

Design of Flexure Members as per AISC360-16

An Online Continuing Education Course for Engineers

Course Number: S-3021

Credit: 3 Hours / 3 PDH / 3 CPD

Design of Steel Flexure Members per AISC360-16

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1. Introduction:

Steel structures are used these days quite widely, for many reasons, like rapid construction, ease of erection, and controlled fabrication quality.

The processes of structural design can be 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.

By putting the loads on the chosen statical system, we get the straining action in the members of the statical system; by the different analysis methods, these straining actions are several, such as tension, compression, flexure, shear, and torsion.

This course will study the design of steel flexure members, which exist in many steel structures, such as floor beams, roof purlins, crane beams, and plate girders.

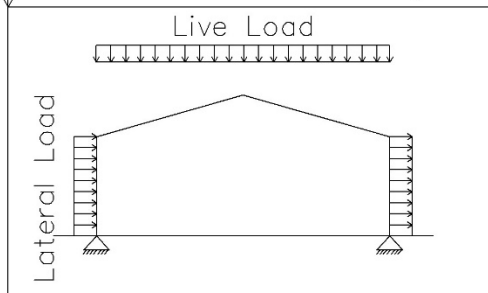
This course is the third course of a series related to the design of members; all of these courses are independent and do not require any prerequisites. The following is the list of related courses:

1. Design of Steel Tension Members per AISC360-16.
2. Design of Steel Compression Members per AISC360-16.
3. Design of Steel Flexure Members per AISC360-16.
4. Design of Steel Members Subject to Shear per AISC360-16.
5. Design of Steel Members subject to Combined Stresses per AISC360-16.
6. Design of Steel Members subject to Torsion per AISC360-16.

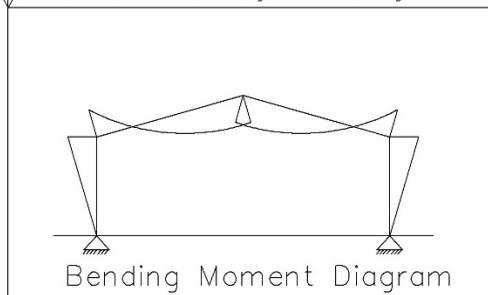
Determination of Loads

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

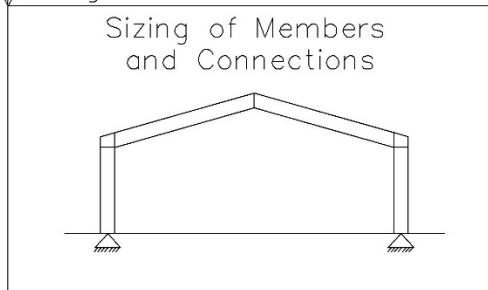


Figure (01). Steps of Structural Design

This course covers the following topics:

1. Flexure limit states (Tension Flange Yielding, Compression Flange Buckling, Lateral Torsional Buckling, ...)
2. Modes of lateral-torsional buckling.
3. Classification of members subject to flexure.
4. Available flexural strength.
5. Available flexural strength of I-shaped sections subject to flexure.
6. Weak axis bending.
7. Available flexural strength of HSS, Tees, Double Angles, Single Angles, Rectangular Bars, Rounds, and Unsymmetrical Shapes.
8. Proportioning of beams & girders.
9. Redistribution of moments in beams with compact sections.

Figure (02) shows examples of flexure members.

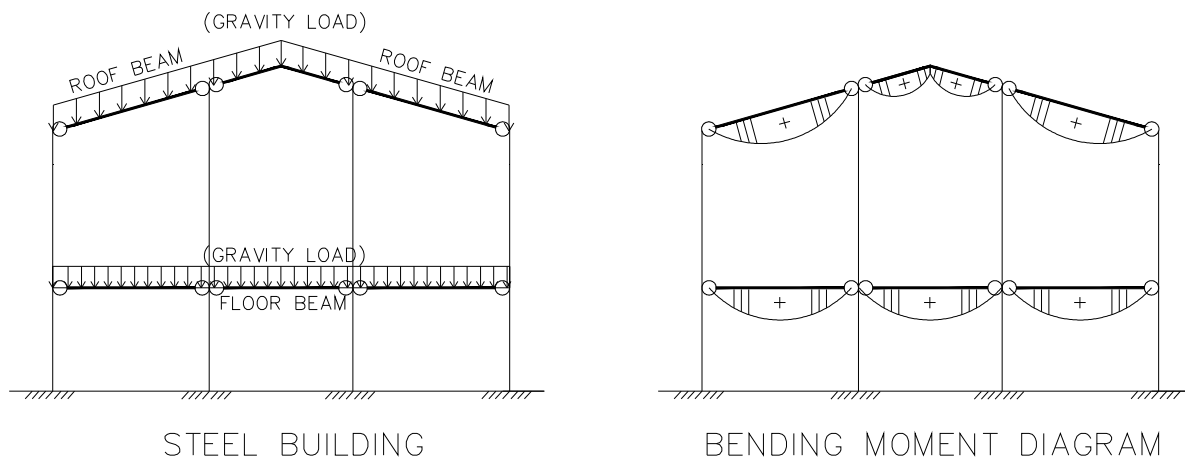


Figure (02). Examples of Flexure Members

2. Modes of Failure for Flexure Members:

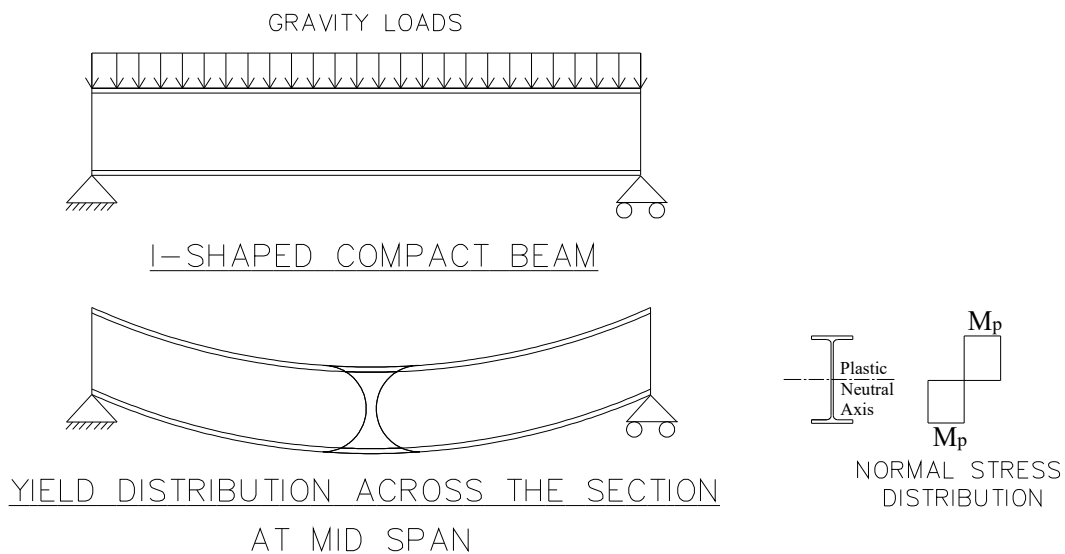
This section discusses modes of failure for members subject to flexure from a conceptual point of view without going through equations.

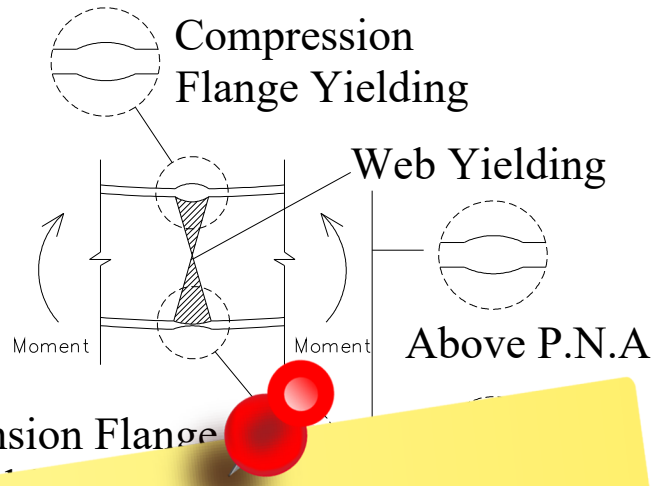
a. Section Yielding (Y):

This mode occurs when the required moment exceeds the plastic moment capacity of the beam.

This mode occurs only in beams with compact sections (compact web and compact flanges), at which all sections elements including webs and flanges are yielding and forming a plastic hinge at the most stressed part of the beam, such as midspan of the simple beam, subject to uniform distributed load.

Figure (03) shows the yielding failure of a compact beam; the yielding is distributed across the most stress section (at the mid-span) of the beam; therefore, all the section is subject to yield, including the tension flange, the compression flange, and the web.





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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b. Compression Flange Yielding (CFY):

This mode occurs when the flexural stress in the compression flange exceeds the plastic strength of the flange, without the occurrence of flange local buckling.

This mode does not depend on the compactness level of the compression flange.

Refer to figure (03) for the shape of compression flange yielding.

c. Tension Flange Yielding (TFY):

This mode occurs when the flexural stress in the tension flange exceeds the plastic strength of the flange, without the occurrence of flange local buckling.

This mode does not depend on the compactness level of the tension flange.

Refer to figure (03) for the shape of compression flange yielding.