České Vysoké Učení Technické v Praze
Fakulta stavební

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

Fakulta stavební ČVUT v Praze - Katedra ocelových a dřevěných konstrukcí

Assignment for Seminars

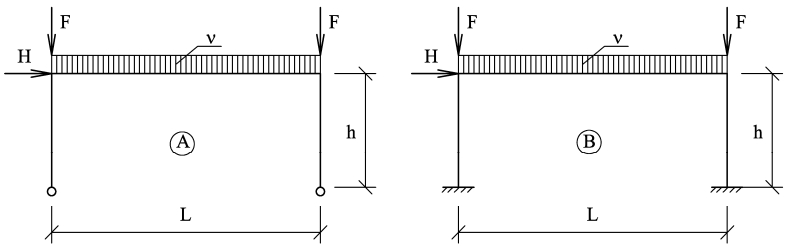
Steel structures 02 - ST02

Name : . . . . . .

A	B	(Choose one from each pair)	a =	c =
C	D		b =	(choose between 0,7 and 1,2)

NOTE: There shall be a general equations, filling and enumeration for each calculation in the report. Use following units: N, mm, MPa.

1) Design posts and beam (rafter) of the steel frame:
Consider the imperfections and second order influences according to EN 1993-1-1 for ULS design. Top flange of the rafter is laterally braced and the column support is laterally fixed.



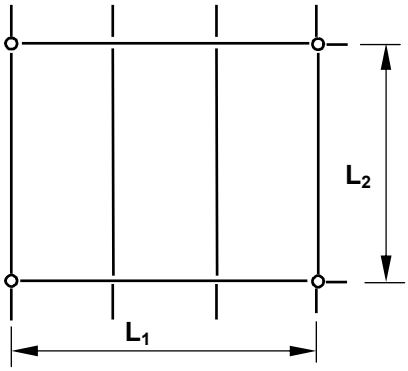
A … two-pinned frame
B … rigid frame
Steel: C … S355J0+N
D … S235J2+AR
F_k = a · 20 kN $H_k = 0{,}3 \cdot F_k$
v_k = b · 10 kN/m
h = c · 3500 mm $L = 1{,}8h$

Design the structure for the highest possible utilization. Check the final design using the appropriate software (SCIA, Dlubal, etc.) and compare the results - explain the discrepancies.

2) Design bolted joint of the frame structure (post x rafter)
Design the bolted joint of the frame designed above (Example 1). Use non-preloaded bolt type, consider the prying force and welds design. Draw a sketch of the bolted joint in scale of 1:10.

Bolt grade: A … 8.8 B … 10.9

3) Design the arrangement of the steel skeleton structure, including spatial bracing.
Use the concrete floor slab with minimum thickness of 70 mm, casting into the composite decking (corrugated sheet with overall depth of 50 mm). Estimate the floor structure, to determine the SDL use 0,8 kN/m^2 for movable partitions and 1 kN/m^2 for facade.



Floor number: C 7 D 8
Construction depth of the floor: H = b · 4,2 m
Laterally (2x) A ... L_1 = 7,5 m B ... L_1 = 9 m
Longitudinally (6x) L_2 = a · 7 m
Operable load v_k = c · 4,0 kN/m^2
Steel grade: C … S355J0+N D … S235J2+AR
Localization: permanent residence of student
Terrain category: A ... I B ... II

Work out:
- Design of composite steel-concrete primary beam with 6 spans and full web cross-section. Primary beam is not supported while casting the concrete, span is L_2, secondary beams distance is B = L_1 / 3.
- Design of non-composite steel girder with span of L_1
- Check of the designed girder for fire resistance of R60
- Design of truss bracing in the lower floor
- Design of edge column as the part of bracing. Design the composite steel-concrete column with circular CS
- Design of following joints: primary beam to girder, girder to column (incl. bracing), column foot (incl. bracing)
- Plan and section (Scale 1:200). Detail drawing 1:10 according to seminar supervisor task.

4) Desing web and stiffeners of the silo

Design web thickness (steel plate), arrangement and dimensions of both longitudinal and transversal stiffeners in the bottom part of the squared silo with dimension of ***a*** · **3 m**. Height of the silo is ***b*** · **3 m**. There are any climatic loads acting on the silo.

Filling of the silo: A...cement, B...grain.

Work out the scheme of stiffeners arrangement.

5) Design a crane beam made of hot rolled opened I-section

Crane span:	A 13,5 m	B 16,5 m
Crane beam span:	(5 + ***b*** · 2) m,	
Crane bearing capacity:	C 5 t	D 8 t,
Load category:	A...S2	B...S3

References:

Macháček - Studnička: Ocelové konstrukce 2, 2005
Studnička: Ocelobetonové konstrukce, 2009
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Jandera – Eliášová - Vraný: Ocelové konstrukce 1, cvičení, 2015
Studnička – Holický - Marková: Ocelové konstrukce, Zatížení, 2009
Vraný - Wald: Ocelové konstrukce - Tabulky, 2009

Seminary advisor: . . . . . .