

EASTERN MEDITERRANEAN UNIVERSITY, ENGINEERING FACULTY, CIVIL ENGINEERING FACULTY,
2019-2020 SPRING SEMESTER

CIVL471 – REINFORCED CONCRETE DESIGN PROJECT SHEET

COUNTRY CODE	STUDENT ID : (last 3 digids)				STUDENT ID:								Name Surname:
M	L	K	J	I	H	G	F	E	D	C	B	A	

A	Material	Seismic Region (Coordinates)	Local Soil Class	Type of Partition Wall Mat.
7, 8, 9	C30/S420a	İzmir City Centre	ZC	Gas Concrete
1,3,5	C25/S420a	Kocaeli City Centre	ZD	Light Concrete Block
0,2,4,6	C20/S420a	Adana City Centre	ZE	Clay Brick

<p>h = story height=(290+2*A) cm =</p> <p>a = (460+5*A+B+H) cm =</p> <p>b = (470+5*M+B+A+H) cm =</p> <p>c = (380+5*L+A+B+H) cm =</p> <p>d = (340+5*M+A+B+H+L) cm =</p> <p>e = (500+6*M+A+B+L) cm =</p>	<p>σ_z = Allowable Stress of the soil = 20+.5*A t/m²</p> <p>Number of Story = Ground Floor + 2 Floors = 3 Floors</p> <p>Floor Cover type = Ceramic, if A is odd Timber floorboard: if A is even</p> <p>Aim of Usage of the Building: Residential</p> <p>Depth of the Foundation: Building Height/6</p> <p>Plaster+cover = 100 + 10xA kg/m²</p> <p>Live Load = 200 + 10xB kg/m²</p> <p>Note: The live load at the balconies and staircase= = 350 kg/m²</p> <p>hd (Freeze Depth) < 60 cm</p> <p>Roof: Timber and clay tile</p>
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A) Work Packages (1-8 work Packages = 80 point/100; 9th work Package=20 point/100)

1. Load analysis according to code TS 498 (5th W.)
2. Static analysis and RC design of slabs of the intermediate (2nd) Floor. (5th -6th W.)
3. Preliminary design of the elements of the 3D frame (7th W.)
4. 3.1. Static analysis of frames of (A-A) and (5-5) axes according to vertical loads (8 H.)
3.2. Modelling of the building by using Sap2000 (9th W.)
5. Analysis of the structure according Earthquake loads (10th W.)
6. Static analysis of the stairs (11th W.)
7. Reinforced design of the beams (12th W.)
8. Reinforced design of the columns (13th W.)
9. Analysis and RC design of the foundation (13th W.)
10. Drawings (14th W.)
 - 9.1. Drawings of elements and reinforcement of the intermediate floor plan (1/50)
 - 9.2. Reinforcement detail plans of the beams (1/20)
 - 9.3. Reinforcement detail plans of the columns (1/50-1/20)
 - 9.4. Reinforcement details plans of staircase (1/20)
 - 9.5. Reinforcement detail plans of the foundation. (1/50-1/20)

SUBMISSION DATES OF THE PROJECT

Control Schedule for Reinforced Concrete Building Design		
Parts	Date	Topics of the Controls
I	23-27 March 2020	Slab analysis of the intermediate floor. Drawing the plans and showing the calculated reinforcements. (Use a scale: 1/50) (WP: 1 and 2)
II	6-10 April 2020	Design and analysis of frames 5-5 and A-A under vertical loads. (1.4 G + 1.6 Q), (1.0 G + 1.0 Q), (0.9 G) (WP: 3.1)
III	20-24 April 2020	Modelling and analysis of the 3D model of the building under vertical and lateral loads. (WP: 3.2, 4 and 5)
IV	4-8 May 2020	Static analysis and RC design of the stairs, RC design of the beams at frame 5-5 (WP: 6, 7 and 8)
V	18-22 May 2020	RC design of the foundations of the frames (5-5) and (A-A) (WP: 8)
VI	1-5 June 2020	Completion of the project report and drawings, and submission (WP: 9)
Use AutoCAD for all the drawings.		

B. THE PROCEDURE TO BE FOLLOWED DURING THE PROJECT WORK:

1. Students will always have the first page of the project data sheet and scaled structural plans (ground floor ceiling gear and first floor ceiling beam) during each project control. Otherwise, they will be considered that have not participated to the project control.
2. Each student must attend 60% of the project controls. Students who do not meet this requirement or whose total project submission is not at least 50/100 cannot take the final exam. In this case, students are required to redo the project in the course repetition.
3. The calculations and the report shall be written on A4 paper with a ballpoint pen.
4. Necessary explanations will be expected from the student during the submission of each project part.
5. The fact that the project has been done on time and sufficient level is the condition required to get the right to take the final exam.

C. EXPLANATIONS ON THE PROJECT SECTIONS:

Section I: Ground floor slab will be designed as joist slab (ribbed). When calculating the floor load, top coating and plaster will be considered. The floor plan and reinforcing plan of the joists shall be made with a scale of 1/50 and the detailed reinforcement of the joists plan with a scale of 1/20. Partial and total lengths of bars and diameter and spacing shall be written.

The slab of the first floor ceiling shall be designed and analyzed as solid slab. The slab above the 1st floor will not be solved. The load of the last floor will be only the ownweight and the roof load. When calculating the normal floor slab load, top coating and plaster will be considered.

Steps of solid slab analysis and design:

- a) The slab thickness shall be selected by checking the slenderness condition.
- b) The dead load of the slab shall be calculated.

- c) It will be considered that the slabs are continuous.
- d) The coefficients required for the calculation of the slab moments shall be taken from TS 500.
- e) Reinforcement calculations will be made, mold plans will be drawn on a scale of 1/50 and slab reinforcement will be shown.

Segment and total lengths of bars and diameter and spacing shall be written.

Section II: Static analysis of the continuous beams of the A-A and 5-5 axis frames of the ground and first floor according to the vertical loads shall be made.

- a) First, the loads from the slabs will be calculated.
- b) The wall load should be calculated according to 20 cm wall thickness above the outer beams surrounding the building and the beams in the staircase, and 13.5 cm wall thickness for the internal beams, without considering door and window spaces.
- c) The beam weight will be automatically taken into account in the SAP2000 program.
- d) The static analysis of the floor frames according to the calculated vertical loads can be done by using SAP2000 computer program.
- e) Max. and min. values of support and span moments will be found by considering the most unfavorable loading situation.
- f) The dimensions of the columns of the frame shall be determined approximately.
- g) The column loads will be calculated by considering the load area corresponding to each column. In this calculation, the estimated column weights are also taken into consideration.
- h) Approximate dimensions of the column can be found by considering the stress of the concrete under axial compression load.

Section III:

- a) Equivalent Earthquake Forces acting along the x and y-directions to each floor shall be calculated in accordance with the Earthquake Code. Then, M, V and N diagrams will be obtained by making analysis in SAP2000 program.
- b) Staircase shall also be taken into account when calculating the building weight. The staircase will also be considered that extending to the roof of the building.
- c) On the roof, 50 cm wide cantilevered slab from the building facade will be considered.
- d) The live load on the roof shall not be considered.

Section IV:

a) Superposition of cross-sectional effects in frame beams shall be made due to vertical and horizontal loads. (Load combinations will be applied)

- i) The absolute value of the support moments (M_d) as max. and min. values will be calculated considering vertical and horizontal effects and their diagrams will be drawn.

ii) It will be assumed that the maximum values of the span moments do not change with horizontal effects and will be calculated according to this assumption.

iii) Max value of the shear force (V_d) for the left and right supports of each frame beam, will be calculated considering vertical and horizontal load effects and their diagrams will be drawn.

b) Reinforced concrete designs shall be made in the span and supports of frame beams.

c) Frame beams sections shall be considered T-shape and an economical section shall be considered.

d) In the section design, the number of longitudinal steel bars shall be considered and inconsistent number of reinforcement shall not be placed.

e) Reinforcement drawings of frame beams shall be drawn on a scale of 1/20. Partial and total lengths and diameters and quantities will be written.

Section V:

The project will be prepared in accordance with "TS 6164 Rules of Drawing and Arrangement of Reinforced Concrete Projects." Reinforced concrete design of the single foundation to be made under the same column as the ground floor column at the intersection point of the axis 5-5 and A-A frames to be solved shall be made and reinforcement drawings shall be presented. The cross-sectional effects from the column at the intersection of the frames solved in the calculation will be considered. Basically, M , V values will be calculated and reinforced concrete calculations will be made according to these effects. The basic mold plan will be drawn on a scale of 1/50, the basic details will be drawn on a scale of 1/20, and reinforcement details will be shown. Symmetrical reinforcement shall be placed in the columns. The column application plan will be drawn on a scale of 1/20. Column-beam connection details will also be drawn.

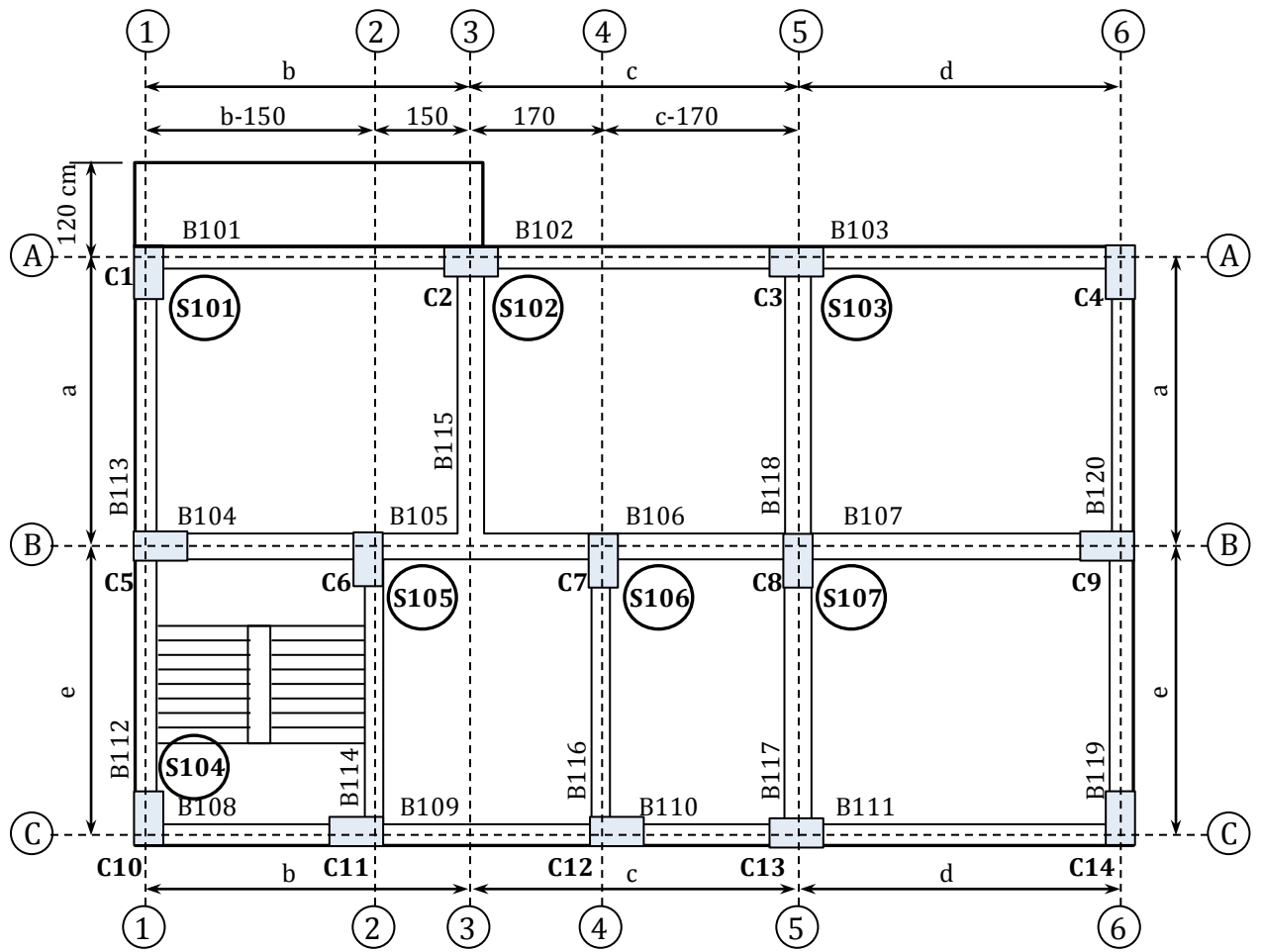
Section VI:

a) "DATA" and "CONCLUSION" files, EXCEL tables, drawings and text sections of all the solutions made on the computer will be delivered in a CD with the project. In addition, all the calculations and printouts will be delivered as bound (spiral binding) and the contents page should be available.

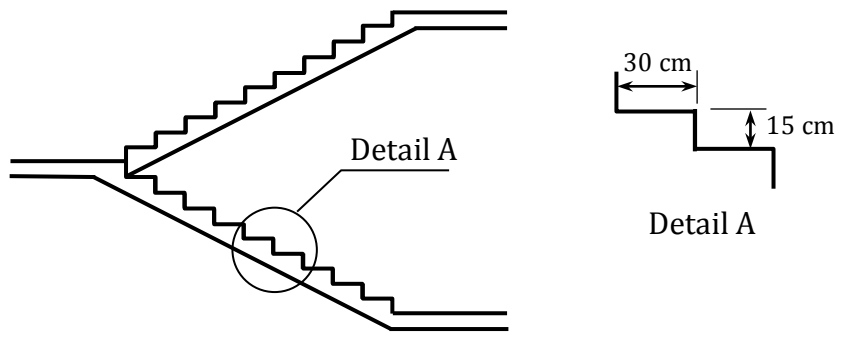
b.) Blueprint outputs of drawings shall be delivered as folded.

c.) Those who do not submit the Project within the specified period or whose Project is rejected cannot take the Final Exam.

d.) Those who have not submitted the Project within the specified time period or those whose Project has been rejected may take the make-up exam if they have submitted it by 16.01.2020 and have provided sufficient conditions for the examination.



Staircase Details



Section of staircase