Retaining wall design (IS 456:2000)

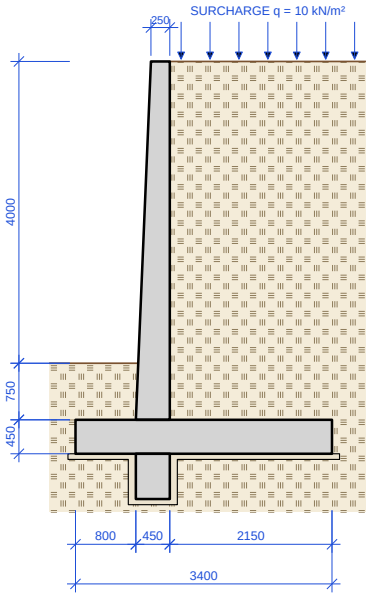
Cantilever Retaining Wall 01 Nov 2026

Project

Project	=	Cantilever Retaining Wall
Client	=	-
Location	=	-
Designed by / checked by	=	- / -

Design Input

Wall type	=	T-shaped cantilever
Height of wall above G.L.	=	4 m
Foundation depth	=	1.2 m
Stem top width	=	0.25 m
Stem bottom width	=	0.45 m
Footing base width	=	3.4 m
Footing thickness	=	0.45 m
Toe length	=	0.8 m
Heel length	=	2.150 m
Shear key (width × depth)	=	0.45 × 0.6 m
Density of soil (γ)	=	18 kN/m³
Density of concrete (γc)	=	25 kN/m³
Friction coefficient (μ)	=	0.5
Surcharge (q)	=	10 kN/m²
Soil bearing capacity (SBC)	=	200 kN/m²
Angle of repose (ϕ)	=	30°
Angle of inclined surface (θ)	=	0°
Concrete / steel	=	M25 / Fe 500



Overall result	=	All stability and design checks satisfied

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1. Design summary

All stability and design checks are satisfied.

Project	=	Cantilever Retaining Wall
Client	=	-
Location	=	-
Wall	=	Cantilever retaining wall, T-shaped (toe and heel), stem batter on the front face, with shear key
Heights	=	Retained height 4 m above the front ground, foundation depth 1.2 m, overall H = 5.200 m
Stem	=	250 mm at the top, 450 mm at the base
Base slab	=	3.4 m wide × 450 mm (toe 0.8 m, heel 2.150 m)
Backfill and loads	=	γ = 18 kN/m³, ϕ = 30°, slope θ = 0°, surcharge 10 kPa, drained backfill
Materials	=	M25 concrete, Fe 500 reinforcement, cover 50 / 50 mm
Quantities (wall length 10 m)	=	Concrete 34.62 m³, reinforcement 1,440 kg (42 kg/m³)
Report date	=	01 Nov 2026

Stability and bearing

Case	Check	Reference	Value	Limit	Status
Static case	Overturning (0.9 Mr / Mo)	IS 456 cl 20.1	2.64	≥ 1.4	OK
Static case	Sliding	IS 456 cl 20.2	1.48	≥ 1.4	OK
Static case	Maximum base pressure	IS 6403	131.6 kPa	≤ 200 kPa	OK
Static case	Eccentricity	Middle third (no tension)	0.302 m	≤ B/6 = 0.567 m	OK

Reinforcement

Mark	Member	Location	Bars	As,prov (mm²/m)	Reference	Detailing	Status
B1	Base slab	Bottom face, transverse (toe)	12Ø @ 200 c/c	565	Annex G, cl 26.5, 40.2	Design	OK
B2	Base slab	Top face, transverse (heel)	12Ø @ 110 c/c	1,028	Annex G, cl 26.5, 40.2	Design	OK
S1/S2	Stem	Back (earth) face, vertical	16Ø @ 140 c/c	1,436	Annex G, cl 26.5, 40.2	Design	OK
K1	Shear key	Both faces, vertical (U-bars)	12Ø @ 200 c/c	565	Annex G, cl 26.5, 40.2	Design	OK
S4/S5	Stem	Horizontal, each face	8Ø @ 230 c/c	219	Cl 26.5.2.1, 26.3.3	Design	OK
S3	Stem	Front face, vertical (nominal)	8Ø @ 230 c/c	219	Cl 26.5.2.1, 26.3.3	Design	OK
B3/B4	Base slab	Longitudinal, each face	10Ø @ 290 c/c	271	Cl 26.5.2.1, 26.3.3	Design	OK

2. Design basis and assumptions

Clause references are to IS 456:2000 (Plain and reinforced concrete - code of practice) unless stated otherwise. Verify the references against the code editions and amendments in force for the project.

• Design per metre run of wall; limit state method of IS 456 for the members.

• Earth pressure: Rankine's active pressure for a sloping backfill, acting parallel to the backfill surface on a vertical plane through the heel end (virtual back) for stability, and on the back of the stem for the stem design. Wall friction is ignored (conservative).

• Surcharge: a uniform load on the backfill giving a uniform lateral pressure Ka·q. It is an imposed load: it drives the wall, but its weight over the heel is not counted as resisting overturning or sliding (it is included for the base pressure and the heel design).

• Stability (IS 456 cl 20.1, 20.2): only 0.9 times the restoring dead load is relied upon; factors of safety of 1.4 against overturning (0.9 Mr / Mo) and 1.4 against sliding are required (all earth pressure treated as the 1.4-factored imposed action, as is usual practice).

• Base pressure under characteristic loads (surcharge included) compared with the safe bearing capacity; where the resultant falls outside the middle third the no-tension (triangular) distribution is used.

• Soil above the toe is ignored (it may be removed).

• Passive resistance in front of the base and of the shear key is relied upon with a mobilisation factor of 1.

• The backfill is drained (weep holes and filter media): no water pressure.

• Seismic loads are not considered.

• Members: load factor 1.5 on all actions (IS 456 Table 18); the stem is a cantilever from the top of the base; toe and heel are cantilevers from the faces of the stem loaded by the base pressure, the slab and the soil (and surcharge) above.

• Shear: slabs without shear reinforcement, $\tau v \le k \cdot \tau c$ (cl 40.2.1.1) at d from the face of the stem for the stem and toe, at the face for the heel (the support is in tension).

• Minimum and distribution steel 0.12 % of b·D (cl 26.5.2.1); spacing limits cl 26.3.3; development lengths cl 26.2.1 with the bond stresses of cl 26.2.1.1 (+60 % for deformed bars).

3. Input data

Geometry

Item	Value	Reference
Wall type	T-shaped (toe and heel)	-
Retained height above the front ground	4 m	-
Depth of the base underside below the front ground	1.2 m	IS 1904
Overall height H	5.200 m	-
Stem thickness top / base	0.25 / 0.45 m	-
Batter	front face	-
Base width B / thickness	3.4 / 0.45 m	-
Toe / heel length	0.8 / 2.150 m	-
Shear key	0.45 m wide × 0.6 m deep under the stem	-
Front ground level	RL 100.000	-
Wall length (BBS, quantities)	10 m	-

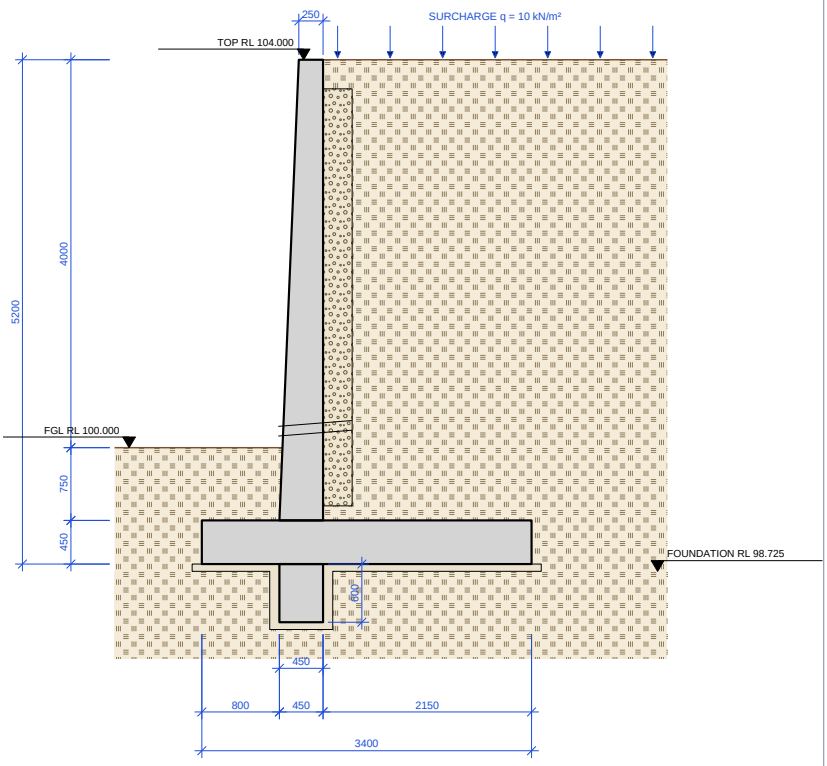
Soil, water and loads

Item	Value	Reference
Unit weight of soil γ / saturated γsat	18 / 20 kN/m³	IS 875 (Part 1)

Item	Value	Reference
Angle of internal friction ϕ	30°	Soil investigation
Backfill slope θ	0°	-
Surcharge q	10 kPa (imposed)	IS 875 (Part 2)
Coefficient of friction μ	0.5	Soil investigation
Safe bearing capacity	200 kPa	IS 6403
Water table behind the wall	none	-
Seismic	not considered	IS 1893

Materials and safety

Item	Value	Reference
Concrete	M25, γc = 25 kN/m³	IS 456 Table 2, IS 875 (Part 1)
Reinforcement	Fe 500	IS 1786
Clear cover stem / base	50 / 50 mm	IS 456 Table 16, cl 26.4.2.2
Load factors	1.5 (static), 1.2 (seismic)	IS 456 Table 18
Required factors of safety	overturning 1.4, sliding 1.4	IS 456 cl 20.1, 20.2
Bar diameters (main / distribution)	12,16,20,25 / 8,10,12 mm	IS 456 cl 26.5.2.2
Bar spacing	100 to 250 mm (distribution ≤ 300)	IS 456 cl 26.3



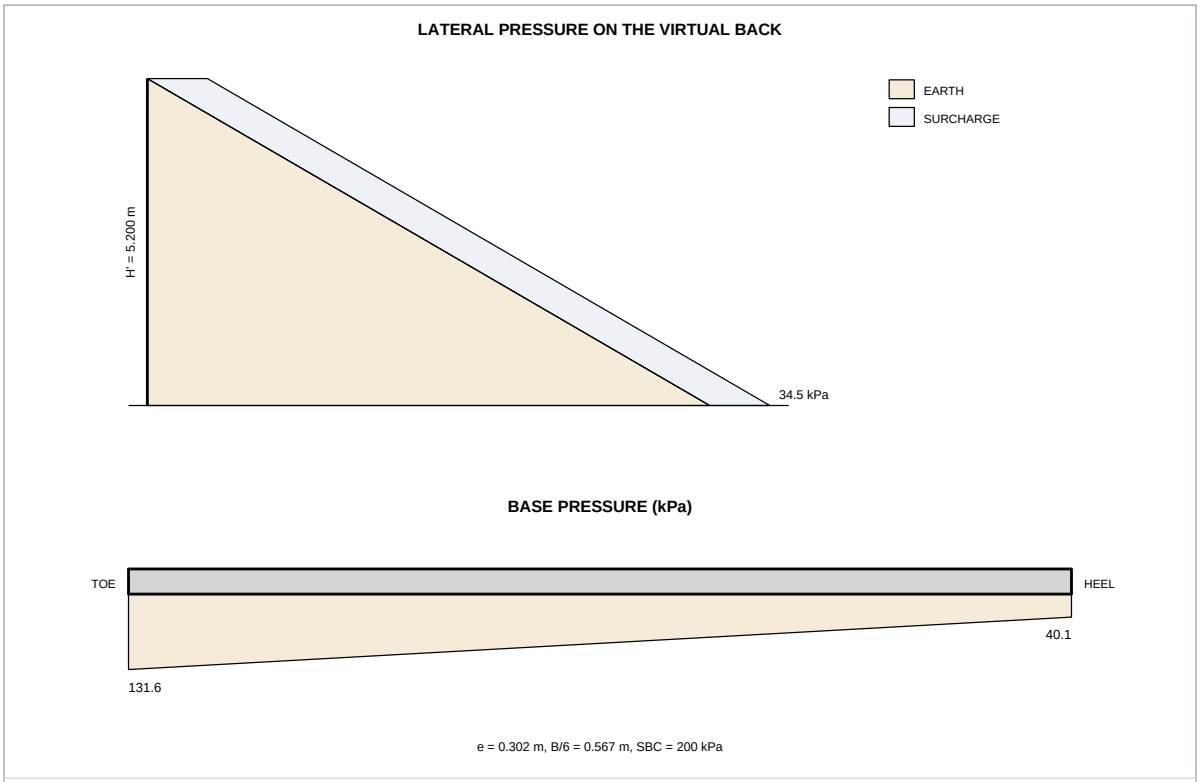
Section of the wall

4. Earth pressure

Earth pressure coefficients				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
Rankine	**Active pressure coefficient**	Ka = (1 – sin ϕ) / (1 + sin ϕ), ϕ = 30°, θ = 0°	**0.3333**	
Rankine	**Passive pressure coefficient (level ground in front)**	Kp = (1 + sin ϕ) / (1 – sin ϕ)	**3.0000**	
	Height of the virtual back	H' = H + (B – x) tan θ = 5.200 + 2.150 × 0.0000	**5.200 m**	

Horizontal forces on the virtual back - static case

Force	Type	H (kN/m)	Height y (m)	Moment H·y (kNm/m)	Reference
Active earth pressure	Dead load / earth	81.12	1.733	140.61	Rankine (Ka)
Surcharge pressure	Surcharge (imposed)	17.33	2.600	45.07	Rankine (Ka)
Passive resistance	Passive	-24.30	-0.340	- (sliding only)	Rankine (Kp)



Lateral pressure and base pressure (static case)

5. Stability and base pressure

Vertical forces (moments about the toe) - static case

Force	Type	V (kN/m)	Lever arm x (m)	Moment V·x (kNm/m)	Reference
Stem	Dead load / earth	41.56	1.070	44.48	IS 875 (Part 1)
Base slab	Dead load / earth	38.25	1.700	65.02	IS 875 (Part 1)
Shear key	Dead load / earth	6.75	1.025	6.92	IS 875 (Part 1)
Backfill over heel	Dead load / earth	183.82	2.325	427.39	IS 875 (Part 1)
Surcharge on heel	Surcharge (imposed)	21.50	2.325	49.99	IS 875 (Part 2)

Force	Type	V (kN/m)	Lever arm x (m)	Moment V·x (kNm/m)	Reference
Total		291.89		593.81	

Overturning - static case				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
	Restoring moment	Mr = Σ V·x of the dead loads (surcharge and seismic vertical forces excluded)	**543.82 kNm/m**	
	Overturning moment	Mo = Σ H·y	**185.67 kNm/m**	
Cl. 20.1	**Factor of safety**	0.9 Mr / Mo = 0.9 × 543.82 / 185.67	**2.64 ≥ 1.4**	OK

Sliding - static case				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
	Resisting vertical load	ΣV = 270.39	**270.39 kN/m**	
Cl. 20.2	**Friction (0.9 × dead load)**	0.9 μ ΣV = 0.9 × 0.5 × 270.39	**121.67 kN/m**	
	Passive resistance	1 × ½ Kp γ (z2² – z1²), z = 0.450 to 1.050 m	**24.30 kN/m**	
	Sliding force	ΣH	**98.45 kN/m**	
Cl. 20.2	**Factor of safety**	(121.67 + 24.30) / 98.45	**1.48 ≥ 1.4**	OK

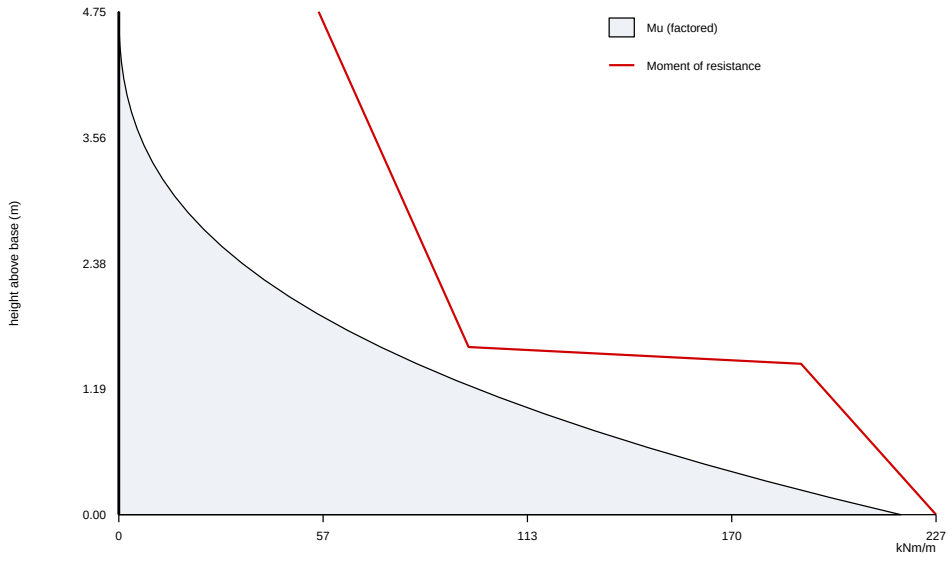
Base pressure - static case				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
	Total vertical load (surcharge included)	ΣV	**291.89 kN/m**	
	Net moment about the toe	Σ V·x – Σ H·y	**408.13 kNm/m**	
	Position of the resultant	x■ = 408.13 / 291.89	**1.398 m**	
	Eccentricity	e = B/2 – x■ = 1.700 – 1.398	**0.302 m**	OK
	Base pressures	q = ΣV / B (1 ± 6e / B) = 291.89 / 3.4 (1 ± 0.533)	**131.6 / 40.1 kPa**	
	Bearing	q,max ≤ allowable 200 kPa	**131.6 kPa**	OK

6. Design of the stem

Stem - main reinforcement at the base (earth face)				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
	Stem height above the base	hs = H – base thickness	**4.750 m**	
	Moment at the base - earth pressure (static case)	∫ p(y) (y – y0) dy	**107.17 kNm/m**	
	Moment at the base - surcharge (static case)	∫ p(y) (y – y0) dy	**37.60 kNm/m**	
Table 18	**Design moment**	Mu = γf × ΣM (static case governs)	**217.16 kNm/m**	
	Design shear at d above the base	Vu = γf × ΣV	**107.25 kN/m**	
	Effective depth	d = D – cover – ϕ/2 = 450 – cover – 8	**392 mm**	
Annex G-1.1	**Limiting moment**	Mu,lim = 0.36 fck b xu,max (d – 0.42 xu,max), xu,max/d = 0.456	**509.9 kNm/m**	OK
Annex G-1.1(b)	**Steel required**	As = 0.5 fck/fy [1 – √(1 – 4.6 Mu / (fck b d²))] b d	**1370 mm²/m**	
Cl. 26.5.2.1	**Minimum steel**	0.12 % × 1000 × 450	**540 mm²/m**	
	Steel provided	16Ø @ 140 c/c (design)	**1436 mm²/m**	OK

Reference	Description	Calculation	Result	Status
Cl. 26.5.1.1(b)	**Maximum steel (4 % of b·D)**	≤ 4 %	**0.32 %**	OK
Cl. 26.3.3(b)(1)	**Spacing of main bars**	≤ 3d = 1176, 300 mm	**140 mm**	OK
Cl. 26.3.2	**Clear spacing between bars**	≥ 25 mm (ϕ, aggregate + 5)	**124 mm**	OK
Cl. 26.5.2.2	**Bar diameter**	≤ D/8 = 56 mm	**16 mm**	OK
Cl. 40.2.1.1, Table 19	**Shear without shear reinforcement**	≤ k·τc = 1.00 × 0.421 = 0.421 N/mm² (pt = 0.366 %)	**τv = 0.274 N/mm²**	OK
Cl. 40.2.3.1, Table 20	**Maximum shear stress in a slab**	≤ τc,max / 2 = 1.55 N/mm²	**τv = 0.274 N/mm²**	OK
Cl. 26.2.1, 26.2.2.1(b)	**Anchorage of stem bars in the base**	≥ Ld = 777 mm	**380 + 8ϕ + 300 = 808 mm**	OK

Stem - curtailment and anchorage				**OK**
Reference	**Description**	**Calculation**	**Result**	**Status**
Cl. 26.2.1	**Development length of the main bars**	Ld = ϕ 0.87 fy / (4 τbd), τbd = 2.24 N/mm²	**777 mm**	
	Section where half the bars suffice	Mu(y) ≤ Mu,R of 16Ø @ 280 c/c	**1150 mm above the base**	
Cl. 26.2.3.1	**Cut-off of the alternate bars S2**	theoretical + max(d, 12ϕ), ≥ Ld above the base	**1500 mm above the base**	
Cl. 26.2.3.2(a)	**Shear at the cut-off**	τv = 0.194 ≤ 2/3 × 0.338		OK
	Curtailment	Alternate bars (S2) stop 1500 mm above the base: theoretical cut-off 1150 mm + max(d, 12ϕ), and at least Ld = 777 mm.		
Cl. 26.2.2.1(b)	**Anchorage in the base**	straight 380 + 90° bend 8ϕ + leg 300 towards the toe	**808 ≥ 777 mm**	OK



Stem: factored moment and moment of resistance of the bars provided

7. Design of the base slab

Base slab - bottom face (toe)				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
	Toe moment at the front face of the stem (characteristic)	∫ (q + u – slab – soil) (x0 – x) dx	**36.21 kNm/m**	
Table 18	**Design moment**	Mu at the front face of stem (toe) (static case)	**54.31 kNm/m**	
	Design shear	Vu (toe at d from the face, heel at the face)	**69.95 kN/m**	
	Effective depth	d = D – cover – ϕ/2 = 450 – cover – 6	**394 mm**	
Annex G-1.1	**Limiting moment**	Mu,lim = 0.36 fck b xu,max (d – 0.42 xu,max), xu,max/d = 0.456	**515.1 kNm/m**	OK
Annex G-1.1(b)	**Steel required**	As = 0.5 fck/fy [1 – √(1 – 4.6 Mu / (fck b d²))] b d	**322 mm²/m**	
Cl. 26.5.2.1	**Minimum steel**	0.12 % × 1000 × 450	**540 mm²/m**	
	Steel provided	12Ø @ 200 c/c (design)	**565 mm²/m**	OK
Cl. 26.5.1.1(b)	**Maximum steel (4 % of b·D)**	≤ 4 %	**0.13 %**	OK
Cl. 26.3.3(b)(1)	**Spacing of main bars**	≤ 3d = 1182, 300 mm	**200 mm**	OK
Cl. 26.3.2	**Clear spacing between bars**	≥ 25 mm (ϕ, aggregate + 5)	**188 mm**	OK
Cl. 26.5.2.2	**Bar diameter**	≤ D/8 = 56 mm	**12 mm**	OK
Cl. 40.2.1.1, Table 19	**Shear without shear reinforcement**	≤ k·τc = 1.00 × 0.290 = 0.290 N/mm² (pt = 0.144 %)	**τv = 0.178 N/mm²**	OK
Cl. 40.2.3.1, Table 20	**Maximum shear stress in a slab**	≤ τc,max / 2 = 1.55 N/mm²	**τv = 0.178 N/mm²**	OK
Cl. 26.2.1	**Development length beyond the front face of the stem, towards the heel**	≥ Ld = 583 mm	**2550 + 8ϕ = 2646 mm**	OK

Base slab - top face (heel)				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
	Heel moment at the back face of the stem (characteristic)	∫ (slab + soil + surcharge – q – u) (x – x0) dx	**109.42 kNm/m**	
	Heel shear at the face (characteristic)	∫ (downward – upward) dx	**81.07 kN/m**	
Table 18	**Design moment**	Mu at the back face of stem (heel) (static case)	**164.13 kNm/m**	
	Design shear	Vu (toe at d from the face, heel at the face)	**121.61 kN/m**	
	Effective depth	d = D – cover – ϕ/2 = 450 – cover – 6	**394 mm**	
Annex G-1.1	**Limiting moment**	Mu,lim = 0.36 fck b xu,max (d – 0.42 xu,max), xu,max/d = 0.456	**515.1 kNm/m**	OK
Annex G-1.1(b)	**Steel required**	As = 0.5 fck/fy [1 – √(1 – 4.6 Mu / (fck b d²))] b d	**1010 mm²/m**	
Cl. 26.5.2.1	**Minimum steel**	0.12 % × 1000 × 450	**540 mm²/m**	
	Steel provided	12Ø @ 110 c/c (design)	**1028 mm²/m**	OK
Cl. 26.5.1.1(b)	**Maximum steel (4 % of b·D)**	≤ 4 %	**0.23 %**	OK
Cl. 26.3.3(b)(1)	**Spacing of main bars**	≤ 3d = 1182, 300 mm	**110 mm**	OK
Cl. 26.3.2	**Clear spacing between bars**	≥ 25 mm (ϕ, aggregate + 5)	**98 mm**	OK
Cl. 26.5.2.2	**Bar diameter**	≤ D/8 = 56 mm	**12 mm**	OK

Reference	Description	Calculation	Result	Status
Cl. 40.2.1.1, Table 19	**Shear without shear reinforcement**	≤ k·τc = 1.00 × 0.366 = 0.366 N/mm² (pt = 0.261 %)	**τv = 0.309 N/mm²**	OK
Cl. 40.2.3.1, Table 20	**Maximum shear stress in a slab**	≤ τc,max / 2 = 1.55 N/mm²	**τv = 0.309 N/mm²**	OK
Cl. 26.2.1	**Development length beyond the back face of the stem, towards the toe**	≥ Ld = 583 mm	**1200 + 8ϕ = 1296 mm**	OK

8. Design of the shear key

Shear key				OK
Reference	**Description**	**Calculation**	**Result**	**Status**
	Passive force on the key (characteristic)	1 × Kp γ ∫ z dz over the key depth	**24.30 kN/m**	
	Moment at the root of the key	∫ p(z) (z – z0) dz	**8.26 kNm/m**	
Table 18	**Design moment**	Mu = 1.5 × 8.26	**12.39 kNm/m**	
	Effective depth	d = D – cover – ϕ/2 = 450 – cover – 6	**394 mm**	
Annex G-1.1	**Limiting moment**	Mu,lim = 0.36 fck b xu,max (d – 0.42 xu,max), xu,max/d = 0.456	**515.1 kNm/m**	OK
Annex G-1.1(b)	**Steel required**	As = 0.5 fck/fy [1 – √(1 – 4.6 Mu / (fck b d²))] b d	**73 mm²/m**	
Cl. 26.5.2.1	**Minimum steel**	0.12 % × 1000 × 450	**540 mm²/m**	
	Steel provided	12Ø @ 200 c/c (design)	**565 mm²/m**	OK
Cl. 26.5.1.1(b)	**Maximum steel (4 % of b·D)**	≤ 4 %	**0.13 %**	OK
Cl. 26.3.3(b)(1)	**Spacing of main bars**	≤ 3d = 1182, 300 mm	**200 mm**	OK
Cl. 26.3.2	**Clear spacing between bars**	≥ 25 mm (ϕ, aggregate + 5)	**188 mm**	OK
Cl. 26.5.2.2	**Bar diameter**	≤ D/8 = 56 mm	**12 mm**	OK
Cl. 40.2.1.1, Table 19	**Shear without shear reinforcement**	≤ k·τc = 1.00 × 0.290 = 0.290 N/mm² (pt = 0.144 %)	**τv = 0.040 N/mm²**	OK
Cl. 40.2.3.1, Table 20	**Maximum shear stress in a slab**	≤ τc,max / 2 = 1.55 N/mm²	**τv = 0.040 N/mm²**	OK
Cl. 26.2.1, 26.2.2.1(b)	**Anchorage of key bars in the base**	≥ Ld = 583 mm	**338 + 8ϕ + leg 150 = 584 mm**	OK

9. Distribution steel and detailing

Distribution and nominal steel

Mark	Location	Check	Value	Limit	Reference	Status
S4/S5	Horizontal, each face	Distribution steel	219 mm²/m	≥ 210 mm²/m	Cl. 26.5.2.1	OK
S4/S5	Horizontal, each face	Spacing of distribution bars	230 mm	≤ 5d = 1480, 450 mm	Cl. 26.3.3(b)(2)	OK
S4/S5	Horizontal, each face	Bar diameter	8 mm	≤ D/8 = 44 mm	Cl. 26.5.2.2	OK
S3	Front face, vertical (nominal)	Distribution steel	219 mm²/m	≥ 210 mm²/m	Cl. 26.5.2.1	OK
S3	Front face, vertical (nominal)	Spacing of distribution bars	230 mm	≤ 5d = 1480, 450 mm	Cl. 26.3.3(b)(2)	OK
S3	Front face, vertical (nominal)	Bar diameter	8 mm	≤ D/8 = 44 mm	Cl. 26.5.2.2	OK

Mark	Location	Check	Value	Limit	Reference	Status
B3/B4	Longitudinal, each face	Distribution steel	271 mm²/m	≥ 270 mm²/m	Cl. 26.5.2.1	OK
B3/B4	Longitudinal, each face	Spacing of distribution bars	290 mm	≤ 5d = 1975, 450 mm	Cl. 26.3.3(b)(2)	OK
B3/B4	Longitudinal, each face	Bar diameter	10 mm	≤ D/8 = 56 mm	Cl. 26.5.2.2	OK

Development and lap lengths (M25, Fe 500; cl 26.2.1, 26.2.5.1)

Bar	Ld (mm)	Lap (mm)	Reference
8 mm	388	390	Cl 26.2.1, 26.2.5.1(c)
10 mm	485	490	Cl 26.2.1, 26.2.5.1(c)
12 mm	583	590	Cl 26.2.1, 26.2.5.1(c)
16 mm	777	780	Cl 26.2.1, 26.2.5.1(c)

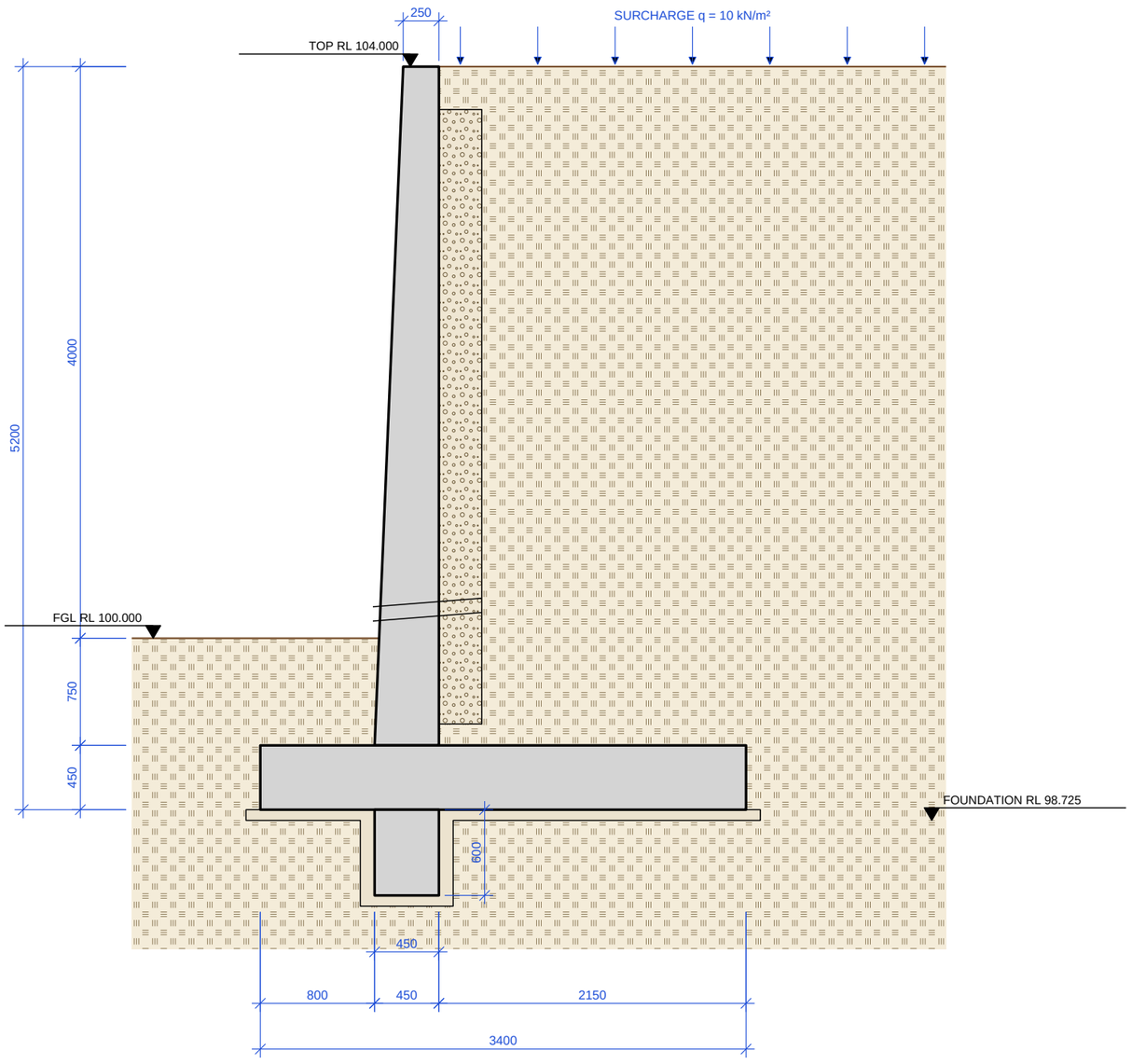
10. Bar bending schedule and quantities

Bar bending schedule (10 m of wall) - IS 2502, cutting lengths with 2ϕ deduction per 90° bend

Mark	Member	Description	Dia	Spacing	Nos	Length (m)	Weight (kg)
S1	Stem	Main bars, earth face (full height)	16	280	36	5.348	304.2
S2	Stem	Main bars, earth face (alternate, stop 1500 above base)	16	280	35	2.150	118.9
S3	Stem	Vertical bars, front face	8	230	44	5.214	90.6
S4	Stem	Horizontal bars, earth face	8	230	21	9.900	82.1
S5	Stem	Horizontal bars, front face	8	230	21	9.900	82.1
B1	Base slab	Transverse bars, bottom (toe), legs up	12	200	50	3.892	173.0
B2	Base slab	Transverse bars, top (heel), legs down	12	110	91	3.860	312.2
B3	Base slab	Longitudinal bars, bottom	10	290	12	9.900	73.3
B4	Base slab	Longitudinal bars, top	10	290	12	9.900	73.3
K1	Shear key	U-bars anchored in the base, legs bent along the top mat	12	200	50	2.386	106.0
K2	Shear key	Longitudinal bars	10	-	4	9.900	24.4
		Total					1440.4

Quantities

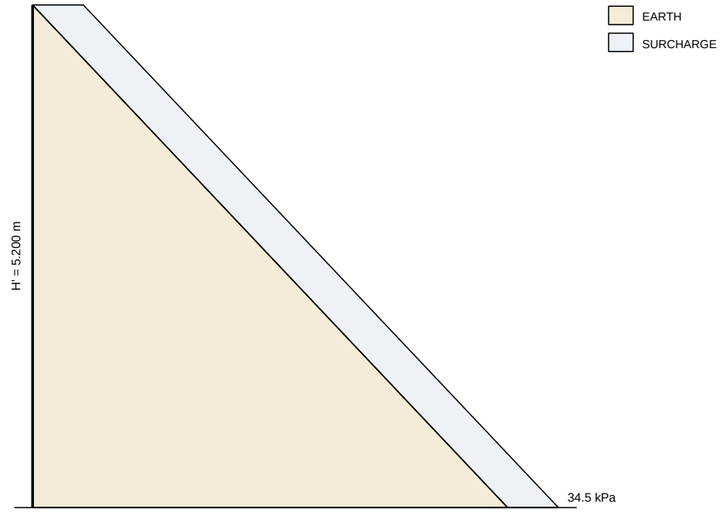
Item	Quantity	Reference
RCC M25	34.62 m³	IS 1200 (Part 2)
Reinforcement	1,440.4 kg	IS 1200 (Part 2)
Steel per m³ of concrete	41.6 kg/m³	-
Formwork	116.0 m²	IS 1200 (Part 5)
PCC levelling course (75 mm)	2.55 m³	IS 1200 (Part 2)
Excavation (to the base underside, vertical sides)	40.8 m³	IS 1200 (Part 1)



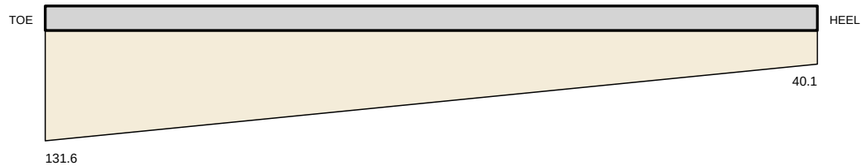
SECTION OF RETAINING WALL

SCALE 1:40

LATERAL PRESSURE ON THE VIRTUAL BACK



BASE PRESSURE (kPa)



e = 0.302 m, B/6 = 0.567 m, SBC = 200 kPa

CHECK	VALUE	LIMIT	
Overturning	2.64	≥ 1.4	OK
Sliding	1.48	≥ 1.4	OK
Max. base pressure	131.6 kPa	≤ 200	OK
Eccentricity	0.302 m	≤ 0.567	OK

NOTES

1. All dimensions are in mm and levels in m unless noted.
2. Backfill to be free draining granular material compacted in layers of 200 mm.
3. 100 mm Ø PVC weep holes at 1.5 m c/c with a 300 mm graded filter behind the stem.
4. Contraction joints at 8 to 10 m c/c; wall length considered 10 m.

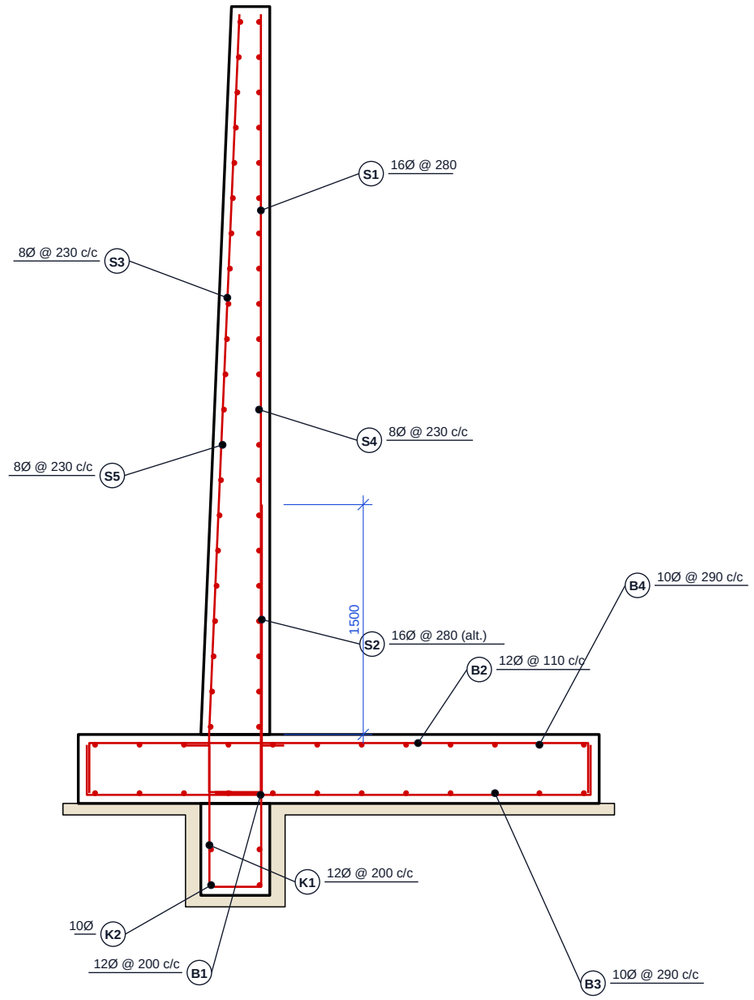
Design: IS 456:2000 | Generated by nxstructural Retaining Wall Designer

CANTILEVER RETAINING WALL

GENERAL ARRANGEMENT

CLIENT	STRUCTURE
-	T-SHAPED CANTILEVER WALL, H = 5.20 m

DESIGNED	CHECKED	DATE	SCALE	SHEET
-	-	01-11-2026	AS SHOWN	1 of 3



REINFORCEMENT DETAILS - SECTION

SCALE 1:40

REINFORCEMENT SCHEDULE

MARK	BARS	LOCATION
S1	16Ø @ 280	Stem, earth face
S2	16Ø @ 280 (alt.)	Stem, earth face (curtailed)
S3	8Ø @ 230 c/c	Stem, front face
S4	8Ø @ 230 c/c	Stem horizontal, earth face
S5	8Ø @ 230 c/c	Stem horizontal, front face
B1	12Ø @ 200 c/c	Base bottom (transverse)
B2	12Ø @ 110 c/c	Base top (transverse)
B3	10Ø @ 290 c/c	Base bottom (longitudinal)
B4	10Ø @ 290 c/c	Base top (longitudinal)
K1	12Ø @ 200 c/c	Shear key U-bars
K2	10Ø	Shear key longitudinal

NOTES

1. Concrete M25, reinforcement Fe 500 (IS 1786).
2. Clear cover: stem 50 mm, base 50 mm.
3. Lap lengths (mm): 8Ø 390, 10Ø 490, 12Ø 590, 16Ø 780; laps staggered, not more than 50 % at a section.
4. Stem bars bent at the bottom mat towards the toe, leg 300 mm (Ld = 777 mm).
5. Alternate bars (S2) stop 1500 mm above the base: theoretical cut-off 1150 mm + max(d, 12ϕ), and at least Ld = 777 mm.
6. S1 and S2 are placed alternately.

Design: IS 456:2000 | Generated by nxstructural Retaining Wall Designer

CANTILEVER RETAINING WALL

REINFORCEMENT DETAILS

CLIENT	STRUCTURE
-	T-SHAPED CANTILEVER WALL, H = 5.20 m

DESIGNED	CHECKED	DATE	SCALE	SHEET
-	-	01-11-2026	AS SHOWN	2 of 3

BAR BENDING SCHEDULE - RETAINING WALL (10 m LONG)

MARK	MEMBER	DESCRIPTION	SHAPE	DIMENSIONS (mm)	DIA	SPACING	NOS	CUT LEN (m)	TOTAL (m)	kg/m	WEIGHT (kg)
S1	Stem	Main bars, earth face (full height)		a=5080, b=300	16	280	36	5.348	192.5	1.580	304.2
S2	Stem	Main bars, earth face (alternate, stop 1500 above base)		a=1876, b=300	16	280	35	2.150	75.2	1.580	118.9
S3	Stem	Vertical bars, front face		a=5080, b=150	8	230	44	5.214	229.4	0.395	90.6
S4	Stem	Horizontal bars, earth face		a=9900	8	230	21	9.900	207.9	0.395	82.1
S5	Stem	Horizontal bars, front face		a=9900	8	230	21	9.900	207.9	0.395	82.1
B1	Base slab	Transverse bars, bottom (toe), legs up		a=3288, b=326	12	200	50	3.892	194.6	0.889	173.0
B2	Base slab	Transverse bars, top (heel), legs down		a=3256, b=326	12	110	91	3.860	351.3	0.889	312.2
B3	Base slab	Longitudinal bars, bottom		a=9900	10	290	12	9.900	118.8	0.617	73.3
B4	Base slab	Longitudinal bars, top		a=9900	10	290	12	9.900	118.8	0.617	73.3
K1	Shear key	U-bars anchored in the base, legs bent along the top mat		a=338, b=922, c=150	12	200	50	2.386	119.3	0.889	106.0
K2	Shear key	Longitudinal bars		a=9900	10	-	4	9.900	39.6	0.617	24.4

STEEL ABSTRACT

DIAMETER (mm)	WEIGHT (kg)
8 mm	254.9
10 mm	171.1
12 mm	591.3
16 mm	423.2
TOTAL	**1,440.4 kg (1.440 t)**

NOTES / QUANTITIES

1. Cutting lengths deduct 2ϕ per 90° bend; bars over 12 m are lapped (IS 456 cl 26.2.5).
2. Concrete M25: 34.62 m³; steel 41.6 kg/m³.
3. Formwork 116.0 m²; PCC (75 mm) 2.55 m³.

Design: IS 456:2000 | Generated by nxstructural Retaining Wall Designer

CANTILEVER RETAINING WALL

BAR BENDING SCHEDULE

CLIENT	STRUCTURE
-	T-SHAPED CANTILEVER WALL, H = 5.20 m

DESIGNED	CHECKED	DATE	SCALE	SHEET
-	-	01-11-2026	NTS	3 of 3