

Designing For a Sprinkler System

So you need a truss package that will carry a sprinkler system and you need help designing the trusses. The information in this article will show you how to design the trusses and is applicable to both floor and roof systems and should be considered as a guide. For the purpose of this article we will review only vertical loads from sprinkler systems. Location, magnitude and direction of lateral loads, where required, must be provided by the Building Designer.

The Building Designer or owner should provide the Truss Designer with the sprinkler information prior to the truss design. The Truss Designer must include adequate dead load to account for the additional weight of the sprinkler system. The value of these loads depends on the size of the pipes used, the layout of the system and the requirements of the local building code. Per ASCE 7 in determining dead loads for purposes of design, the actual weights of materials and constructions shall be used, provided that in absence of definite information, values approved by the authority having jurisdiction shall be used. In addition to dead loads from water-filled pipes, Truss Designers must apply a minimum 250 pound concentrated live load to any single fire sprinkler support point to accommodate installation personnel per NFPA 13 (the National Fire Protection Association) Standard for the Installation of Sprinkler Systems. Per NFPA 13, the 250 pound load is not required to be applied concurrently to all support points and it is nonconcurrent with other live loads such as roof live, floor live, snow, wind, etc. If multiple sprinkler lines are attached to the same truss, the 250 pound load should be applied at only one location at a time, representing only one worker on the individual truss. MiTek Engineering has included the capability to run sprinkler loads concurrent with dead loads only, as well as truss dead and live loads should the building designer choose to specify concurrent live loads (shown in examples 2 and 3 below).

Weights of Water-Filled Pipe from NFPA 13

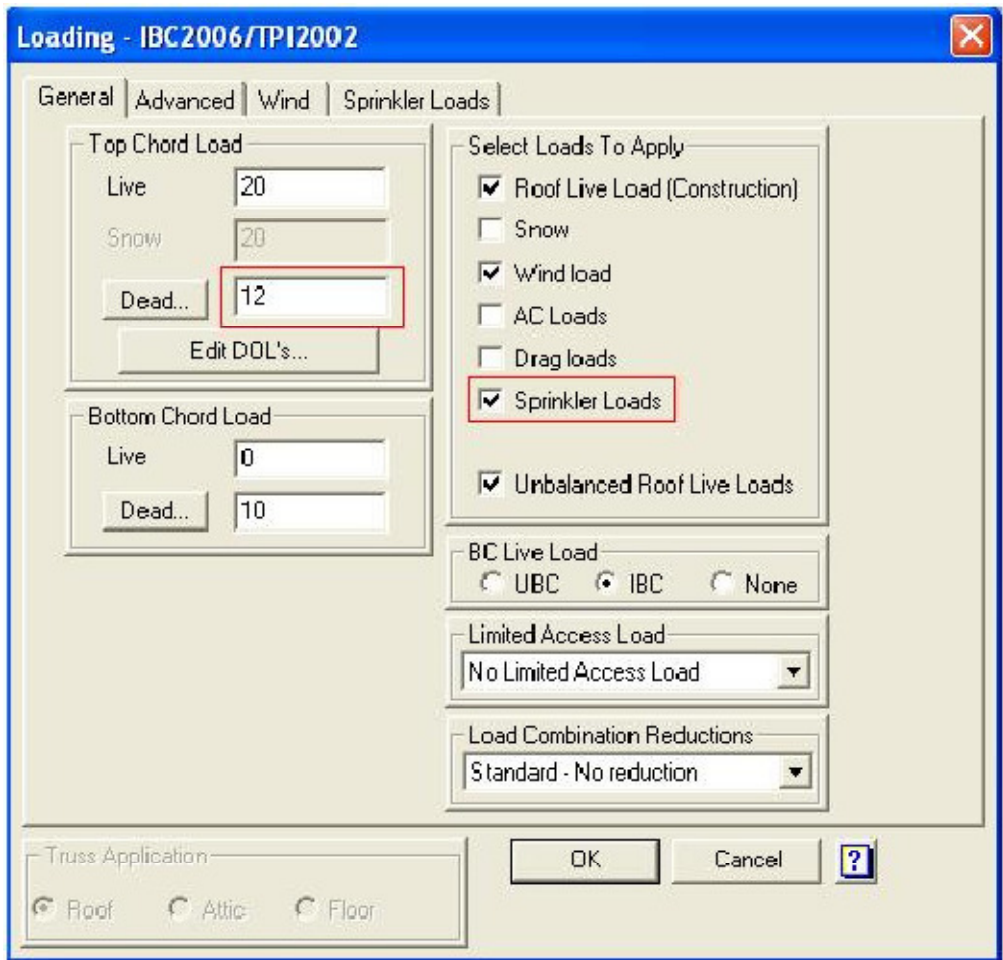
Nominal Pipe Size (in.)	lb/ft of Water-Filled Pipe	
	Sched. 40 Steel	Sched. 10 Steel
1	2.05	1.81
1 1/4	2.93	2.52
1 1/2	3.61	3.04
2	5.13	4.22
2 1/2	7.89	5.89
3	10.82	7.94
3 1/2	13.48	9.78
4	16.40	11.78
5	23.47	17.30
6	31.69	23.03
8	47.70*	40.08

* Schedule 30

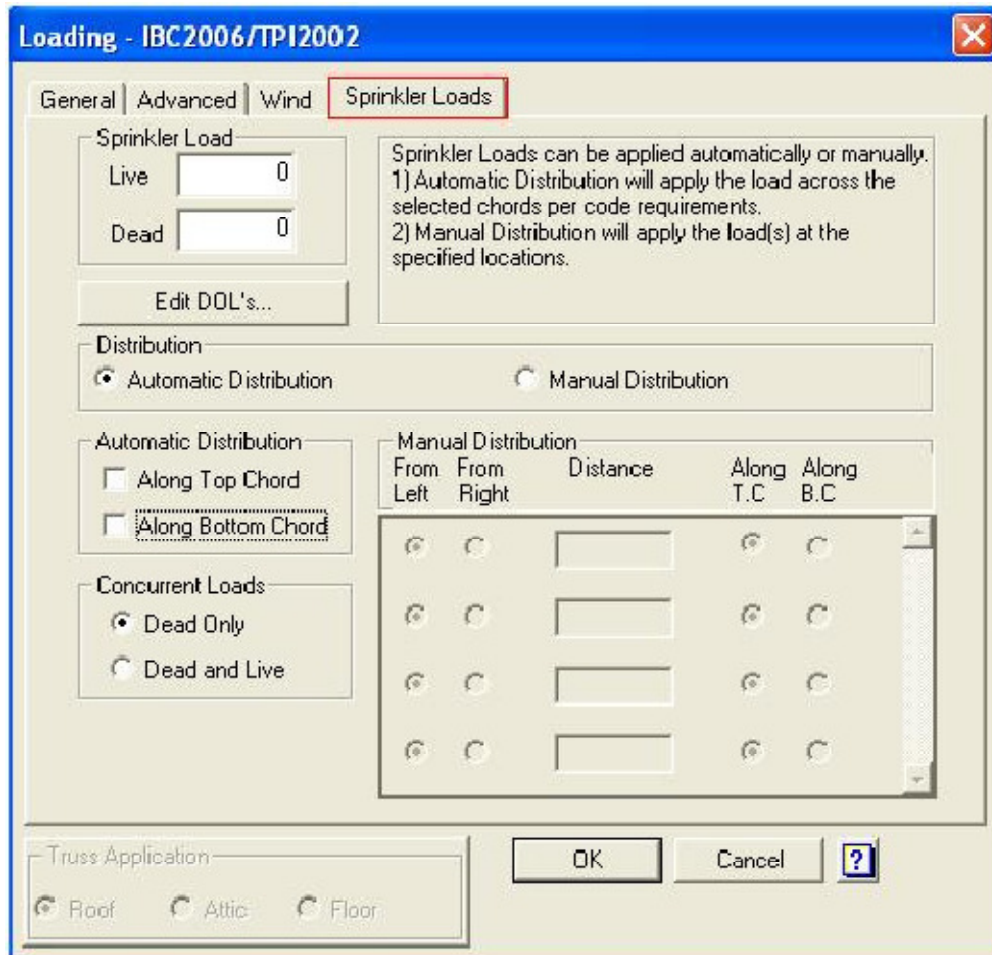
Engineering has the ability to automatically apply sprinkler loads specified by a truss designer using the appropriate dialog window. Let's run a couple examples to see how the tool functions.

Example 1

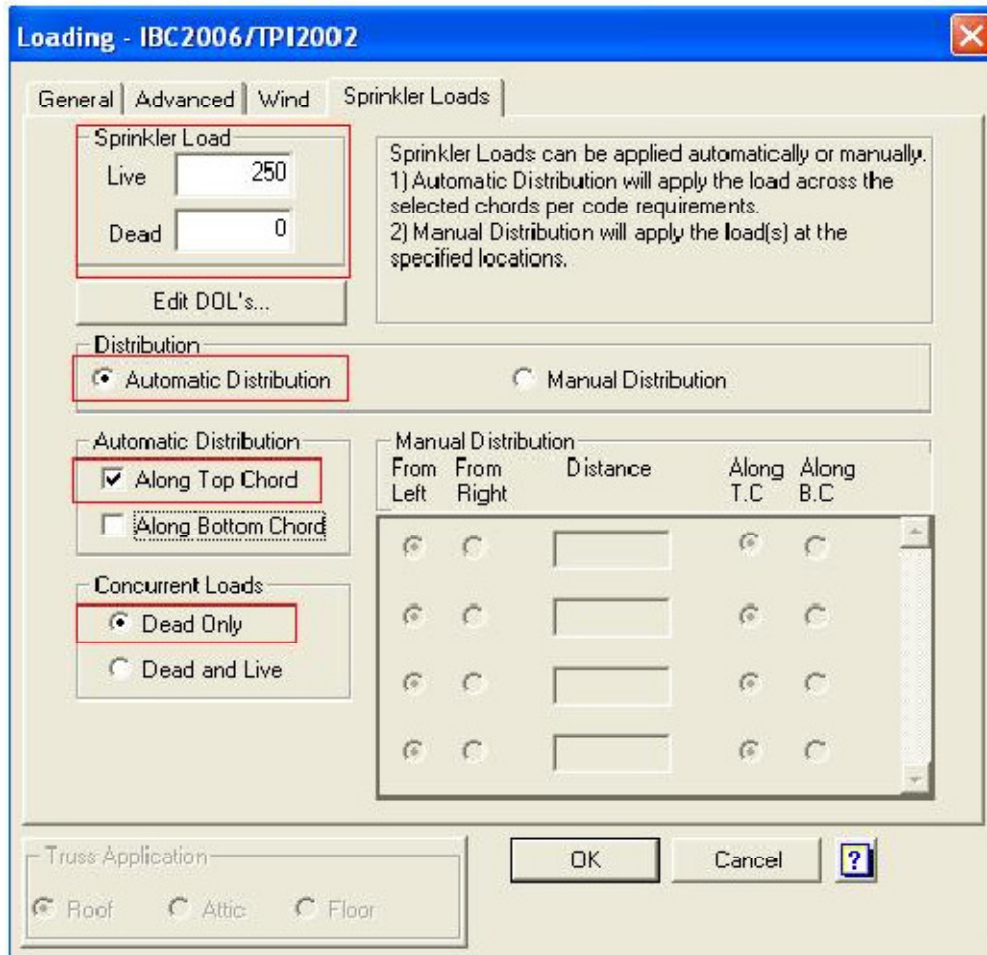
Let's assume the plan indicates 2 pounds per square foot (lb/ft²) additional dead load for the weight of the sprinkler system. Fire Sprinkler Systems can be supported either from the top or bottom chord of the trusses. If the sprinkler system is supported from the top chord then this load must be applied to the top chord. If the attachment is to be made to the bottom chord, this load must be applied to the bottom chord. Let's assume the Fire Sprinkler System is supported from the top chord of the truss. Open the Loading Dialog Window and include 2 lb/ft² in Top Chord Dead Load. In addition to dead weight of the Fire Sprinkler System, the Truss Designer must apply the minimum 250 pound concentrated live load to any single fire sprinkler support point to accommodate installation personnel. Engineering can provide for this load. In the Loading Dialog Window, check on Sprinkler Loads.



Then click on the Sprinkler Loads tab at the top of the Loading Dialog Window.



Since the truss is already designed to handle the dead loads from the Fire Sprinkler System (included in the Top Chord Dead Load), it only needs to be checked for the additional 250 pound live load (weight of sprinkler installation personnel) which is nonconcurrent with any other live loads. Specify 250 for Live and 0 for Dead. Choose Automatic Distribution. Then specify distribution of Sprinkler Load Along Top Chord and Concurrent Loads as Dead Only.

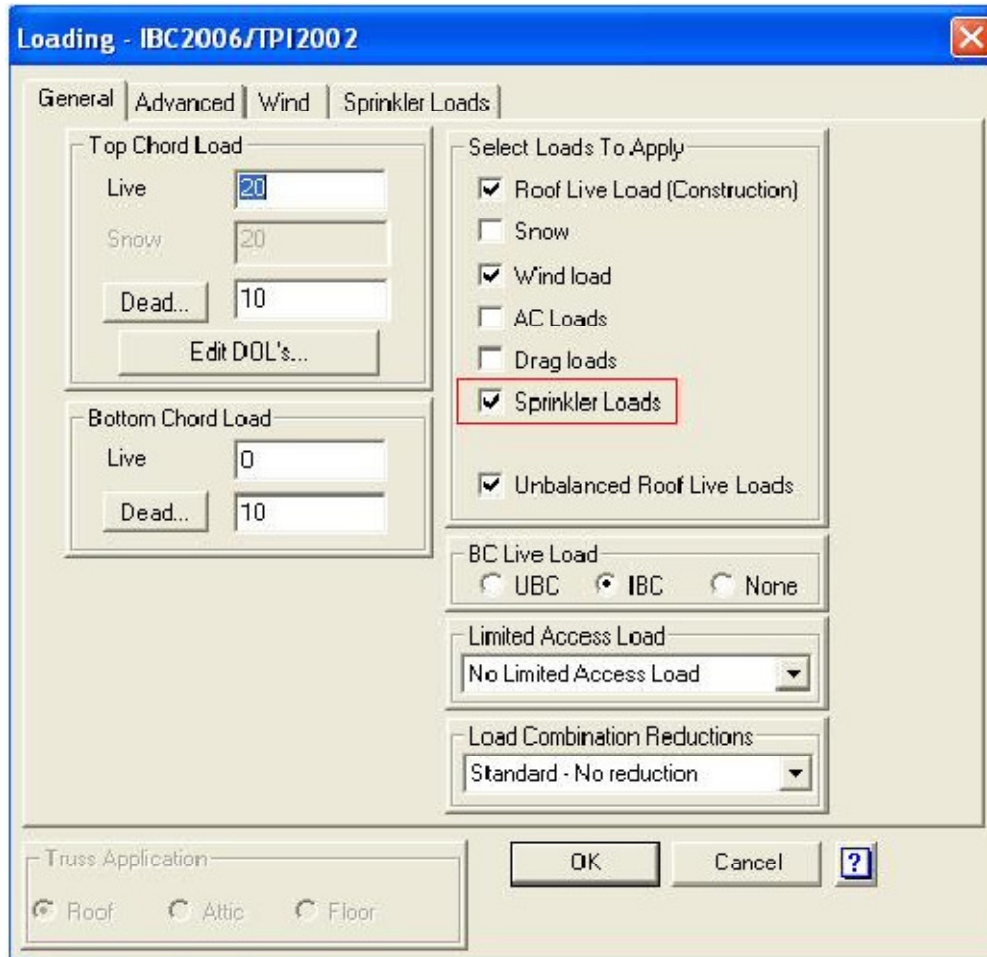


Select OK. Program will automatically apply specified load to each panel point and mid-panel point in separate load cases. This is a conservative approach, but it ensures that this live load has been covered for any variance in the installed location of the sprinkler system hangers.

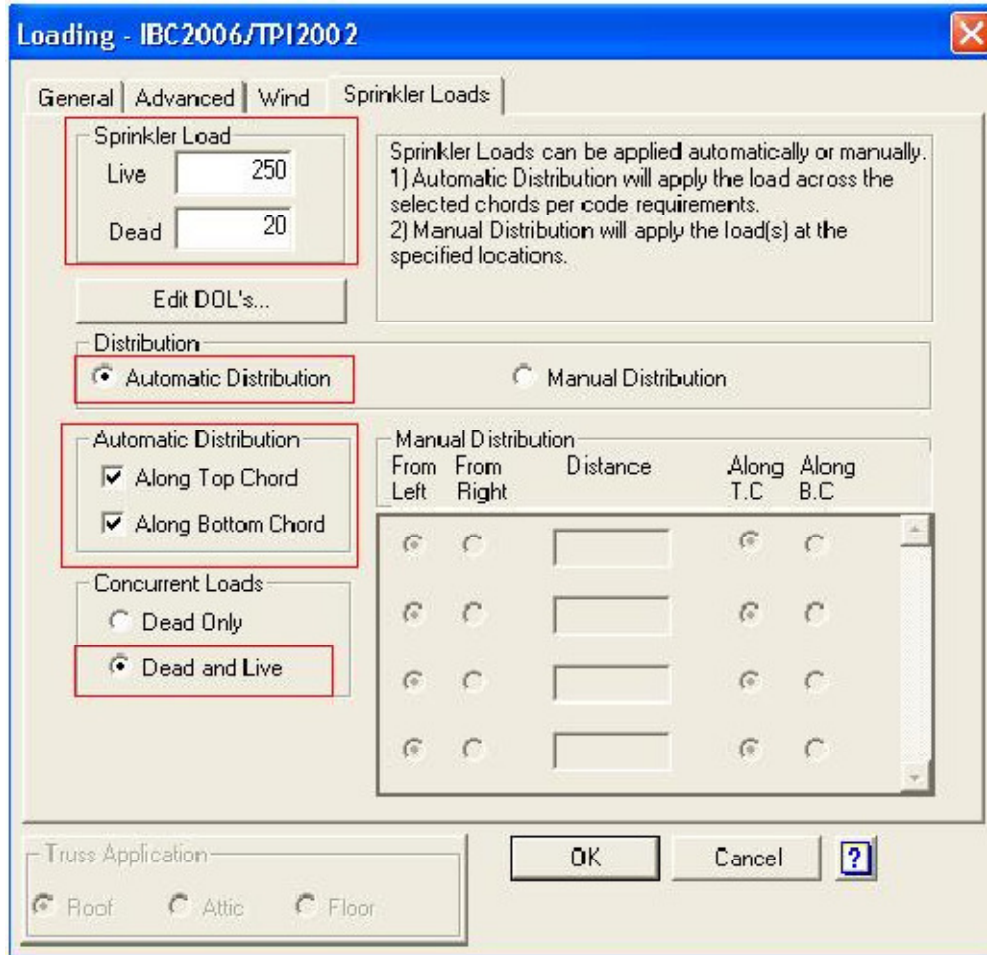
Example 2

Let's assume the plan indicates 20 pounds additional concentrated dead load for the weight of the water-filled pipe which must be applied anywhere along the Top Chord and Bottom Chord.

The first step is to choose the Loading Dialog and check on Sprinkler Loads.



Then click on the Sprinkler Loads tab at the top of the Loading Dialog box. Specify 250 pound Live Load (weight of sprinkler installation personnel) and 20 pound Dead Load (weight of water-filled pipe). Choose Automatic Distribution. Then specify distribution of Sprinkler Load Along Top Chord and Along Bottom Chord and Concurrent Loads set to Dead and Live.



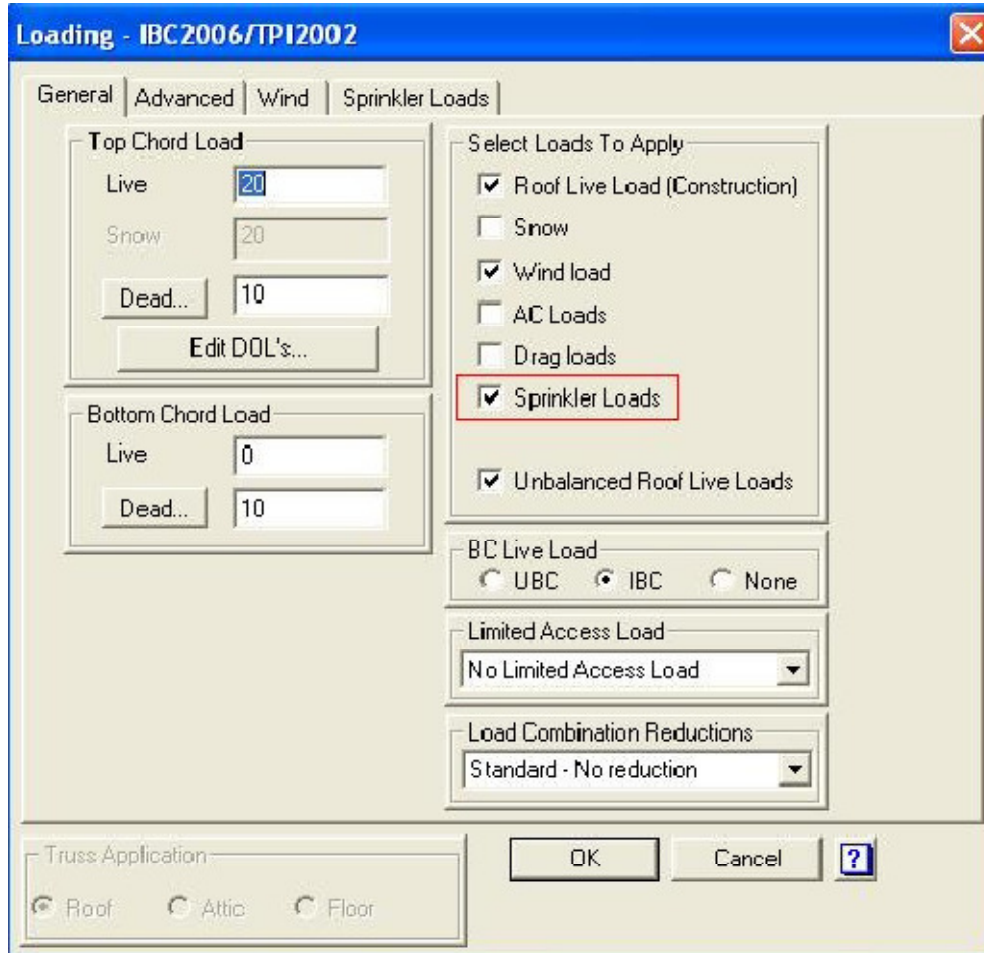
Select OK. Program will automatically apply specified load to each panel point and mid-panel point in separate load cases.

Example 3

Let's assume the plan indicates 50 pounds additional concentrated dead load for the weight of water-filled pipe. The point of hanger attachment is top chord at 6 feet from the left end of the truss.

The location of the pipe support relative to the panel points of the truss is critical for design as trusses can support higher loads at panel points than at mid-panel points. Large diameter pipe lines may require specific attachment points or additional members.

The first step is to choose the Loading Dialog and check on Sprinkler Loads.



Then click on the Sprinkler Loads tab at the top of the Loading Dialog box. Specify 250 pound Live Load (weight of sprinkler installation personnel) and 50 pound Dead Load (weight of water-filled pipe). Choose Manual Distribution and then specify location of concentrated load at 6' From Left Along Top Chord and Concurrent Loads set to Dead and Live.

Loading - IBC2006/TP1200 2

General | Advanced | Wind | Sprinkler Loads

Sprinkler Load

Live

Dead

Edit DOL's...

Sprinkler Loads can be applied automatically or manually.
 1) Automatic Distribution will apply the load across the selected chords per code requirements.
 2) Manual Distribution will apply the load(s) at the specified locations.

Distribution

Automatic Distribution Manual Distribution

Automatic Distribution

Along Top Chord
 Along Bottom Chord

Manual Distribution

From Left	From Right	Distance	Along T.C	Along B.C
<input checked="" type="radio"/>	<input type="radio"/>	<input type="text" value="6"/>	<input checked="" type="radio"/>	<input type="radio"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>	<input checked="" type="radio"/>	<input type="radio"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>	<input checked="" type="radio"/>	<input type="radio"/>
<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>	<input checked="" type="radio"/>	<input type="radio"/>

Concurrent Loads

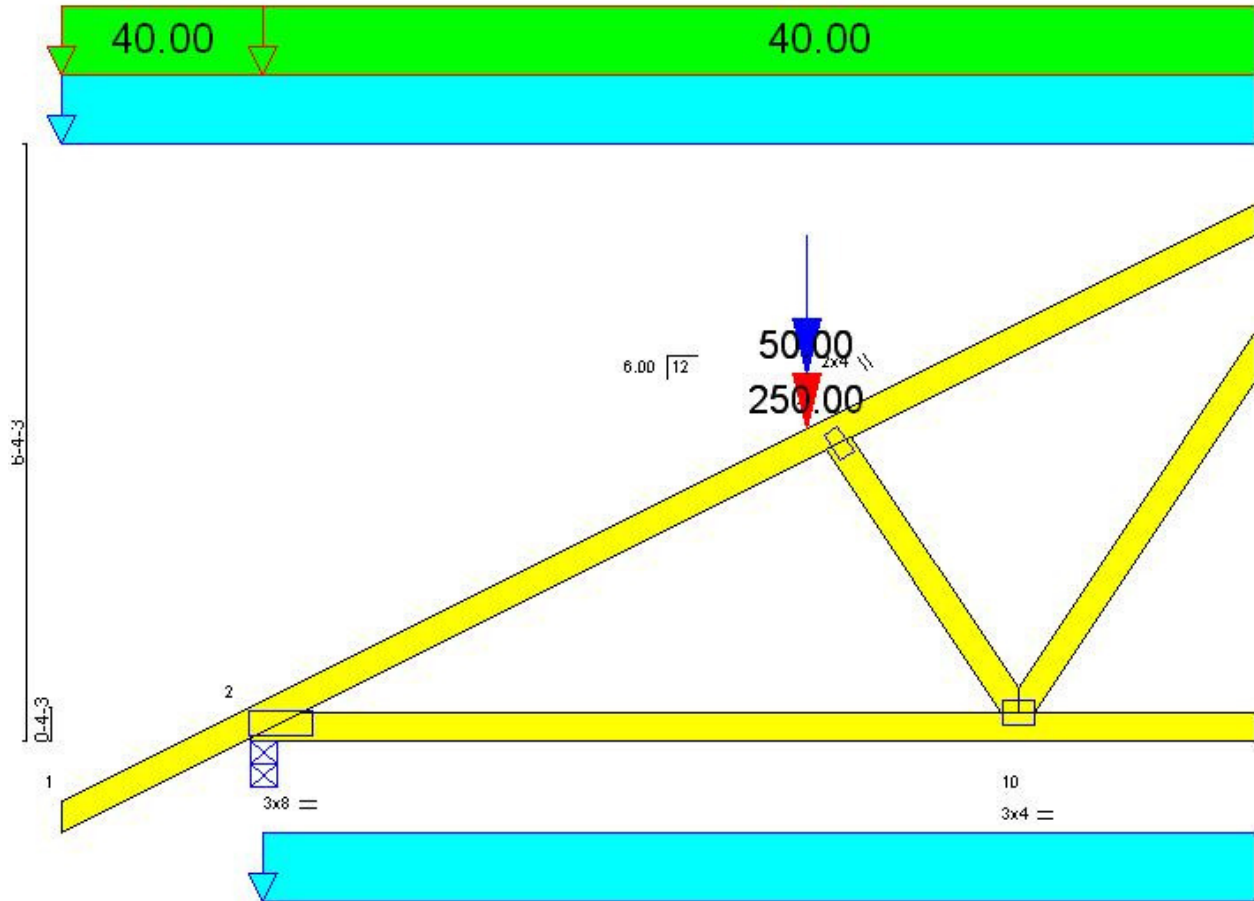
Dead Only
 Dead and Live

Truss Application

Roof Attic Floor

OK Cancel ?

Below is a picture of 1st Moving Load case showing the two point loads on the truss.



There should be no more than one Fire Sprinkler System support attached to each truss panel. If more than one Fire Sprinkler System support is needed in one panel or loading for Fire Sprinkler System indicated on the plan is not covered in this article please contact Engineering Office.

For further support information refer to the Metal Plate Connected Wood Truss Handbook (Section 17).