

Cambering Steel Beams

DAVID T. RICKER

DEFINITIONS

A dictionary definition of the verb *camber* is: "to arch slightly, to bend or curve upward in the middle." The noun *camber* is defined as "the curve resulting from the camber process."

The noun *sweep* is defined as "a widely or gently curving line, form, or part." As applied to steel beams, it usually pertains to the gentle curve of a beam about its weaker axis. The term *camber* generally applies to the curve about the strong axis of the member. This paper deals primarily with camber.

The camber process as applied to steel beams can be expressed as: "the pre-deforming of a member so that, in a loaded state, it more nearly approximates its theoretical presumed shape."

TYPES OF CAMBER

Natural mill camber is the out-of-straightness remaining after the initial rolling, cooling, and straightening of the member at the mill. Tolerances for natural mill camber are listed in the *AISC Manual of Steel Construction*.¹

Induced camber is that which is applied subsequent to the initial rolling and straightening process. Induced cambering can be done at either the rolling mill or the fabricating shop. Tolerances for induced camber are also listed in the *AISC Manual of Steel Construction*.

THE CAMBER CURVE

The deflection curve for a horizontal uniformly loaded member of constant cross section theoretically approximates a parabola. However, since the sag ratio for beams, that is, the ratio of mid-ordinate to chord, is so small, it is generally accepted that adequate accuracy results if the camber curve is considered to be a segment of a circular curve. Some camber calculations are based on circular curves.

Camber is usually expressed in terms of the maximum ordinate at midspan. If it is desired to find the camber at other locations along the span, a handy method is shown in Fig. 1. Divide the span into an even number of equal segments as desired. This example shows eight equal segments. Number the points as shown starting with zero at

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the support. Multiply the points as shown to form a "factor fraction." If the centerline camber is, say, 1.5 in., the camber at the other points is found as follows:

Point #1 ordinate = $7/16 (1.5) = 0.65 \text{ in.} = 5/8 \text{ in.}$

Point #2 ordinate = $12/16 (1.5) = 1.125 \text{ in.} = 1 \text{ 1/8 in.}$

Point #3 ordinate = $15/16 (1.5) = 1.4 \text{ in.} = 1 \text{ 3/8 in.}$

The resulting camber curve is shown in Fig. 2. This method is especially useful for calculating the camber at truss panel points. If six segments were laid out, the factors would be as shown in Fig. 3.

The *AISC Manual of Steel Construction*, 8th ed., pages 2-130, gives various co-efficients for determining the centerline deflection for various load combinations. Once the deflections are determined, the desired amount of camber can be selected.

The selection of camber is often arbitrary. The methods of cambering are relatively crude, and the results are less than precise. There is little need nor justification in meticulous mathematical manipulation or methodical multifarious meditation when it comes to determining camber requirements.

METHODS OF CAMBERING

At one time, cambering was done at the rolling mills during the rolling process by means of adjusting (gagging) the rollers. Most mills are now reluctant to use this method. Instead they use presses and/or offset rollers and cambering (or straightening) is done subsequent to the shaping process.

The method most popular at this time is *cold* cambering utilizing brute force. Steel members can be purchased with the cambering performed at the mill, or the fabricator can order the straight beams and do the cambering in his own shop.

Beams can also be cambered by the application of heat at various points along their length. This will be discussed later on.

A combination of *heat and force* can be used to induce camber.



Figure 1

Cambering Steel Beams Aisc

Rachel Sandford



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Decoding **Cambering Steel Beams Aisc**: Revealing the Captivating Potential of Verbal Expression

In an era characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its power to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Cambering Steel Beams Aisc**," a mesmerizing literary creation penned by way of a celebrated wordsmith, readers attempt an enlightening odyssey, unraveling the intricate significance of language and its enduring affect our lives. In this appraisal, we shall explore the book is central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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