TRUSS DESIGN CHOICES:

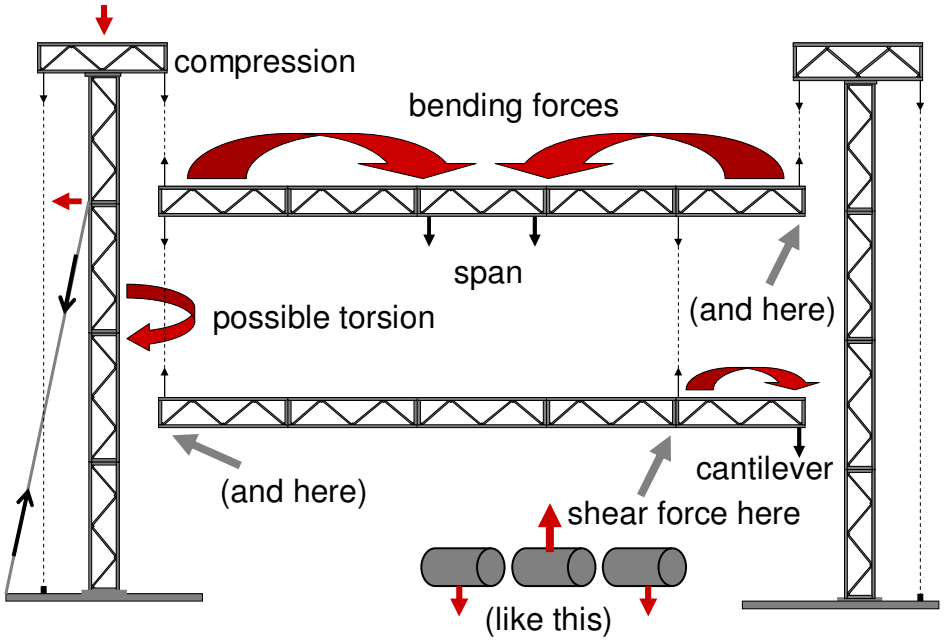
The engineer who designs a truss system must balance the needs for it to deal with a variety of forces.

Will it be loaded vertically (as a mast) with compression along its axis leading to buckling forces, along with twisting (torsional) forces and bending moments if it is not perfectly vertical and symmetrically laden?

Is the same truss required to work as a span and/or a cantilever, where it will receive predominantly bending forces?

What about the pick-up points? These will involve pressure concentrations and shear forces in the main tubes.

MULTIPLE FORCE TYPES



All the smaller types of Litec truss employ diagonal bracing on all faces. This gives good resistance to torsional forces and bending moments.
The nodes are seen to “step” around the truss– where they are not opposite one another.

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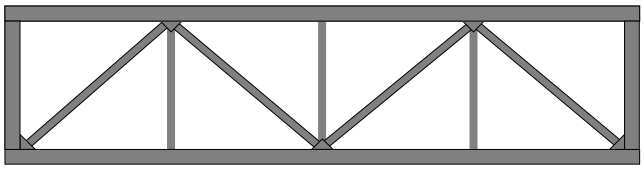
One engineering concern here is welding. For a thin-walled tube the “Heat Affected Zone” (HAZ) creates a greater weakening than for a thicker-walled tube. The light-duty range of truss is kept stronger by having only two welds to diagonals in any one area of a main chord.

Because the smaller truss sizes have shorter distances between nodes, the risk of bending a chord where the truss is picked up is not critical unless loads approach the maximum.
At high loading the truss should be slung at nodes or at the strong Litec end-plate.

The cross-over region comes at ~40cm truss size. Here the nodes are approximately 60cm apart and the possibility of bending chords under heavy load increases.

When we look at the High-Load Range we can see the introduction of extra vertical tubes adding strength to main chords mid-way between diagonal nodes.



With tube wall-thickness of 4mm and above, and with the use of more complex tube extrusions (where the tube is not completely hollow), the ability to resist the shear forces at pick-up points on heavy-laden trusses is improved.

All these choices, bracing orientation, node spacing, proximity of welds and tube-wall thicknesses come into play to different degrees in different loading types and situations.
It is the engineer’s task to achieve the best balance for all the likely circumstances.

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