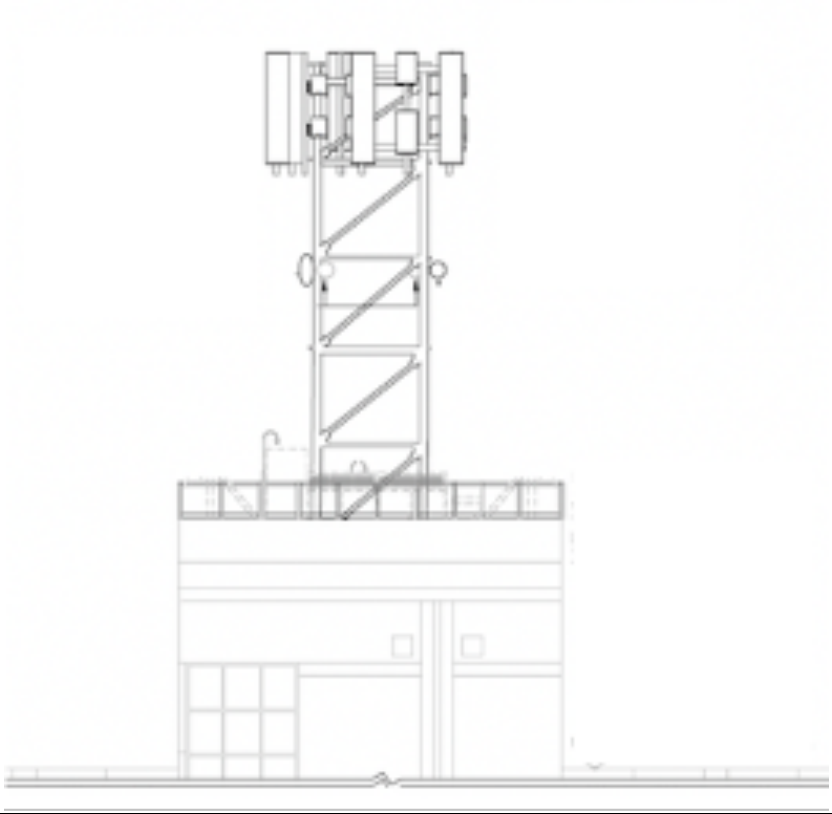
Design Options

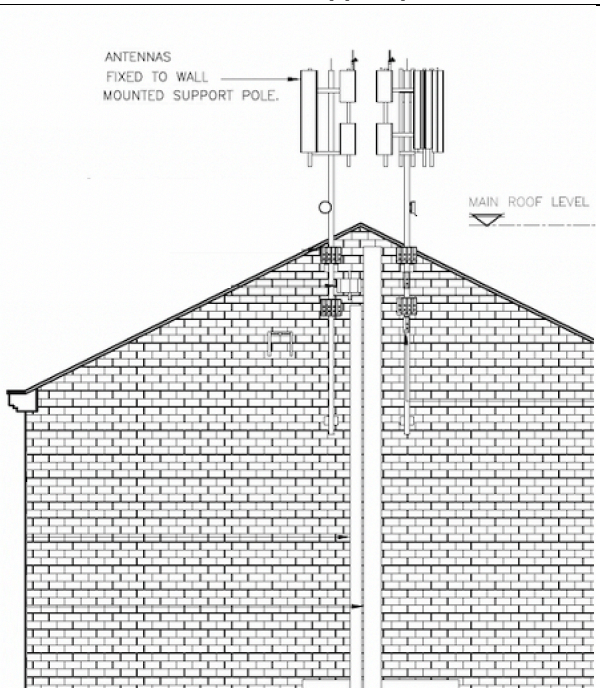
Rooftop Stub Masts



Due to the weights outlined above and the associated engineering and steelwork required involved, stub mast solutions tend only to be deployed on large buildings with significant structural capabilities, (e.g., multistorey residential tower blocks, car parks, hotels). These masts tend to be set upon a steel grillage base or concrete plinth which further increases the structural demands upon the host building. Please see the design example below for further details as to what a stub mast looks like.

As outlined above, a 10m stub mast with headframe including the supporting steel grillage (excluding antennas, RRUs and feeder cables), weighs approximately 4.3tonne. Without the headframe the weight would be circa 2tonnes (excluding antennas, RRUs and feeder cables).

Wall-mounted support poles

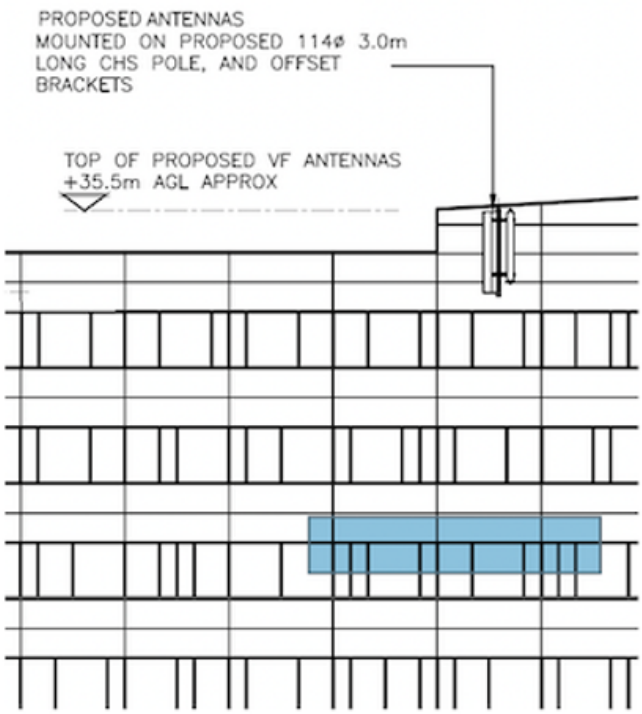


Tend to be deployed on the gable ends of commercial or industrial buildings in the region of 15-20m in height and where sufficient wall space is available. On average, the poles and antennas will need to protrude 4-6m above the roofline to provide sufficient height for the antennas to reach the target coverage area and comply with ICNIRP requirements. However, the actual height requirement is dependent on the height of the host building, the technologies to be deployed and the presence of surrounding buildings and the way they are used, e.g. roof top terraces, balconies, windows etc. In addition, if support poles are not proportionate to the size of the host building, they will look out of place.

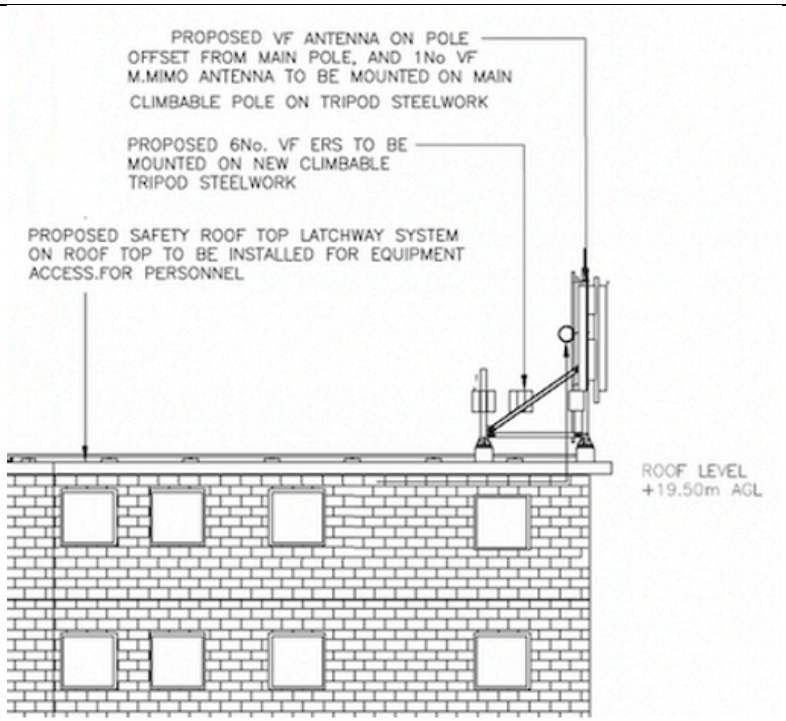
The host building would have to be of adequate height to secure these poles safely. This type of scheme requires sufficient bracing to account for wind loading, with brackets to be bolted at intervals down the side of the building, through the entire wall and fastened internally via a number of back plates to ensure stability. The support pole needs to be a minimum of equidistant in height above and below the building height to ensure sufficient fixtures can be achieved. The poles also have to protrude above the building and surrounding features to avoid signal clipping and ensure no person can access areas of the host building's roof that may encroach upon the exclusion zone around the antennas that are supported.

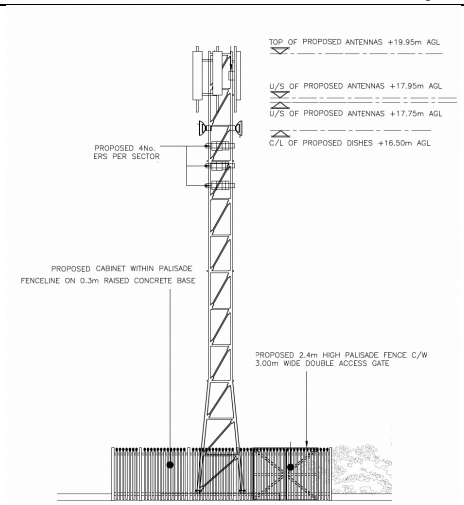
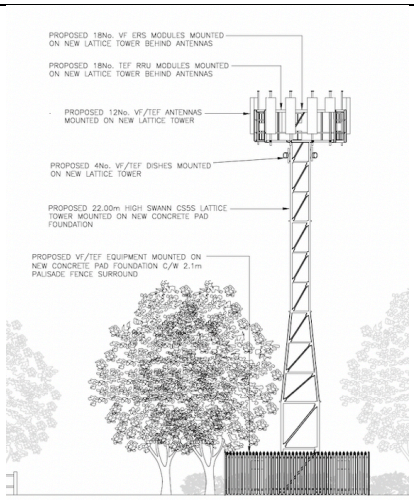
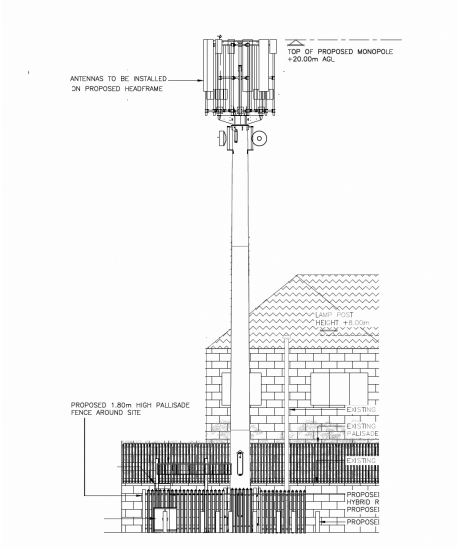
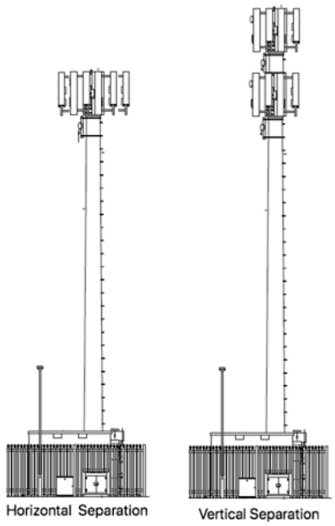
The internal back plate fixtures have legal implications and would be intrusive for the occupants, both during construction and maintenance with the backplates requiring checked at least once a year on routine maintenance visits. Backplates within residential properties is not viable as it would be too intrusive, both during construction and maintenance.

Face-mounting antennas



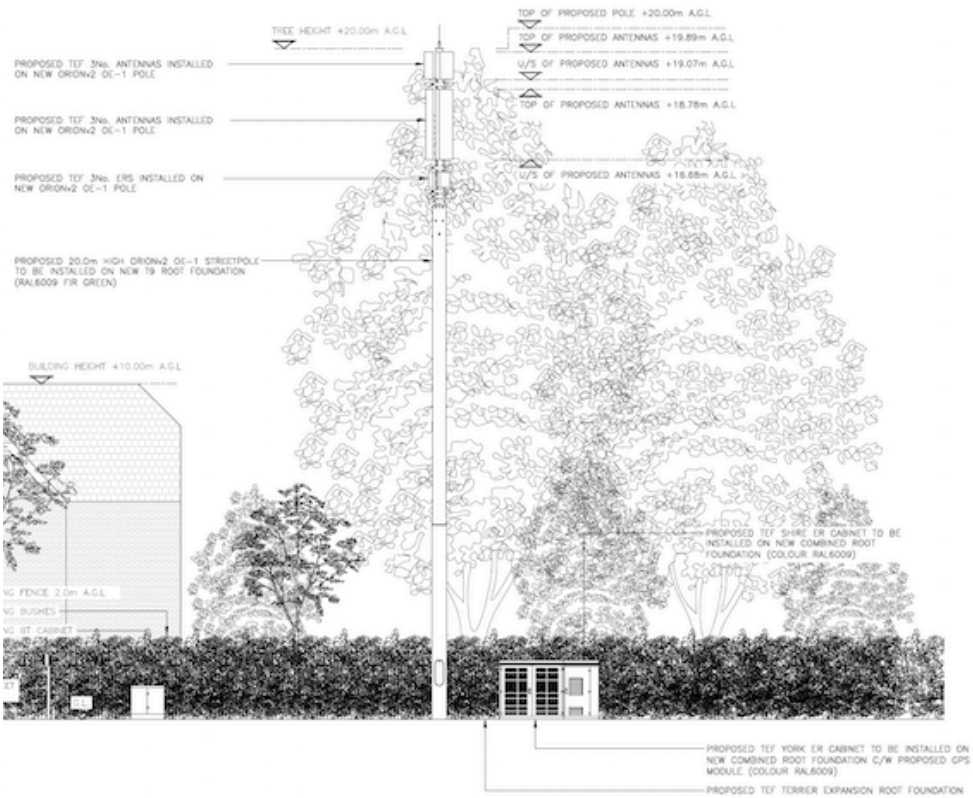
Antennas are fixed to brackets attached to the wall allowing them to sit out approximately 200mm from the building façade and be orientated to best address the operational need, tend only to be used on large buildings in the region of 20-25m in height and in setting where the neighbouring buildings are much lower in height. Antenna locations also need to avoid proximity to windows for ICNIRP reasons with easy access available for a cherry picker for construction and maintenance purposes. The bracketing upon which the antennas are fixed can either be direct to the wall, or they can incorporate a pole allowing for more acute antenna orientation, as per the design example below.

Pole-mounted antennas

Can be deployed on medium scale, flat roofed, residential, commercial or industrial buildings. Using tripod style structures attached to newly deployed steel grillage, or the existing concrete or steelwork of the host building, the antennas will protrude 4-6m above the host building and are usually located on a central plantroom or close to the edge of the building to avoid signal clipping. The antennas also need to be positioned at a height and location that will ensure no person can access areas of the roof that may encroach upon the exclusion zone around the antennas that are supported.

Monopole or Lattice mast solution	
	
Single operator lattice mast	Shared operator lattice mast
	
Single operator monopole	Shared operator monopole

Cornerstone has both single operator and shared, 5G compatible, multi-generational monopole and lattice style mast options within their design portfolio, as per the examples above. These masts are significantly more substantial and structurally robust than street furniture masts, thus they have a wider girth and larger footprint. The headframes on these masts offer operators the ability to orientate or tilt antennas to direct their signal to specific target areas, so their operational potential is much greater. These masts are climbable structures would need to be secured within a fenced compound, usually requiring a 10m x 10m area. Shared monopole masts would need to incorporate either a single wide headframe (left hand side in the above example) or dual stacked headframe (right hand side in the above example) to ensure the necessary separation, (either horizontal or vertical), of each individual operator's transmission equipment. Shared lattice masts would incorporate a wide headframe to ensure the necessary horizontal separation of each individual operator's transmission equipment. Monopole and lattice solutions tend to be deployed in less sensitive urban/suburban areas, for example commercial/industrial estates or recreational grounds. Lattice structures tend also to be preferred to monopole solutions in more rural settings.

Street furniture mast solution



Cornerstone currently has a single 5G compatible, multi-generational street furniture style mast for each operator within their design portfolio. These designs incorporate a stacked antenna scheme whereby a sets of antennas would be located one below the other with the 5G antennas occupying the top spot. A set of remote radio units (RRUs) that are integral to the function of the antennas, is installed just below the lower set of antennas. This is not a climbable structure and can therefore be deployed without the need for security fencing.