



# Determination of Live & Roof Live Loads as Per ASCE7-22

An Online Continuing Education Course for Engineers

**Course Number: S-4027**

**Credit: 4 Hours / 4 PDH / 4 CPD**

# Determination of Live & Roof Live Loads as Per ASCE7-22

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## 1. Introduction:

Structural design is a set of processes that ensures the building can resist applied loads, fulfill its functions, and sustain its stability.

The processes of structural design are summarized in the following steps (Figure 01):

1. Determination of applied loads.
2. Selection of economic and proper structural system.
3. Structural analysis of the structural system to get internal actions.
4. Design of structural members to resist internal actions.

Determining loads is a critical step, because any deviation in calculations of applied loads, will lead to an underestimate of loads, which may cause structural failures, or it will lead to an overestimation of loads, which may cause uneconomic design.

To understand the behavior of any structural load, the structural designer should know the following properties:

1. Value of the load.
2. The code of loads sets the minimum value.
3. The direction of the load concerning the building or structural elements.
4. Classification of load in load combinations.
5. Load cases pattern.

This course is prepared in accordance with the latest code of ASCE7-22, the reader can see the new sections, statements, or provisions updated by the code in inclined underlined font.

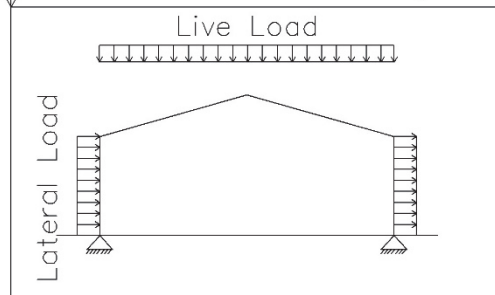
The value of the load is calculated from the actual load applied on the building, such as dead load, or is extracted from the code of load (ASCE7-22), such as live, roof live, snow, wind, and seismic load.

The minimum value of the load is the value that is not permitted to be not exceeded, which is set by the code of loads (ASCE7-22) for specific loads, such as live, roof live, snow, wind, and seismic loads.

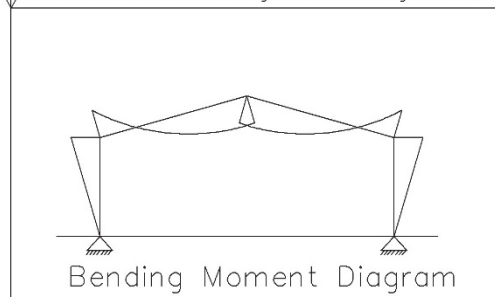
### Determination of Loads

Dead	Soil Pressure
Roof Live	Hydrostatic Pressure
Live	Wind
Crane	Seismic
Rain	Temperature
Snow	
Flood	
Ice	

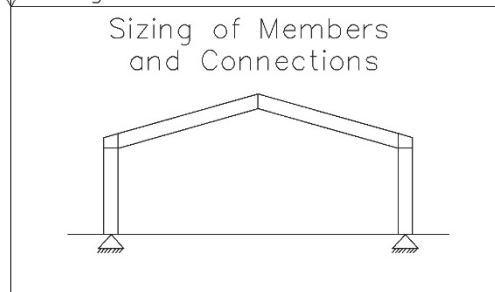
### Selection of Structural System



### Structural Analysis of System



### Design of Members & Connections



**Figure (01). Steps of Structural Design**

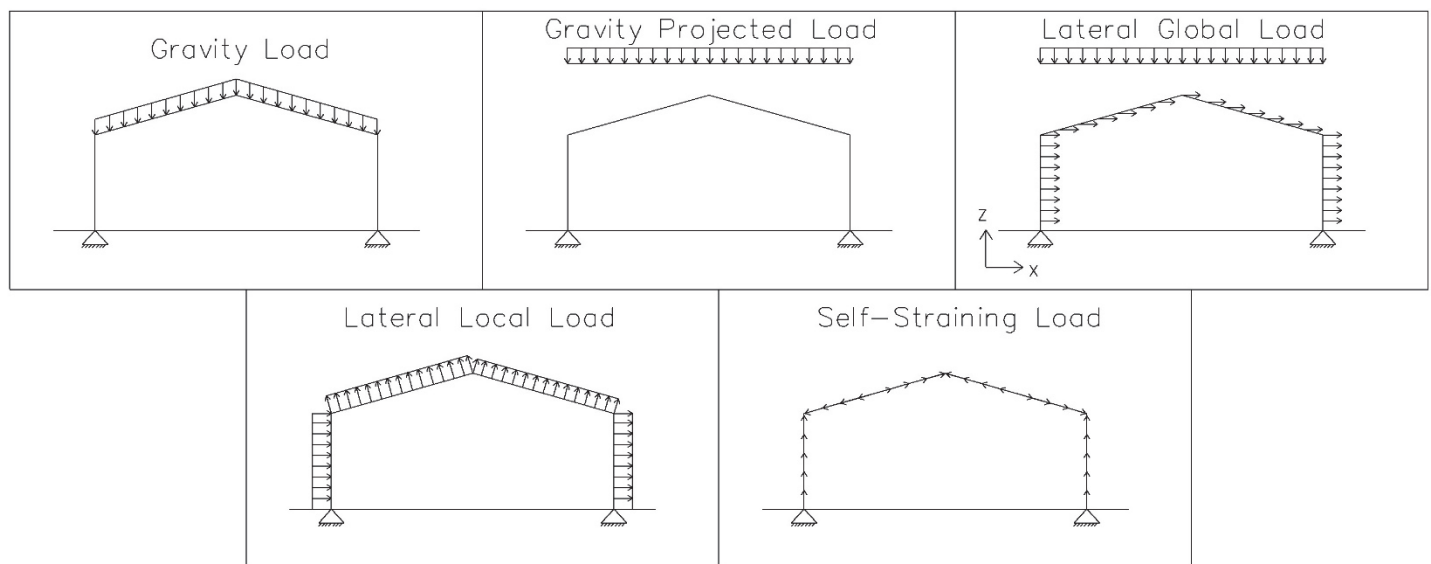
Sometimes, the code gives two values for the same load, a calculated value, and a minimum value, the structural designer should check that the calculated value is larger than the minimum value.

The direction of load is quite important, as it represents the behavior of the load. For example, the direction of wind pressure acting on the frame rafter is perpendicular to the surface itself, which is different from the direction of seismic load which is working in X, Y, or Z global directions.

Types of the direction of loads (Figure 02):

1. Gravity loads: these loads are distributed on the actual length of the structural member, like inclined roof members and its direction is parallel to gravity force, such as dead, collateral loads.
2. Gravity projected loads: these loads are distributed on the horizontal projection of the structural member, and their direction is parallel to gravity force, such as roof live, snow, and live loads.
3. Lateral global X, Y, or Z loads: these loads are acting laterally on each unit of area of the floors and vertical elements commonly these loads are a ratio of vertical loads, and their direction is parallel to X, Y, and Z direction, such as seismic, structural integrity and notional loads.
4. Lateral local loads: these loads are distributed perpendicularly to the structural elements, even if the member is inclined, such as wind loads.
5. Self-straining loads: such as temperature change, settlement, creep, and shrinkage loads.

**Figure (02). Types of Directions of Loads**



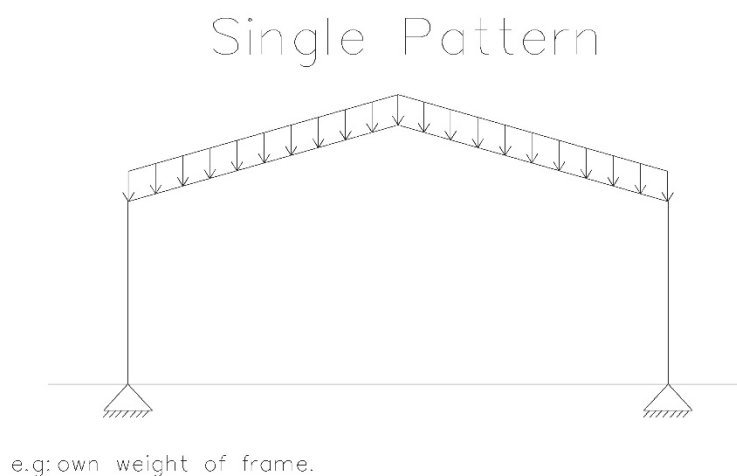
Classification of loads in load combinations is also essential, as the improper determination of load may increase or decrease the effect of the load away from the actual value, especially when the structural designer deals with a load that is not mentioned explicitly in the code of loads (ASCE7-22)

Classification of loads in load combinations:

1.  $A_k$ : a load of extraordinary events.
2. D: such as dead, collateral load.
3.  $D_i$ : weight of ice.
4. E: earthquake load
5. F: loads of fluids with well-defined pressures and maximum heights.
6.  $F_a$  flood load.
7. H: load due to lateral earth pressure, groundwater pressure, or pressure of bulk materials.
8. L: Live load, the crane lifted capacity, machine loads.
9.  $L_r$ : roof live load.
10. R: Rain load.
11. S: Snow load.
12. T: such as temperature change, settlement, creep, and shrinkage loads.
13. W: Wind load.
14.  $W_i$ : Wind on Ice.

Load cases pattern represents the arrangement of the load on the structure, the following types of patterns demonstrate the concept clearly:

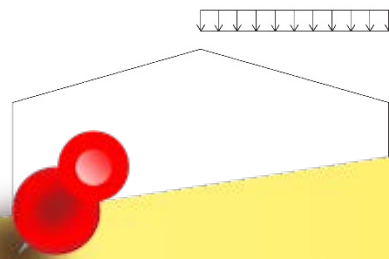
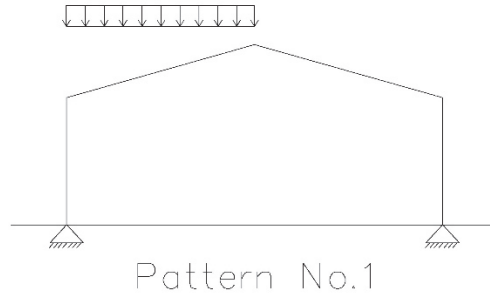
1. Single pattern: the load has only one load case such as a dead load of weights of materials and construction, as shown in Figure 03.



**Figure (03). Single Pattern Loading**

2. Separate patterns: each case of loading is added separately to the load combinations, such as varying dead load of fixed service equipment, vegetation, landscaped roofs, snow load, or temperature variance, as shown in **Figure 04**.

Separate Patterns



3.

To view the remainder of the course material and to take the quiz for PDH credit, you must purchase the course.

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...e loads on  
...load combinations,