GOVERNMENT POLYTECHNIC FOR GIRL'S

AHMEDABAD

CIVIL ENGINEERING DEPARTMENT

"CONSTRUCTION PROJECT MANAGEMENT"

(3360603)

Erection of Steel Structures

Prepared by:-
R.M.Patel

Contents :

INTRODUCTION :

- The **erection** of **structural** steelwork consist of the assembly of **steel** components into a **frame** on site. The processes involve lifting and placing components into position, then connecting them together.
- Generally this is achieved through **bolting** but sometimes **site welding** is used. The assembled frame needs to be **aligned** before bolting up is completed, and the structural handed over to the principal contractor.
- Adequate access is required by the steelwork contractor for steel transportation, unloading and erection , both in site as well as on surrounding or adjacent access roads.
- Is modern construction steel structure is used for almost every type of structure including heavy industrial buildings , multi-storey building , equipment support system , infrastructure , bridges, towers , airport, terminals, etc.
- Steel structure is a metal structure which is made of structural steel which is made of structural steel components connect with each other to carry loads and provide full rigidity.

Steel Structures

- Steel Roof Truss
- Multi Storeyed Building
- Steel Bridges
- Chimneys
- Overhead Water Tanks
- Plate Girders
- Large Span Lattice Girder
- Transmission Line Towers

WHAT ARE STEEL STRUCTURES ?

- A structure which is made from organised combination of structural STEEL members designed to carry loads and provide adequate rigidity.
- Steel structures involve a sub -structure or members in a building made from structural steel .
- Some famous steel structures are :-

WALT DISNEY CONCERT HALL, US

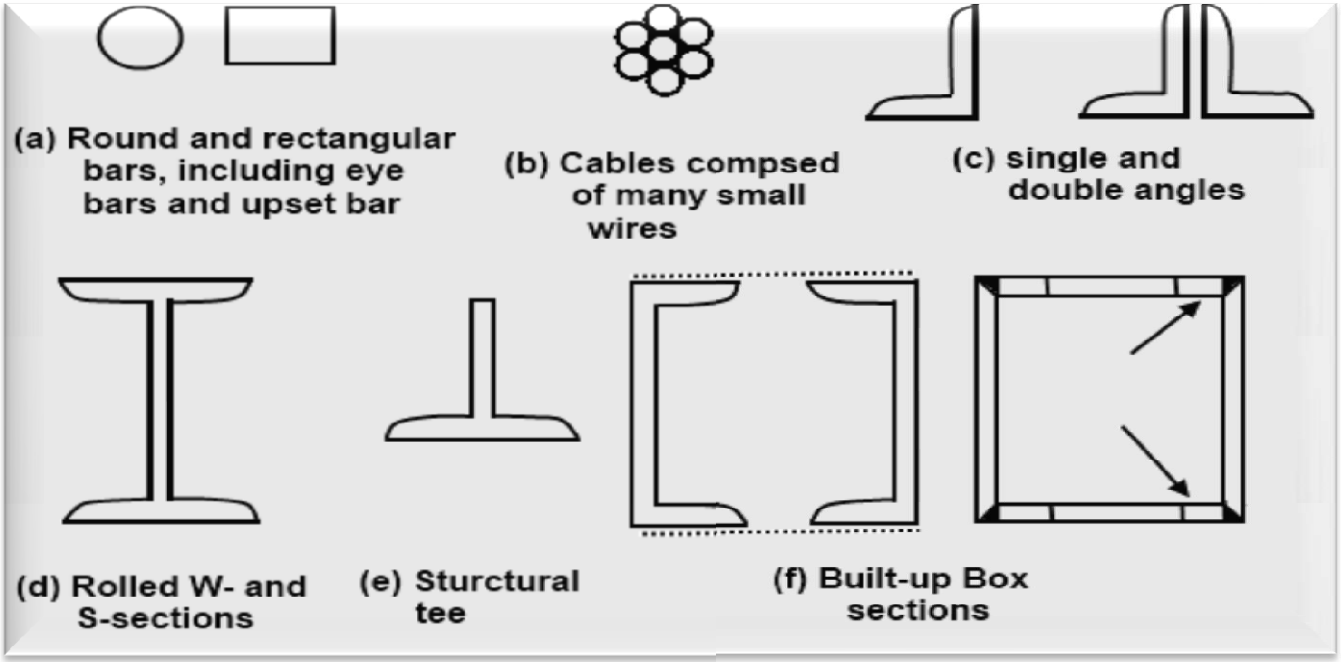
TYNE BRIDGE, UK

Where and When Steel Structures are used?

1. Long – span structures
2. Multi- storey & high- rise buildings
3. Building of heavy duty plants
4. Tower & mast structure
5. Portal frames
6. Bridge
7. Infrastructures
8. Deployable structures
9. Generalized structures: mechanical

Elements in a Steel Structure

- Structural member is physically distinguished part of structure with independent structural function, e.g. member
- Elements , cable, beams, sections etc.



GENERAL TERMS

- Rivets are permanent mechanical fastener. Before being installed a rivet consists as a smooth cylindrical shaft with a head on one end.

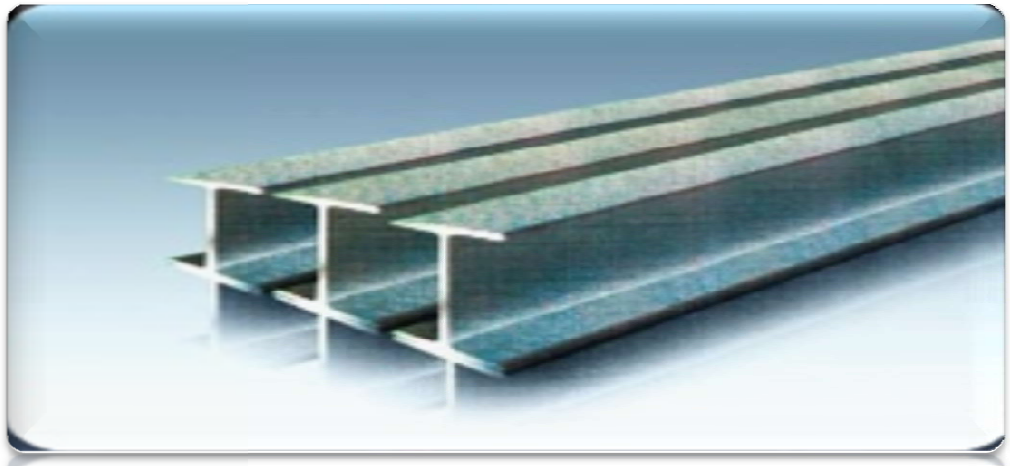
- **Panel joint** : It is a point of connection between two or more members of a truss also called **node.**
- **Girder :** It is a support beam used in construction. Girder often have an I-beam cross section for strength.

- **Pin and Hanger :** The assembly is used to connect two plate girder of bridge. These assemble are used when the space between two bridge piers is too wide to be spanned by a single set of girder.
- **Strings :** This projection used for supporting the deck of a bridge
- **Bridge deck** or **road bed :** It is the roadway, or the pedestrian walkway, surface of a bridge. It is not to be confused with any deck of a ship
- An **expansion joint** or **movement joint** is an assembly designed to safely absorb the heat – include expansion and contraction of construction materials, to absorb vibration, to hold parts together, or to allow movement due to ground settlement or earthquakes.
- **Mild steel** also called **plain –carbon steel** because its price is relatively low while it provides material properties that are acceptance for many applications, more so than **iron.** Low – carbon steel contains approximately 0.05-0.3% carbon.

Mild Steel

9. An **I –beam** also known as **H-beam** with an i- or H-shaped cross section. The horizontal elements of the "I" are **flanges** , while the vertical elements is termed the "WEB".

I - Beam



TYPES OF STEEL :

ACCORDING TO VARYING CARBON CONTENT

- Dead mild steel (less than 0.15 % carbon)
- Mild steel (0.15 – 0.30% carbon)
- Medium carbon steel (0.30- 0.80 % carbon)
- High carbon steel (0.80- 1.50 % Carbon)
- Cast steel /carbon tool steel (more than 1.50% carbon)

1. Mild steel

- More tough and more elastic than cast iron and wrought iron
- Easily forged , welded & rivet
- Not much affected by saline water
- Equally strong in tension , compression and in shear
- Difficult to harden and temper
- Sp. Gravity **7.8**

Uses :

- Used as rolled structural sections like I- beam sections , t-sections , channel section , angle sections plates round and square rods
- Reinforcement in R.C.C.
- M.S. Tubes are used in structure
- Plain and corrugated M.S. sheets are used in roofing.

2 . Medium carbon steel :

- Granular structure
- More tough & elastic than M.S.
- More difficult to forge and to weld
- Stronger to compression and tension in shear

3. High carbon steel :

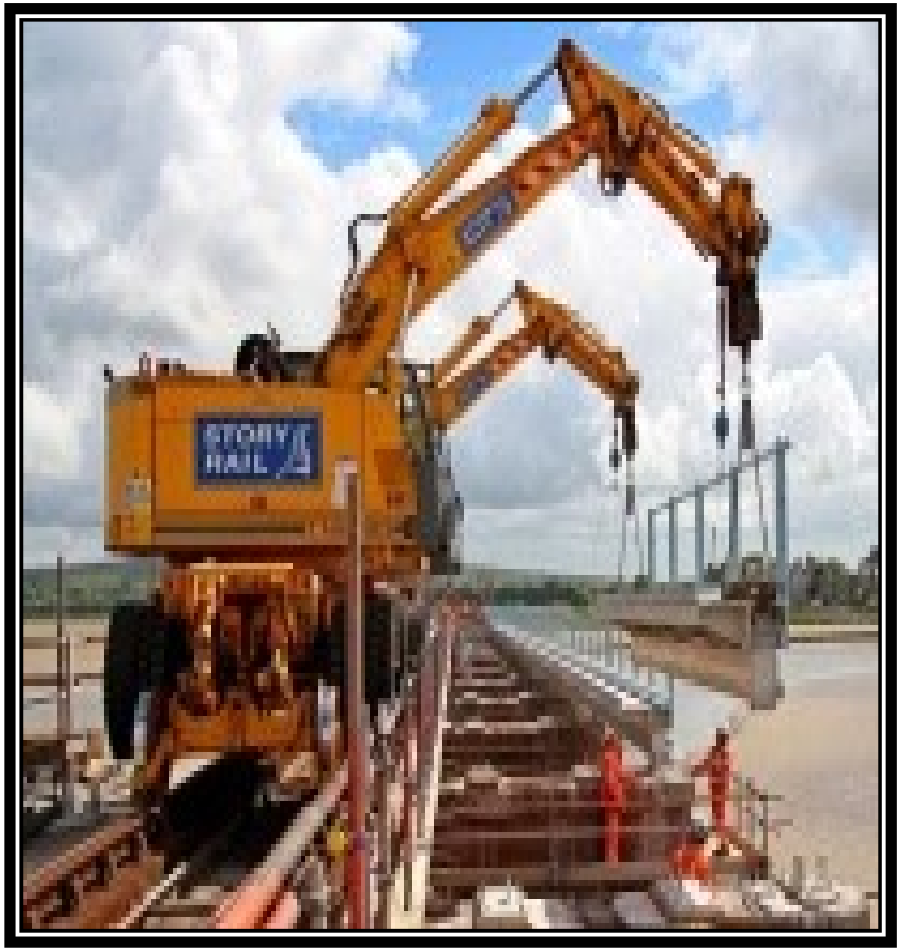
- Increased tensile strength leads to less weight of it being used as compared to M.S.
- Structure becomes lighter
- Resist corrosion better
- Tougher and more elastic

ERECTION TECHNIQUES

- Cranes and MEWPs (Mobile Elevating Work Platforms) are predominantly used for the erection of structural steelwork for buildings and bridges in the UK, although other techniques are sometimes used for steel bridge construction.
- Generally, cranes may be divided into two broad categories, mobile and non-mobile. The first category includes truck mounted cranes, crawler cranes and all-terrain cranes, whilst the second category primarily covers tower cranes.

MOBILE CRANE :

- Normally, truck mounted cranes do not require a back-up crane for site assembly, and require very little set-up time. These two attributes mean that they are suitable for one-off, single day commissions.
- Their main drawback is that to achieve a high lifting capacity from a light vehicle, a larger footprint is required than for an equivalent crawler crane. The size of the footprint can be increased using outriggers.
- Crawler cranes are more rugged than truck mounted cranes. Ground conditions are therefore less critical. Crawler cranes may travel with suspended loads on site, because they are stable without the use of outriggers.
- They also have a relatively high lifting capacity. Daily hire is not possible for crawler cranes, because transportation to and from site is expensive, and they require site assembly.



Mobile Crane

TOWER CRANES :

- Tower cranes must be assembled on site, because of their size, and this operation often requires a second (usually truck mounted) crane.
- They also have a relatively slow lifting rate, which means they are only used when site conditions preclude an alternative. A further consideration when specifying a crane is that tower cranes are 'vulnerable' to wind loading, which may prevent crane use at times.
- Their advantages are an ability to lift to greater heights than a mobile, and to lift their rated capacity over a significant proportion of their radius range. A tower crane may even be tied to the building frame to provide stability as height increases. Alternatively, climbing cranes may be used

Tower Crane

SELECTION OF EQUIPMENTS FOR ERECTION:

- The selection of equipment required for the erection of steel structure depends on following factors
- Whether member is to be pulled or pushed?
- Weight of member
- Length of member
- Height of construction
- Method of construction
- Cost of erection
- Available budget
- Use of equipment
- Availability of open space
- Store facility

- Type of structure –residential / industrial / multi-storeyed
- Available bearing strata
- Maintenance cost
- Purchase cost
- Size of equipment
- Size of work
- Site selection
- Speed of work of equipment

ADVANTAGES OF STEEL STRUCTURE

- High strength
- The high ratio of strength to weight
- Excellent ductility and seismic resistance
- Withstand extensive deformation without failure even under high tensile stress.
- Elasticity ,uniformity of material
- Ease of fabrication and speed of erection
- High elasticity
- Performance
- Ductility and toughness
- Steel is cost effective and rarely fluctuates in price.

DISADVATAGES OF STRUCTURE

- Can bend in fires.
- Faulty design leads to the corrosion of iron and steel in building.
- Fireproofing cost.
- Fatigue and brittle fracture
- Maintenance cost

SAFETY PRECAUTIONS DURING ERECTION OF STEEL STRUCTURES

- All erection equipments such as cranes, derricks, hoists, etc. should be thoroughly checked before use.
- Worker engaged in erection work should wear helmets and use safety belts to avoid accidents.
- All lifting tools and tackles such as wire ropes ,u-clamps , shackles, chain pulley blocks, hooks etc. should be checked thoroughly.
- Trestles should be erected on hard river bed to avoid settlement.
- The erection work should be carried out under the supervision of experienced persons.
- Danger signs should be promptly displayed around the periphery of erection site.

EXAMPLES OF STEEL STRUCTURE

1. HOWRAH BRIDGE :

When commissioned in 1943, Howrah was the 3rd - longest cantilever bridge in the world.

2. WILLIS TOWER :

The Willis tower is 1,450 foot (442.1 m) sky scraper in Chicago. At completion in 1973.

3. SYDENY HARBOUR BRIDGE

- The Sydeny harbor bridge is a heritage – listed steel through arch bridge across sydeny harbor that carries rail, vehicular ,bicycle and pedestrian traffic between the sydeny central business central and the north shore.
- Length of bridge 1,149m (3,770 ft) no of lanes 8 .

4. EGG SHAPED BUILDING

5. BEIJING NATIONAL STADIUM :

Beijing national stadium officially the national stadium to china . also known as birds “s nest is a stadium in Beijing.

THANK YOU