Rod Tie-Down Systems

Part 5 – Inspection

By Alfred D. Commins

Continuous tie-down systems that include shrinkage compensation for wood shrinkage offer significant advantages over standard holdowns and straps. The performance advantages of continuous systems are clear, but engineers, framers, and inspectors accustomed to standard holdowns may not fully understand the installation differences. This article reviews inspection areas most commonly overlooked. If the installer knows what is expected, the installation and inspection can be fast, clean, and without call backs.

Figure 1.

Inspection should be by an independent third party. Except for unique details, a manufacturer should normally not be asked to inspect an installation. But inspectors are in short supply and continuous tie-down systems are new, so sometimes the manufacturer will be asked to perform an inspection. Before inspecting, ask the purpose of the inspection and the extent to which the inspection should be made. The following lists items to check, and typically missed details and locations. This list is by no means complete. Due to job site creativity "unique" details may appear at any time.

Preparation

When inspecting a rod tie-down system, arrive with a hard hat, safety shoes, safety glasses, camera, flashlight, and a catalog from the rod system manufacturer. Start with the stamped shop drawings. Are they on site? Unless specifically requested, shop drawings are seldom carried onto a job site by an inspector. If the proper drawings are not on site or can't be found, it is not possible to install, let alone inspect, any system. Are the drawings stamped by the engineer-of-record and the local jurisdiction? Is the rod tie-down system to the latest code? It is not uncommon to see systems with an obsolete code (1997 *Uniform Building Code*) in areas requiring the 2006 *International Building Code*.

Figure 2.

Components

Inspection items commonly include rod, bearing plates, couplers, nuts, washers, and shrinkage compensators. **Rod** material is usually grade 2, made from A36/A307 steel. This is often called standard strength rod. Unless marked, rod is considered grade 2. High strength is either grade A449 or A193-B7. High strength will be marked on the rod end (*Figure 1*). If cut, high strength rod must be re-marked. The mark is not easy to see. If installed with a coupler, disassembly may be necessary.

Bearing plates transfer tension load from the rod through a shrinkage compensator and into the structure. Bearing plates are identified by paint color or by a number marked on the plate.

Couplers connect rods. Couplers are either straight, same thread on both ends, or reducing, with one end smaller than the other. Couplers are supplied in several different strengths such as grade 2, 5, 8, and 2H. Notches or a mark on the coupler identify the coupler as high strength. To achieve full strength, the rod must be threaded into the coupler a set amount. To gauge proper thread engagement, some couplers have sight holes drilled into the side of the coupler. The rod is threaded until threads can be observed in the holes. All straight couplers should have sight holes.

Figure 3a.

Figure 3b.

Reducing couplers are stepped in the middle, where the rods meet. Reducing couplers are installed until the large rod end bottoms-out. The smaller rod is installed until it hits the larger rod. Sight holes are sometimes provided with reducing couplers, but are normally not required since the rod will bottom-out. A notch indicates the coupler is for high strength rod, while the witness holes allow the installer to check for required rod engagement. (*Figure 2*)

Shrinkage Compensators

Four companies offer rod tie-down systems with **shrinkage compensators**. Shrinkage compensators have moving parts, and are subject to jamming if not properly installed and protected. Jamming may result from sawdust, dirt, excessive rod angle, excessive shrinkage compensator angle, and insufficient outside clearance.

1) **Dirt or sawdust** in the mechanism. Jobsites are often dirty and wet. Dirt or sawdust may penetrate moving parts and jam the device. (*Figures 3a* and *3b*)
   Prevention: Install the device in a clean environment and with clean hands. Correction: remove and replace the shrinkage compensator.

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Figure 4.

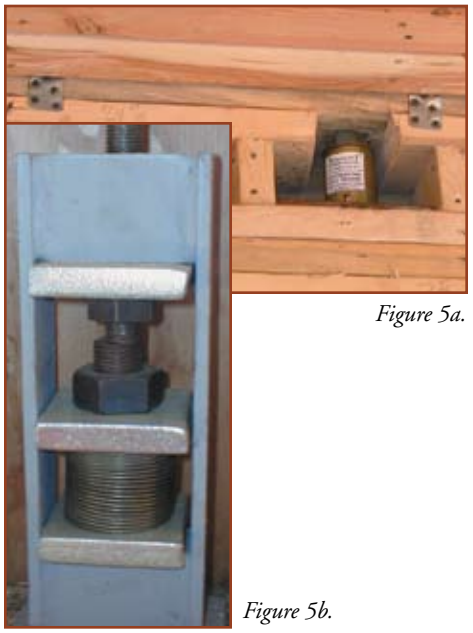

Figure 5a.

Figure 5b.

Figure 6a.

Figure 6b.

2) **Out-Of-Square** installations. Some devices are sensitive to an out-of-square installation. Out-of-square limits may be as little as 1½ inches in 10 feet (less than 1 degree). Out-of-square conditions may be caused by rod "drift" floor-to-floor, device mis- installation, or material under the bearing plates. An out-of-square condition may lead to rod binding and lifting the shrinkage compensator. (*Figure 4*)
Prevention: Observe manufacturers off-set limits and keep shrinkage compensators level.
3) **Expansion room**. Overhead may limit expansion and destroy system integrity. (*Figures 5a, 5b*)
Prevention: Keep headroom clear over the shrinkage compensator. Insure rods in cages have sufficient room to expand.
4) **Device Not Activated**. Most devices have a wire, a screw or a tie to keep the device from expanding until it is installed and activated. After the device is installed, and before the wall is enclosed, activate the device per the manufacturer's instructions. (*Figures 6a* and *6b*)
5) **Missing Shrinkage Compensator**. *Figures 7a* and *7b* show systems without shrinkage compensators. Technically, these may not be installation errors since some systems do not specify shrinkage compensators. Solution: Use a system with shrinkage compensation devices.

Shop Drawings

Shop drawings are provided for most installations. A typical shop drawing details required materials such as rod, plates, shrinkage compensators, couplers, nuts, compression wood, and nailing patterns unique to the compression wood. *Figure 8* shows a typical shop drawing.

Key Inspection Points

1) Shrinkage compensators installed square to the building and activated.
2) Rod offset limits can vary from 1½ inches per 10 feet up to 4 inches in 10 feet. Follow manufacturers' recommendations. Ratchet systems are more sensitive to offset than screw type devices. First floors tend to see greater offsets than upper floors because of embedment variations.

Figure 7a.

Figure 7b.

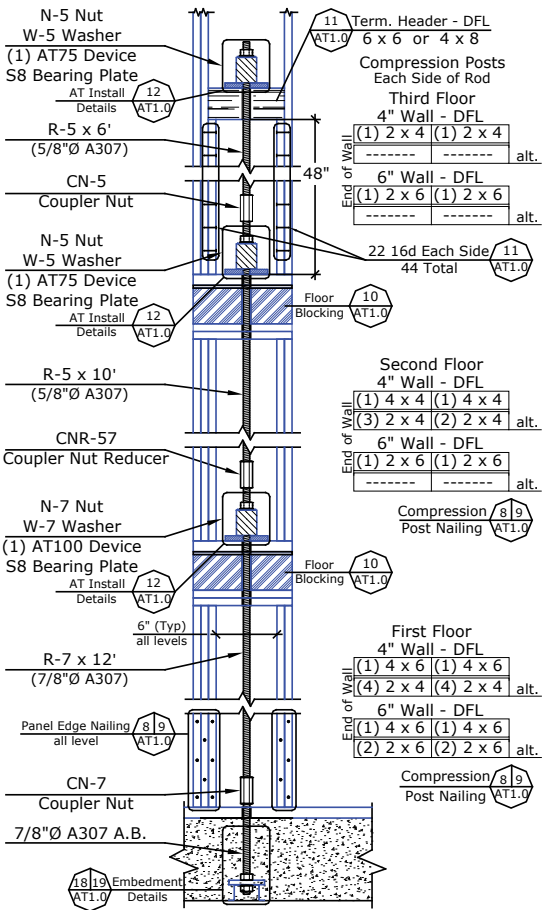

Figure 8.

3) Coupler nuts tend to be installed properly because of a high level of inspection awareness. In addition, they can be inspected easily at all times, with one exception. The coupler nut take-up device obscures the rod inspection hole after it is activated. So inspection must be made before activation. Verification of rod depth is not possible after activation.
4) Gaps at the header-trimmer interface must be $^1/_{64}$ inch or less. Gaps will be additive to shrinkage and must be eliminated.
5) Improper trimmer nailing is a common error. Typical trimmer nailing is 12 inches on-center, except for the top floor. Top floor trimmers must be nailed according to the schedule in the shop drawings to get the load into the shear panel.
6) Deficient blocking is a fairly common problem area. This must be followed carefully otherwise the load will not be properly carried into the structure below.
7) The final common problem is embedment location. Mis-located embedments often require rod "drift" of several inches.

These inspection notes are for general use only. There may be special requirements for specific installations. The final authority is the Engineer-of-Record.▪

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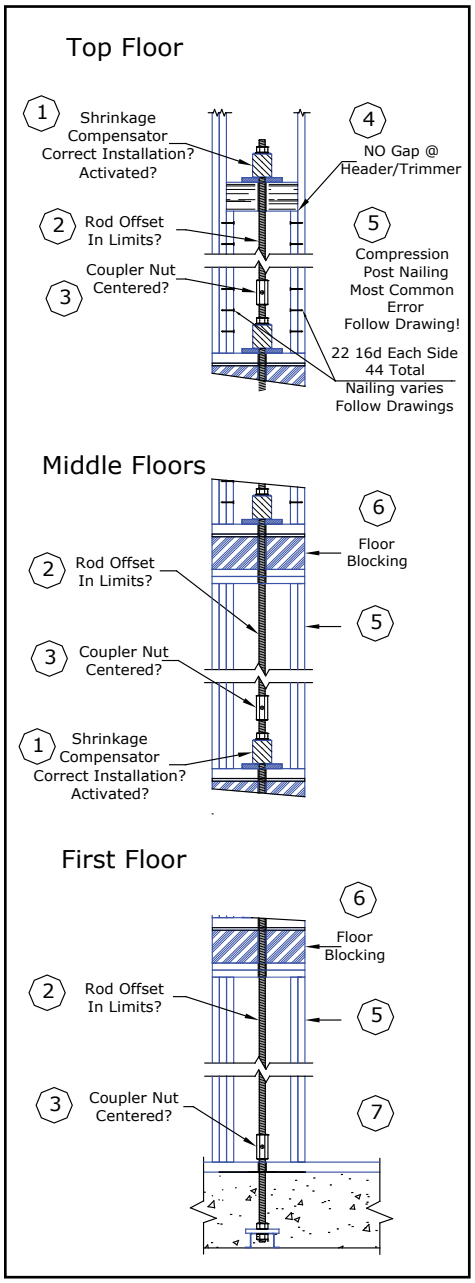

Figure 9.