

## Technical Note #1:

### Specifying Steel Joists for "Hybrid" Panelized Roof System

#### 1) Which is best – "Catalog" designations or 'Load-Per-Foot' designations?

'Load-per-foot' designations are more economical and they allow for proper load combination design. To properly use a catalog designation, the specifying engineer must analyze all loads and load combinations and pick a joist from the catalog that will accommodate all uniform, concentrated, up/down and lateral loads. This is virtually impossible especially if any economy is to be utilized. The most economical joist is a 'load-per-foot' joist that has been specified with any and all concentrated loads (from mechanical units, etc.); sprinkler main loads, sprinkler brace loads, seismic loads, future loads (Ad Loads), etc. indicated on the drawings.

#### 2) What size of wood nailers is used?

The wood nailers are mostly 2 1/2" (3x) or sometimes 1 3/4" thick X joist width. Girders nailers are typically 4x6 (3 1/2" wide x 5 1/2" tall) which coincides with the 3" deep joist seat + the 2 1/2" (3x) nailer.

#### 3) How are the wood nailers attached to the steel joists?

The wood nailers are attached, at the place of manufacture, using #14 wood screws. 5/32" diameter holes are punched in the joist chords, at the specified spacing, to accept the screws.

#### 4) Who specifies the nailer attachment?

The Engineer of Record should specify the nailer attachment utilizing #14 wood screws. He is the one who knows how much lateral load needs to be transferred into the joist top chord from the diaphragm based on the wall tie forces, sub-diaphragm chord forces and collector forces.

#### 5) What considerations are there when using a joist or girder as a drag or collector?

How the axial load enters and exits the joists needs to be addressed. The joist seats are limited to the amount of force they can accommodate. The use of miscellaneous steel is recommended such as tie plates, knife plates etc. to transfer the loads from wall-to-truss and truss-to-truss. Due to the typical (yet unknown at the time of design) chord angle thickness, 3/16" maximum fillet welds are suggested for joists and 5/16" maximum for girders.

#### 6) What considerations are there when a sprinkler system is being used?

**Joists:** For non-ESFR systems, the joist webs are simply aligned from the tag end and the branch lines are field adjusted as necessary to pass thru the trusses. For ESFR systems, joist webs need to be held clear for the branch lines. 'K' series joist have 4'-0 panels (2' o/c panel points). Therefore the branch line spacing must be 8', 10' or 12' o/c so that the lines will pass thru the joists without hitting the webs. If branch line spacing other than increments of 2' are needed, such as 11' or 9'-6" o/c, then 'LH' series joists will be needed as 'LH' series joists will allow for customized web layouts.

**Girders:** If the mains are to pass underneath the girders, they may be hung or trapezed from any of the joists. If the mains are to pass through the girders, they cannot be trapeze'd - they need to be supported from only one joist. Also, they cannot be hung from the first joist off the wall or column.

**7) What are the joist and girder seat (bearing) depths?**

Girders seats are to be 7 1/2" deep. Unlike the standard catalog joists, the hybrid system joists, both 'K' and 'LH', have 3" deep seats when 3x nailers are used. If 1 3/4" LSL nailers are used, the joist seats should be specified at 3 3/4" deep. The 3x nailer is preferred by most, as there is more area for the attachment of material by other trades (sprinkler support thru-bolts, etc).

**8) What are the bridging requirements?**

The joists in the hybrid system are installed using the panelized method of erection. That is, the top chord is laterally supported with a wood diaphragm panel during erection. This eliminates the need for typical SJI erection bridging. Instead, only joist and girders BRACES are needed to maintain the bottom chord L/r design requirements.

**9) Are there standard details available?**

Yes, Panelized Structures, Inc. can provide the designing engineer with a set of typical details on CD, available upon request.