Truss Lateral Restraint

Purpose of this Bulletin

Trusses require lateral ***restraint*** to perform properly. This bulletin outlines the ***restraint*** options available and how they are referenced on the TrusSteel truss design drawings and associated documentation.

The following topics are important considerations regarding lateral ***restraint*** for trusses. These topics are expanded upon in this Technical Bulletin.

- Lateral ***restraint*** can be provided to truss members by ***structural panels***, ***purlins***, a ***bearing restraint***, or other means.
- At a minimum, each end of an individual ***chord segment*** must be laterally restrained.
- ***Purlins*** require some form of anchorage method so the ***restraint*** forces can be distributed to the buildings lateral force resisting system.
- Roof planes covered by ***structural panels*** are typically designed as diaphragms. Diaphragms transfer lateral forces imposed on the building, to other elements of the lateral force resisting system. One such lateral force a diaphragm resists and distributes is the truss member restraint forces.
- If the truss chord ***restraint*** condition is not explicitly stated on the truss design drawing, the assumption is that the member is restrained by ***structural panels.***
- In the absence of other means of ***restraint***, individual purlins must be placed at the start and end of each ***purlin zone***.

Important Documents

- **CFS BCSI, "Cold-Formed Steel Building Component Safety Information – Guide to Good Practice for Handling, Installing, Restraining & Bracing of Cold-Formed Steel Trusses", published by the Cold-Formed Steel Council (CFSC).**
- **TrusSteel Technical Bulletin TB98.07.17 "Truss Handling and Bracing"**
- **TrusSteel Technical Bulletin TB98.09.25 "Uplift Hardware with Attachment Criteria"**

Definitions

- ***Bearing Restraint*** – Trusses sit on bearings which provide vertical support. The bearings may also have the ability to provide lateral support. The trusses are attached to the bearing using various truss-to-bearing connections depending on the bearing support material. Refer to TrusSteel Technical Bulletin TB98.09.25 for more information regarding truss-to-bearing attachments. These attachments have the ability to resist uplift forces as well as lateral forces. These values are outlined on the individual detail. When a truss is attached to a bearing that can provide lateral support, the truss chord can be designed using that attachment point as lateral ***restraint***. Typically, exterior bearings are capable of providing lateral ***restraint***.
- ***Chord Segment*** – An individual section of a truss where the chord forms a single plane. This may be a top chord or a bottom chord and there may be several ***chord segments*** on a truss. At a minimum, each end of an individual ***chord segment*** must be laterally restrained. If properly attached sheathing is used along the entire chord ***segment***, this requirement is satisfied. If ***purlins*** are used, then a properly attached ***purlin*** must be attached to each end of the ***chord segment***.
- ***Purlin*** – This is one method of providing lateral ***restraint*** to a truss member. Typically, ***purlins*** are attached to a truss member in the form of a hat-channel, but can be of any structural shape. If ***purlins*** are used to laterally restrain a truss member, they will be placed perpendicular to the truss member and at specified spacing along the entire length of the member. For truss chords, there may be several ***purlins*** attached along the length. If lateral ***restraint*** is required on truss webs, there may be only one placed in the middle of the web or more than one equally spaced along the member. ***Purlins*** will require some form of anchorage method so the ***restraint*** forces can be distributed to the buildings lateral force resisting system. Refer to TrusSteel Technical Bulletin TB98.07.17 for more information.
- ***Purlin Zone*** – An individual section of a truss that has a specific ***purlin*** spacing.

- ***Restraint*** – The means of providing lateral support to a truss member that restricts the movement of the member out-of-plane of the truss.
- ***Structural Panels*** – Also known as "Sheathing". This is one method of providing lateral ***restraint*** to a truss member. Typically, ***structural panels*** are attached to the truss top chord in the form of structural steel deck or span-rated plywood, but could also be attached to any truss member, if appropriate. These sheathed roof planes are typically designed as diaphragms. Diaphragms transfer lateral forces imposed on the building to other elements of the lateral force resisting system. When properly attached, the ***structural panels*** also laterally restrain the truss member, and then transfer those ***restraint*** forces to the buildings lateral force resisting system.

Information

There are various ways that truss member lateral ***restraint*** assumptions are outlined on the truss design drawings. Items that offer lateral ***restraint*** are ***structural panels, purlins,*** and possibly bearings. It is important to state these assumptions on the drawings, because the truss members are designed using them. Depending on the number of chord segments and the difference of the restraint on each chord, there could be a simple note on the drawing, or there could be a table to outline the assumptions. Listed below are the different ways these ***restraint*** options could show up on the drawings.

- **Chord Restraint: Simple Note** – There will be a note on the truss design drawing stating the ***purlin*** spacing for the chord segments. This note will be displayed only when the ***restraint*** condition is straightforward. An example of this note is shown below:

  In lieu of rigid ceiling use purlins to brace BC @ 48" oc.

  This example represents a truss that has all the top chords restrained by ***structural panels*** and all the bottom chords (BC) restrained by ***purlins*** attached at 48" spacing along its length.
  NOTE: In this situation, the top chord ***restraint*** condition is not noted. If the condition is not explicitly stated, the assumption is that the member is restrained by ***structural panels.***

  Another example of a version of the note is shown below:

  In lieu of structural panels or rigid ceiling use purlins to brace all flat TC @ 48" oc, all BC @ 72" oc.

  This example represents a truss that has at least one flat top chord and that it may or may not have a sloping top chord. For this example, let's say the truss does have a sloping top chord. This note represents all the sloping top chords restrained by ***structural panels***, all the flat top chords (TC) restrained by ***purlins*** attached at 48" spacing along its length, and all the bottom chords (BC) restrained by ***purlins*** attached at 72" spacing along its length.
  NOTE: In this situation, the sloping top chord ***restraint*** condition is not noted. If the condition is not explicitly stated, the assumption is that the member is restrained by ***structural panels.***

- **Chord Restraint: Table** – A table will be shown on the truss design drawing when the ***restraint*** requirements for the chords are not as simple. Each truss ***chord segment*** and ***purlin zone*** will be represented in the table. This table will define the chord type associated with each method of lateral ***restraint***, the start and end location of the zone, and the type of ***restraint*** used for each zone. An example of this table is shown below:

Laterally Restrain Chords as follows:

Chord Type	*Start (ft)*	*End (ft)*	*Restraint*
Sloped TC	*0.00*	*20.00*	*Structural Panels*
Sloped TC	*20.00*	*40.00*	*Structural Panels*
BC	*0.00*	*10.00*	*Purlins at 72”*
BC	*10.00*	*30.00*	*Purlins at 48”*
BC	*30.00*	*40.00*	*Purlins at 72”*

NOTE: Unless restrained by a bearing or structural panels, a purlin is required at each end of all zones shown above.

This example represents a 40’0” truss that has the top chord (TC) restrained by ***structural panels*** and the bottom chord that has three ***purlin zones***. The first zone is from 0’0” to 10’0” and has the bottom chord (BC) restrained by ***purlins*** attached at 72” spacing. The second zone is from 10’0” to 30’0” and has the bottom chord (BC) restrained by ***purlins*** attached at 48” spacing. The third zone is from 30’0” to 40’0” and has the bottom chord (BC) restrained by ***purlins*** attached at 72” spacing.

The note under the table means that some form of ***restraint*** is required at each end of every zone listed. For this example, that means that a ***restraint*** must be provided at 0.00 feet, 10.00 feet, 30.00 feet, and 40.00 feet. As was mentioned earlier, exterior bearings are typically capable of providing lateral ***restraint,*** which satisfies the lateral ***restraint*** requirement at 0.00 feet and 40.00 feet. The locations at 10.00 feet and 30.00 feet can either be restrained by a ***bearing restraint*** or by a discrete ***purlin*** placed at those locations. For the discrete ***purlin*** condition, in addition to the ***purlins*** equally spaced within the zones, there would need to be a ***purlin*** located at 10’0” and 30’0”.

- **Chord Restraint: Bearing** – Truss chords can also be laterally restrained by a bearing that has been defined as being able to provide this ***restraint*** to the chord. This is called a ***bearing restraint***. In this case, the assumption is outlined under the reaction callouts on the truss design drawing. There could be other types of reactions called out on some trusses. An example of this callout is shown below:

R=2000#
U=780#
W=6”
H=8’
Restrained

R is the vertical gravity load reaction, U is the vertical uplift reaction from wind, W is the width of the bearing, H is the elevation of the bearing, and the term “Restrained” means the bearing provides lateral ***restraint*** to the chord at this location. The truss-to-bearing connection as well as the supporting structure shall be capable of providing this ***restraint*** in these situations.

- **Web Restraint** – Truss webs can be laterally restrained by ***purlins***. If a truss web requires a lateral ***restraint***, there will be a note on the truss design drawing. An example of the note is shown below:

(A) Continuous Lateral Restraint (CLR) equally spaced on member.

In this example, the symbol denoted as “(A)” will be shown next to the truss web at the proper location. The truss web will also have a ***purlin*** shown as a hat channel at that location.

Revisions

- **This bulletin was issued on 09/18/17**