Understanding loading, geometry, and available materials (lumber and plating) can reduce the cost of an agricultural truss by as much as 20 percent when compared to an "out of the box" run. This article will cover a way to load agricultural trusses in order to be competitive in the marketplace and at the same time produce sealable designs. It is important to note that the applicability of these suggestions be verified by the authority having jurisdiction and/or by the building designer for the truss designs in question. MiTek is not specifying how to load trusses. All these design parameters must be verified by others.

Start in File – Setup – Job Properties - Job Settings – Design – Building Code Settings. In **General** section select the "Building Code", set "Importance Factor" to "Agricultural" and "Exposure Category" to the one dictated by the job site as shown in Figure 1 below. Your Building Code may be determined by the authority having jurisdiction for the area where the project is going.
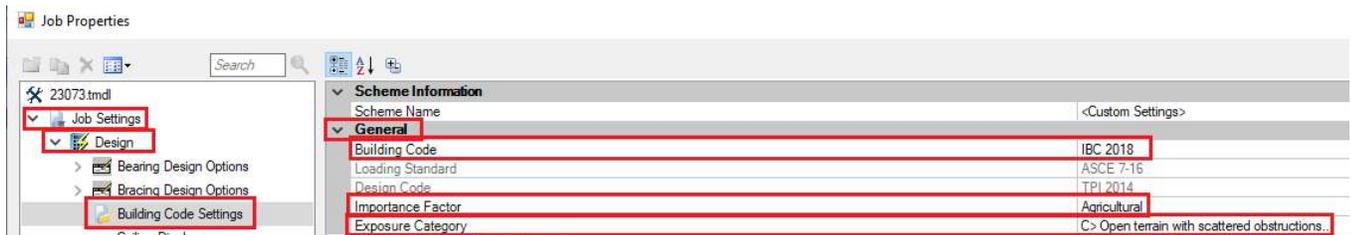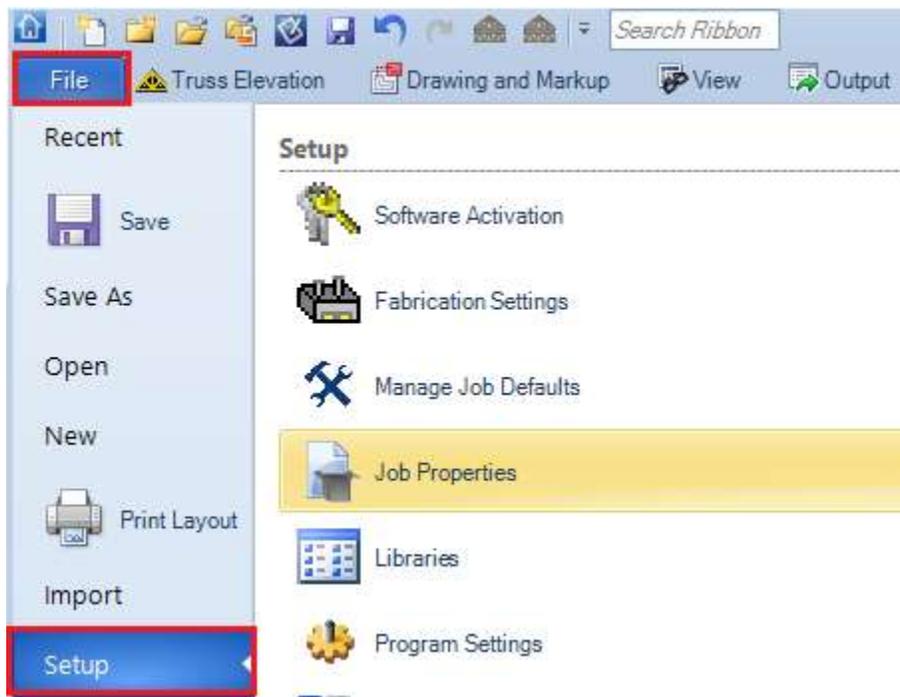

Figure 1

In the **Loading General – Roof Load** section select "No" for "Roof Top Chord Live Load (Construction)" as shown in Figure 2 below. Unless you are in an area where snow is not

considered a factor such as the state of Florida, where roof live load should be selected. The minimum roof live load generally used in agricultural truss design ranges between 16 to 20 PSF and is based on the tributary area supported by one truss, as well as the pitch.

Loading General - Floor Load	
Loading General - Roof Load	
Roof Top Chord Live Load (Construction)	No
Roof Top Chord Dead Load	4.0 lb/ft²
Roof Bottom Chord Live Load	0.0 lb/ft²
Roof Bottom Chord Dead Load	4.0 lb/ft²
Roof Truss Options	
Roof Ceiling Type	Flexible
Set Companion Live Load factor to 1.0	No

Figure 2

In **Loading - Snow** section, see Figure 3 below, select "Yes" for "Consider Snow Load". You will note that in Design Method the appropriate edition of ASCE 7 is selected for you based on the building code specified in the General section. The "Ground" snow should be selected from the snow map, or as specified by the authority having jurisdiction or the building owner/designer. Select "Ground (Pg)" in "Snow Load Location". If you design trusses for the Arctic Circle or mountain tops, based on ASCE 7-16 edition, you will need to select "Yes" in "Windswept", otherwise set it to "No". The "Roof Exposure" should be set to the one dictated by the job site. The "Thermal condition" (Ct factor) should be set to "1.2" (cold roof) if the building is not going to be heated. Select "Yes" in "Apply slope reduction factors". The "Surface condition" may only be set to "Unobstructed slippery" if the roof is a metal roof with no anti-snow-slide devices. The "Building Lu" is the distance from the truss in question to the furthest Eave from that truss. It is used to account for snow blowing parallel to the ridge of a hip roof. You will notice that this has no effect on trusses that do not have a flat section. If you do not want to modify Building Lu for each individual truss in the job, the building "Lu" should be the length of the building measured perpendicular to the truss span. Finally, verify that the unbalanced snow load is set to "Do for any geometry" as shown below.

Loading General - Attic Load	
Loading - Snow	
Consider Snow Load	Yes
Design Method	ASCE 7-16
Snow Load Location	Ground (Pg)
Snow Load	35.0 lb/ft²
Roof Exposure Category	Fully Exposed
Windswept	No
Exposure Factor Ce	0.9
Surface Condition	Unobstructed slippery
Overhang Snow Load Factor	1.00
Thermal Condition	Ct=1.2 Structures kept just below freezing
Roof 'R' Value	0.00
Roof Ventilation	Ventilated
Building Lu	80-00-00
Apply Slope Reduction Factor (Ps)	Yes
Unbalanced snow load	Do For Any Geometry

Figure 3

The snow load value shown above is for example only and will be dictated by the location of the building.

In **Loading - Wind** section, see Figure 4 below, set "Occupancy/Risk Category" to "I" assuming the building to be "Low hazard to human life in failure". The "Wind Design Method" should be set to one of the Main Wind Force Resisting System (MWFRS). We recommend using MWFRS (Envelope), but it does not mean it will always give a better result for bottom chord bracing. If you select MWFRS (Envelope), the "MWFRS Roof Zone" for agricultural trusses may be set to "Interior" except for the gable end truss that needs to be run in the "Exterior" zone. Set the "Opening conditions" to "Enclosed". A Ground Elevation Factor was added in ASCE 7-16 to account for variations in air density at different altitudes. Entering the correct Ground Elevation above Sea Level can result, as an example, in 17% reduction in design wind loads in Denver.

Unbalanced snow load	Do For Any Geometry
Loading - Wind	
Wind Load	Yes
Wind Design Method	MWFRS (Envelope) ASCE 7-16
Directions	Eight
Topographic Factor, Kzt	1.00
Ground Elevation	0-00
Ground Elevation Factor, Ke	1.00
Building Rigidity	Rigid
Occupancy/Risk Category	I> Low hazard to human life in failure (agricultural...
MWFRS Roof Zone	Interior
Wind Velocity	105 mph
Directionality Factor	0.85
Opening Conditions	Enclosed Bldg.(Cond.I)
Height Above Ground	25-00-00
Max Top Chord Dead Load	2.4 lb/ft²
Max Bottom Chord Dead Load	2.4 lb/ft²
Cantilever Exposed to Wind	Both
End Vertical Exposed to Wind	Both

Figure 4

Please note that no bottom chord live loads are generally required on agricultural type trusses:

Seismic Load	
Loading Advanced - Limited Access Loads	
Limited Access Load	No Limited Access Load
Follow Building Code	Yes
Limited Access Load	0.0 lb/ft²
Minimum Height	0-00
Minimum Width	0-00
Apply to Entire Panel	No
Loading Advanced - Stabilizer(tm) Installation Load Case	
Additional Bottom Chord Live Load Considerations	
Bottom Chord Live Load	None
Minimum Roof Live Load	

Figure 5

Loading - Geometry section will allow you to input additional geometric information about the roof plane so that the loading on that truss can be modified to match the roof, rather than truss, profile. The "Use Transverse Pitch" is there to account for "rain on snow surcharge" and is only applicable to roofs with a flat section and a ground snow load of 20 psf or less. It tells the program that the flat section is not flat because it has a pitch perpendicular to the truss and therefore this load is not applied. The value to enter in "Transverse Roof Pitch" is the pitch of the roof perpendicular to the truss.

Load Duration Factors for wind (Wind DOL) should be set to 1.6 for Dry Lumber and Plate Grip in most locations.

Figure 6

in File – Setup – Job Properties - Job Settings – Design – General Preferences (Engineering) – Roof Design General Preferences set **Sheathing / Purlin Spacing** as shown in Figure 7 below. Note the Top Chord Purlin Spacing is set to 2'- 0" on center and the Bottom Chord Purling Spacing is set to 10'- 0" on center as is typical in agricultural framing. If the bottom chord bracing spacing is flexible, you may enter "0" in the "Bottom Chord Purlin Spacing" line. This option will design the bracing spacing for the bottom chord material selected, rather than calculate the chord material based upon the selected 10' o.c. bracing/purlin spacing.

Figure 7

If truss is to be capped and you are designing for snow loads, you should turn on "Loading - Geometry" by selecting "Yes" for "Use Roof Profile" on truss level as shown in Figure 8 below. Turning this on will tell the program that the truss in question is not a hip and is therefore not subjected to the drifts that accumulate on a hip end. The program will unbalance the truss about the ridgeline which is determined by the geometry information found in the Geometry Tab.
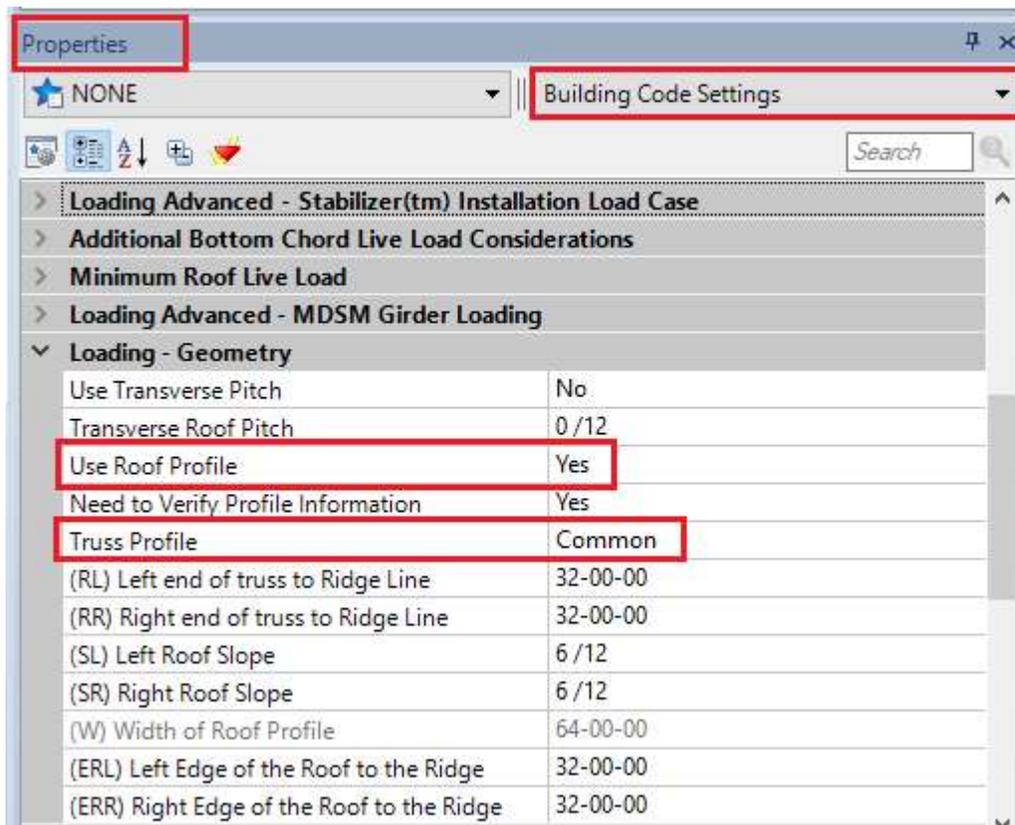
Figure 8

Once again, all these parameters must be verified by the authority having jurisdiction and/or by the building owner/designer.

For additional information, or if you have questions, please contact the MiTek Engineering department.