HIT-HY200 Post-installed Rebar Design
ETA/EC2 Design Method

Ultimate Limit State

1. Basic anchorage length {Clause 9.2.1.4(2), EC2}:

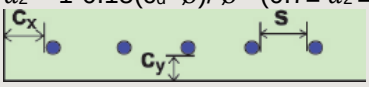
   $$l_{b,rqd} = (\frac{d_s}{4}) \times (\frac{\sigma_{sd}}{f_{bd}})$$

   d_s = rebar diameter
   σ_{sd} = calculated design stress of rebar [1]
   f_{bd} = design value of bond strength [2]

2. Design anchorage length {Clause 8.4.4, EC2}:

   $$l_{bd} = \alpha_1\alpha_2\alpha_3\alpha_4\alpha_5 l_{b,rqd} \geq l_{b,min}$$

   α_1 = 1.0 for straight bars
   α_2 = 1-0.15(c_d- Ø)/ Ø (0.7≤ α_2 ≤1)

   c_d = min(c_x; c_y; s/2)
   α_3 = 1.0 for no transverse reinforcement
   α_4 = 1.0 for no welded transverse reinforcement
   α_5 = 1.0 influence of transverse pressure is neglected

3. Check minimum anchorage length [3]
   {Clause 8.4.4(1), EC2}:

   $$l_{b,min} = \max\{0.3l_{b,rqd};\ 10Ø; 100\text{mm}\}$$

4. Get the required embedment

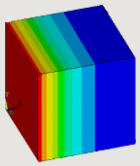
   $$l_{ef} = \max\{l_{bd};\ l_{b,min}\}$$

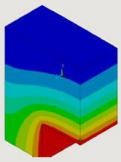
5. Check the additional provision
   ➔ c_{min} = 30 + 0.06 l_{ef} ≥ 2 Ø for Ø < 25 mm
   = 40 + 0.06 l_{ef} ≥ 2 Ø for Ø ≥ 25 mm
   ➔ s_{min} = max {40mm; 4 Ø}

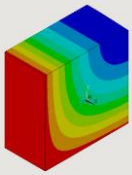
Fire Limit State (where applicable)

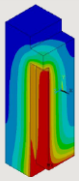
1. Check the connection type:

   Parallel connection **Anchoring connection**

   
   Slab to Slab

   
   Wall to Slab

   
   Beam to Beam

   
   Wall to Beam

2. Calculate the FLS loading according to CoPSUC (γ_{Load}&γ_s = 1.0) {CoPSUC: 2013 table 2.2, 2.3}

3. Check the corresponding fire resistance table in report no. FAHY200C-2016-S.
   ➔ For **anchoring connection**:
   Refer to maximum force in the rebar and select required embedment in FLS.
   ➔ For **parallel connection**:
   1) Refer to the table with corresponding concrete cover to find out the bond strength and divide it by γ_g=1.43. {CoPSUC table 2.3 & CSTB report no. 26033756 section 5.1}
   2) Calculate the required embedment by ULS equations with the FLS loading and bond strength.

Final Design Anchorage Length

$$l_{ef} = \max\{l_{ef,ULS};\ l_{ef,FLS}\}$$

Note:
[1] Design stress σ_{sd} of rebar
➔ For calculated design stress

$$\sigma_{sd} = \frac{Area\ of\ steel\ required}{reinforcement\ provided} \times \frac{f_{yk}}{\gamma_s}$$

➔ For yield stress design {HK CoPSUC: 2013 table 2.3}

$$\sigma_{sd} = \frac{f_{yk}}{\gamma_s} = \frac{500N/mm^2}{1.15}$$

[2] **Basic design data for rebar design according to ETA-12/0083**

Bond strength

Bond strength in N/mm² according to ETA for good bond conditions

Rebar (mm)	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 - 32	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3

[3] For dowel bar, if all the force is assumed to be taken by steel provided, there is no performance requirement for the chemical. Hence minimum embedment can be used.