As you have come to expect, MiTek engineering software is a very powerful tool. One more example of this is the wide range of options you have available when considering wind loads and wind load cases. Magnitudes of wind loads and their application on a structure are called out in the design standard ASCE-7, Minimum Design Loads for Building and Other Structures.

It cannot be emphasized enough that the Engineer of Record (EOR) or Building Designer (BD) is responsible to provide you all the criteria you need to design a truss component that will go into the final structure. Wind loading is the most complicated of the live loads considered on a truss component design and requires the most input to get the most accurate results.

Figure 1 shows a generic input screen of the Wind Loading fields. Within this screen there are fields that have drop down lists. Some of which will add more input fields.

Loading - Wind	
Consider Wind Load	Yes
Wind Design Method	MWFRS (Directional)/C-C hybrid Wind ASCE 7-22
Consider Tornado Load	No
Directions	Four
Ground Elevation	0-00
Ground Elevation Factor, Ke	1.00
Building Rigidity	Rigid
C-C Roof	Automatic
Basic Wind Speed	115 mph
Tornado Velocity	60 mph
Directionality Factor	0.85
Opening Conditions	Enclosed Bldg.(Cond.I)
Height Above Ground	30-00-00
Run Components and Cladding Load Cases On Girders	No
Number of CC load cases	Directional Envelope
Max Top Chord Dead Load	6.0 lb/ft²
Max Bottom Chord Dead Load	6.0 lb/ft²
Building Width	30-00-00
Building Length	45-00-00
Truss Category	Common
Distance To Eave	4-00-00

Figure 1 – General Wind Load Tab

Consider Wind Load – This field is YES or NO. This should be set to YES and only changed for the unusual condition of designing something that will not be exposed to wind loads.

Wind Design Method – See Figure 2 for options available. For your standard designing we recommend using either of the two methods that combines both MWFRS (The Main Wind Force Resisting System) and C-C (Components and Cladding). One of the MWFRS methods should be specified by the EOR or the BD. The Directional method is for buildings of all heights while the Envelope is for buildings with heights <= 60’-0”.

When using one of these combined methods the design will be checked for both the MWFRS and C-C load conditions. The reactions reported will be from the MWFRS method, lower wind pressures, while the truss members and joints will be checked using the heavier C-C loads.

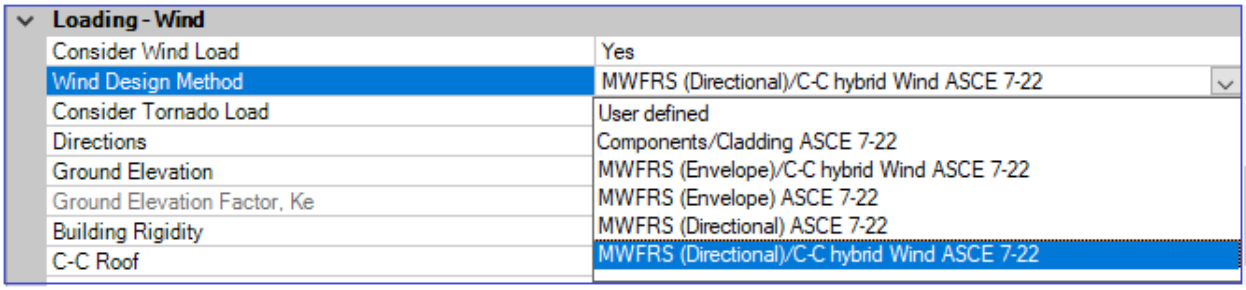

Figure 2 – Options for Wind Design Method

Consider Tornado Load – Tornado Loading is a new chapter in ASCE 7-22. Risk Category III or IV buildings that are located in a tornado prone region shall consider tornado loads in the design. When turning the "Consider Tornado Load" property to Yes, the "Tornado Velocity" property appears.

Directions - There are two options either "4" or "8" directions. Unless stated by EOR or BD we recommend using the "4" direction option.

Ground Elevation – This is the elevation above sea level for the job site location. Leaving this set zero is slightly conservative.

Ground Elevation Factor, K_e– Ground Elevation Factor is automatically adjusted based on the ground elevation above sea level.

Building Rigidity – There are two options here "Rigid" or "Flexible". Unless stated by EOR or BD we recommend using "Flexible" for buildings under 60'-0" tall.

C-C Roof – There are three options, see Figure 3. The location of the truss component within the roof system will dictate the winds loads that need to be considered. "Automatic" will load the truss based on the additional information seen in Figure 4. Both Gable and Hip will load truss accordingly.

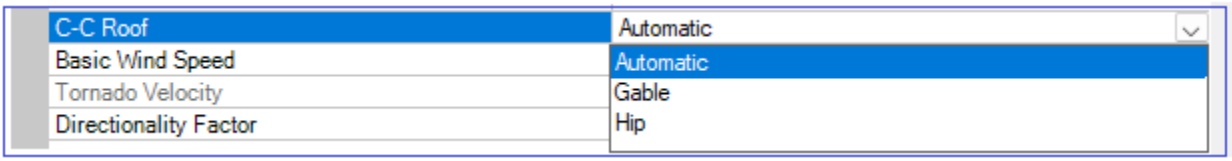

Figure 3 – C-C Roof Options

Building Width	30-00-00
Building Length	45-00-00
Truss Category	Common
Distance To Eave	4-00-00

Figure 4 - C-C Extra Input for Automatic Roof

Basic Wind Speed – The Design Wind Speed (mph) should be called out on the plans. The wind speed provided will be the "Ultimate" wind speed and the software will adjust this to the "Allowable" wind speed used with the Allowable Stress Design method we use today.

Directionality Factor – For Buildings, this factor is 0.85 per ASCE 7 and the program defaults to 0.85, use caution if you are changing this.

Opening Conditions – For all the procedures, the options available are "Enclosed Bldg (Cond. I)", "Partially Enclosed (Cond. II)", and "Partially Open (Cond. IV)". Under the Components/Cladding and MWFRS (Directional) procedures you will find "Open Bldg (Cond. III)". See Wind section of ASCE 7 for detailed explanation of opening condition or refer to construction documents for specifications.

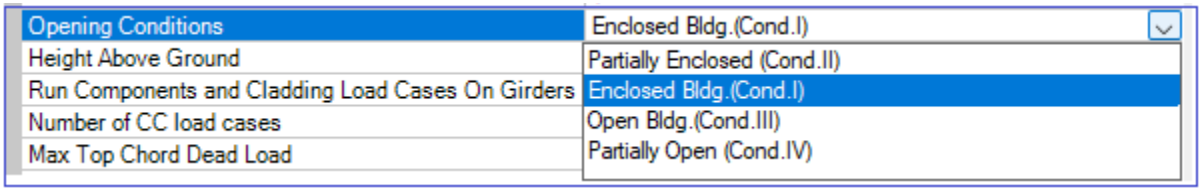

Figure 5 – Opening Conditions

Height Above Ground – This is the Mean Height of the building, calculated by averaging the eave height and the height of the highest point of the roof. Mean roof height of the roof with parapet is the vertical distance between the ground surface adjacent to the building to the top of the parapet height.

Run Component and Cladding Load Cases on Girders – It is recommended that this option be used only when the building designer specifies it. **Exception** all girder trusses with parapet(s) need to be checked with these CC wind load cases.

Number of CC Load Cases – There are two options, Single Envelope and Directional Envelope. Always use the Directional Envelope option.

Max Top and Bottom Dead Load –The program will allow a maximum of 0.6 times of the dead loads input under the "Loading General – Roof Load" section.

Building Width and Length – Input, accordingly, Building Width is parallel with the truss and Building Length is perpendicular to the truss.

Truss Category – See Figure 6 for the options and it should be selected accordingly.

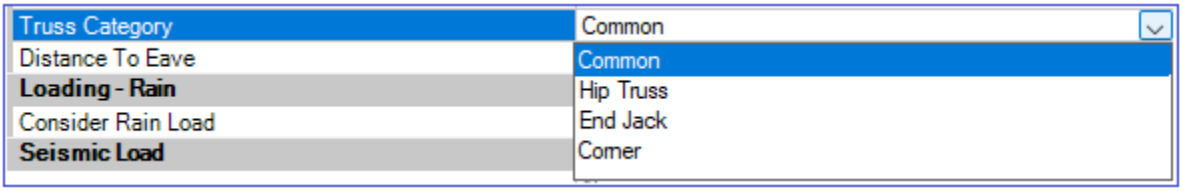

Figure 6 – Truss Category Options

Distance To Eave – This dimension defines where the truss component is in relation to the closest end wall measured perpendicular to the truss.

Load Duration Factors - Wind load cases are permitted to use duration of load factors of 1.6 for both lumber and plates per ASCE 7. Some jurisdictions may require the lower factor of 1.33.

Load Duration Factors	
Dead Only DOL	Dry Lumber: 0.9 Plate Grip: 0.9 Plate Metal: 0.9
Construction DOL	Dry Lumber: 1.15 Plate Grip: 1.15 Plate Metal: 1
Floor DOL	Dry Lumber: 1 Plate Grip: 1 Plate Metal: 1
Snow DOL	Dry Lumber: 1.15 Plate Grip: 1.15 Plate Metal: 1
Wind DOL	Dry Lumber: 1.6 Plate Grip: 1.6 Plate Metal: 1
Person DOL	Dry Lumber: 1 Plate Grip: 1 Plate Metal: 1

Figure 7 – Load Duration Factors

The following will discuss the additional specific input fields required by MWFRS (Envelope) and User Defined Wind Design Methods.

MWFRS (Envelope)/C-C hybrid Wind – MWFRS (Envelope) procedure is for structures less than 60'-0" in height. There are some other stipulations and requirements that must be met before its use that we will not go into in this article. Hybrid procedure will develop the load cases for both CC and MWFRS. Only the MWFRS/Envelope loads will be used for the uplift reactions, but the design will be based on both the MWFRS/Envelope loads and the CC loads.

Loading - Wind	
Consider Wind Load	Yes
Wind Design Method	MWFRS (Envelope)/C-C hybrid Wind ASCE 7-22
Consider Tornado Load	No
Directions	Four
Ground Elevation	0-00
Ground Elevation Factor, Ke	1.00
Building Rigidity	Rigid
MWFRS Roof Zone	Exterior
C-C Roof	Automatic
Basic Wind Speed	115 mph
Tornado Velocity	60 mph
Directionality Factor	0.85
Opening Conditions	Enclosed Bldg.(Cond.I)
Height Above Ground	30-00-00
Run Components and Cladding Load Cases On Girders	No
Number of CC load cases	Directional Envelope
Max Top Chord Dead Load	6.0 lb/ft²
Max Bottom Chord Dead Load	6.0 lb/ft²
Building Width	30-00-00
Truss Category	Common

Figure 8 – MWFRS Roof Zones

MWFRS Roof Zone – If you know the specific zone within the roof system the truss component is to be placed, select that zone. Recognize that wind from all directions need to be considered. Otherwise, select "Automatic" and input the Building Width.

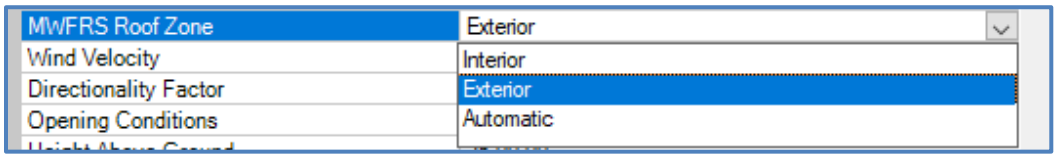

Figure 9 – MWFRS Roof Zones

User Defined - This wind design method allows you to enter and design a truss component with a specific magnitude of load that the EOR (Engineer of Record) or BD (Building Designer) specifies.

Loading - Wind	
Consider Wind Load	Yes
Wind Design Method	User defined
Consider Tornado Load	No
Directions	Four
Ground Elevation	0-00
Ground Elevation Factor, Ke	1.00
Building Rigidity	Rigid
External Wind Pressure	20.0 lb/ft²
Internal Wind Pressure	20.0 lb/ft²
Tornado Velocity	60 mph
Max Top Chord Dead Load	6.0 lb/ft²
Max Bottom Chord Dead Load	6.0 lb/ft²
Truss Category	Common

Figure 10 – User Defined Inputs

- **External Wind Pressure –** Enter the wind pressure given the EOR or the BD.
- **Internal Wind Pressure –** If given enter the wind pressure given by the EOR or the BD for the internal pressure.

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