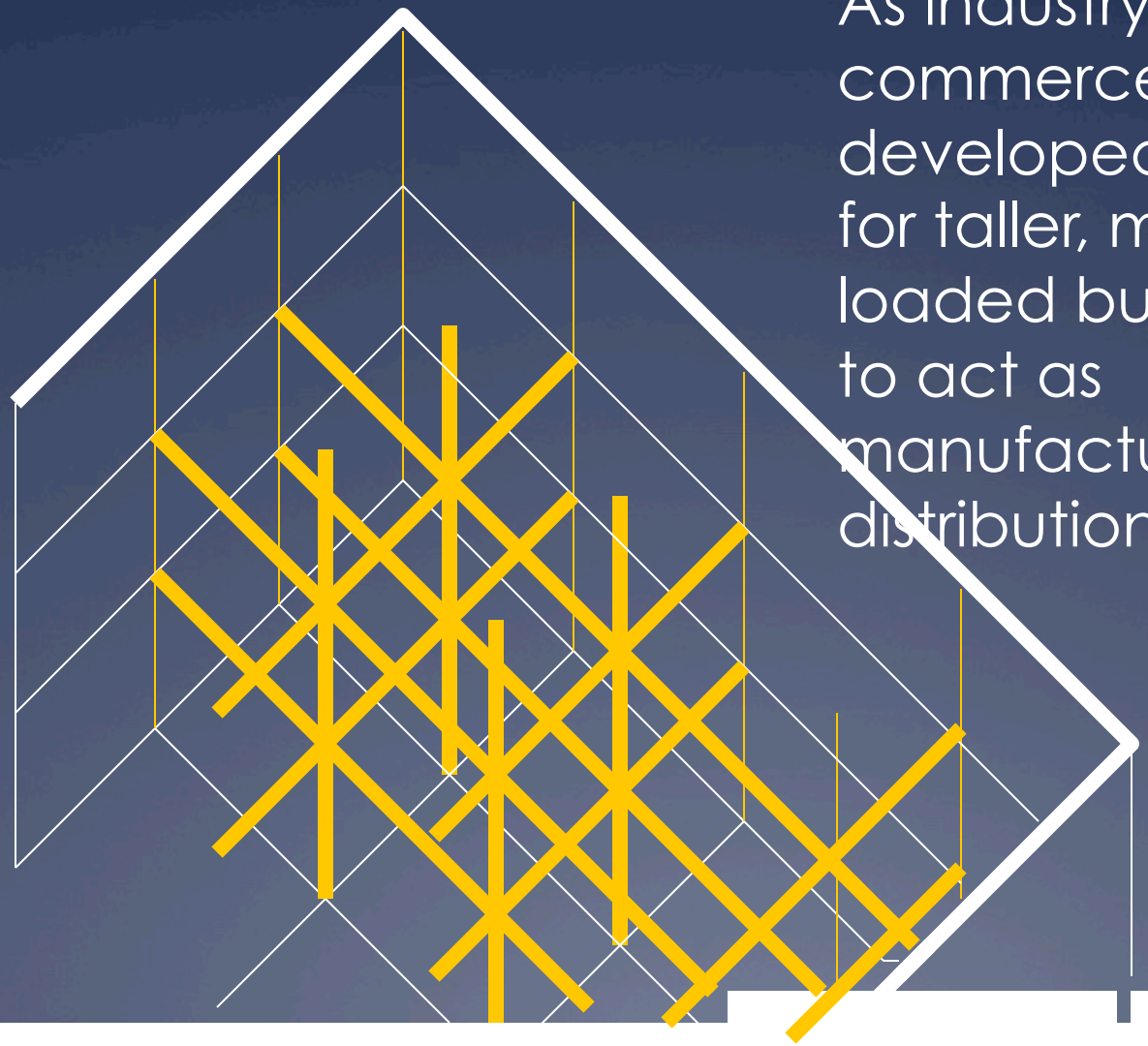
...an architect's vision

Butler Brothers Warehouse
Minneapolis Minnesota 1974
Arvid Elness

Ready for demolition

Mill Construction

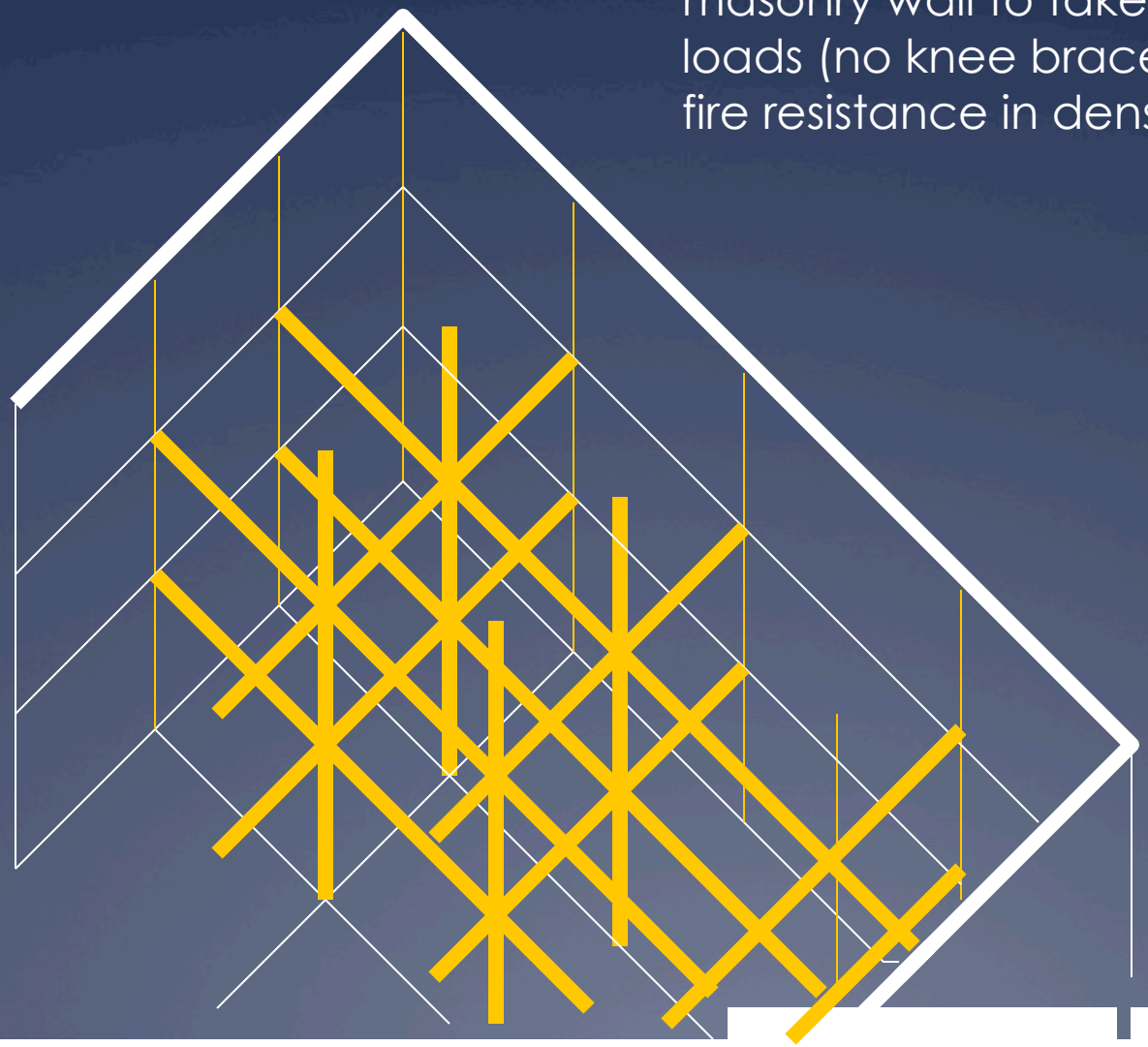


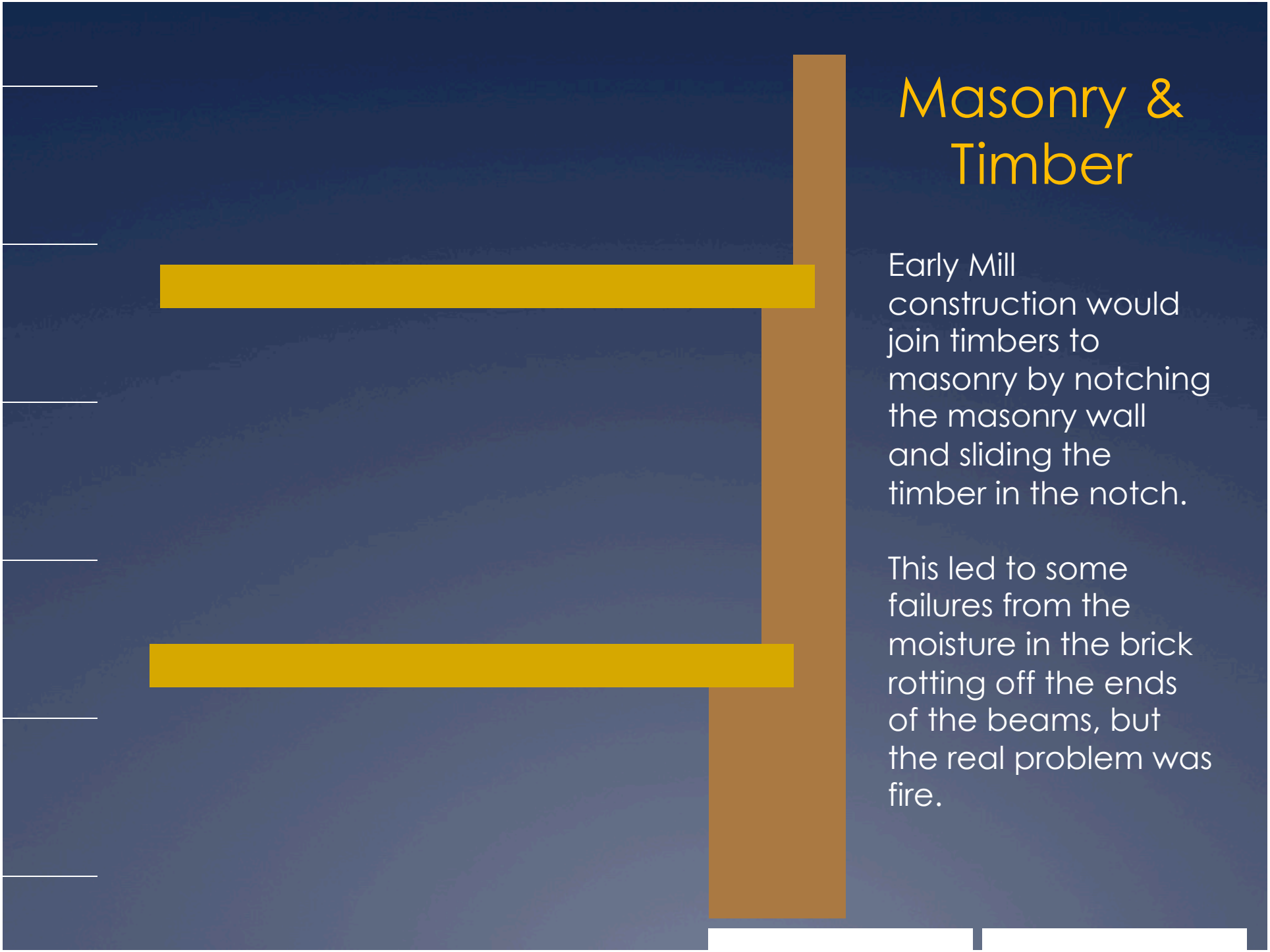
As industry and commerce developed, the need for taller, more heavily loaded buildings arose to act as manufacturing and distribution centers.

Masonry & Timber

Mill construction developed to overcome the limits in traditional timber frame joints and labor skill

Mill construction used a heavy masonry wall to take all the wind loads (no knee braces) and improve fire resistance in dense city settings.



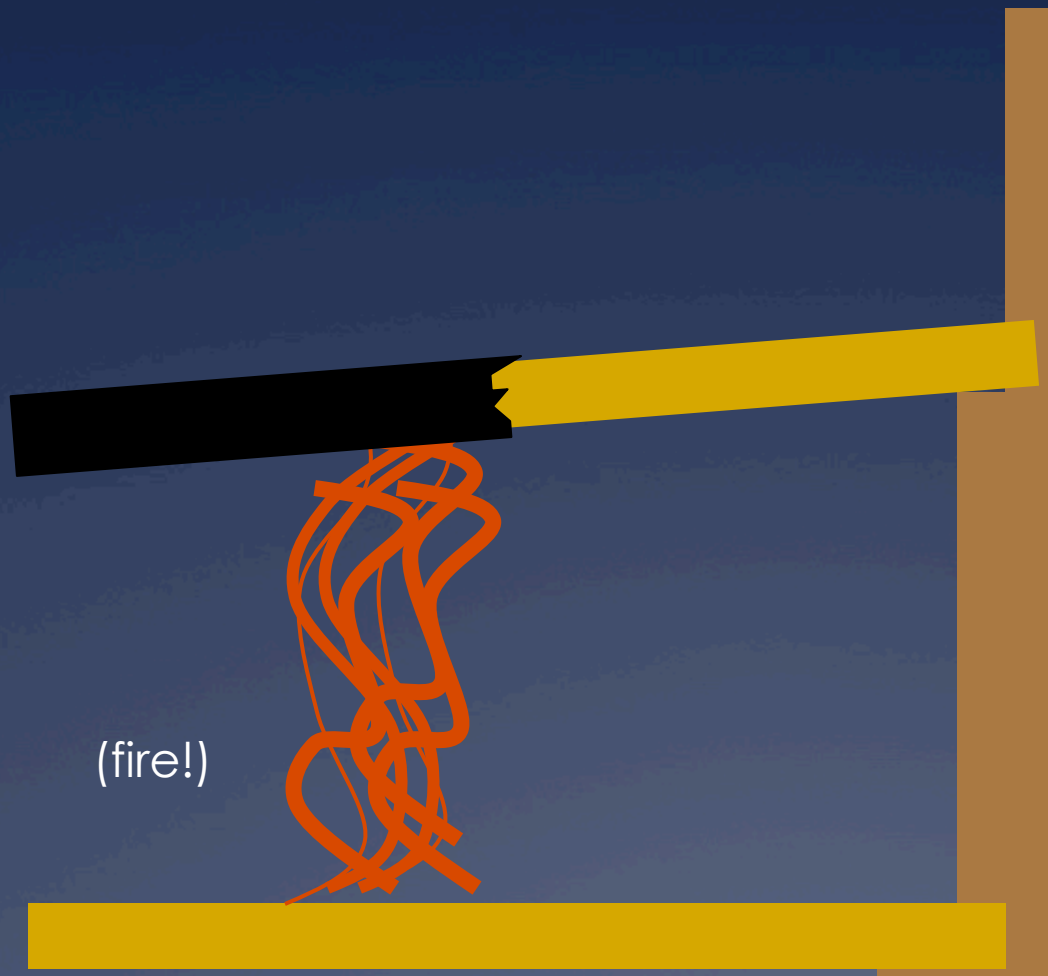


Masonry & Timber

Early Mill construction would join timbers to masonry by notching the masonry wall and sliding the timber in the notch.

This led to some failures from the moisture in the brick rotting off the ends of the beams, but the real problem was fire.

Timber, Masonry & Fire

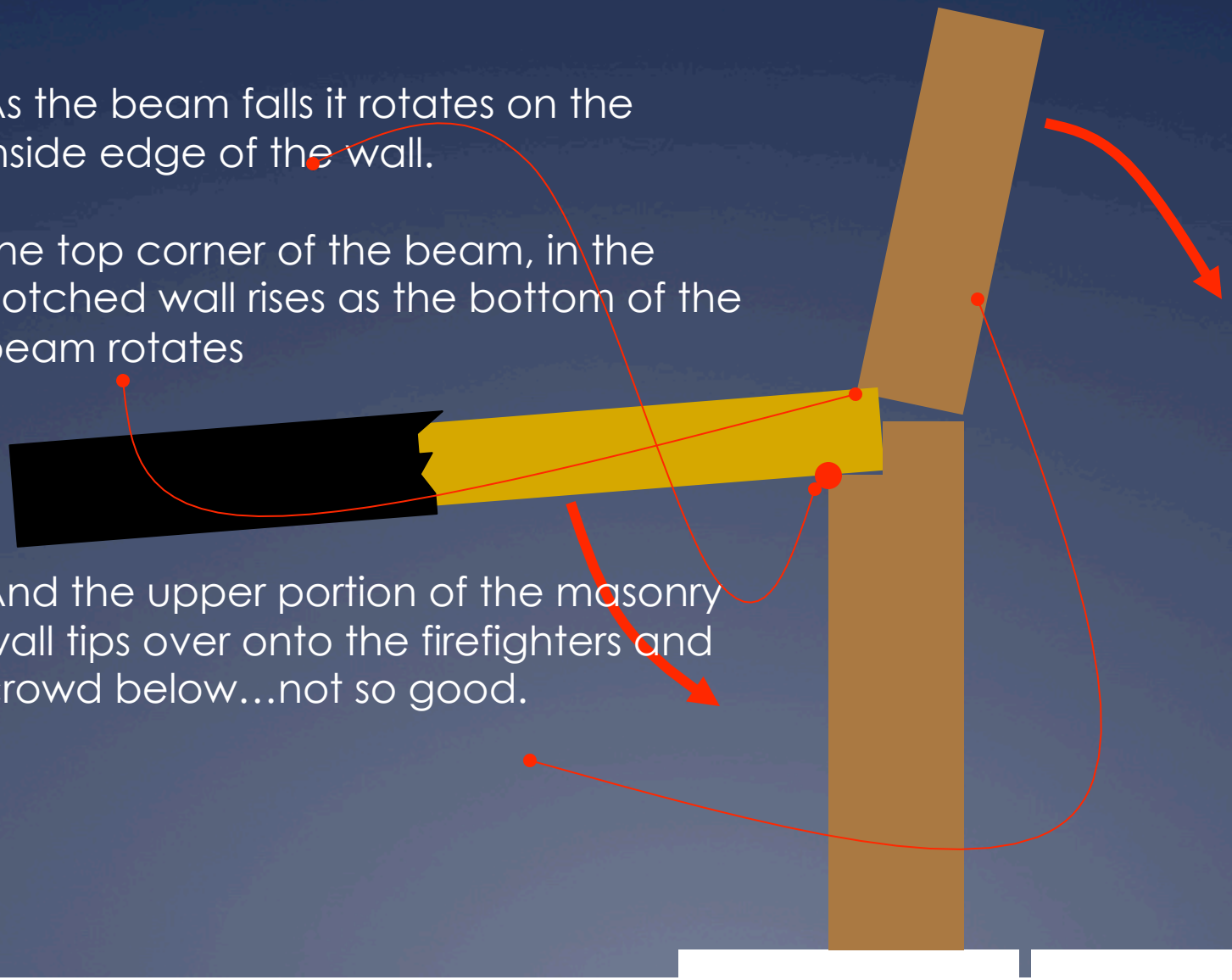


When the fire burned through the beam above, the beam would start to fall

Wood tips over wall

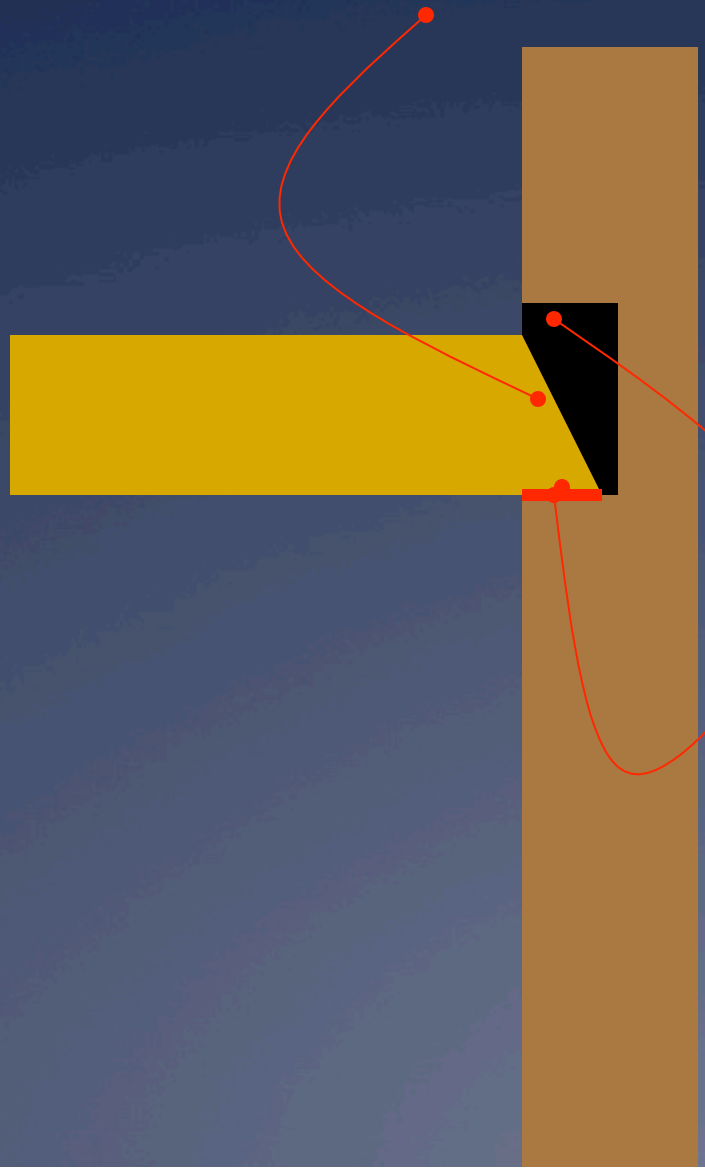
As the beam falls it rotates on the inside edge of the wall.

The top corner of the beam, in the notched wall rises as the bottom of the beam rotates



And the upper portion of the masonry wall tips over onto the firefighters and crowd below…not so good.

Firecut to prevent wall failure



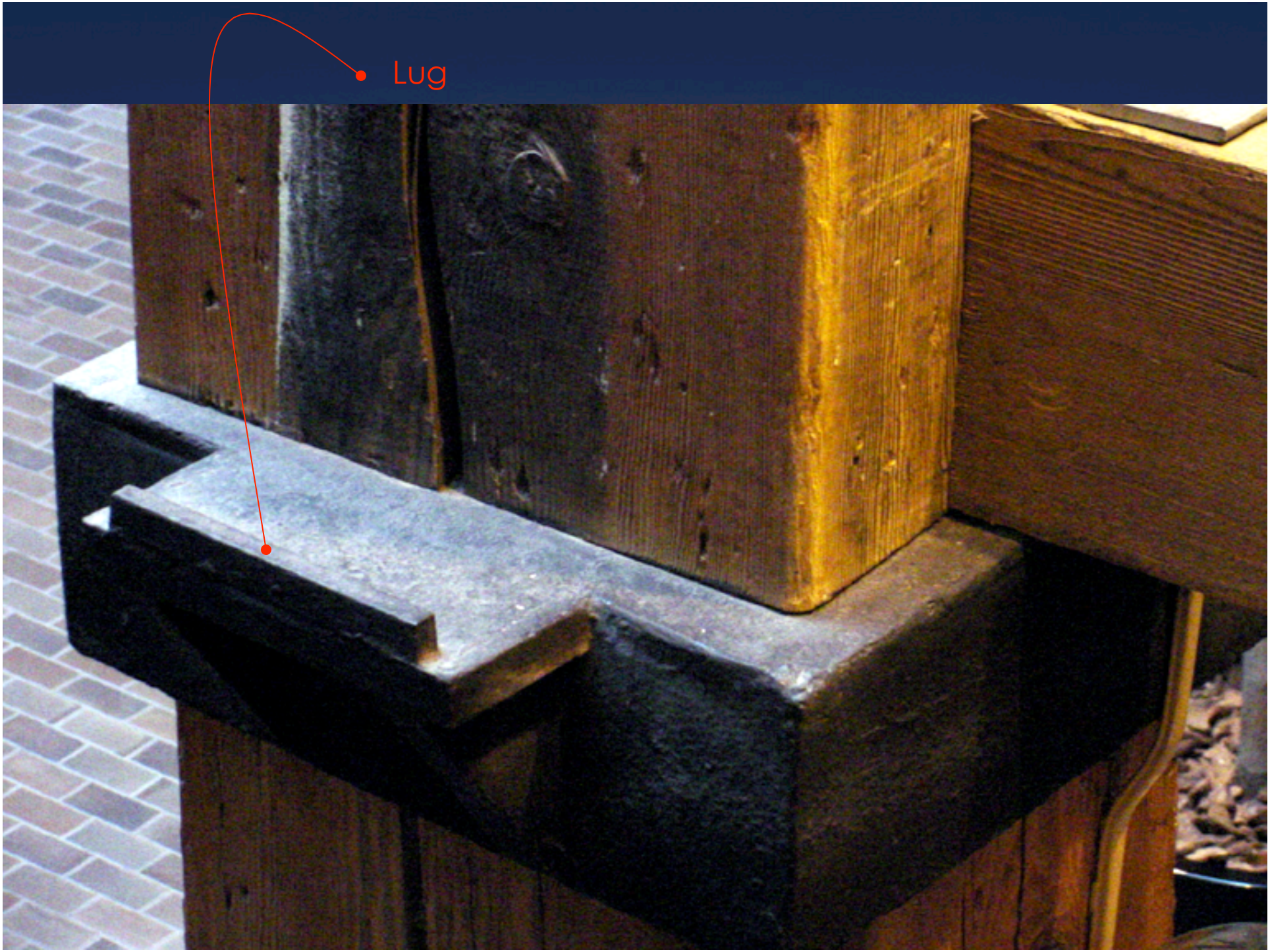
By cutting the beam end at an angle, the top corner (which pushes the wall up as the beam rotates after burn through) is not in a position to damage the wall.

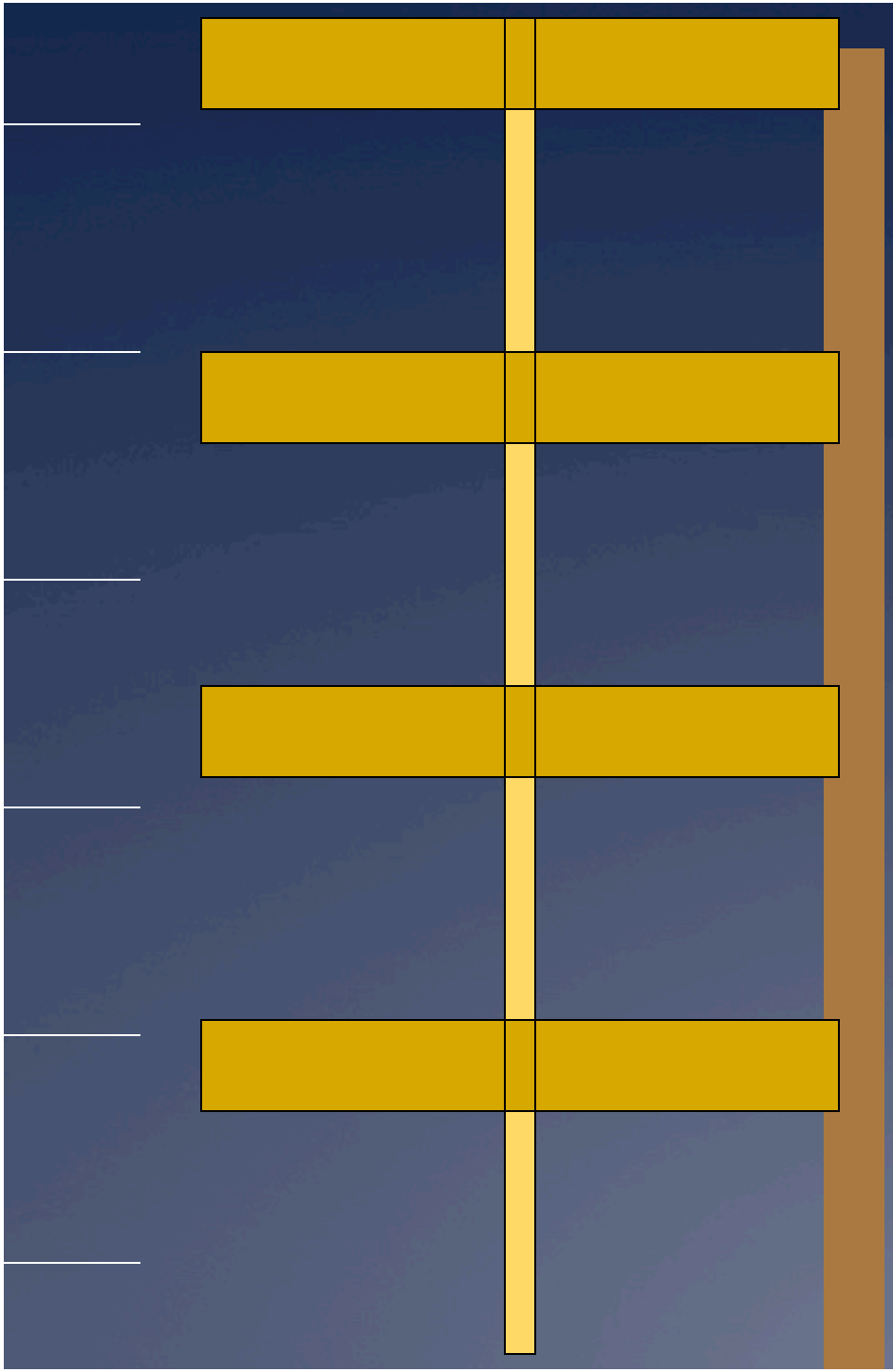
Leaving 1 inch of airspace around the beam end helps prevent rot

Anchoring the beam end to the masonry wall with a lugged connection helps keep the beam from sliding out of the wall.

Big Lug

The lug is a round or square rod welded or cast onto a steel or iron plate. The plate is attached to the masonry wall with anchor bolts into the mortar joints between brick.

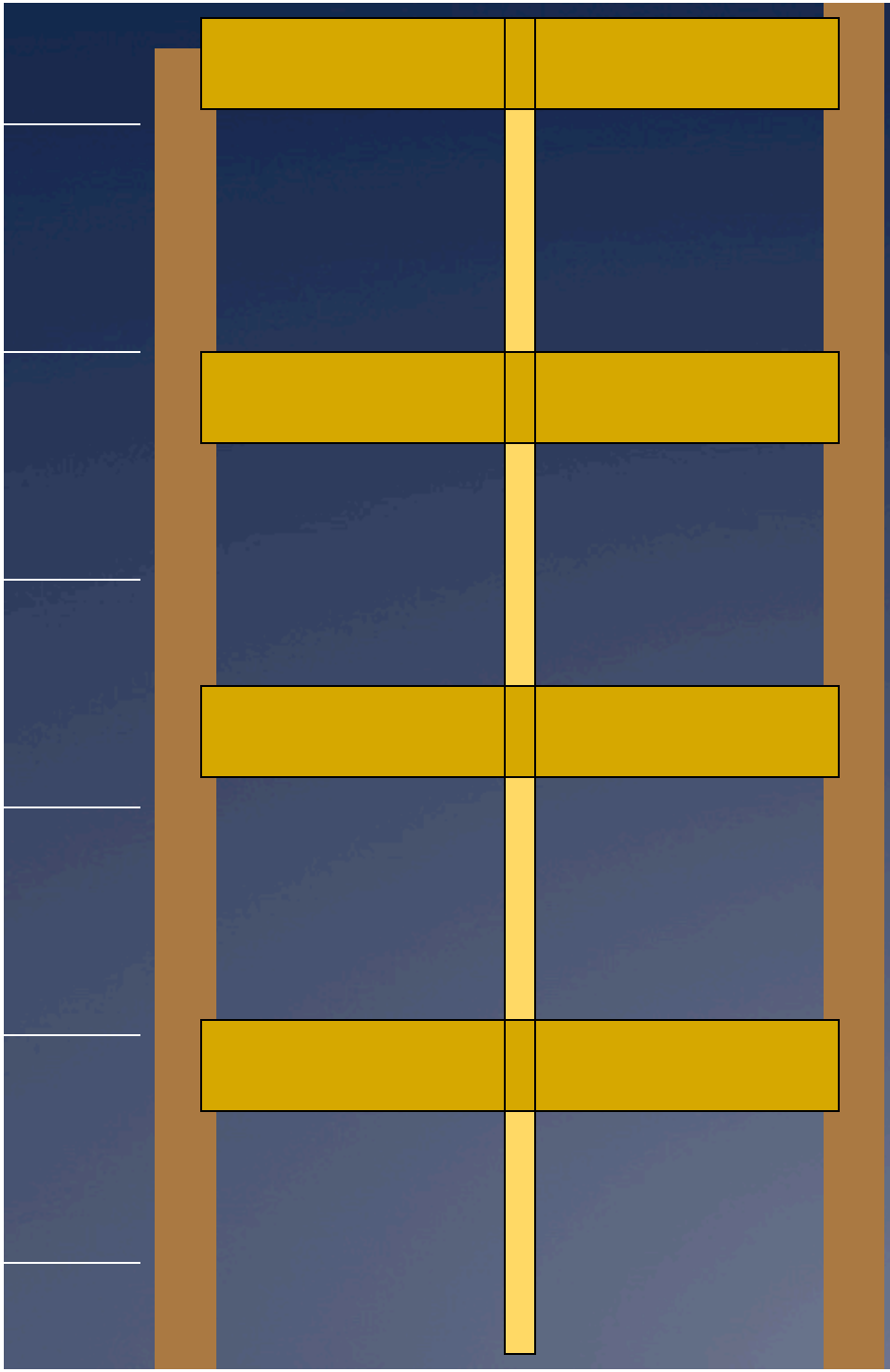

Lug



Wood & Metal

The lugged connector was one of the earliest widespread uses of metal as a wood connector.

Multistory timber buildings posed problems seldom encountered in one or two story timber frames.

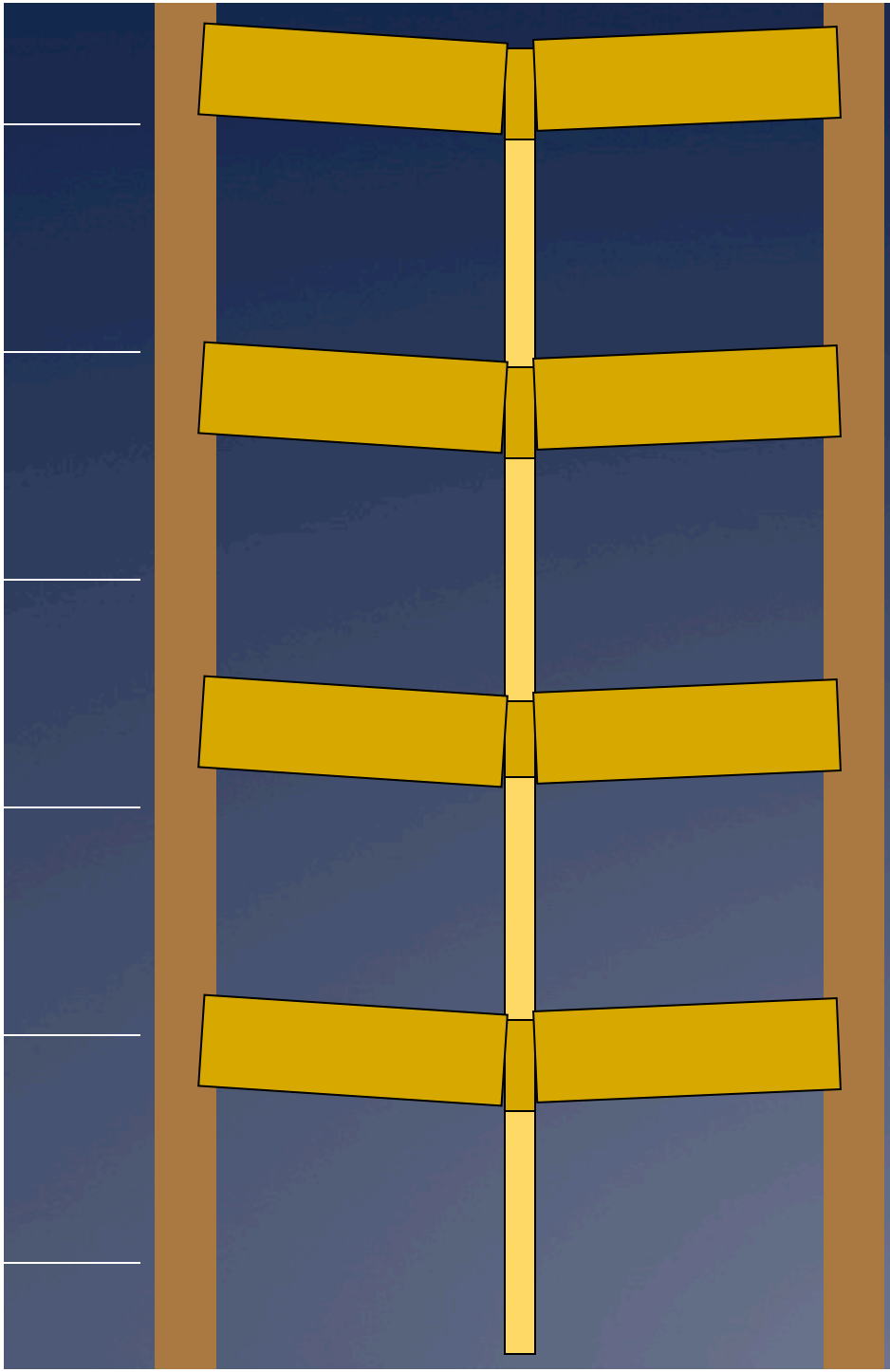


Sloping floors

Over time, the floors in these mill buildings became more and more uneven.

A marble dropped on the floor would quickly roll to the center of the building

Why?

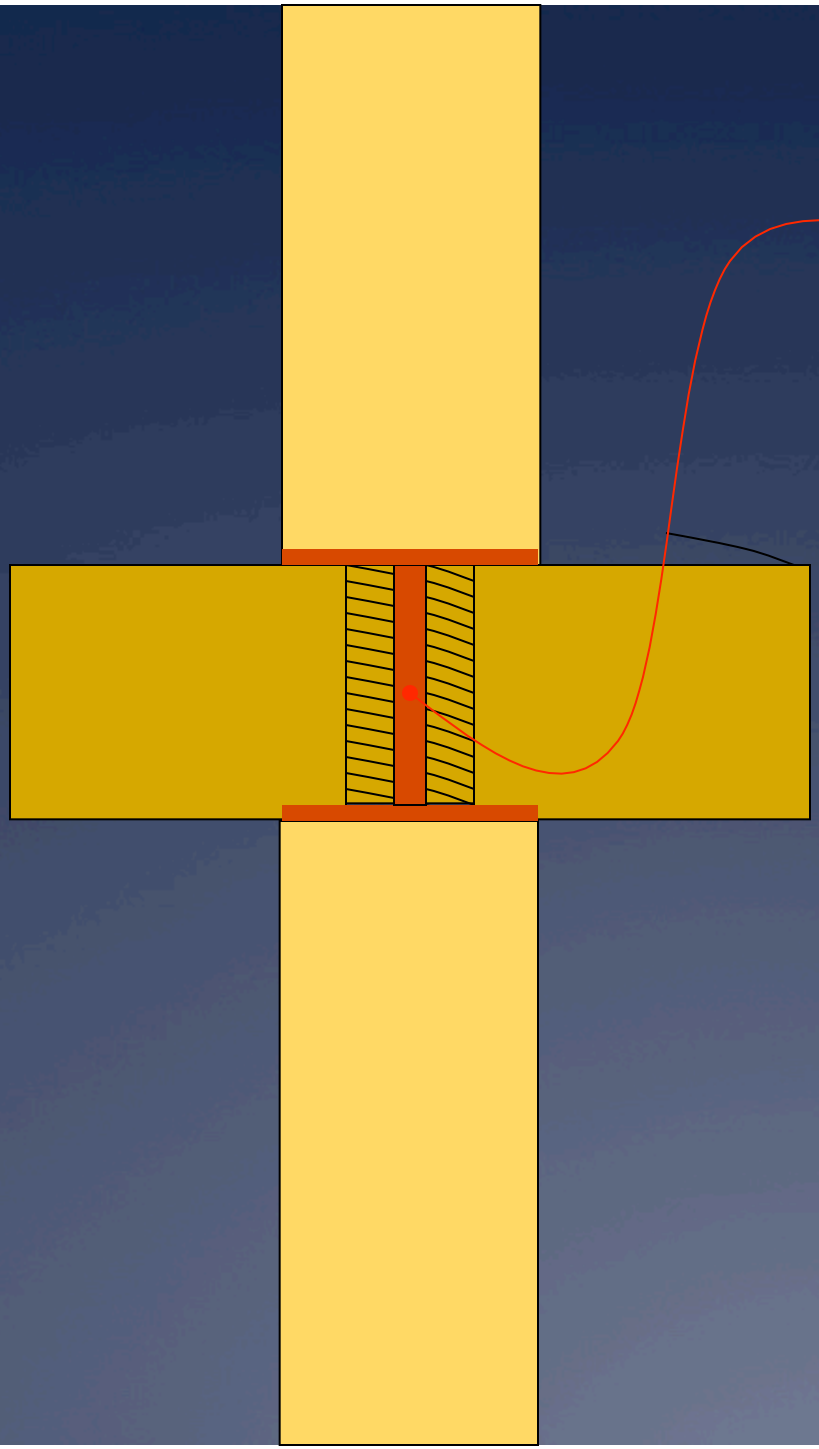


Shrinkage across the grain.

It turns out foundations weren't settling the wood was shrinking..and the masonry wasn't!

The columns weren't shrinking (grain is parallel to the long axis of the column… a tree doesn't shrink in height)

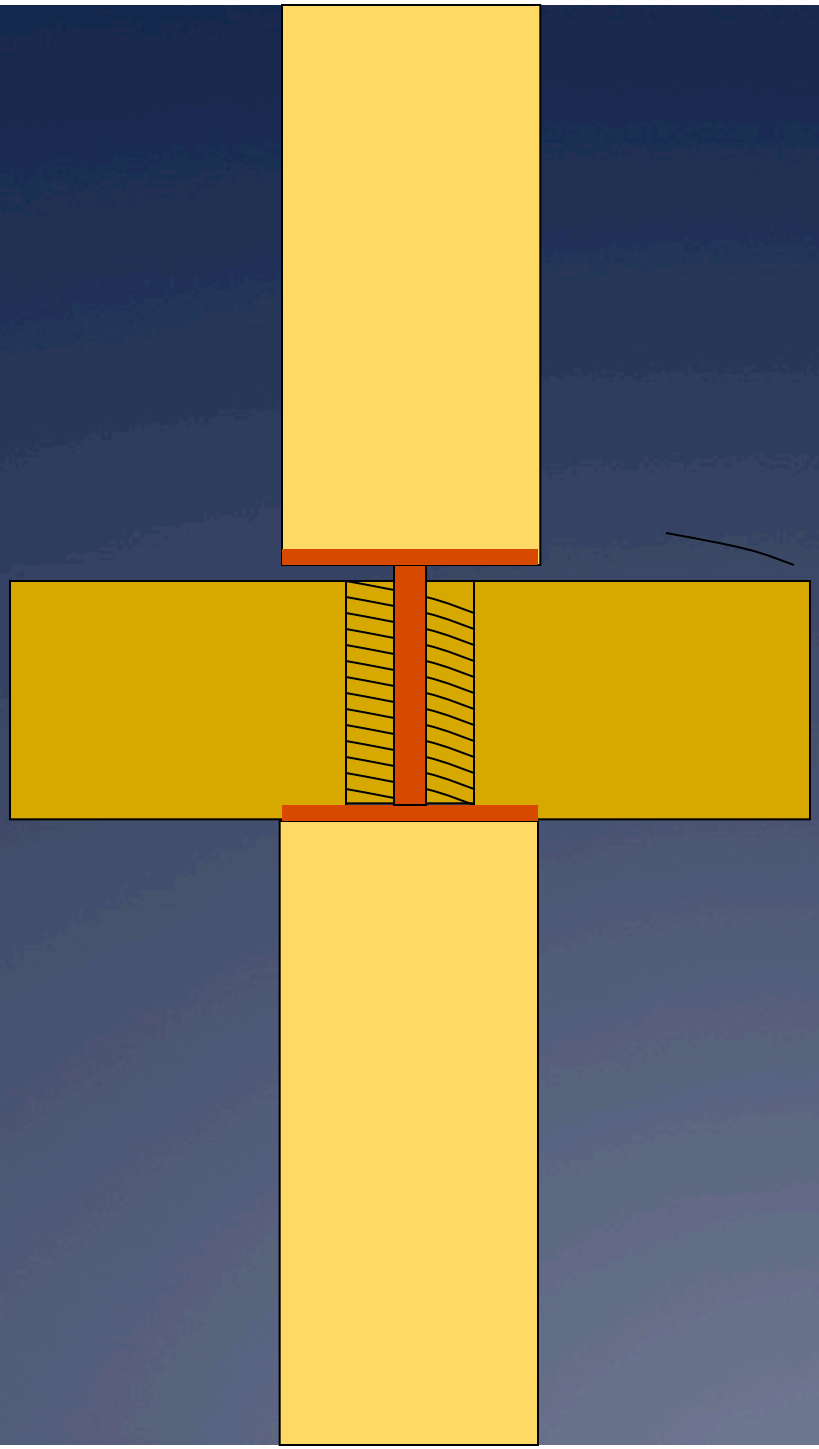
The beams were shrinking. If the 24" beams shrunk 10% each (2.4") the total shrinkage in a ten story warehouse could be TWO FEET at the top!



Pintle

That two feet of displacement for the top floor comes from the cumulative effect of each beam shrinking, and the columns sitting on top of the beams.

The answer was what's called a pintle… actually a little metal column that projects through the beam to carry the column above.



Flat floors

The use of the pintle between the top of one column and the bottom of another allowed the beam between to shrink without the column following.

This opened up a gap below the column which could be covered with trim as desired.

When is a warehouse not a warehouse?

When an architect, who knows construction sees it as a fourteen story grid of timber and iron, and makes a thoughtful subtraction to make the grid present.

Butler Square, Minneapolis, MN.
Arvid Elness, Architect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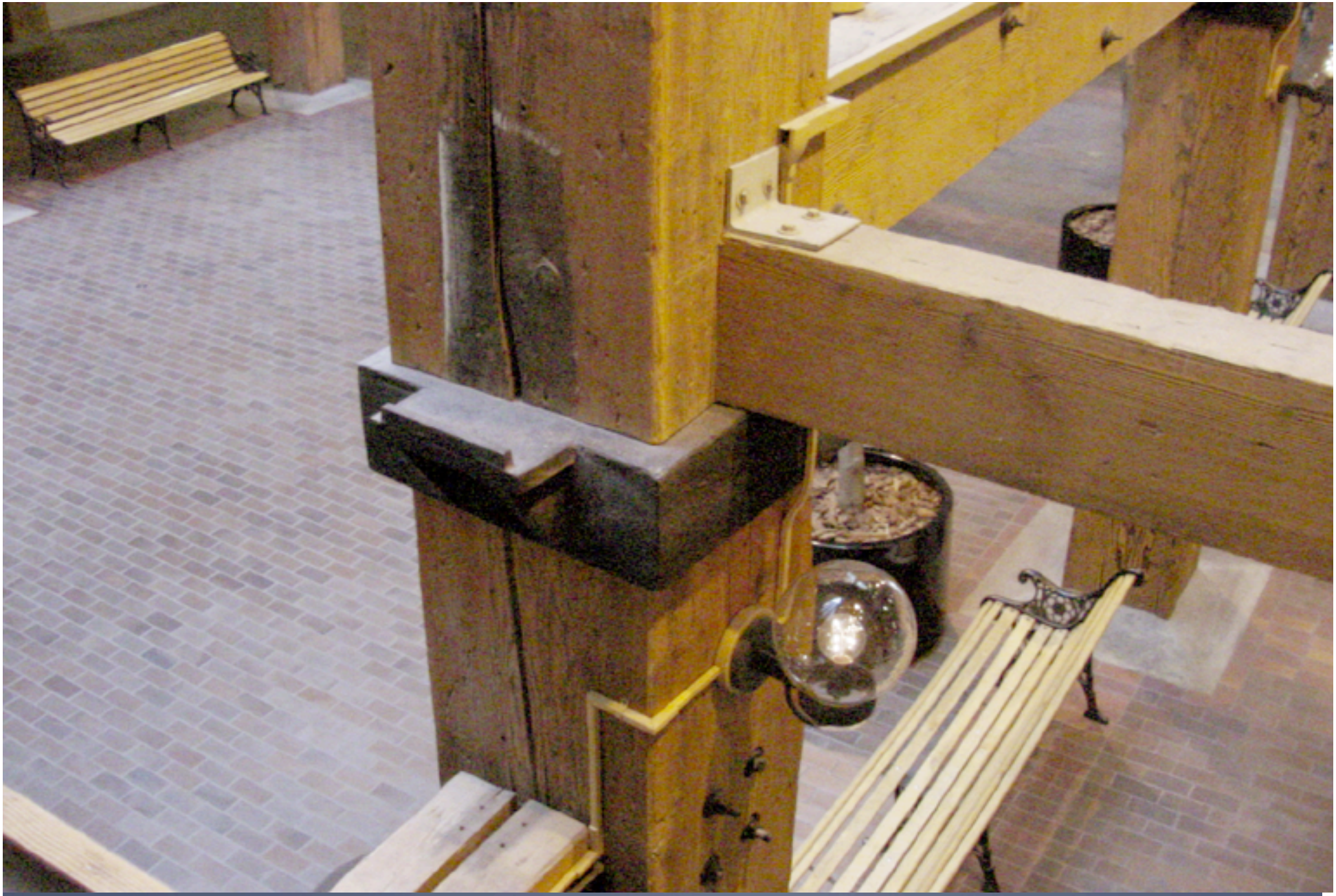
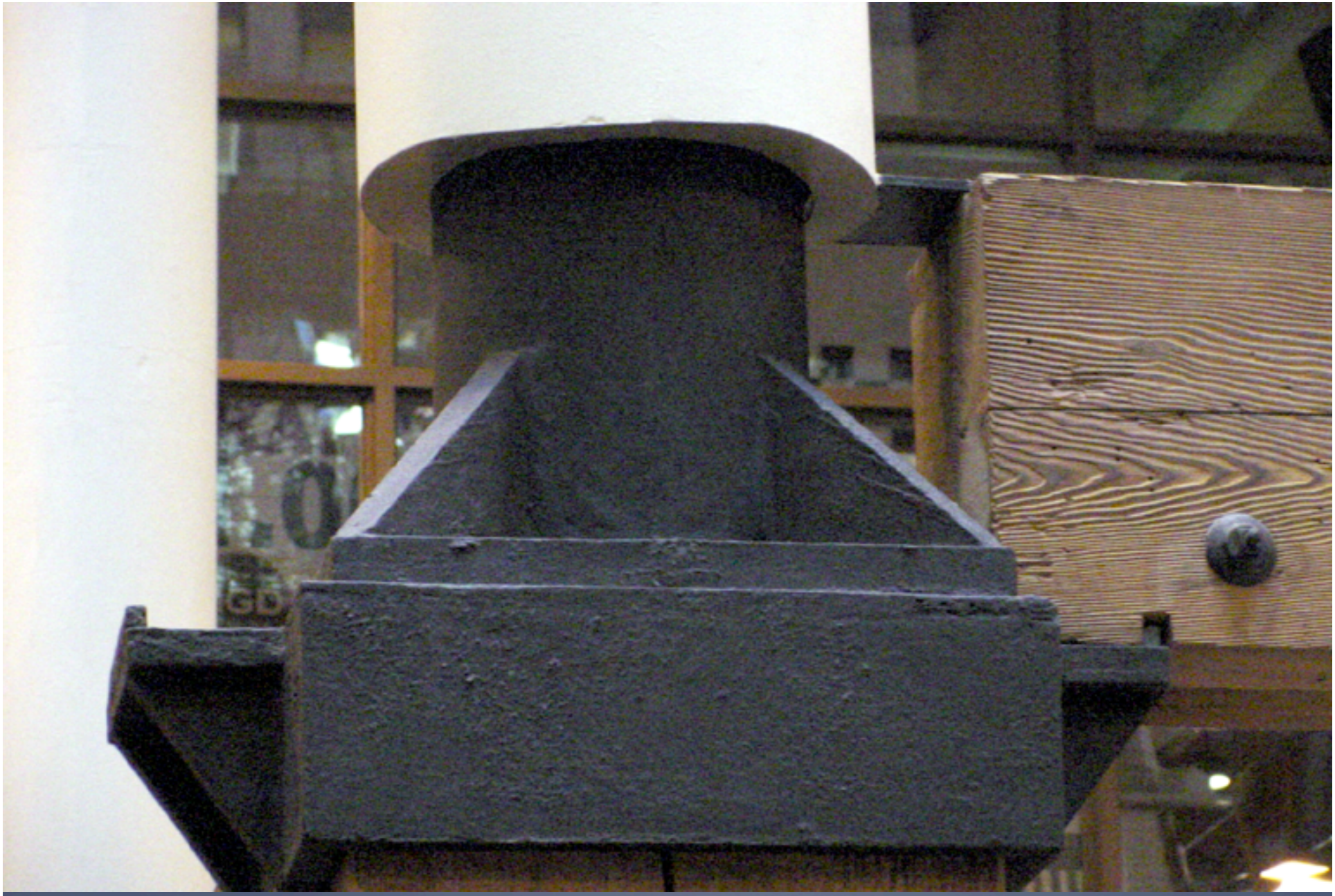
E1



Why no pintle?


Kokapelli
Kokapelli

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