YILDIZ TECHNICAL UNIVERSITY
CIVIL ENGINEERING DEPARTMENT
CONSTRUCTION MATERIAL DIVISIONS

CONSTRUCTION MATERIALS /3rd LABORATORY REPORT: CONCRETE MIX DESIGN & THE FRESH AND HARDENED PROPERTIES OF CONCRETE

Name-Surname:	**Group:**
Student No.:	**Session:**

3.1. CONCRETE MIX DESIGN

Table 3. 1 Physical properties of the constituents of concrete

Materials	Specific gravity (kg/dm³)	Mix ratio (%)	Water absorption (%)	Moist content (%)
Fine Aggregate 1: Natural Sand	2.67	20	1.2	3.8
Fine Aggregate 2: Crushed Sand	2.69	25	0,9	2
Coarse Aggregate: Crushed Stone No.1	2.71	55	0.5	0.2
Cement: CEM I 42,5 R	3.1			
Superplasticizer	1.15			

Table 3. 2 Recommended limit values for concrete mix and its properties

Exposure Class	Min Strength Class	Max w/c ratio	Min cement dosage kg/m^3	Min Air content, %
XC3	C30/37	0.55	280	-

Calculate the amounts of the components to be used in the concrete mixture according to the preliminary test results and material properties given below.

- ✓ Water/cement ratio and cement dosage are 0.42 and 355 kg/m^3, respectively.
- ✓ Air content of the fresh concrete was obtained as % 1.6%.
- ✓ The solid content of the superplasticizer is 35%.
- ✓ The desired slump class was obtained by using 0.9% superplasticizer.

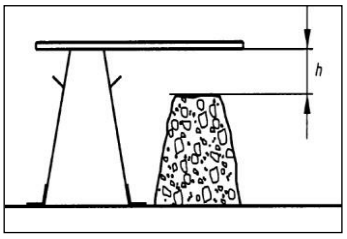
Calculations:

Table 3. 3 Amount of constituents for $1m^3$

Materials	Amount of constituents for SSD condition (kg)	Amount of constituents for moist aggregate (kg)
Cement		
Water		
Natural Sand		
Crushed Sand		
Crushed Stone No.1		
Superplasticizer		

3.2 FRESH STATE PROPERTIES OF CONCRETE

3.2.1 Slump Test (TS EN 12350-2)



Measured slump value (h) is .....cm.

According to this result, the slump class of fresh concrete is ……. defined in TS EN 206.

Figure 3. 1 Slump test

3.2.2 Fresh Density (β) (TS EN 12350-6)

Figure 3. 2 Concrete mold with dimensions of 150×150×150 mm^3

Table 3. 4 The density of fresh concrete

No.	W(kg)	β(kg/m^3)
1		
2		
3		
Average		

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3.3. Non-Destructive Tests

3.3.1. Ultrasonic Pulse Velocity (UPV) Test (TS EN 12504-4)

Table 3.5. UPV test results

No.	Time (µs)	Length (mm)	UPV (mm/µs)
1		150	
2		150	
3		150	
		Average:	

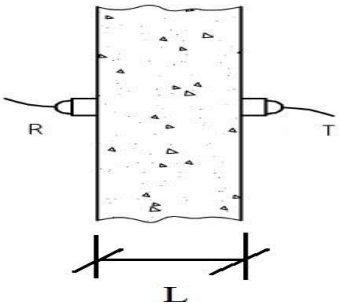

Table 3.6. Evaluation of concrete by determining the UPV
(Whitehurst, E.A., "Soniscope Tests Concrete Structures", Journal of ACI)

UPV (mm/µs)	Concrete Quality	✓
> 4,5	Excellent	
3,5 – 4,5	Good	
3,0 – 3,5	Questionable	
2,0 – 3,0	Poor	
< 2,0	Very Poor	

3.3.2. Rebound Hammer (Schmidt Hammer) Test (TS EN 12504-2)

Rebound Number	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Average	

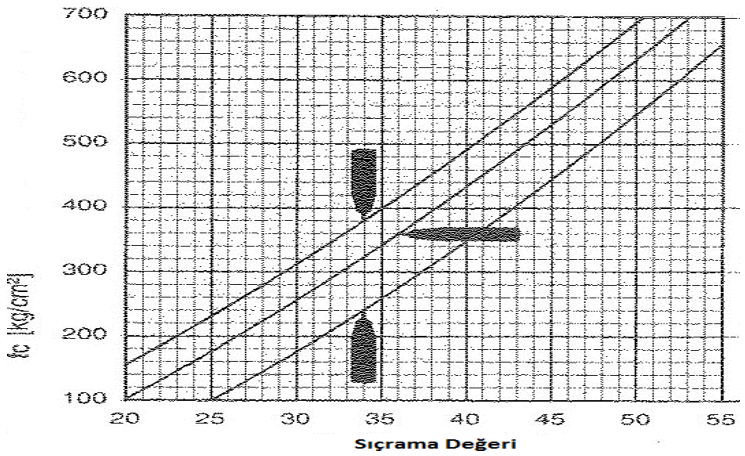

Figure 3.3. Relation between compressive strength and rebound number (1 kg/cm2=0.0981 MPa)

Estimated Compressive Strength: $f_{c,tah} \approx$ ..... MPa

3.4. DESTRUCTIVE TESTS

3.4.1. Compressive Strength Tests (TS EN 12390-3)

Table 3.7. Test results and conformity criteria for the compressive strength classes (TS-EN 206)

No.	P_c (kN)	f_c (MPa)	Evaluation
1			$f_{cm} \geq f_{ck} + 4{,}0$ (MPa) $f_{c,min} \geq f_{ck} - 4{,}0$ (MPa)
2			
3			
Average ($f_{c,m}$):			
Minimum Individual value ($f_{c,min}$):			

Table 3.8. Compressive strength classes for normal-weight and heavy-weight concrete (TS EN 206)

Basınç dayanımı sınıfı	En düşük karakteristik silindir dayanımı $f_{ck,sil}$ N/mm^2	En düşük karakteristik küp dayanımı $f_{ck,küp}$ N/mm^2
C 8/10	8	10
C 12/15	12	15
C 16/20	16	20
C 20/25	20	25
C 25/30	25	30
C 30/37	30	37
C 35/45	35	45
C 40/50	40	50
C 45/55	45	55
C 50/60	50	60
C 55/67	55	67
C 60/75	60	75
C 70/85	70	85
C 80/95	80	95
C 90/105	90	105
C 100/115	100	115

Calculations:

According to the test results, the compressive strength class is determined as …… Hence, this concrete ***conforms / does not conform*** the minimum strength class requirement (C30/37) for exposure class XC3 that was considered during the mix design.

3.4.2. Splitting-Tensile Strength Test (TS EN 12390-6)

Failure Load: P_s = …… kN

f_s = …… MPa

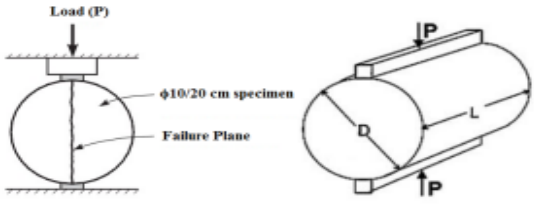

Figure 3.4 Split-tension test