*Question of the Day*

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Q: "When I use the truss software's automatic hanger selection, why do I keep getting the 'Hanger Not Found' result?"

A: This is a question I have heard since the very first attempts were made to include hangers in the proprietary truss design software. Early on, it may have had to do with the software. Today, as the software has gotten more and more sophisticated, it is more often than not that the software is right.

Let's look at some of the parameters that go into the selection of a truss hanger. Interestingly, the fact that it is a truss hanger adds another level of complexity to common joist hanger selection due to additional considerations spelled out in ANSI/TPI 1. More on that in a future *Question of the Day*. First let's list the design considerations for hanger selection outside of gravity and uplift loading. It's the old case of what comes first, the hanger or the load? In this case we're going to look first at the hanger, header (or carrying member) and the joist/truss (otherwise know as the carried member).

In order to correctly specify the hanger, we need to know the size (thickness and depth), species and number of plies of the carrying member or header. Second, we need to know the size of the heel (thickness and end depth of member in the hanger), species and number of plies of the carried member (joist). Third, we need to know if the carried member is flush with the carrying member at the top, bottom or somewhere in between. (Roof truss applications are generally assumed to be flush bottom, floor joist applications are generally assumed to be flush at the top, and mid-height applications break both rules and need additional considerations.)

Next we may want to decide whether we are looking for a face mount or top mount hanger. Additionally, we may want to specify the fasteners for the connection. For example, knowing that the contractor on the jobsite never has 16d commons on his jobs, we may want to specify that the hangers only get 10d common nails specified (or even 10dx1 ½").

Notice that we have not yet even addressed the download and uplift demand loads. Before we do, we will need to address the application and assign the appropriate duration factors to those forthcoming loads. The American Wood Council, through its National Design Specification (NDS) spells out the load duration factors. Section 2.3.2.1 states, "Wood has the property of carrying substantially greater maximum loads for short durations than for long durations of loading. NDS Table 2.3.2 (see below) gives frequently used load duration factors. Load duration factors take into account how long the load is anticipated to be applied to the hanger and range from 0.90 [for cases with excessively high permanent dead load to live load ratios] to 2.0 for impact loads that happen instantly. Most commonly used are 1.00 for normal joist duration, 1.15 for snow applications, 1.25 for construction loads and 1.60 for wind and seismic event loads."

**Table 2.3.2 Frequently Used Load Duration Factors, $C_D$[1]**

| Load Duration | $C_D$ | Typical Design Loads |
|---|---|---|
| Permanent | 0.9 | Dead Load |
| Ten years | 1.0 | Occupancy Live Load |
| Two months | 1.15 | Snow Load |
| Seven days | 1.25 | Construction Load |
| Ten minutes | 1.6 | Wind/Earthquake Load |
| Impact[2] | 2.0 | Impact Load |

Now do we consider loads? Still not yet. In a nutshell, what we've done so far is established the rules for available real estate available for both the carrying and carried members, in addition to perhaps specifying fasteners and determining the appropriate load durations. Why is it so important to establish the available real estate before even considering the loads? Let's take a look at the following two pictures to see the answer.


Looking only at the picture on the left, we see a conventional truss heel seated into a hanger with slant nailing through the hanger flange through the end of the truss heel and into the header or carrying member, in this case a glu-lam beam. Looking at this same connection from above we clearly see that there is no way that the carried truss is providing the needed real estate (heel height) to account for and accept all of the hanger flange fasteners. It is a safe bet that this connection is not developing the published uplift loads with over half of the required joist nails missing. This short heel height condition can also affect the download capacity of the hanger. Real estate matters! The published design values for hangers assume that the stated number of fasteners are installed and installed properly.

Only once we have established the real estate area, determined the width and height requirements of the connector, specified fasteners and duration factors do we need to consider loads.

Now back to the original question…why the "Hanger Not Found" result? The most prevalent reason for a hanger not being found is lack of adequate heel height, similar to the photos above. What about all those cases where you have a stubbed truss or mono framing into the girder? How could that possibly not get enough heel height? Do you inset your end verticals on those carried trusses to account for

girders placed out of plumb? If you do, your heel height has just returned back down to your bottom chord depth as far as the hanger is concerned.

What if you've optimized your supporting truss and it only needs to be a one ply? The published loads are probably going to be less if those header nails are reduced from full 10d commons to 10dx 1 ½". Does that hanger still work now?

As far as automatic hanger specification is concerned, the software is looking at all the design assumptions, General Notes, footnotes, and exceptions. If you get the "Hanger Not Found" result, it's probably time to do a little investigation versus assuming that this function of the software doesn't work well. I would suggest that you first review to make certain all required inputs are correctly provided and in some cases it may be necessary to look at alternative truss design or layout. Simpson Strong-Tie Tech Support is happy to help you find the best solution to all of your connector concerns, and even set you up with a stand-alone version of the Simpson Strong-Tie Connector Selector® software as a future resource.

Thanks for reading.