that has an ICC Evaluation Service research report and is certified by the International Accreditation Service (IAS) under the Accreditation Criteria for Inspection Agencies (AC98) or other approvals as accepted by the building official overseeing code compliance. Our understanding is that the inspection agencies performing inspections in our industry comply with this requirement.
4. When structural building components are fabricated for the specific project, they are stamped as certified by the approved special inspection agency and, if needed, a certificate of compliance can also be provided to the building official.

If your plant is meeting those four items, it also meets Section 1704.2 and the requirements of special inspections in Chapter 17. Furthermore, as noted above, the design and manufacture of trusses shall be in compliance with section 2303.4. This also requires an approved agency to make unscheduled inspections of truss manufacturing operations and ANSI/TPI 1-2002 requires that truss manufacturers establish methods that document the application of these quality assurance procedures throughout the manufacturing process. This process then also meets the needs of IBC 2003 Chapter 17 with regard to special inspections.

In-Plant Quality Control Programs

We have talked about the building code defined inspection process and what the building official will require. We have talked about a periodic third party inspection. What about a component manufacturer's in-plant quality control?

AC-10 is the Acceptance Criteria that the ICC-ES has been created to provide a template for what is reasonable to include in a manufactured product's quality control manual as follows:

> Acceptance Criteria For Quality Control Manuals - AC 10 Cover Page - This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable codes referenced in the acceptance criteria.

Just like the **In-Plant WTCA QC** program and the TPI 1 section 3 commentary, AC-10 is a tool or guide to help the plant meet the building code and inspection agency requirement that each plant have a quality control program and an accompanying quality control process. (See Figure 6 for ANSI/TPI 1 implementation language.)

Based on the code language and concepts explained here, it is clear that metal plate connected wood trusses explicitly follow the IBC and IRC code requirements for supplying structural building component products to the building contruction marketplace....

"ANSI/TPI 1 - 2002 3.1.1 Chapter 3 is the quality standard for the manufacturing processes of metal plate connected wood trusses, and shall be used in conjunction with a manufacturing quality assurance procedure and a truss design. These provisions shall be included in the quality assurance program of each Truss Manufacturer."

"ANSI/TPI 1 - 2002 3.2.1 An in-plant quality control manual shall be maintained for each truss manufacturing facility, which will include the requirements for daily quality control and any audits that will be performed."

Figure 6.

In-Plant WTCA QC provides a very good foundation for a quality control manual. **In-Plant WTCA QC** is a tool designed to help all fabricators meet the ANSI/TPI 1 Chapter 3 truss quality standard requirements on a consistent basis and meet the basic requirements of having quality control procedures and an in-plant quality control manual in place. A significant side benefit of deploying WTCA QC is that it also provides management with data that can be used to more easily manage manufacturing operations.

Based on the code language and concepts explained here, it is clear that metal plate connected wood trusses explicitly follow the IBC and IRC code requirements for supplying structural building component products to the building construction marketplace and also in any construction project that requires special inspections. In all cases, truss manufacturing follows the IBC/IRC referenced ANSI/TPI 1-2002 standard. Finally, the ICC model code process desires to be an overall framework for creating safely-built construction. Inside this framework, it provides specific language that implements the proper time to use consensus-based industry standards, like ANSI/TPI 1, to undertake a specific portion of the built construction using the latest industry technology. This process is intended to ensure that the final built construction uses state-of-the-art construction techniques where appropriate while maintaining a focus on state-of-the-art building safety. **SBC**

WTCA Quality Control staff appreciates your consideration of the concepts presented here. If you have any questions or need additional information, contact Tony Piek at tpiek@qualtim.com.

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