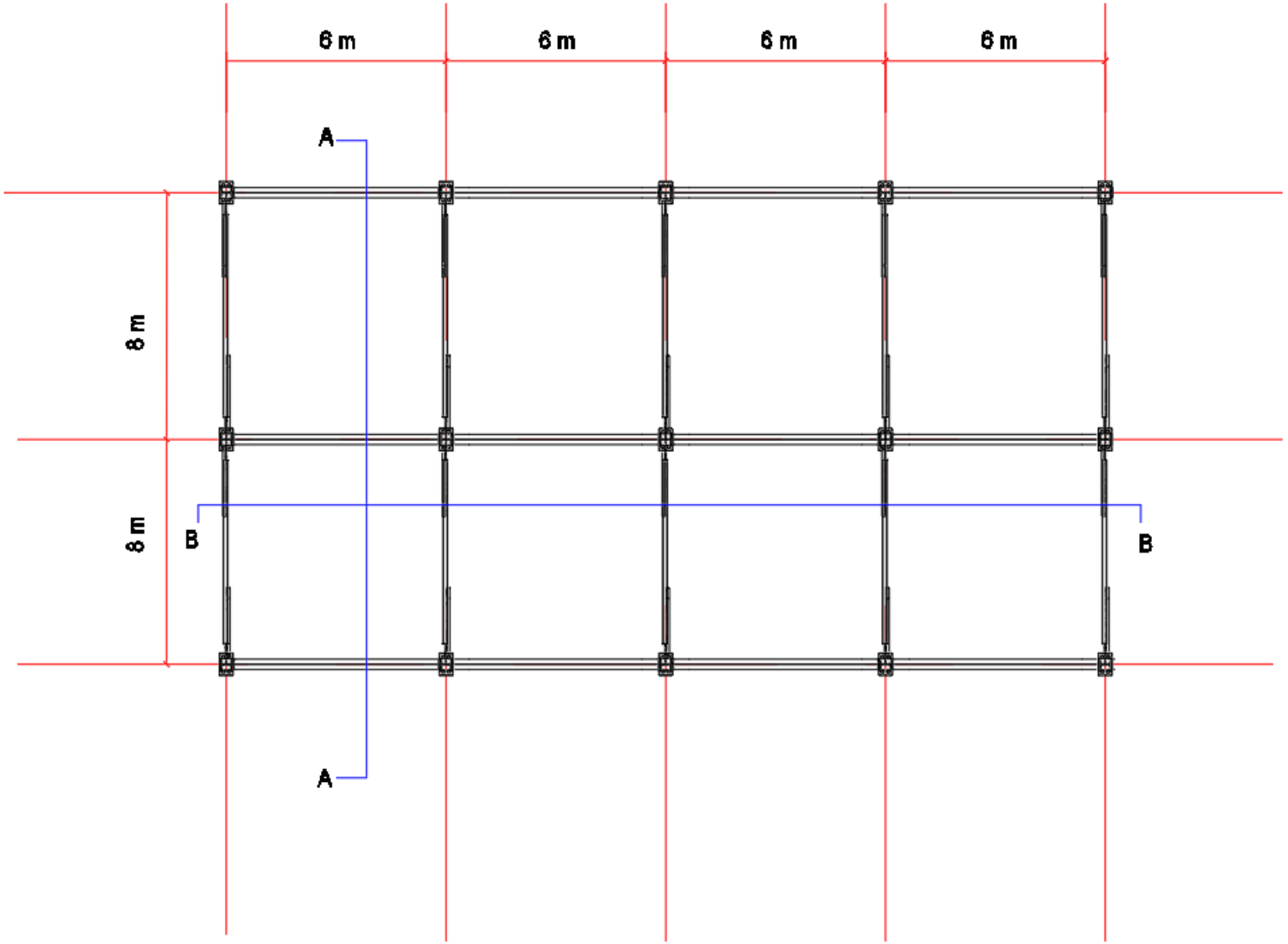
DESIGN OF STEEL STRUCTURES
2019 – 2020 Fall Semester

Term Project – Design of a Rack System

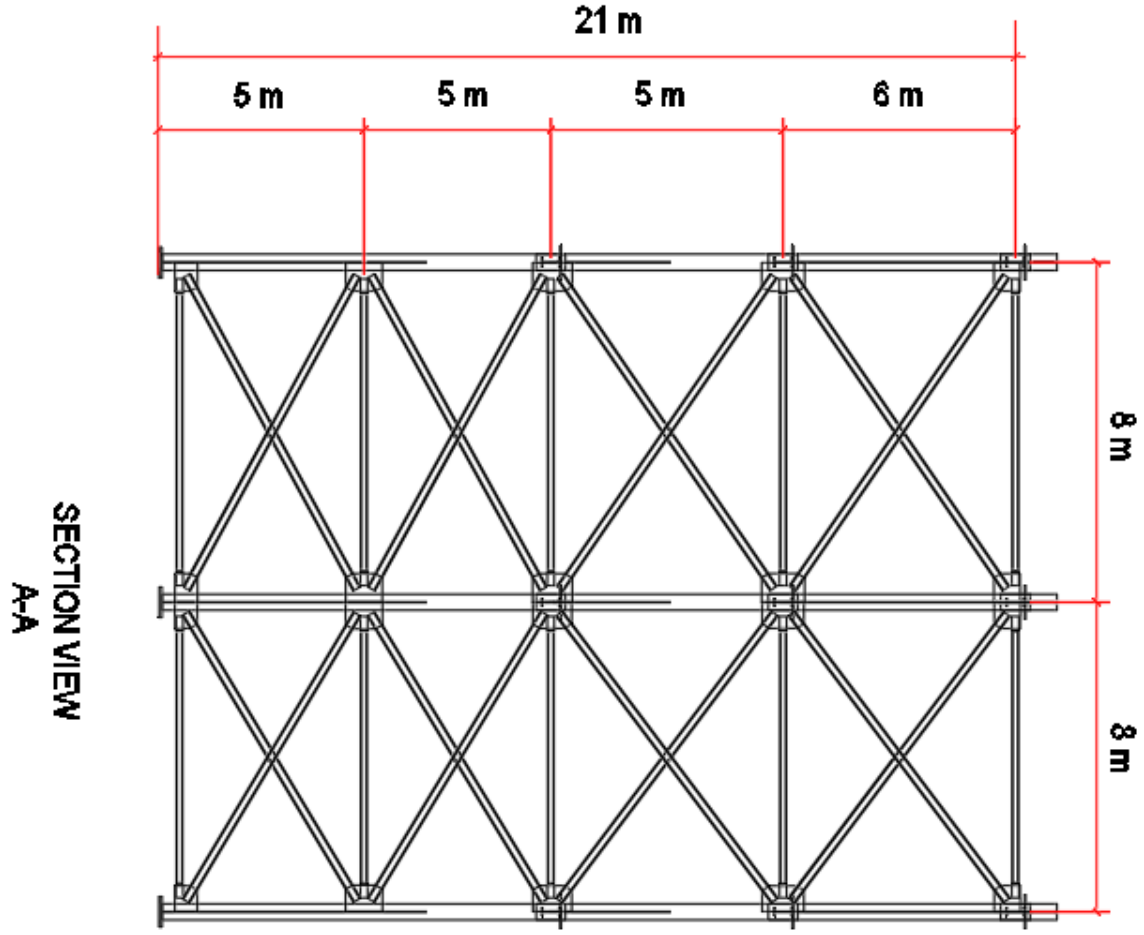
Due Date: 27 December 2019 Friday before 11:00
Group members will be paired later. Only one report needs to be submitted by each group.

1. **Objective:** A structural steel of a 4-story rack system is to be constructed in İstanbul. Typical plans and sections are given below.
   - Material grade is S275 Steel (St 44).
   - Bolt grade is 8.8.
   - Use European norms (EN1991-1-1, EN1991-1-3, EN1991-1-4, EN1998-1) to calculate loads.
   - Use AISC 360-16 for steel design.
   - Design all members using European rolled shapes or built-up sections.
   - Prepare an engineering report showing your calculations

2. **Loading:** At least, self-weight, cover, live, snow, and wind loads need to be considered. Types of the loads and their properties are as follows.
   - Live load: Live loads on the floors may be taken as 2.50 kPa.
   - Cover load: Cover load on the roof may be taken as 0.15 kPa.
   - Snow load:
     i. For this project C_e and C_t values may be taken as 1.0
     ii. Characteristic value of snow on the ground, S_k = 2.00 kPa
   - Wind load:
     i. Terrain category may be taken as "III"
     ii. Orography factor is taken as 1.0 ($C_o(z)$=1)
     iii. Basic wind velocity, V_b = 28 m/sec.
     iv. Air density, ρ=1.25kg/m^3
     v. Mean wind velocity, $V_{m(z)} = C_{r(z)} . C_{o(z)} . V_b$
     vi. Wind pressure, $W_e=q_p(z_e). C_{pe}$
   - Seismic load:
     i. Use Spectrum Type 1 (a_{gR}= 0.4g)
     ii. Take importance factor as 1.0 (γ_I=1.0)
     iii. Ground Type B
     iv. Ductility class: DCH (High)
3. **Report:** You are expected to write a brief report on the complete design of the steel rack assigned to you. In preparing your report, please be sure that you include the following topics
   - Give brief information about your structure.
   - Show your load cases and load combinations.
   - Show your load calculations, e.g. wind load and snow load etc.
   - Give a sketch of your computer model, e.g. 3-D view, loading, member sections etc.
   - Show design calculation details for beams, columns and braces (provide hand calculation for each different structural member, rest can be taken from software program as summary).
   - Show 3 typical connection details. (For example, beam to column, brace-to-beam, purlin-to-truss, base plate, etc.)
   - Indicate the total steel used and steel used per m^2.
4. **Drawing:** You are expected to draw general arrangement of whole structural system.



PLAN +5.00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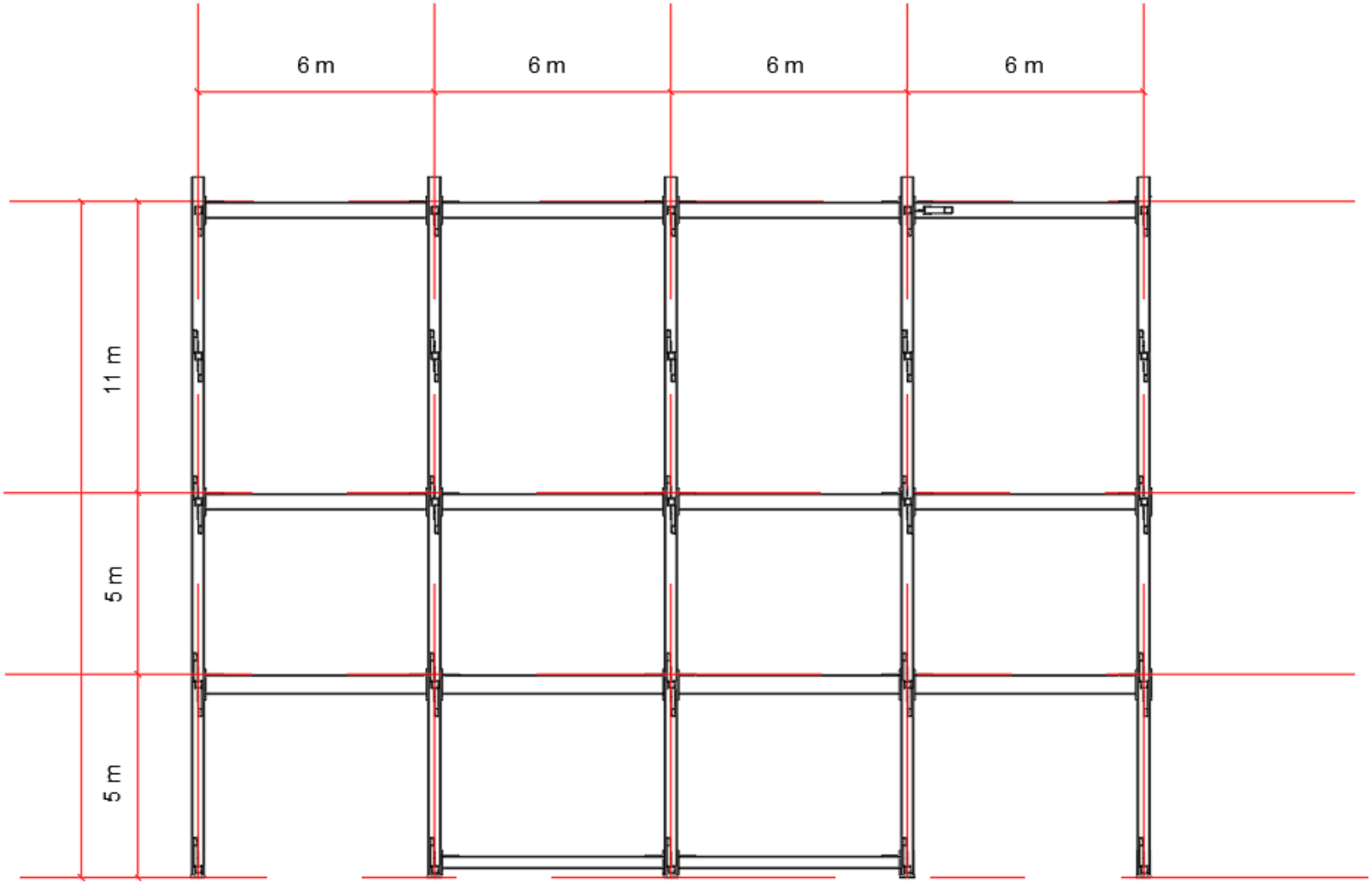
SECTION VIEW
A-A



SECTION VIEW
B-B