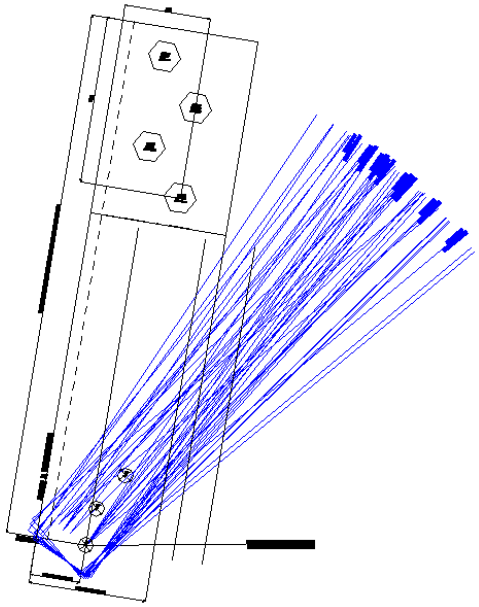
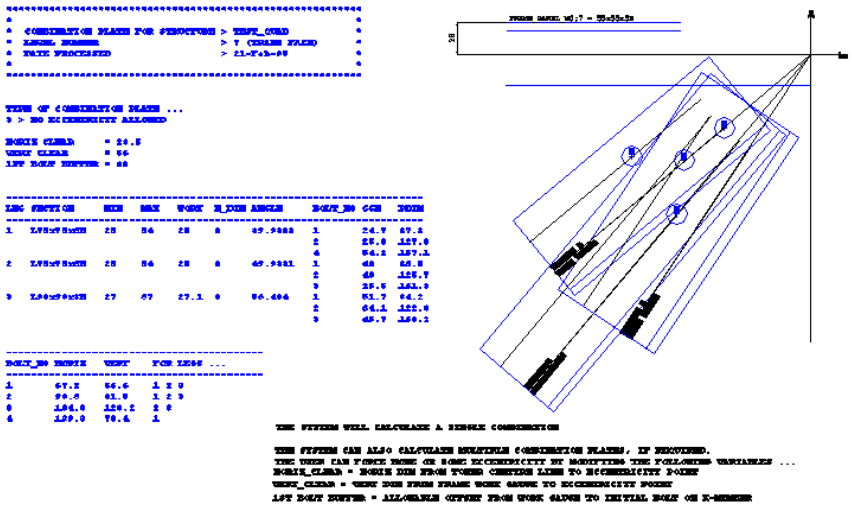
TowerSmart

Tower Detailing Tips





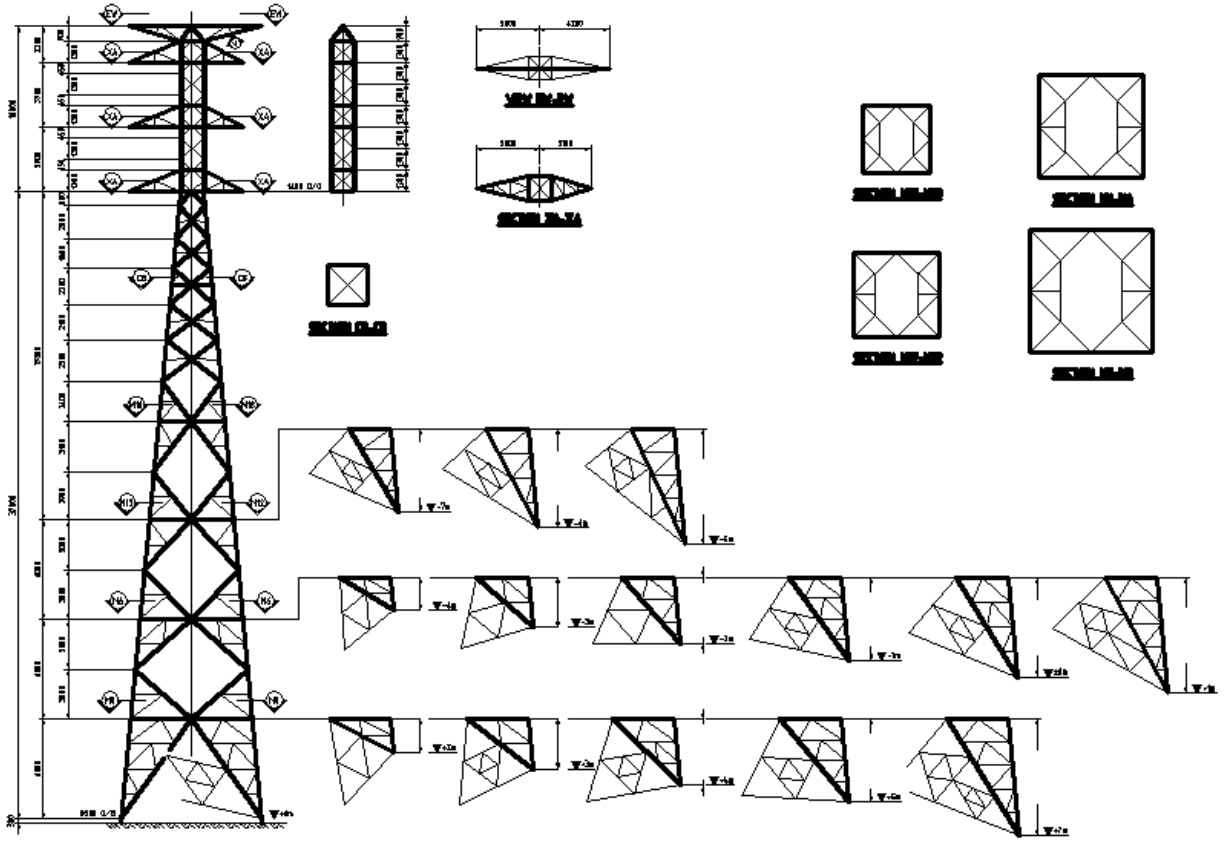
Series 4

gad TECHNOLOGIES
Software Developers

Tower Detailing Tips

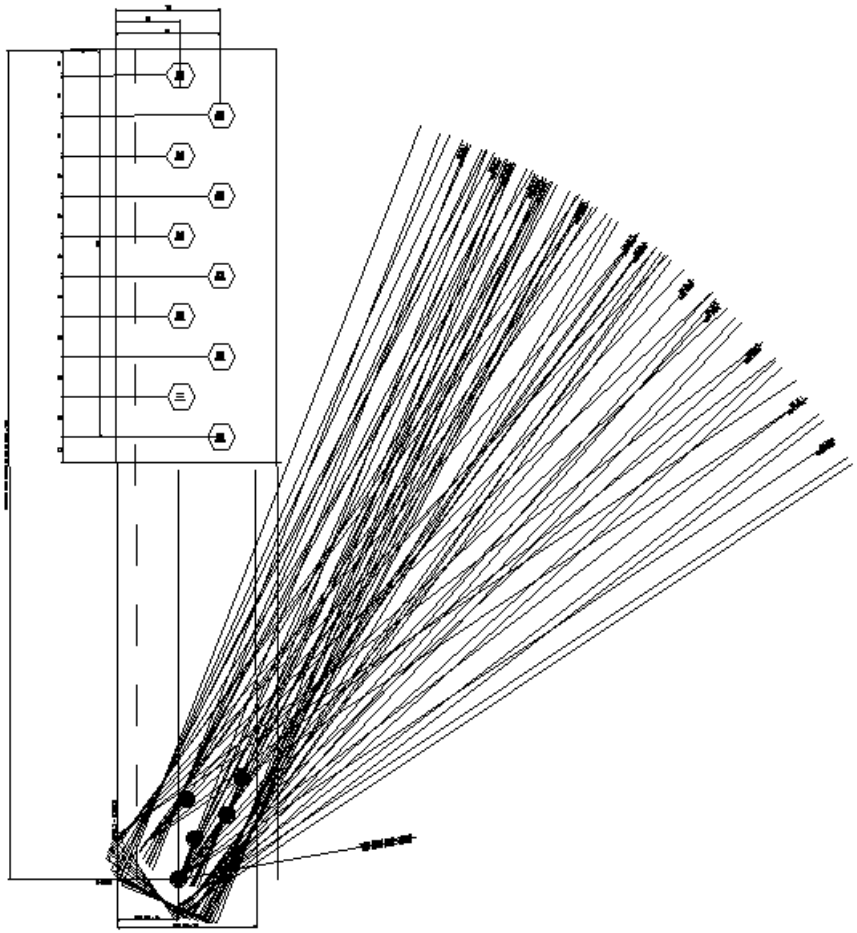
Out of all the types of engineers I have worked with, I would say without doubt that transmission line designers are the engineers I respect the most. They have a tough job, they need to come up with a few tower designs that will suit hundreds of tower sites for the proposed line. Not only that, they need to design the towers as light as possible to win the tender, then the towers they designed are tested, fail at 98% then you incur the cost of a re-test, pass at 100% and you're a hero, but pass over 110% you become labelled as a 'conservative' engineer.

One of the methods tower engineers use to design a tower to suit many sites is by utilising body extensions with multiple legs. This isn't a simple task since the engineer still needs to ensure that all extensions and leg combinations do not fail under there imposed loads. Shown on right is a typical light suspension angle tower with body extensions, each extension has multiple leg combinations to suit varying tower heights.



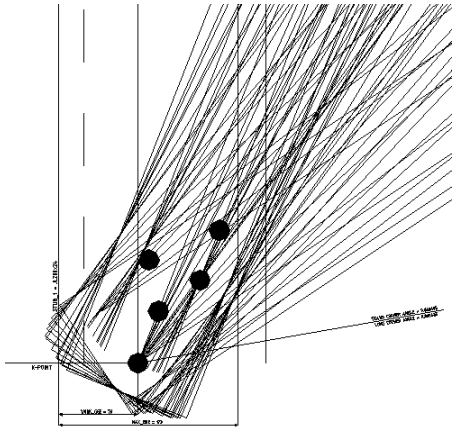
Tower Detailing Tips

An important initial task a detailer would need to do is to determine the common stub. This allows the stub to be manufactured early so the foundations crew can start preparing the tower sites before the rigging crew come along with the rest of the steelwork.

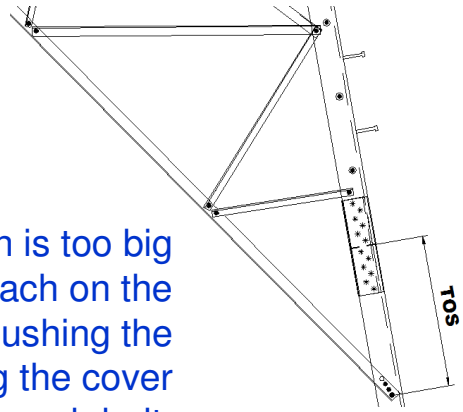


Creating a common stub is not a complex task, basically its just super-imposing all the K-members of the legs to determine a common bolt pattern and the maximum top of stub dimension. Sometimes a smaller K–member section on one leg will restrict the bolting pattern on the corner and this could mean stub plates might be required. Alternatively discussions with the design engineer might allow the section size to be bumped up to prevent stub plates. At times different strands of legs might mean different stub sections, for example, an L200x16 on the first strand and maybe L200x20 on the lower strand but most times to prevent site mishaps the bigger section is adopted.

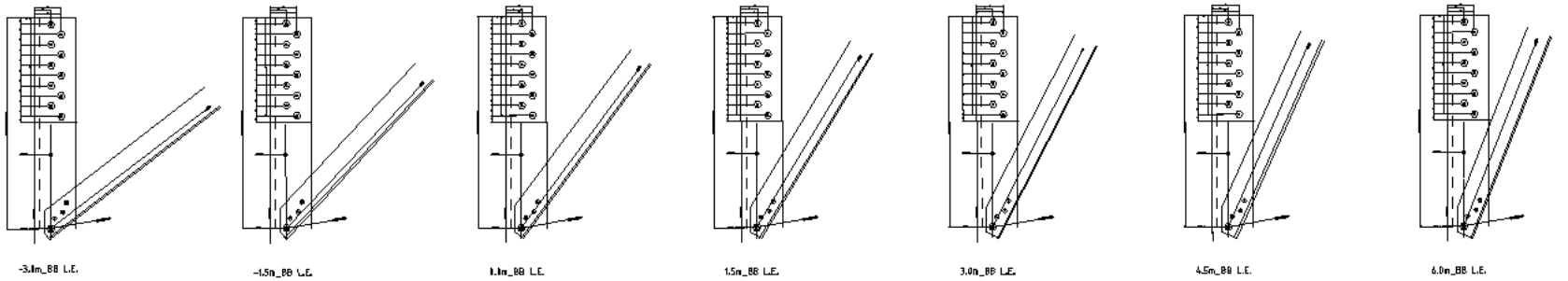
Tower Detailing Tips



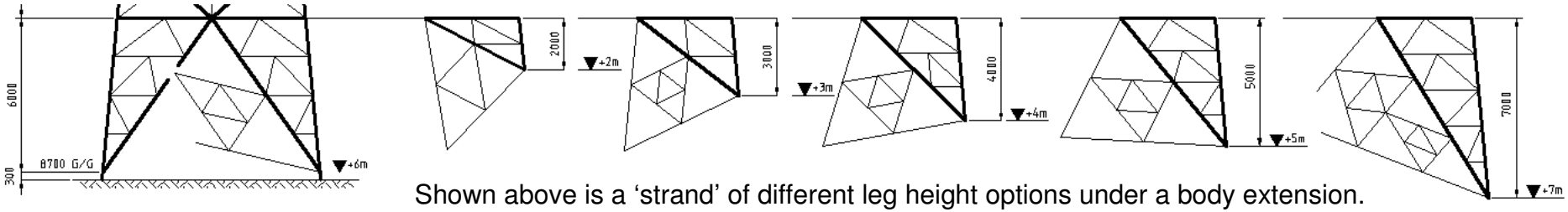
When determining the bolt pattern, care must be taken too ensure that the net cross-sectional area is not critical, both on the stub and also all k-members.



Also if the top of stub (TOS) dimension is too big then the splice (corner join) could encroach on the lower web bracing which could mean pushing the web brace up or alternatively extending the cover plate of the splice to include the web bolt.

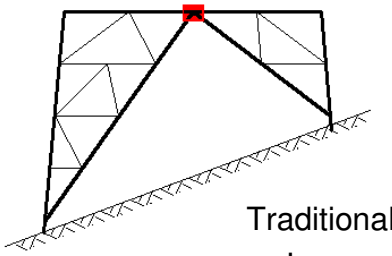


Tower Detailing Tips



Shown above is a ‘strand’ of different leg height options under a body extension.

Another important connection to analyse early is the plate that joins different tower legs together. The type chosen depends on many factors such as … type of legs (traditional or truss type), number of bolts required per k-member, type of terrain for the line (mountainous or flat), client or builder preference.

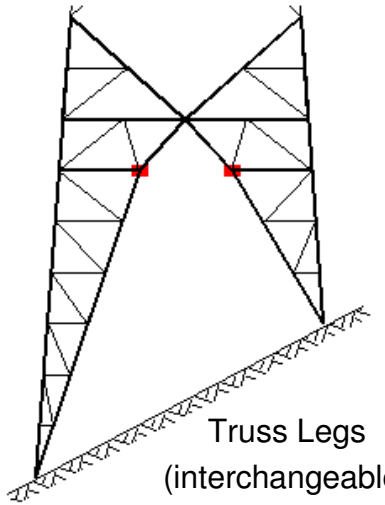


Traditional Legs

Basically there are 4 types of connections that could be used, they are …

- multiple combination plates
- overlapped leg plates
- single combination plate (no eccentricity)
- single combination plate (with small eccentricity)

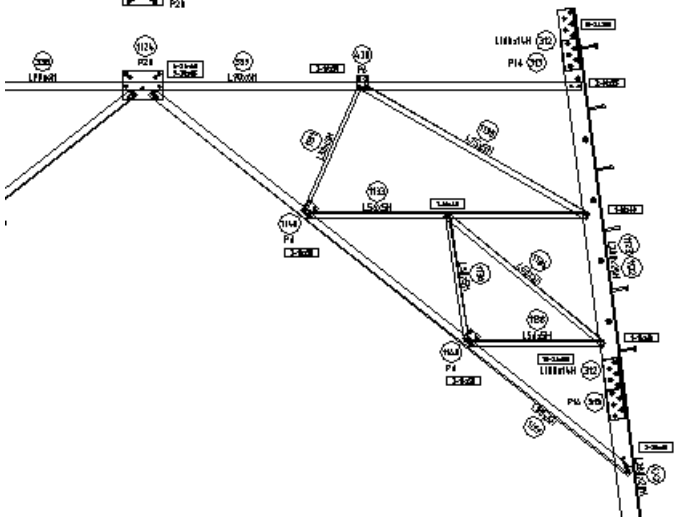
The following slides explain the above options further.



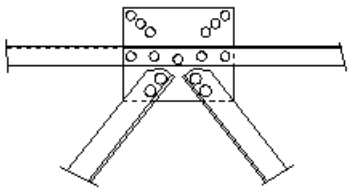
Truss Legs (interchangeable)

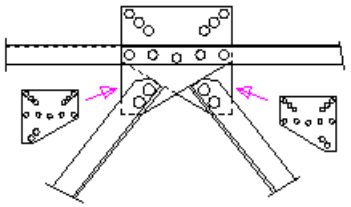
Tower Detailing Tips

Multiple combination plates are the most popular option used. Basically a plate is created for each leg combination, that is, if 6 legs are on a strand then 21 plates are required (6+5+4+3+2+1), that is if all leg height combinations are requested. This option has the least material waste but does mean more mark numbers are generated.

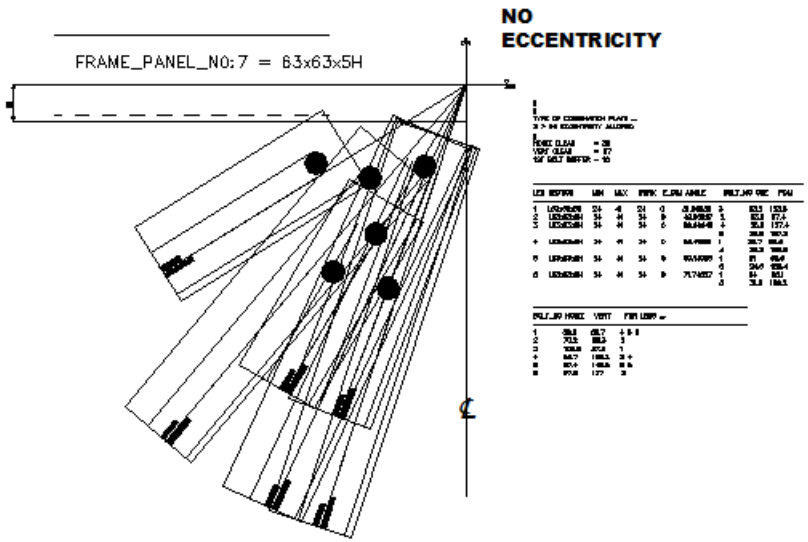


Some clients prefer overlapped leg plates. The benefit is that each leg has its own plate. The pitfall is that a bigger plate is required so the overlapping plates don't interfere with the K members. Also it does create a small eccentricity between the k-members (plate thickness). Sometimes this option is preferred on the first strand of legs when truss type legs are used.





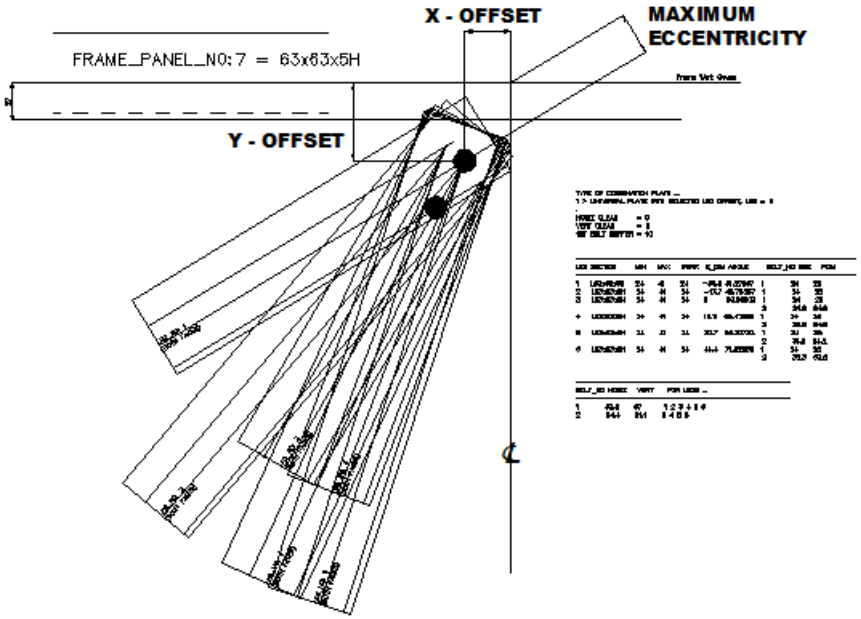
Tower Detailing Tips



It is possible to create a single combination plate that suits all leg combinations. But this is not suited well when there are many legs on the strand since it creates a large plate with many redundant holes.

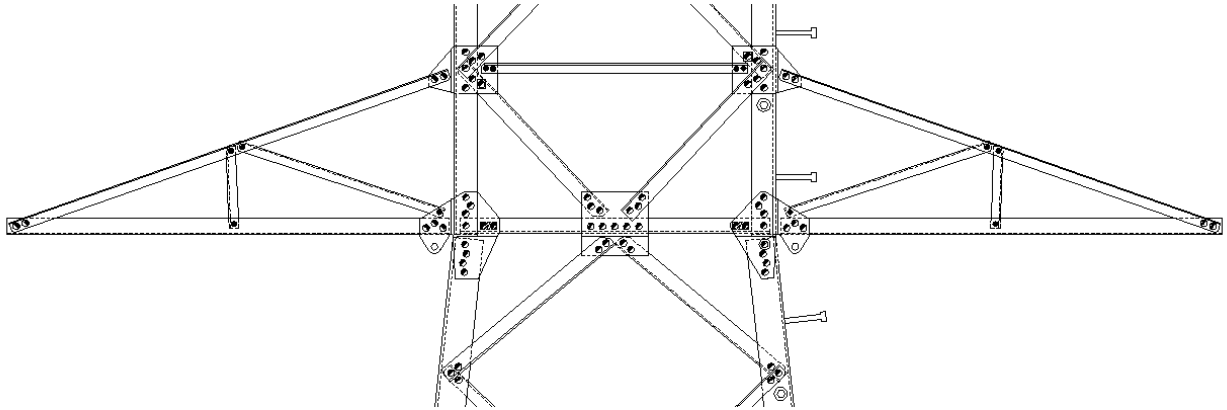
A better option is to use a single combination plate but allow for small eccentricities between the legs by ‘hinging’ on a single bolt. This does decrease the plate size dramatically as can be seen between the 2 options.

When using this option it is important to understand the affect on the k-members triangulation values since this will affect the bolt pattern of the common stub.



Tower Detailing Tips

In the next presentation (Tower Detailing Tips - Series 5) we look at the tower ‘waist’, this is a crucial area that transfers most of the forces from the upper structure (superstructure) to the lower structure (common body).



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