Wtca Update

Introduction to The Load Guide (TLG) – Part 2

by WTCA Staff

As you become more familiar with The Load Guide, follow this step-by-step procedure to consider design loads for roof trusses.

Section 106 and R106 of the International Building Code and International Residential Code respectively require that structural loading information be provided as part of the construction documents to show that the work proposed will conform to the provisions of this code and relevant laws, ordinances, rules and regulations. Trusses and structural building components (SBC) require a clear presentation of design loads and their application on the structure as detailed by the building designer, defined as the owner of the building or the individual or organization (including either an architect or engineer or the contractor) that contracts with the owner for the design of the building structural system and/or who produces the structural design documents.

WTCA, in cooperation with the Truss Plate Institute (TPI), has created a comprehensive **LOAD CALCULATOR**, intended to help with developing the proper loading for roof and floor structural building components. The GUIDE TO GOOD PRACTICE FOR SPECIFYING & APPLYING LOADS TO STRUCTURAL BUILDING COMPONENTS is freely available for download from the WTCA web site (www.woodtruss.com/loads.php).

The positions, interpretations, comparisons and commentary included in TLG are intended to assist anyone using it with specifying and applying loads on trusses and other structural building components.

WTCA's **The Load Guide** (TLG) is intended to be used by building designers (architects, engineers, etc.), building code officials, component manufacturers, truss designers and truss technicians, in a manner similar to that of a calculator, with the goal of helping everyone that uses it to more easily understand, define and specify all the loads that should be applied to the design of each structural building component used to resist these loads.

The positions, interpretations, comparisons and commentary included in **TLG** are intended to assist with specifying and applying loads on trusses and other structural building components. They are intended to aid in the consistent interpretation and application of loads, yet are not intended to supersede an architect or engineer's judgment and design specification for the loads that should be applied to a specific building.

TLG provides summary sheets for roof truss and floor truss live and environmental loads and load design parameters, as well as a calculator for dead loads commonly used in light frame construction, all in a Microsoft Excel® spreadsheet. These summary sheets are linked to commentary pages that include code interpretation, examples and discussion regarding application of loads. The 2003 International Building Code (IBC) and the International Residential Code (IRC), as well as SEI/ASCE 7-02, Minimum Design Loads for Buildings and Other Structures, are the basis for the discussions. Although local code variations may be mentioned, **TLG** does not include a discussion of all local amendments.

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at a glance

- The primary goal of **The Load Guide** is to provide a design load calculator for each uniquely loaded roof and floor structural component that anyone involved in designing a building can use as the basis of their design.
- A secondary goal is to help ensure that everyone involved in a construction project agrees on the applied loads.
- It is important to have the person responsible for determining the loads to agree to and sign off on the loads to be applied to each uniquely loaded roof or floor component. **TLG** makes it easy.

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The step-by-step procedure below presents a simplification of the process of selecting the design loads for a common roof truss. For those less familiar with the loading concepts, following the hyperlinks to the definitions, examples and discussions will be essential.

STEP 1

A. Open the Roof Loads worksheet.

Note that input fields are color coded as follows:

- User input cells are shaded with a yellow background.
- Dropdown list box selections are shaded with a blue background.
- Calculated or auto-filled cells are shaded with a gray background.

Additional information is available in a number of ways:

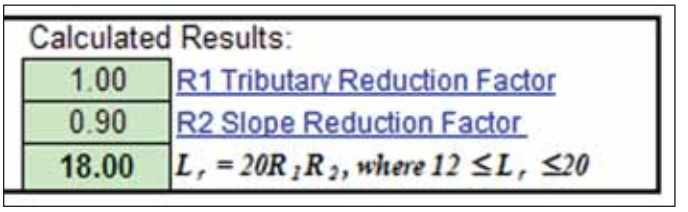
- Concepts are coded to indicate that a choice is based upon one or more of the following:
  - **C**ode requirement
  - **E**ngineering decision
  - **F**ield evaluation of the site where the structure is to be located
- Cells that include short comments have a small red triangle in the upper right corner. Hover over a cell with your mouse to display the comment.
- Text that is a hyperlink to commentary or additional information is blue and underscored. Since this is a spreadsheet, there is no back button. One can follow appropriate hyperlinks to a subject and back again.

B. Describe the general roof area under consideration. This example will use a 36 foot common roof truss.

STEP 2

Residential roof loads are typically controlled by either roof live or snow loads. In areas of the country where snow is a consideration, to verify which controls, enter the roof live load parameters (see below). The code default roof live load is 20 pounds per square foot (PSF). Trusses are typically spaced 24 inches on-center, so the tributary area of a 36 foot truss is 72 square feet (SF). The Rise for our example is 6 inches per foot of run.

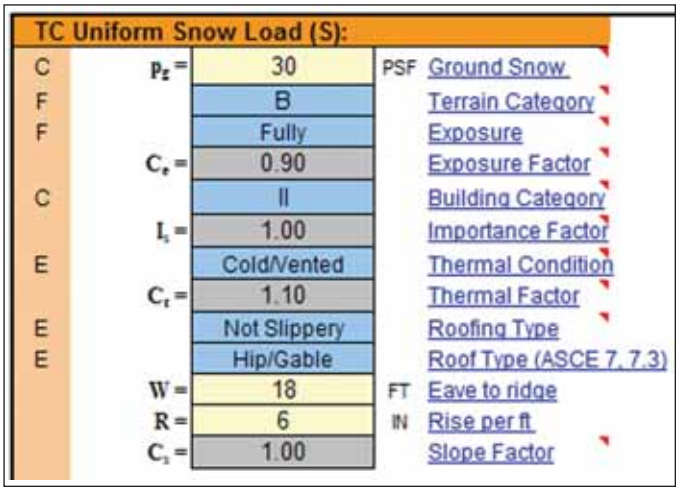
Based on the inputs the calculated results are given in the worksheet (see below). The tributary area is not large enough to have an effect (the reduction factor is 1.0), but the slope reduction factor reduces the 20 PSF default load to 18 PSF. Note that the minimum allowable reduction is to 12 PSF.



STEP 3

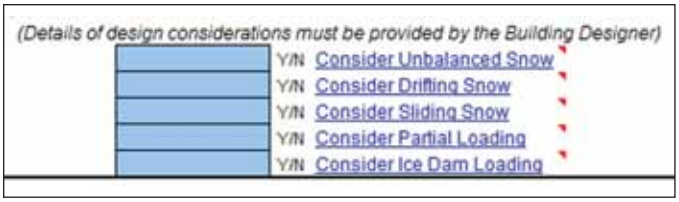
Where snow is a consideration, snow load design parameters are required. The absolute minimum information required is the PSF value for Ground Snow (see below).

For additional information regarding snow load design issues, follow the hyperlink to Ground Snow.



A. To adequately take snow loads into account on a structure, all the snow parameters need to be filled in. The calculated design snow loads are displayed. In this case, the ground snow load of 30 PSF is adjusted by the design parameters to a roof uniform snow load of 20.79 PSF.

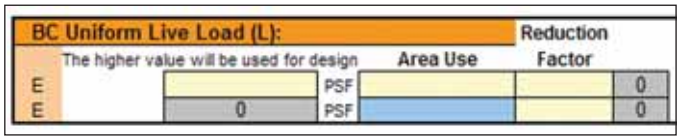
B. Since roof shape and structural concerns can influence the distribution of snow, additional evaluations may be required. In order to consider some of these options, additional input may be required.



Examples are provided in the Commentary on Snow (C-Snow) of each of the snow load considerations and can be accessed by clicking a hyperlink.

STEP 4

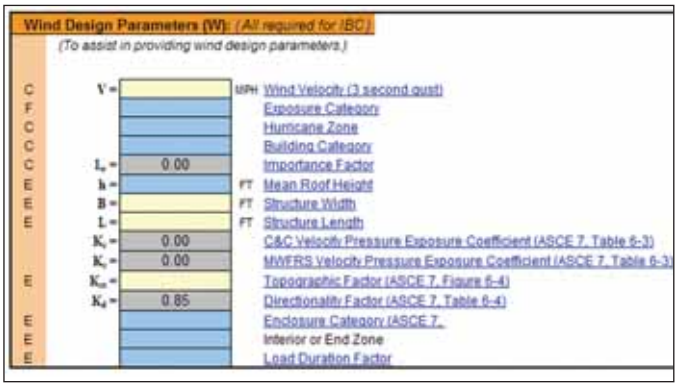
Loading requirements on the bottom chord of a truss, inside the roof, must also be considered (see below). Loading conditions are based upon use and include the consideration of construction loading (non-storage), storage loading or occupancy loading (in the case of an attic frame).



Consideration of these loads has often been confusing. Detailed information on these considerations is included in the Commentary on Live Loads (C-Live). The text of the accepted IBC/IRC code change that clarifies these load considerations is also included.

STEP 5

The effect of wind forces on a building and the individual structural members or assemblies that make up the structure are to be considered. The evaluation of these effects appears complex, but the accompanying Commentary on Wind (C-Wind) includes discussions of each of the design parameters.

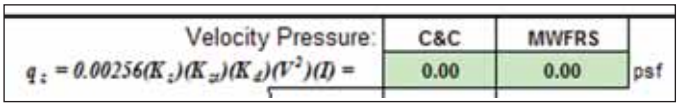


For most residential construction, a minimum of three wind design parameters are required (the rest are typically assumed):

- Wind Velocity (V)
- Exposure Category (B, C, or D)
- Mean Roof Height (h)

For accuracy in design, all the design parameters must be indicated and will be entered into the truss design software to evaluate the effect of wind on each individual truss and to calculate the expected uplift.

The calculated value is the design Velocity Pressure (see below). This base value is used to determine the impact of wind on the various roof wind zones of the individual trusses.



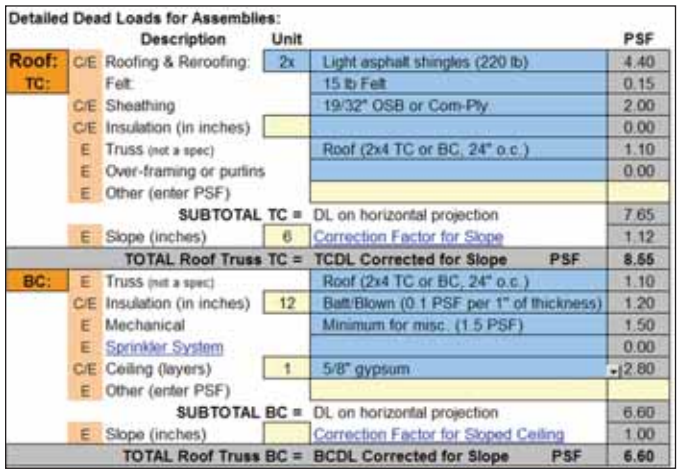
STEP 6

Any special loading considerations for the building need to be indicated. Details are required on the construction documents.

STEP 7

Define the dead loads that the roof truss must be designed to carry. Dead loads are included on a separate worksheet, since in many cases the materials for roof and floor trusses could be the same. In addition to the input section of the worksheet, the representative loads are listed for reference.

Note that some selections require a unit of measure in addition to a material specification.



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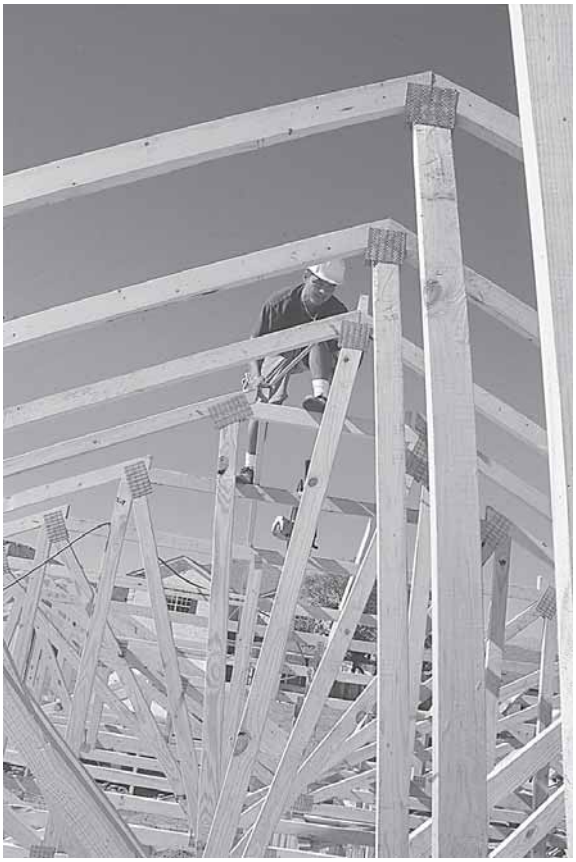
	IRC	IBC 2308	
Wind Velocity (3 second gust)	<110	<=100	Minimum Required
Exposure Category	B	A-D	
Hurricane Zone	No	No	
Building Category	II	Any	
Importance Factor	1.00	Any	
Mean Roof Height	>60	3 stories	
Structure Width	n/a	n/a	
Structure Length	n/a	n/a	
C&C Velocity Pressure Exposure Coefficient (ASCE 7, Table 6-3)	0.85	0.85	
MWFRS Velocity Pressure Exposure Coefficient (ASCE 7, Table 6-3)	0.85	0.85	
Topographic Factor (ASCE 7, Figure 6-4)	1.00	1.00	
Directionality Factor (ASCE 7, Table 6-4)	0.85	0.85	
Enclosure Category (ASCE 7, Interior or End Zone	Enclosed	Enclosed	
Load Duration Factor	varies	varies	



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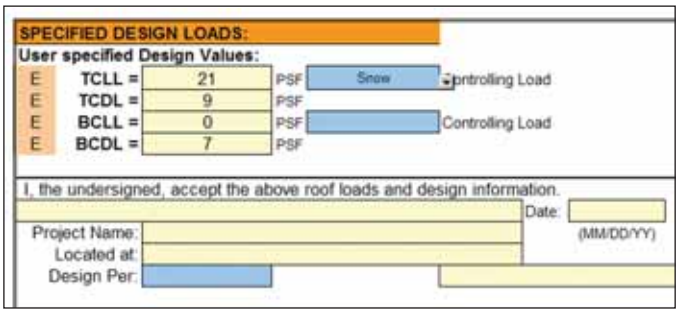
The dead load calculator also includes the ability to adjust dead loads for slope on either the top or bottom chords. The total PSF dead load values from the Dead Load worksheet are also included in the Roof Loads summary table.

STEP 8

Evaluate the calculated loads. In this example, the calculated snow load controls over roof live load.

By Calculation:	Roof Live	Snow	Rain	
TCLL	18.00	20.79	0.00	
TCDL	9.00	(Dead Loads)		C-Dead
BCLL	0.00			
BCDL	7.00	(Dead Loads)		C-Dead

The person responsible for the construction project (owner, builder, building designer) is to enter the load design values, select the controlling loads, and sign off on the design information.



The worksheets can be printed and submitted with the construction documents for plan approval as well as submitted with the construction documents to the truss manufacturer to be used in the design process.

If an electronic copy of the worksheets is desired, we suggest printing to an electronic format (like Adobe Acrobat) rather than saving a copy of the entire **TLG** for each roof area or job. SBC

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Truss Publications, Inc.

6300 Enterprise Lane • Suite 200 • Madison, WI 53719
608/310-6706 phone • 608/271-7006 fax
www.sbcmag.info • admgr@sbcmag.info