Definition

- The structural steel is steel structure made up of the following load-bearing steel elements connected by bolts or welding:
  - beams
  - girders
  - trusses
  - stanchions
  - bracing

إن الأبنية بنظام الهيكلية الفولاذي تتركيب من العناصر الحاملة التالية تستخدم وصلات بالمزاليج أو اللحام:
  - جوائز
  - عوارض
  - جملونات
  - دعامات
  - عناصر تثبيت
Structural Steel work (BS 449, BS 5950)

- Grade 43
- Grade 50
- Grade 55
Structural Design

- Safety
- Serviceability
Steel Cross-Section

- I - Universal Beam/Column
- U - Channel
- L - Angle
- T - Tee
- - Hollow Sections
- Girder
Beams

- Beams are structural elements carrying loads from slabs.
- The loads are resisted by bending and shear in the beams.
- There are 3 types of beams:
  - Simply support beams
  - Continuous beams
  - Cantilevered beams
Columns/Stanchions

- Stanchions are vertical members supporting floors and beams in building
Connections

- Connections join individual elements together to form the structural frame, for example, floor beams to stanchions in a building
Types of Connections

- Bolts
- Welding
Bolt Connections

- Black bolts
- High-strength friction-grip bolts
Basic components (3)

• The nominal form of the steel components (members) and bolts are standardized in series and specified by the relevant Standards, such as BS4190, BS3692, BS4395 and BS5135.
Common form of Steelworks

Steelworks can appear in the following form:

- **To carry loads over a span:**
  - Universal beam
  - Castellated beam
  - Plate girder
  - Truss
  - Lattice
  - Vierendeel girder
  - Portal frame
  - Space frame

- **To carry vertical loads:**
  - Universal column
  - Laced stanchion
  - Battened stanchion
Use together with concrete

- Steelworks are in some situations used with concrete for:
  - composite beam (concrete to be the compression member at top)
  - foundations
  - Protection to steel
Drawings contents

The drawings should show the steelworks for different levels of details:

(a) layout of the whole structures for which the steel works are to form – by plans and elevations
(b) Layout of the steelworks (e.g. a truss) – by plans and elevations
(c) Details of connections of the steelworks – by plans, elevations and sections, even isometric views.
The following information are relevant:

- The general dimensions of the steelworks
- The nominal size of the members (e.g. 305x102x25kg/m UB)
- The centre lines (or line of centroid) of members forming the framework.
- The arrangements of connection (referred to enlarged details where necessary)
Drawings for connection details

The following information are relevant:

(a) for bolting
- The number and diameter of bolts
- Provision of washers
- Diameter of bolt holes
- Position/spacing of bolt holes
- Edge distance to hole

(b) for welding
- Form of weld (e.g. fillet, butt.)
- Size of weld (leg length)
- Weld length
- Spacing of intermittent welds
- Symbols as recommended by BS 499.
Glossary

The following terms may be used in drawing to describe steelworks:

- Flange
- Web
- Web stiffener
- Cleat
- Bracket
- End plate to tube

- Base (to stanchion)
- Gusset
- Splice
- Tie (of a truss)
- Top chord (of a truss)

- Bottom chord (of a truss)
- Strut (of a truss)
- Countersunk bolt
- Shank/thread of bolt
- Backing (to contain weld)
Specifications given in the drawings

The drawing notes may specify the following:

▪ Grade of the steel members. (e.g. Grade 43C)
▪ Grade of the bolts (e.g. Black bolts, stainless steel bolts.)
▪ Method to form holes and to cut member
▪ Method of welding
▪ Tolerance of fabrication
▪ Treatment to steel surface (hot-dip galvanized, painting, etc.)
Typical Connection of Joint

2 - 100 X 75 X 8L

70 X 70 X 8L

50 X 50 X 6L
Black Bolts Connections

4 No. 20 mm dia. black bolts

Stanchion “A”

Beam B3

Elevation
6 mm fillet weld

Beam B3

Stanchion “A”

Elevation

171

352

200
STEEL TRUSS

Make a detail drawing for joint 1, 2 & 3 of the truss shown.
The truss is to be bolted connection
Scale: Elevation 1 : 20  Joint: 1 : 5

Notes:
1. All dimensions are in millimetre
2. All steel to BS 4360 Grade 43A
3. All bolts are 16 mm diameter black bolts
   Grade 4.6 except otherwise stated
4. All gusset plate are of 8 mm thick
5. All member clearances are 5 mm