

Sheridan | Architecture

# Office/Warehouse Structure

Structural Steel Framing

- a. Structural Steel – Hot rolled vs. Cold formed
- b. Steel members and elements
- c. Steel frame building components
- d. The Collins office/warehouse structure
- e. Steel terms

# Contents of this presentation

- Hot rolled steel is where you roll the steel at a very high temperature – more than 900° C (the steel bar goes through rollers which press and shape the bar).
- Hot rolled steel does not have very sharp corners, and is less accurate than cold formed steel. But it is cheaper.
- The link below shows a good explanation of this process:
- [https://www.youtube.com/watch?v=6xnKmt\\_gsLs](https://www.youtube.com/watch?v=6xnKmt_gsLs)

## Structural Steel – Hot rolled

- Many steel shapes are hot rolled, such as L angle shapes, C channels, and I beams.
- These steel shapes can be found in the CISC (Canadian Institute of Steel Construction) handbook.

# Structural Steel – Hot rolled

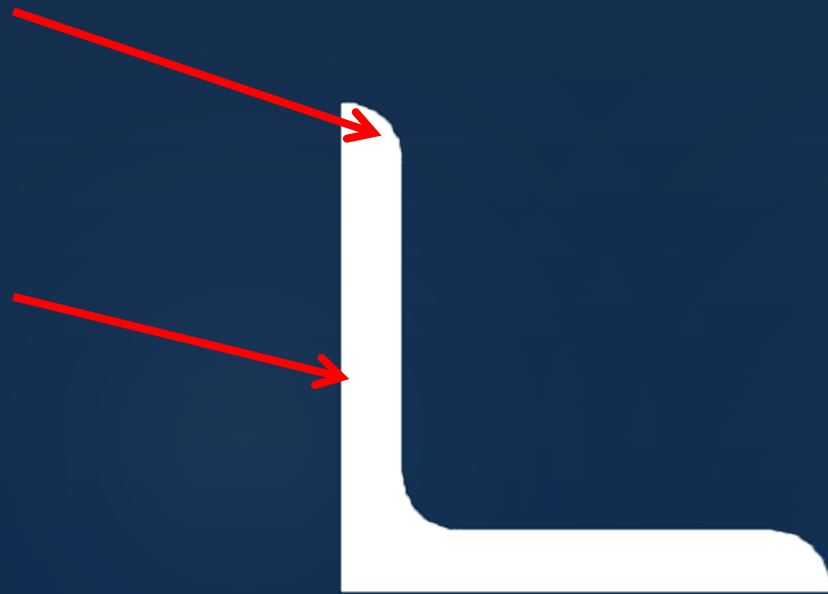
- Cold formed (or Cold rolled) steel is when you take a hot rolled steel member such as a plate or a bar and form it further.
- The steel is heated, then allowed to cool to room temperature, and then rolled into shape.
- This is more expensive, but produces more accurate and more smooth steel members.
- Samples of cold rolled steel are steel decks and steel bars.

# Structural Steel – Cold formed

- A good comparison of hot rolled vs. cold rolled steel is shown below:

Edges rounded

Surface dull and a little rough

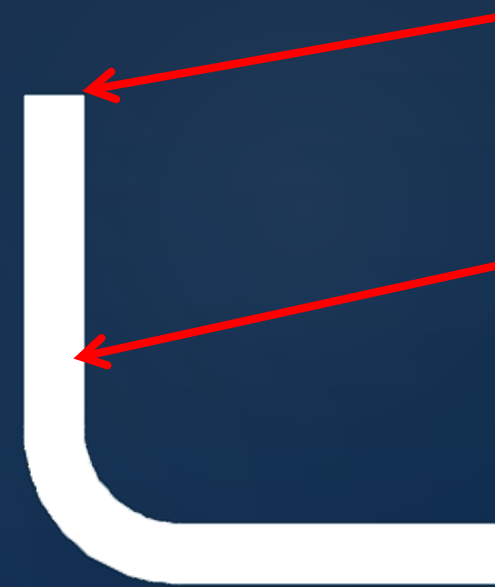


Hot rolled angle  
(standard L shape)

Sharp edges

Surface very smooth – feels oily

More expensive



Cold rolled angle

## Structural Steel – Hot rolled vs. Cold formed

## W shapes



- The most common steel members are welded wide flange shapes.
- These are two steel plates (called flanges) at the top and bottom, with another steel plate (called the web) in between.
- They are named something like W250x33,
- Where W is the shape, 250 is the depth (height of beam), and 33 is the linear weight in kg/m.

# Steel Members





## C channels

- This is a hot rolled steel member.
- It is named something like C200x21,
- Where C is the shape, 200 is the depth (height of beam), and 21 is the linear weight in kg/m.

# Steel Members



HSS (hollow steel sections)

- Made from a cold formed steel plate.
- It is named something like HSS127x127x6.35,
- Where HSS is the shape, 127x127 is the cross section size and 6.35 is the plate thickness.

# Steel Members



## Steel angles

- This is a hot rolled steel member.
- It is named something like L50x50x6,
- Where L is the shape, 50x50 is the cross section width and depth, and 6 is the plate thickness.

# Steel Members

## Open web steel joists (OWSJ)

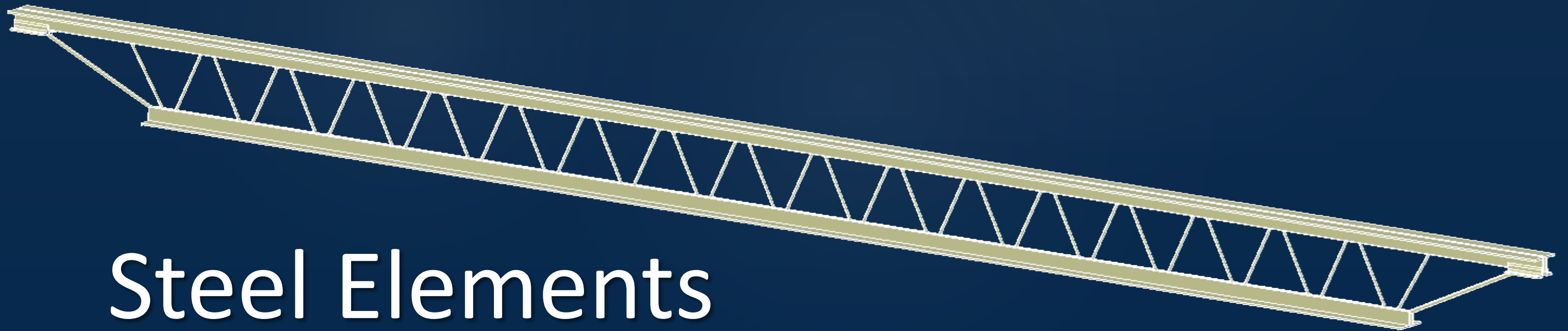
- made of a top chord and a bottom chord that are usually parallel to each other.
- The chords are held apart by an open web which could be made of rods or L angle members.



# Steel Elements

## Open web steel joists (OWSJ)

- A small support is welded at either end – this is called the joist shoe.
- The shoe is most commonly 65mm in height; for larger spans it may be double (130mm) and it may be 100 or 200mm.
- The shoe size will be important later when the structure will be designed and assembled.



# Steel Elements

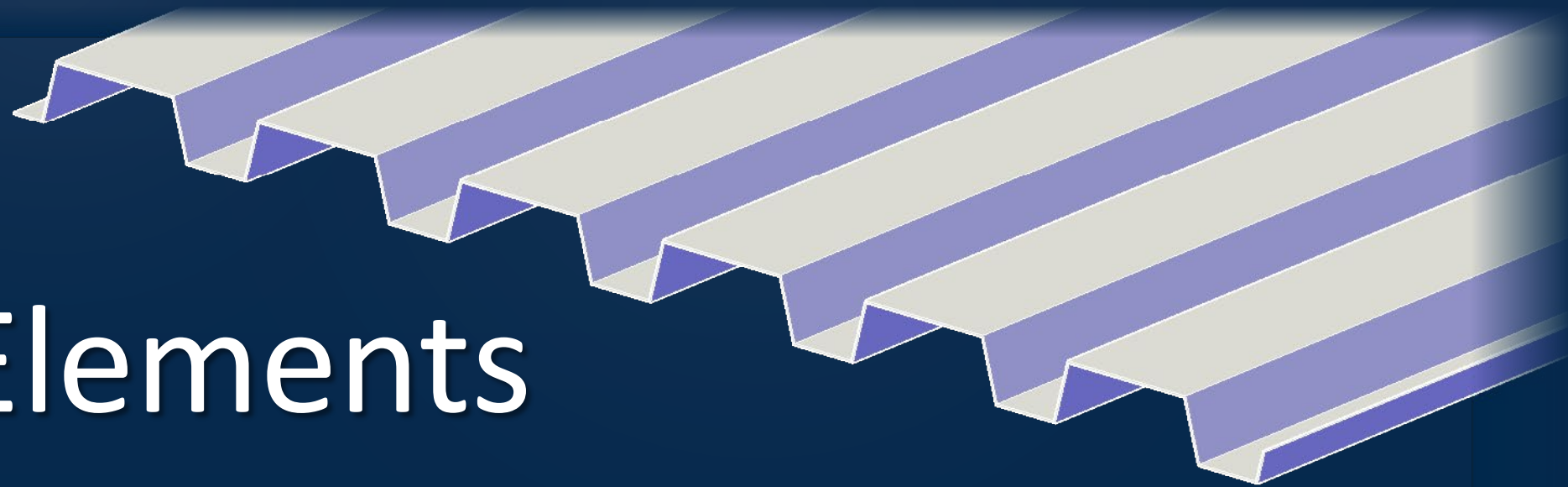
- Open web steel joists (OWSJ) are very light in weight compared to other steel members but properly used are very efficient and economical.
- Their main function is to carry vertical loads.



# Steel Elements

## Steel decks

- Steel decks are cold formed corrugated sheet metal that is used as a support layer for a floor or a roof.
- For example, you can pour a layer of concrete on top to form a floor.
- Or add insulation, a roof membrane etc. to create a roof.



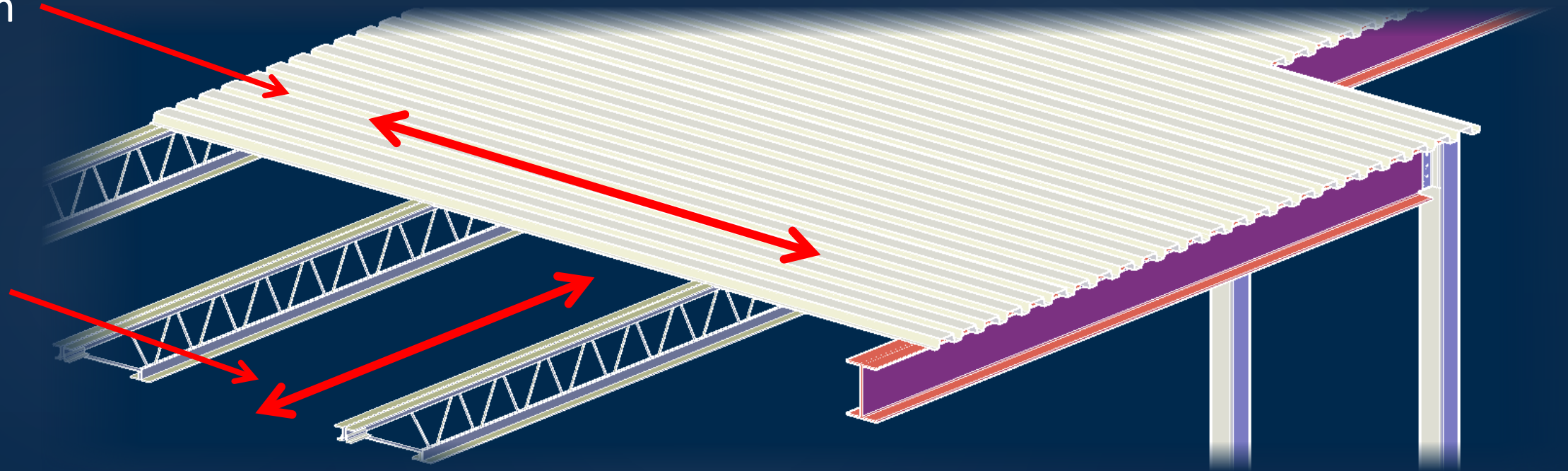
# Steel Elements

## Steel decks

- Steel decks are always placed as perpendicular as possible to the supporting members underneath.

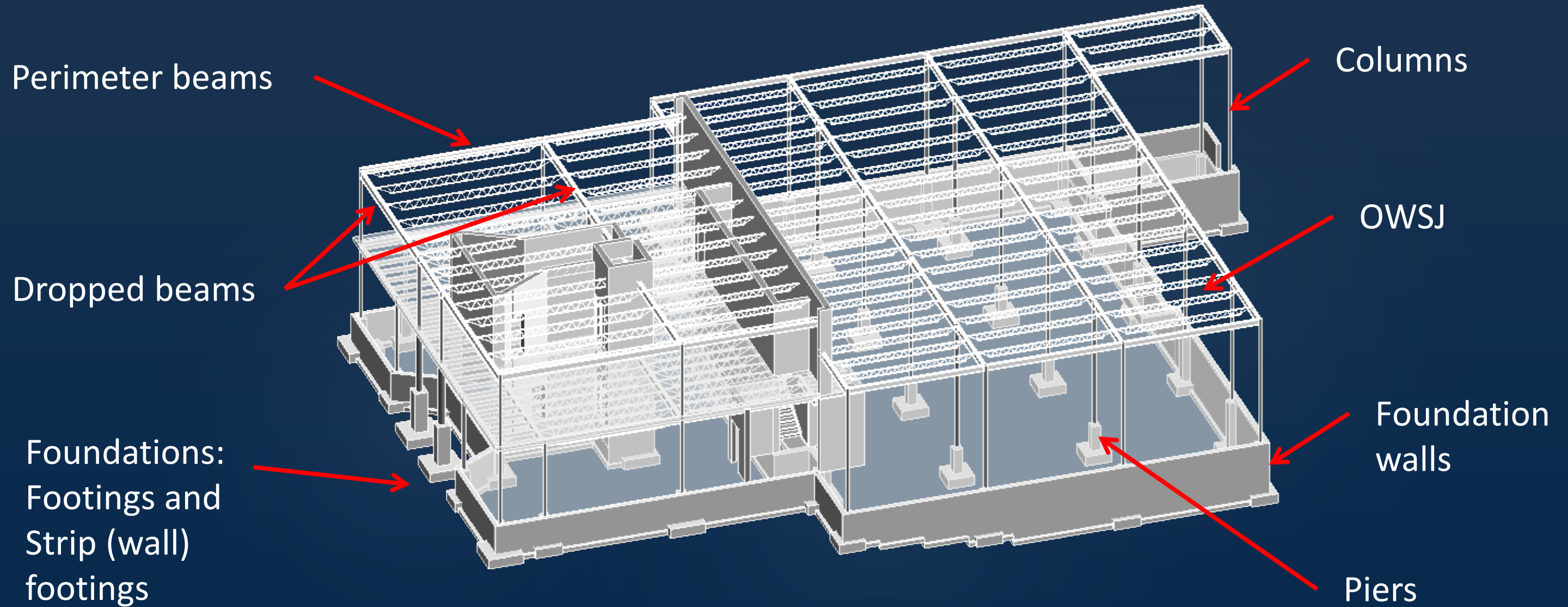
Deck span direction

OWSJ and beam  
direction



# Steel Elements

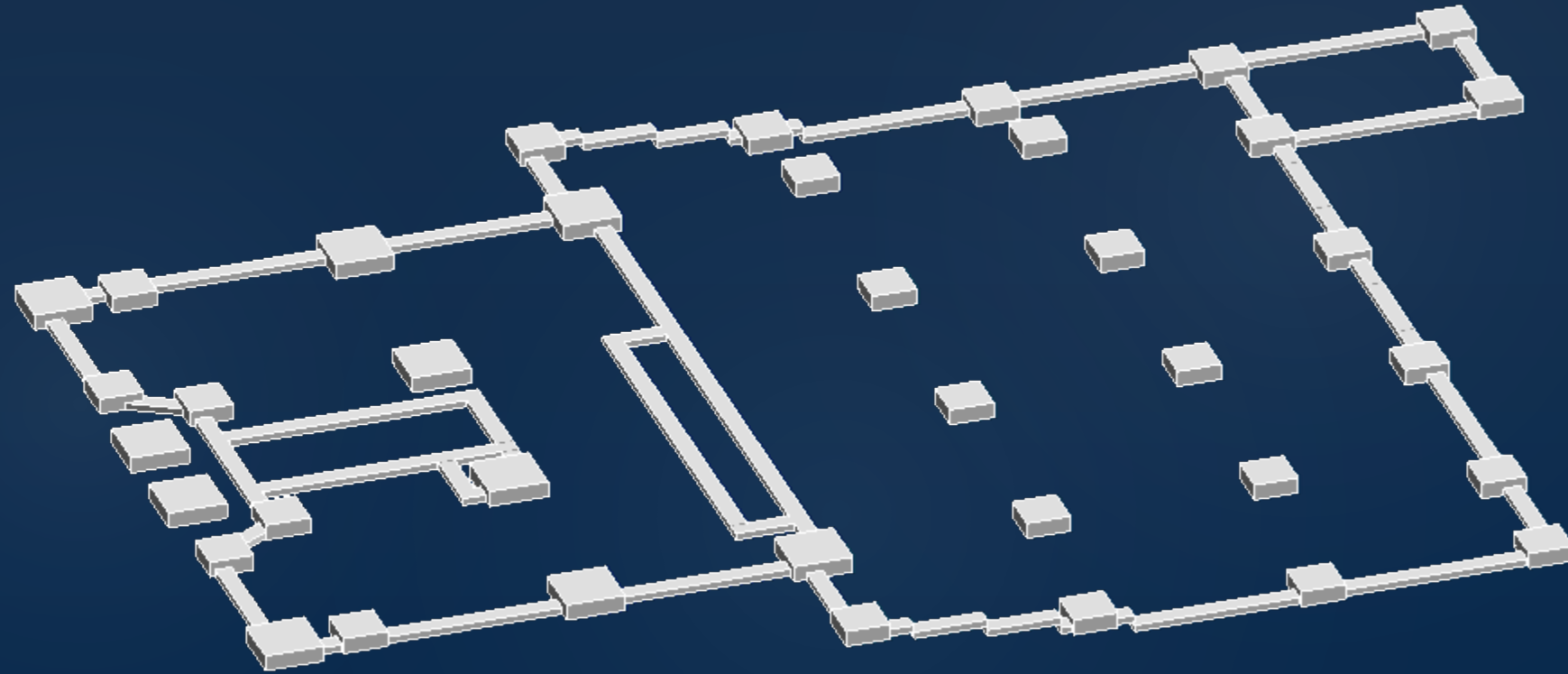




# Steel frame building components

Foundation:

Excavate and pour  
foundations.

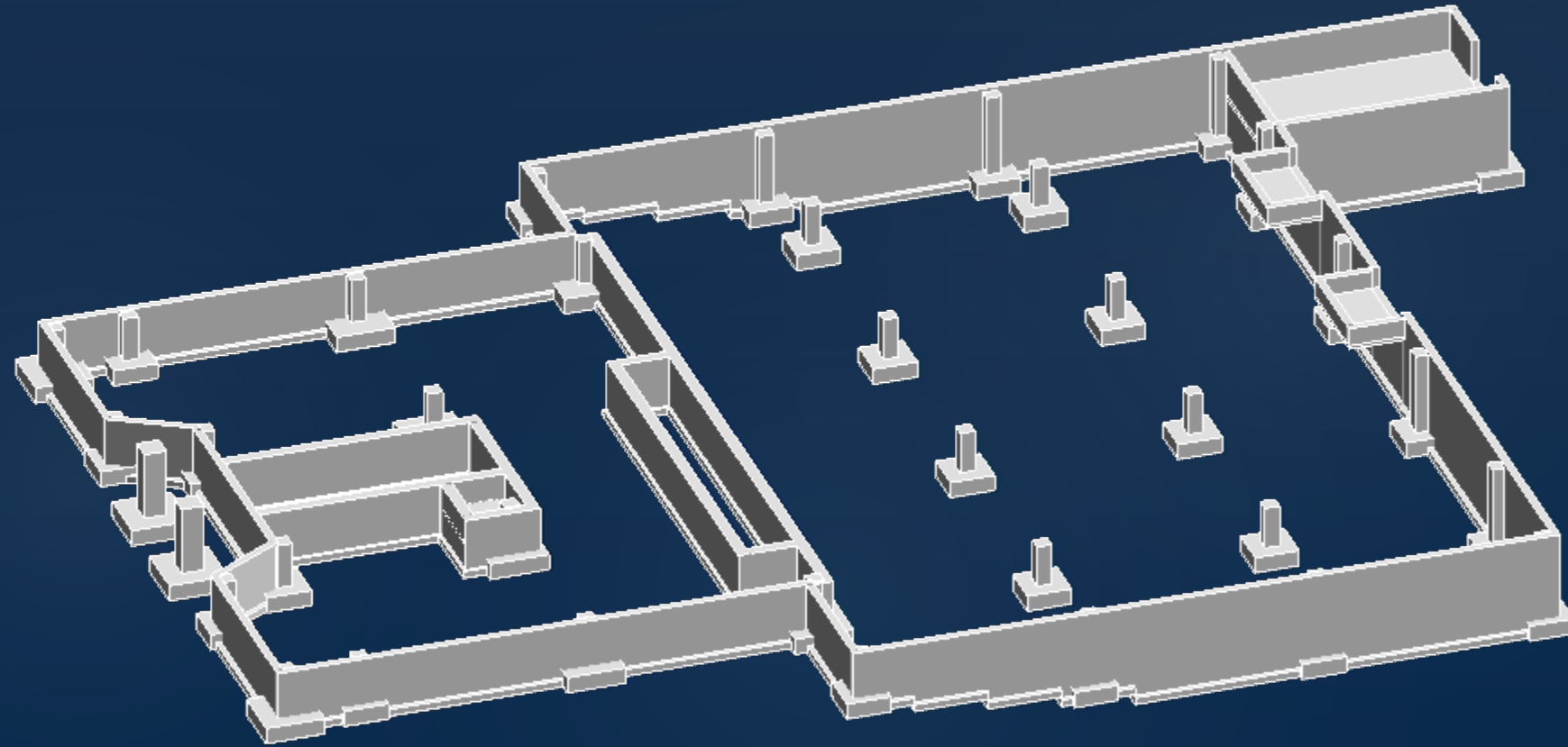


# The Collins office/warehouse structure

Foundation:

Add foundation walls.

Add backfill.

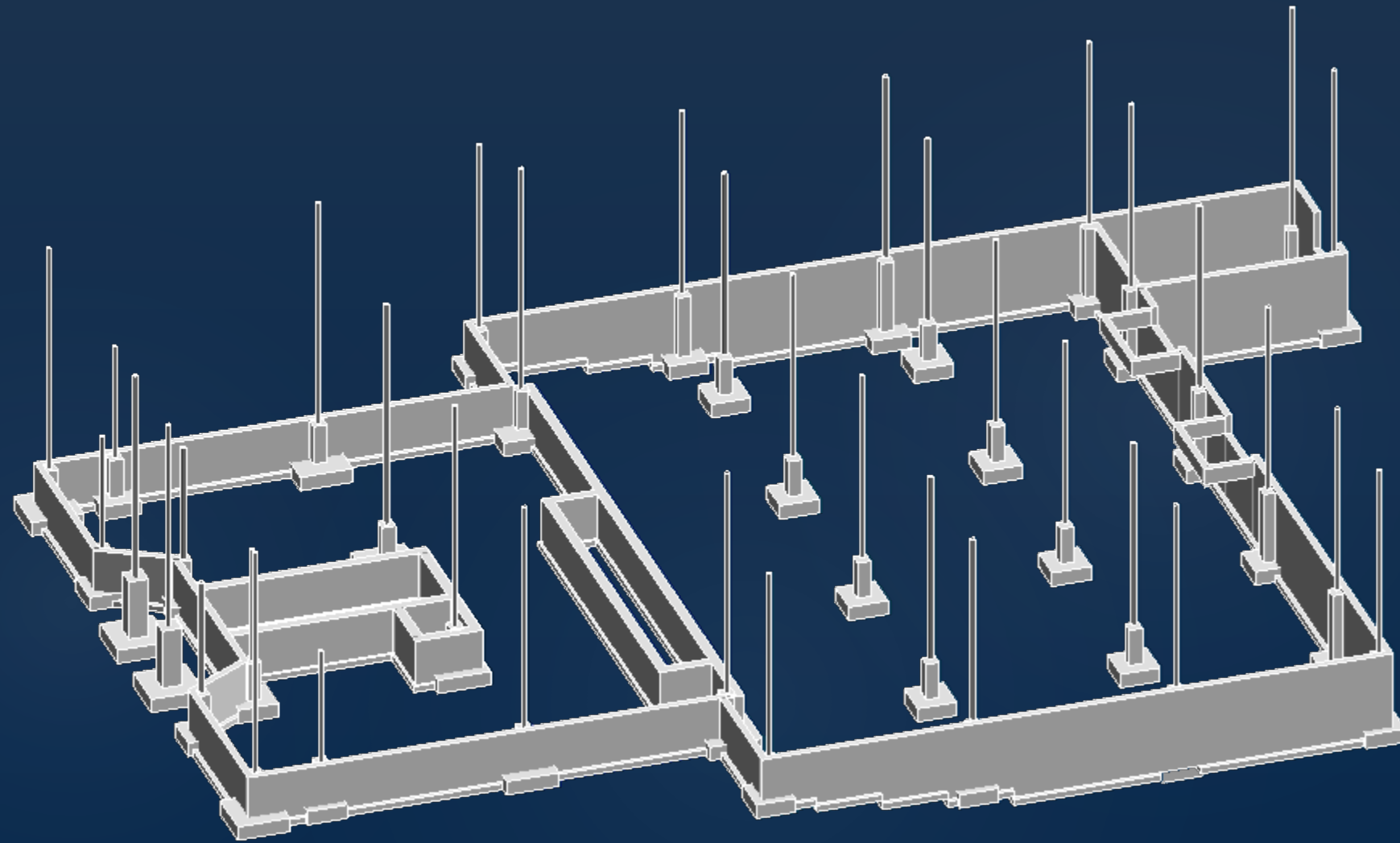


# The Collins office/warehouse structure

Steel:

Erect the columns.

Hold the base plate  
down with nuts on  
anchor bolts.

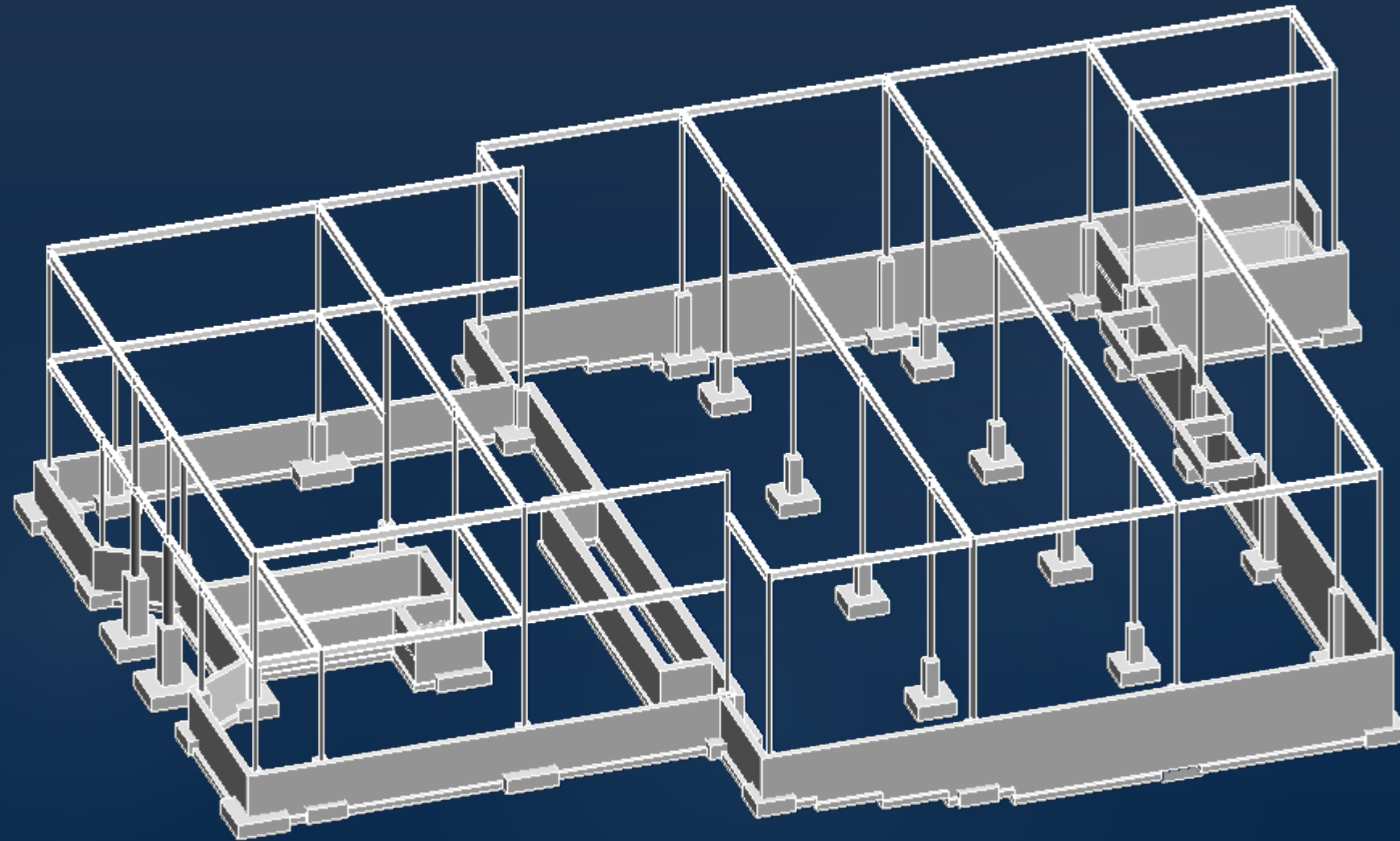


# The Collins office/warehouse structure

Steel:

Add the beams.

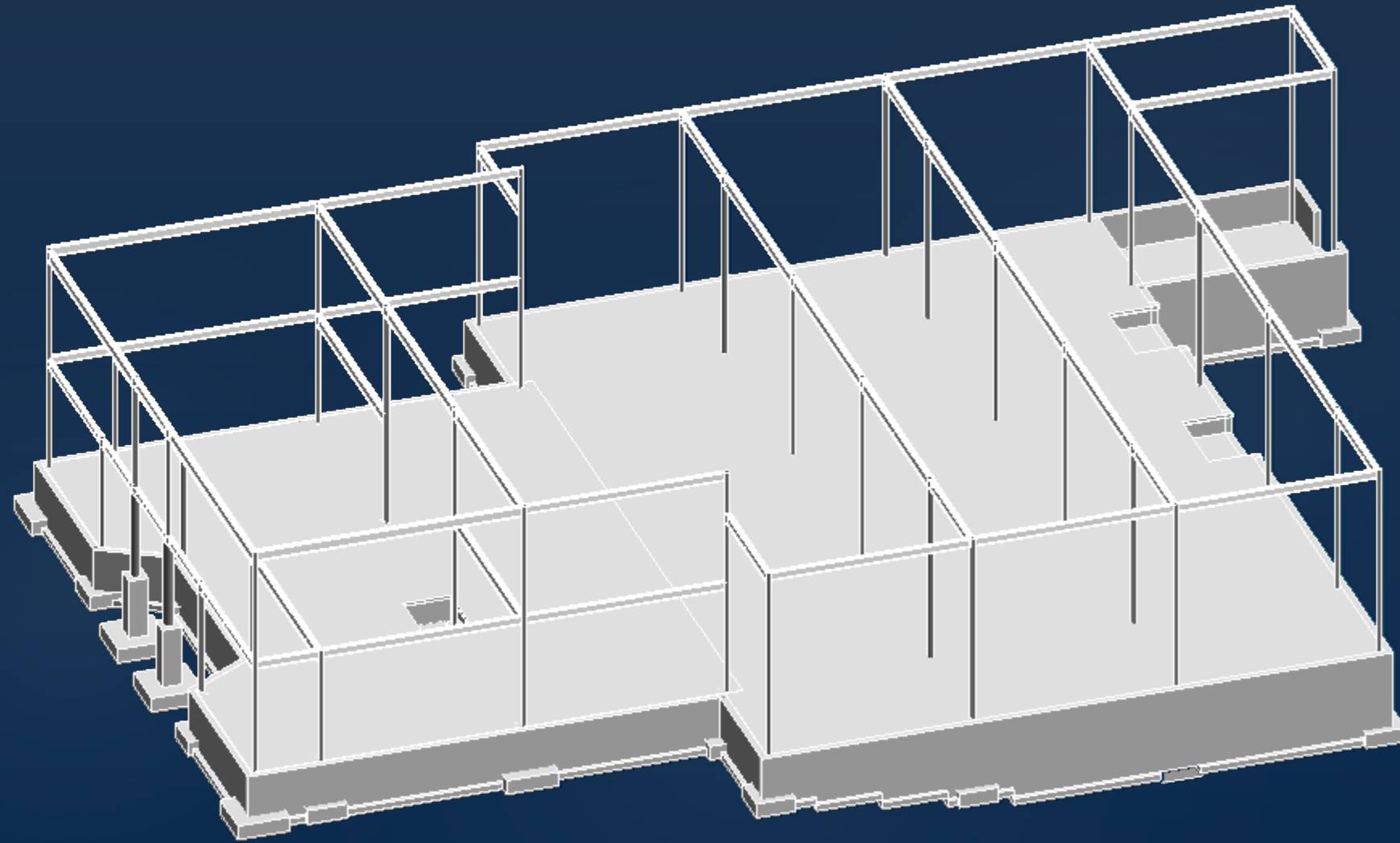
Add bracing between  
columns (not shown)



# The Collins office/warehouse structure

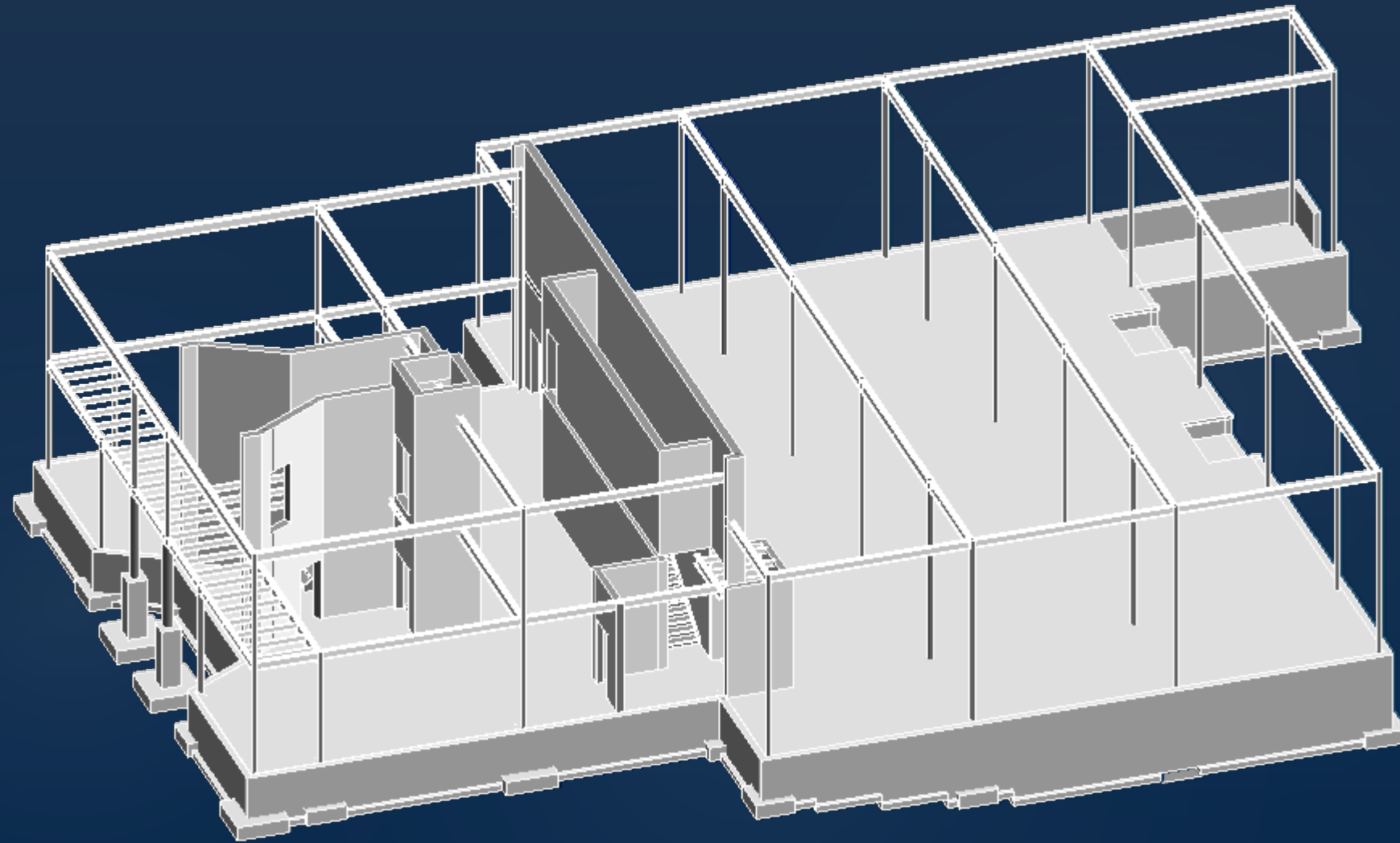
Floor:

Pour the slab on grade.



# The Collins office/warehouse structure

Walls:  
Add the walls.

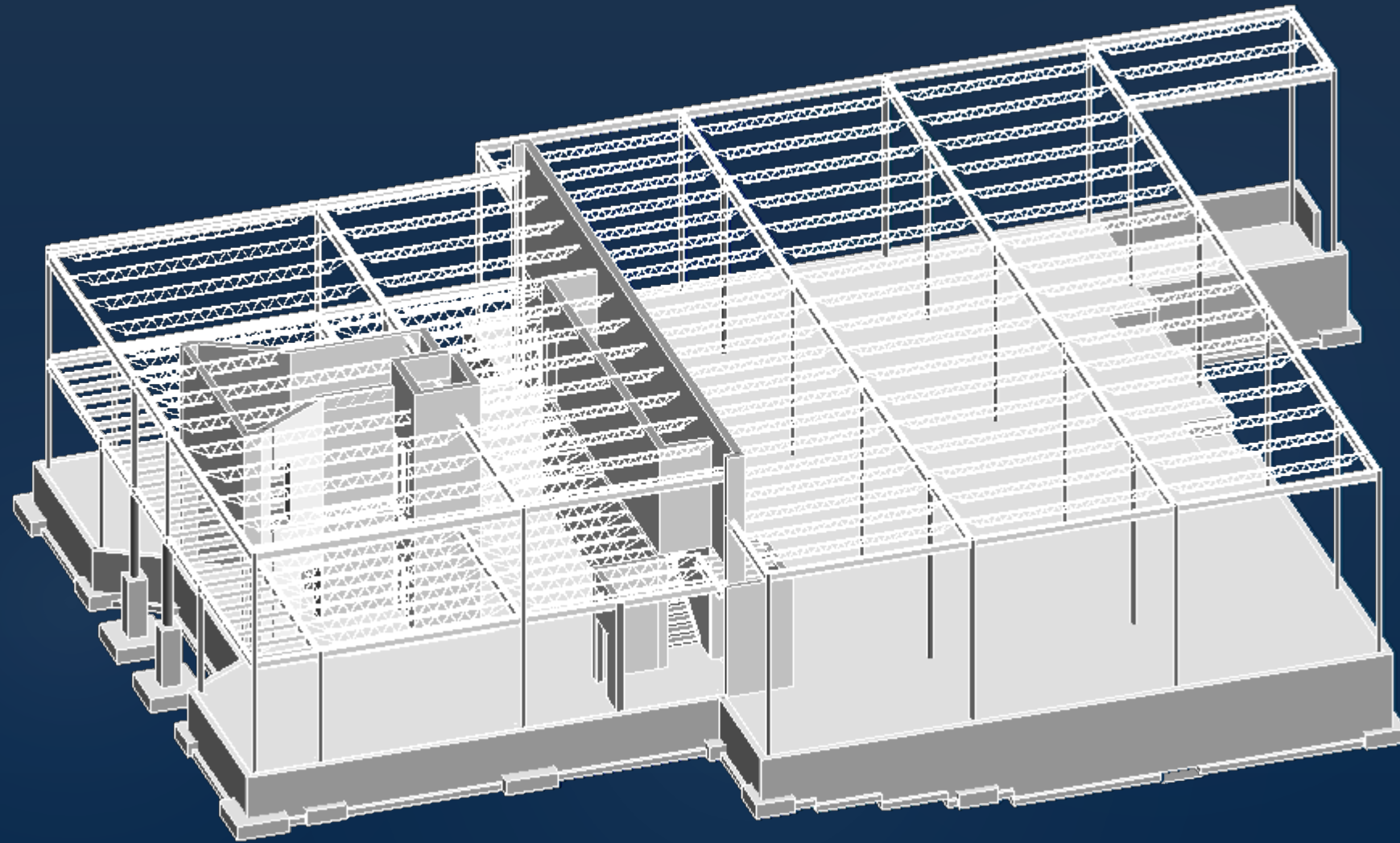


# The Collins office/warehouse structure

Steel:

Add open web steel joists.

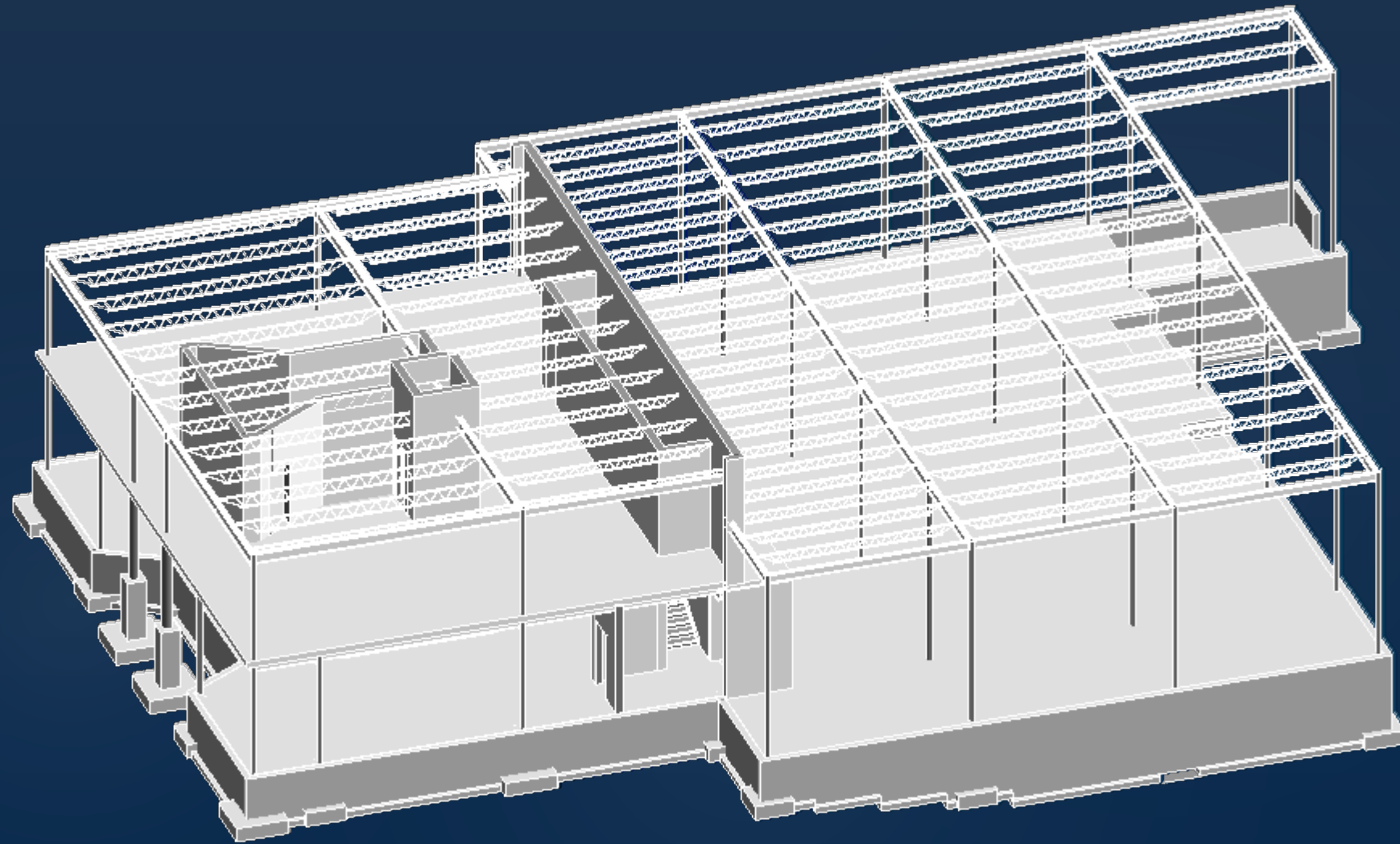
Add bridging between joists (not shown)



# The Collins office/warehouse structure



Floor:  
Pour the second floor  
concrete.



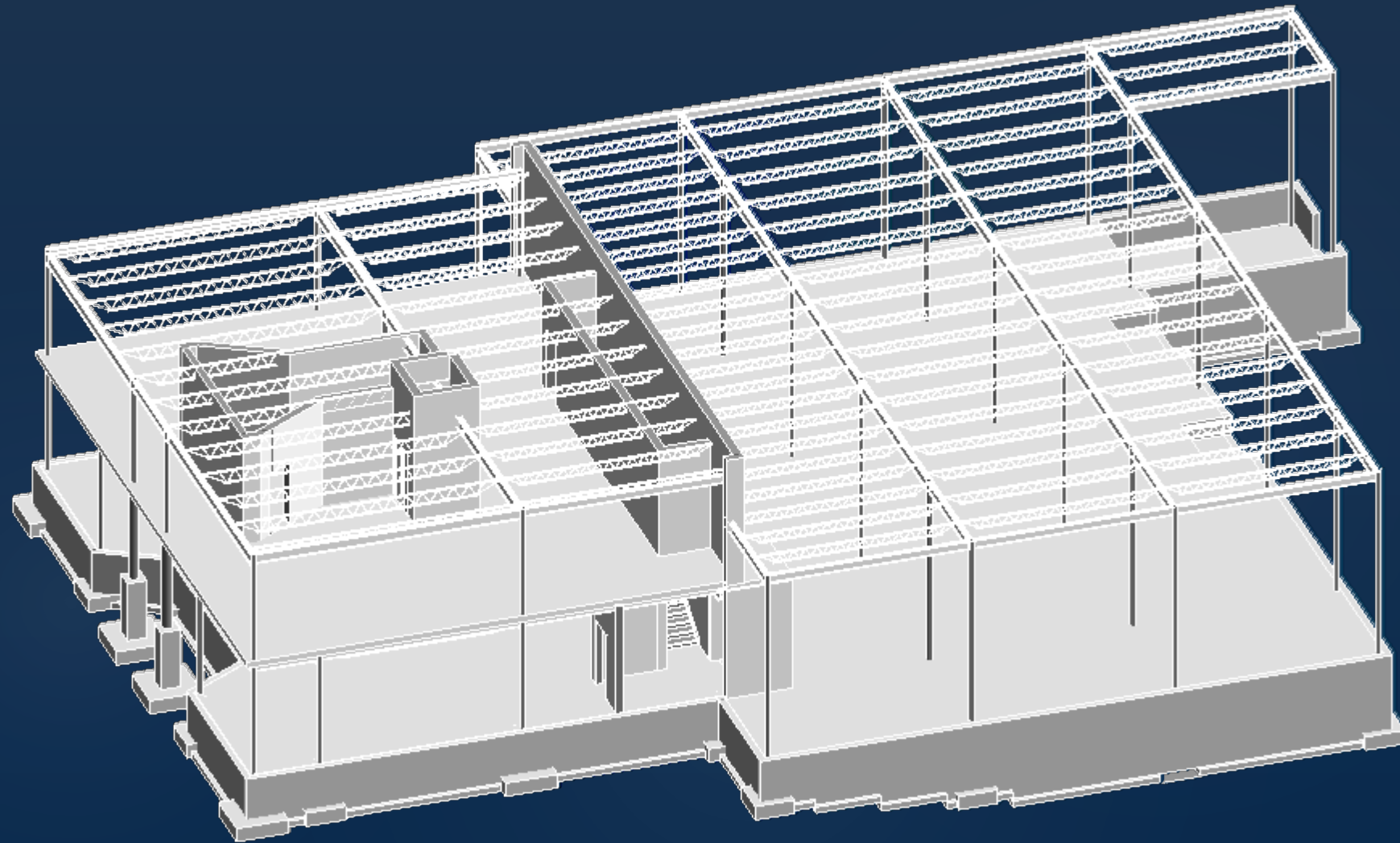
# The Collins office/warehouse structure

Misc Steel:

Add any miscellaneous steel, including the perimeter angle.

Add deck (not shown).

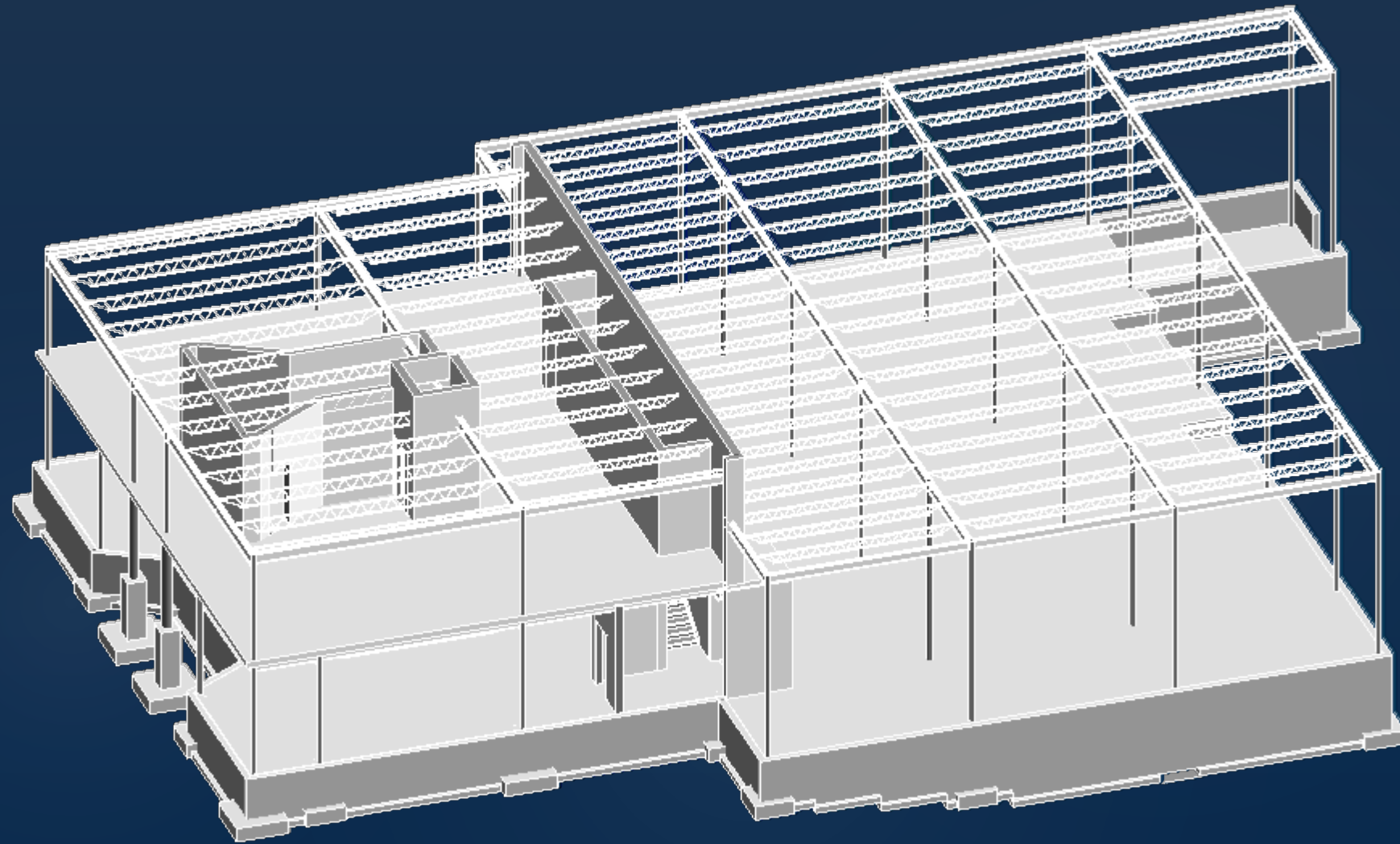
Structure is complete.



# The Collins office/warehouse structure

Add outer cladding:  
EIFS in office,  
Precast walls in  
warehouse  
(not shown).

Finish building.



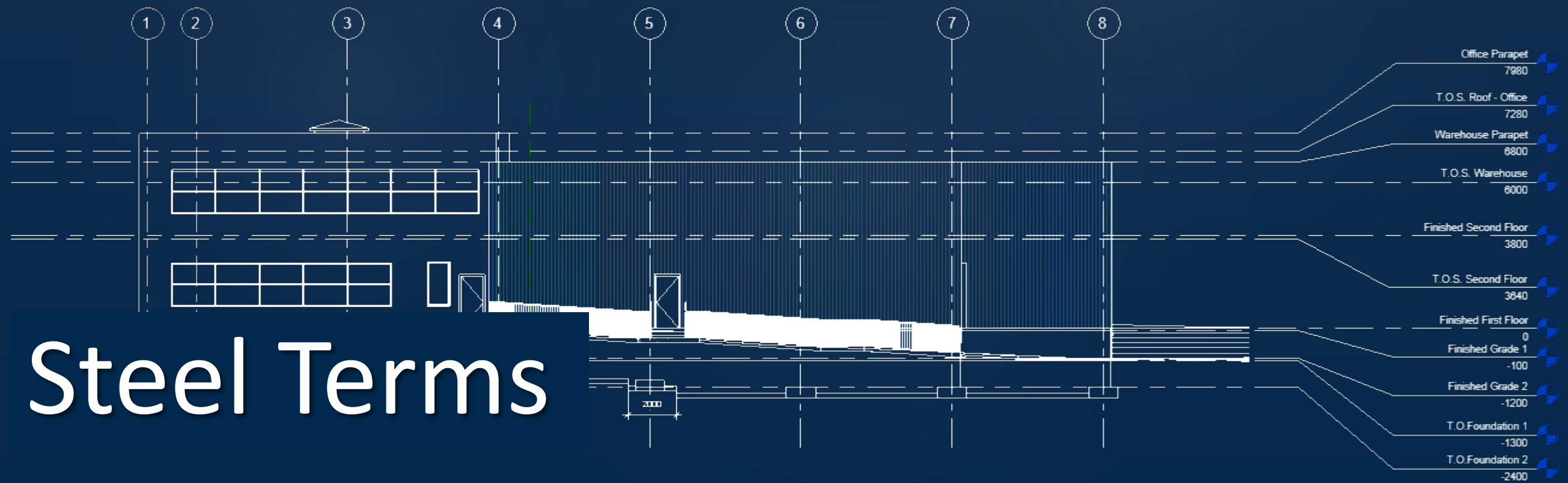
# The Collins office/warehouse structure

T.O.S.:

Top of Steel is the elevation (height) datum for the top of the joists (under the steel deck). This will appear in many sections and elevations.

In the Collins project, there are three T.O.S. levels:

T.O.S. Office, T.O.S. Warehouse, and T.O.S second floor.



Dropped beam:

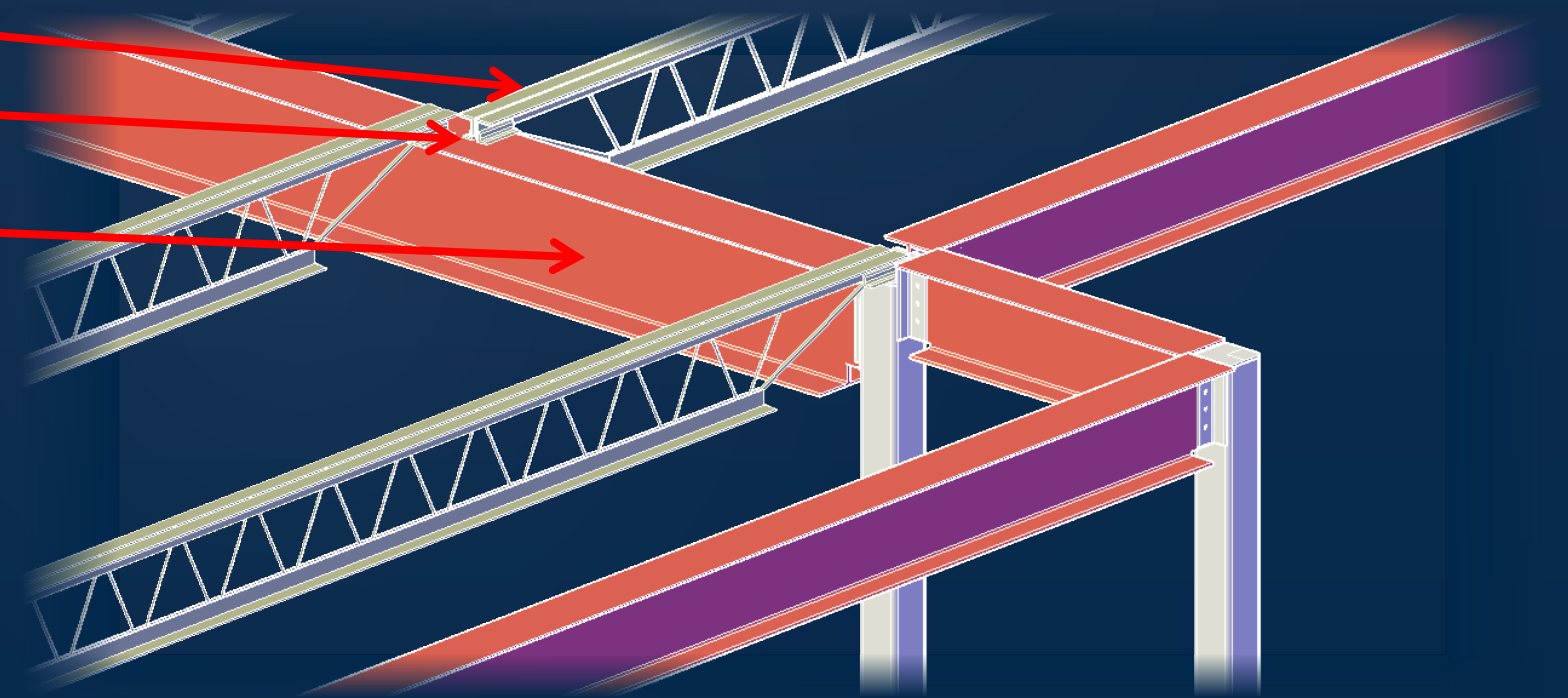
A term for a beam which has been lowered from T.O.S., usually to make room for the OWSJ shoe.

Normally beams that are not dropped are labeled with a (0).

T.O.S. Level

OWSJ Shoe

Dropped beam (lower than T.O.S. by 65 mm, the height of the joist shoe).



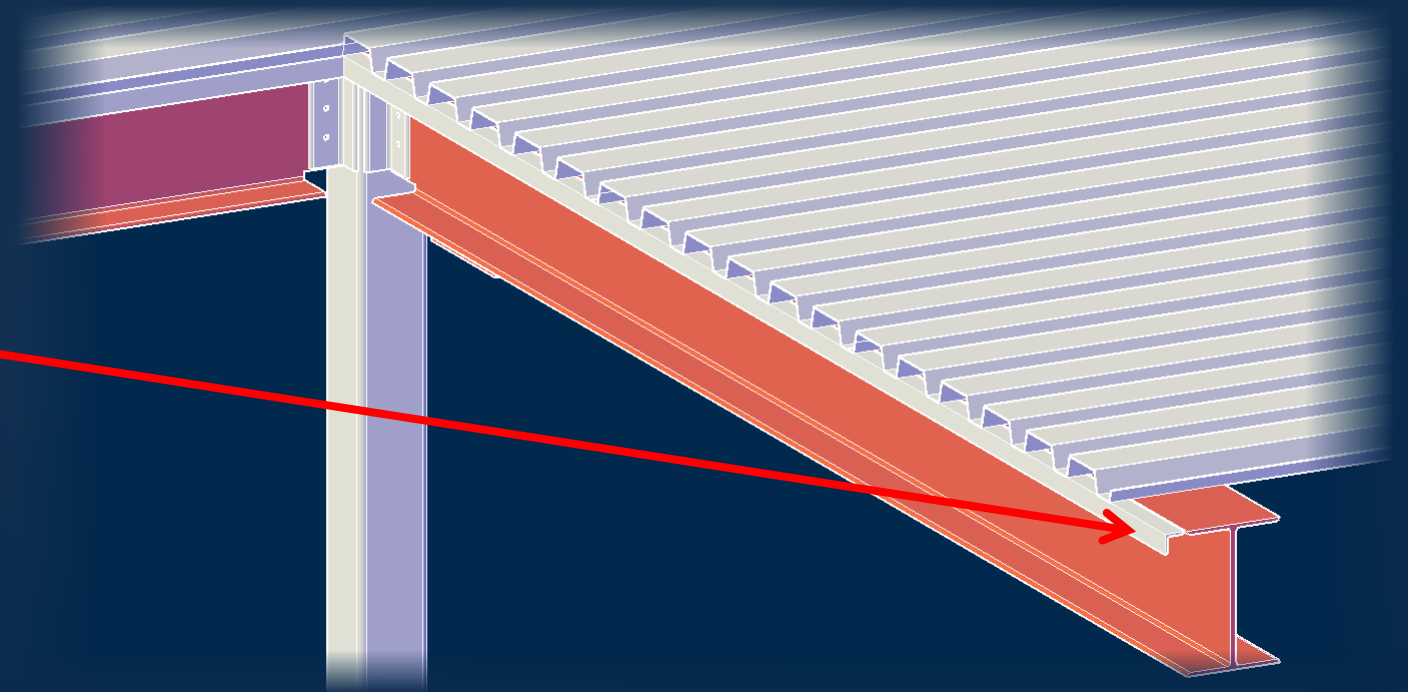
# Steel Terms

Perimeter steel:

A steel angle that runs along the inner side of the walls.

Its function is to support the edges of the steel deck.

Perimeter steel



# Steel Terms

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Creative