# EXERCISE BAT1: OVERALL STABILISATION

## Problem 1

## Data

Consider the volume of a T-shaped airport terminal shown in perspective in Figure 1. This terminal should be made up of frames braced in both directions. Each floor has a concrete slab, and the roofs are of metal construction with light roofing. A typical floor plan, with the dimensions and positions of the columns, is shown in Figure 2. The services part of the terminal has 3 storeys, the boarding part 2 storeys and no internal posts (only around the entire perimeter, including the interface zone). The floor height is 5 m. The stabilisation systems must remain on the façade.

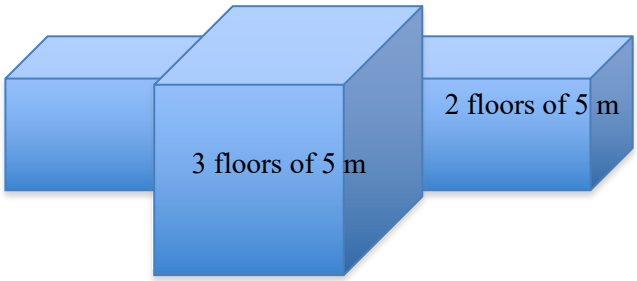


***Figure** 1 - 3D view of the terminal volume.*

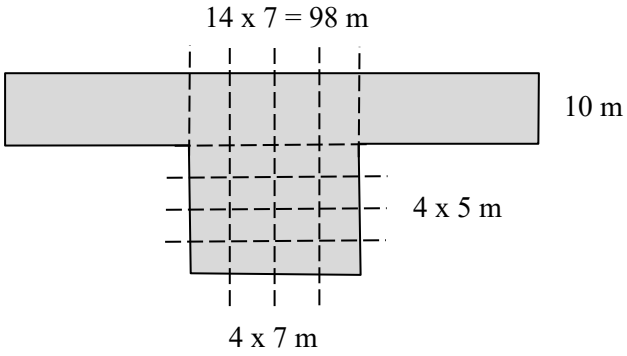


***Figure** 2 - Plan view of a floor.*

## Question

Design a longitudinal and transverse stabilisation system (bracing) for the terminal to take up the horizontal forces, justifying the positions and dimensions chosen. Draw your solution in plan and elevation.

# Problem 2

## Data

This is the hall used during the Bachelor's course. A variant of the solution implemented is envisaged, with unstable transverse frames, see Figure 3 below. The other data remains the same as for the basic hall, i.e. :

- Total length 110 m, total width 45 m (3 bays of 15 m). The core in one corner of the hall is made of reinforced concrete.
- The reinforced concrete core area measures 15 x 20 m.
- Frame spacing: 5 m
- Between purlins: 2.5 m (horizontally)
- Between channels: 1.75 m

A plan view of the hall is shown in Figure 4.

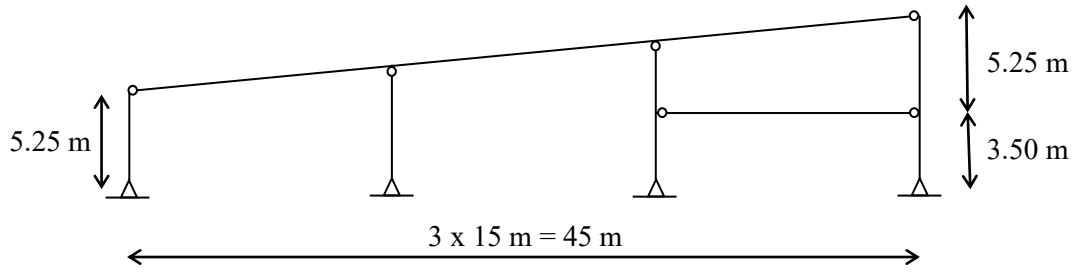


***Figure 3:*** *Static frame system.*

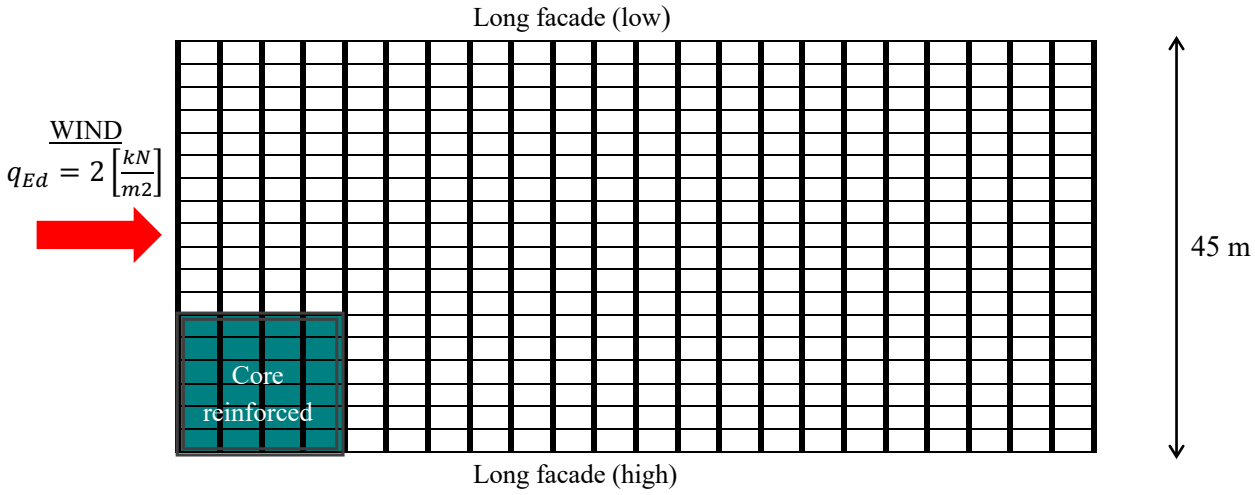


***Figure 4:*** *plan view of the hall grid, without bracing.*

## Questions

1) Design the bracing system for the hall, with the constraint of having only 2 vertical facade bracings in total. Make **clean, to-scale drawings** of your solution, including 1 plan view and 2 elevations.
2) Considering the wind acting on the gable facade and the most stressed diagonal of the long-span facade bracing, check whether an LNP 50x6, S235 profile is sufficient to withstand the forces.

# Problem 3

# Data

Consider the building shown in Figure 5. The columns are continuous, and the main beams and secondary beams (joists) are connected to the columns in an articulated manner. Determine the loads on the inner column of level 1 (marked column to be sized) for the snow risk load situation. Use the load values given below.

Dead weight of the column (permissible without variation in height): 1.17 kN/m

Permanent loads :

Joists (lPE 270): 0.361 kN/m, and main beams (HEA 280): 0.764kN/m

Composite slab: 2.55 kN/m$^2$

Weight of finishes: 1.6 kN/m$^2$

Payloads :

Terrace 3.0 kN/m$^2$

Residential: 2.0 kN/m$^2$

Offices: 3.0 kN/m$^2$

Snow (at 600 m altitude): 1.26 kN/m$^2$

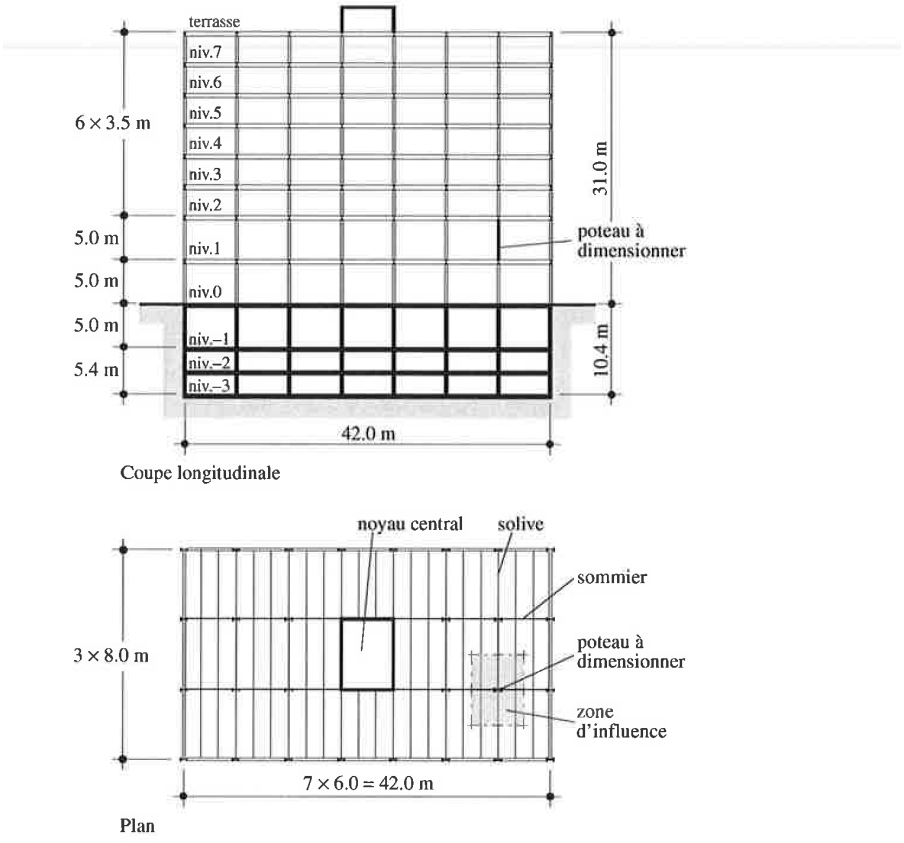


***Figure 5:*** *Elevation and plan view of the building.*