

CONSTRUCTION SITE MATERIAL EXERCISE



SITE: FACADE ON OXFORD STREET
MATERIAL: STEEL FRAME STRUCTURE

This construction site consists of just the facade with nothing behind it. There is steel scaffolding supporting the facade.

PROPERTIES OF STEEL

Most steel construction is done with a type of steel called mild steel. Mild steel is a material that is immensely **strong**. This immense strength is of great advantage to buildings. The other important feature of steel framing is its **flexibility**. It can bend without cracking, which is another great advantage, as a steel building can flex when it is pushed to one side by say, wind, or an earthquake. The third characteristic of steel is its **plasticity** or **ductility**. This means that when subjected to great force, it will not suddenly crack like glass, but slowly bend out of shape. This property allows steel buildings to bend out of shape, or deform, thus giving warning to inhabitants to escape. Failure in steel frames is not sudden - a steel structure rarely collapses. Steel in most cases performs far better in earthquake than most other materials because of these properties.

However one important property of steel is that it quickly loses its strength in a fire. At 500 degrees celsius (930 degrees F), mild steel can lose almost half its strength. Therefore, steel in buildings must be protected from fire or high temperature; this is usually done by wrapping it with boards or spray-on material called fire protection.

WHERE STEEL FRAME STRUCTURES ARE USED?

Steel construction is most often used in-

1. High rise buildings because of its strength, low weight, and speed of construction
2. Industrial buildings because of its ability to create large span spaces at low cost
3. Warehouse buildings for the same reason
4. Residential buildings in a technique called light gauge steel construction
5. Temporary Structures as these are quick to set up and remove

TYPES OF STEEL BUILDING CONSTRUCTION

1. **Conventional Steel Fabrication** is when teams of steel fabricators cut members of steel to the correct lengths, and then weld them together to make the final structure. This can be done entirely at the construction site, which is labour-intensive, or partially in a workshop, to provide better working conditions and reduce time.
2. **Bolted Steel Construction** occurs when steel fabricators produce finished and painted steel components, which are then shipped to the site and simply bolted in place. This is the preferred method of steel construction, as the bulk of the fabrication can be done in workshops, with the right machinery, lighting, and work conditions. The size of the components are governed by the size of the truck or trailer they are shipped in, usually with a max length of 6m (20ft) for normal trucks or 12m (40ft) for long trailers. Since the only work to be done at site is lifting the steel members into place (with cranes) and bolting, the work at site is tremendously fast. Pre-engineered buildings are an example of bolted steel construction that is designed, fabricated, shipped and erected by one company to the owner.
3. **Light Gauge Steel Construction** is a type of construction that is common for residential and small buildings in North America and parts of Europe. Light gauge steel is steel that is in the form of thin (1-3mm) sheets of steel that have been bent into shape to form C-sections or Z-sections.

WEIGHT OF STEEL FRAME STRUCTURES

Consider a single storey building measuring 5 x 8m (16 x 26ft). If we build this of steel, with a sloping roof covered with corrugated metal sheeting with insulation, this would weigh about 65 kg/m². The steel framed building will weigh only 2.6 Tons (2,600 kg). This low weight of steel frame buildings means that they have to be firmly bolted to the foundations to resist wind forces, else they could be blown away like deck umbrellas!



Conventional Steel Fabrication



Conventional Steel Fabrication



Light Gauge Steel Construction



Bolted Steel Construction