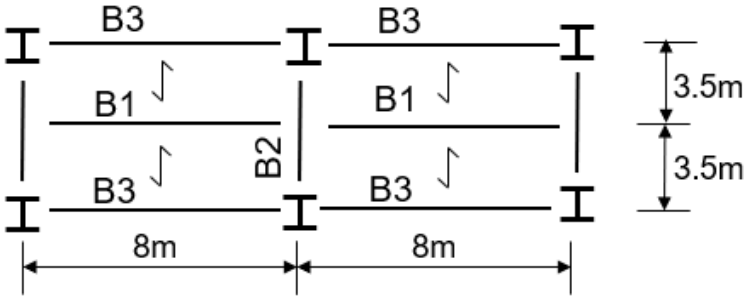
Q.1 (a) Floor plan of a storage area is as shown in ***Figure Q1***. Compression flanges of the steel beams (**Beam B1 and B2**) are fully restrained from lateral torsional buckling by concrete slabs. The concrete slabs are 170 mm thick supporting additional finishes load of 0.6 kN/m^2. The imposed load on the slabs is 4.5 kN/m^2. All steel beams are of ***Grade S355*** and simply supported at their ends. Unit weight of concrete is assumed to be 24.5 kN/m^3. All the beams are carrying brittle finishes.

(i) Determine the factored load intensity (in kN/m^2) carried by the slabs.
(ii) With consideration of beam self-weight (g = 10 m/s^2), detremine the maximum factored shear force and bending moment of **Beam B1**.
(iii) Determine the maximum factored shear force and bending moment of Beam **B2**.
(iv) Find the section classes of the steel **Beams B1** and **B2**.
(v) Check the adequacy of steel **Beam B2** against shear, bending and deflection.



Beam B1: 457 x 152 x 60 kg/m UB
Beam B2: 533 x 210 x 92 kg/m UB

Figure Q1

(b) By application of AI tools (eg. ChatGPT, Copilot, Deepseek, etc), produce an annotated sketch of the isometric view of connection details between concrete floor slab, steel beam B1 and B2 with following requirements:
- Concrete floor slab is supported by steel **Beams B1** and **Beam B2**.
- Secondary steel **Beams B1** are supported by primary steel **Beam B2** by fillet weld at both sides of its web.
- Design information (eg. dimension and setting-out, loadings, supporting conditions, design assumption, etc) shall be included in the sketch.
- Communication with AI tools (all steps of input prompts and intermediate/ final output by AI) must be captured in screenshots for submission.

Q.2 A tension splice connection is subjected to an ultimate tensile force of 1000 kN as shown in ***Figure Q2.*** The main plate is 26 mm thick and the cover plates are 10 mm thick. All steel plates are of ***Grade S355*** and all bolts are of ***Grade 8.8*** M30 with 33 mm holes.

(i) Check the shear capacity of the bolts.

(ii) Check the bearing capacity of the bolts.

(iii) Check the bearing capacities of the plates.

(iv) Check the tensile capacities of the plates.

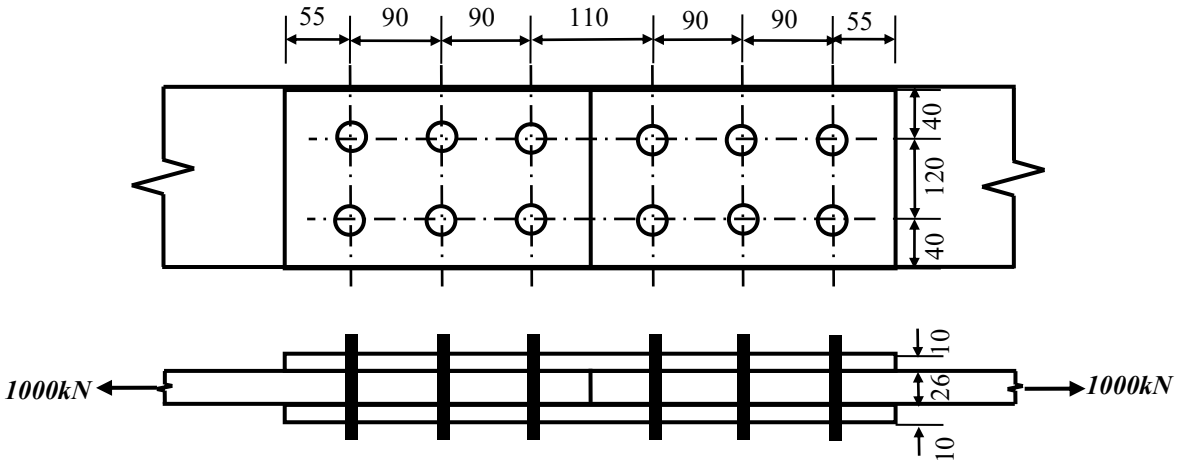


Figure Q2 (dimension in mm)

Q.3 A steel bracket as shown in ***Figure Q3*** is subjected to an eccentric design load, and the loading is on one side plate. Determine the size of fillet weld required for the bracket connection. The steel is of ***Grade S355*** and the electrode is of ***Class 42***.

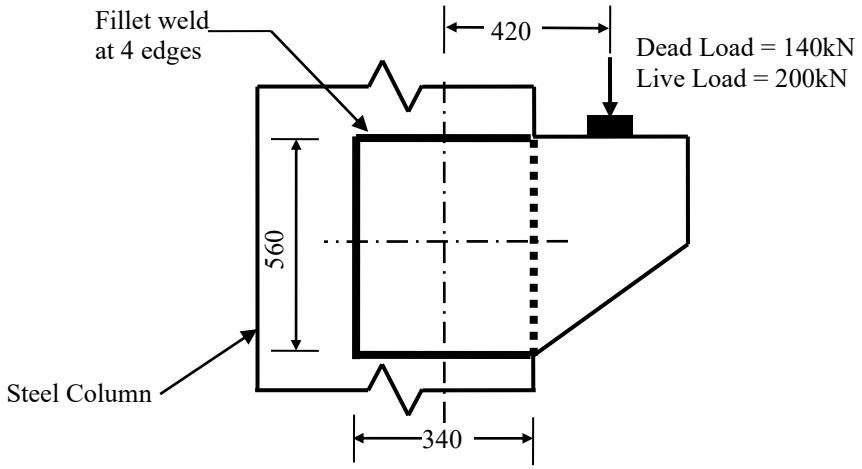


Figure Q3 (dimension in mm)