SOLUTION **EXERCISE 10-D -** ED
UHPFRC SPECIFICATION (MIX-DESIGN)

Case	Type of structure or element	Fibers	Aggregates	Binders	Mineral additions	Mixing water	Admixtures	Other products
3	**Ribbed slab, city fire station** **40 mm reinforcing layer in reinforced UHPFRC (with rebar)** cast in place on existing slab, hydrojetting of 10 mm thickness. Total volume of UHPFRC to be produced in a concrete plant 15 km away: 40 m^3	For tensile hardening behavior Steel, straight L_f = 10 to 20 mm, slenderness 50 to 80, V_f such that **$V_f * l_f / d_f > 240$**	Quartz sand 0.1-0.4 mm (or more) to be adjusted according to fiber factor and desired workability Generally between 0 and 1000 kg/m^3 V_{paste} > 60 %	CEM I, CEM II, CEM III, White cement, etc. Typical dosage: 600 to 1400 kg/m^3 (volume of paste to be adjusted according to fiber factor and desired workability)	Generally, silica fume between 7.5 and 35% of cement mass Depending on the UHPFRC: Slag (included in CEM III), and/or limestone filler, quartz flour, etc.	between approximately 140 and 250 liters per m^3, depending on the W/C, the composition of the UHPFRC and the desired workability. Water/Fines generally between 0.13 and 0.20	Superplasticizer (SP) in all cases (Polycarboxylate) - caution regarding compatibility with cement/binders Typical dosage = 2 to 4% of cement mass (total mass of admixture) **- Pay attention to the amount of water included in SP**	Add 3 to 4 kg/m^3 of polypropylene (PP) fibers for fire resistance. Setting accelerator possible according to case and needs
4	**Protective plates for overpass piers on a highway** **Swiss Alps** Prefabricated UHPFRC Thickness 40 mm, height 3 m, width 2 m	For deflection hardening behavior Steel, straight, L_f = 10 to 20 mm, slenderness 50 to 80, V_f such that **$V_f * l_f / d_f > 0.7*240=168$**	Quartz sand 0.1-0.4 mm Same as case 3	Same as case 3	Same as case 3	Same as case 3	Same as case 3	UHPFRC can be pigmented to modulate its color.