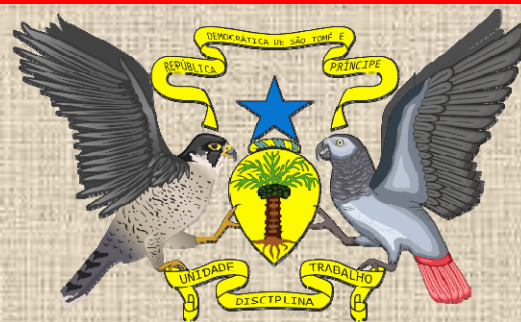


Fiduciary Agency For Project Administration (AFAP)



The National Institute of Roads (INAE )



DEMOCRATIC REPUBLIC OF SÃO TOMÉ AND PRÍNCIPE  
UNITY - DISCIPLINE - WORK



**PREPARATION OF PRELIMINARY DESIGN, ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND BIDDING DOCUMENTS FOR DESIGN-AND-BUILD CONTRACT FOR CONSTRUCTION OF BRIDGE OVER THE RIVER LEMBÁ AND A BRIDGE BRIGOMA**



**FINAL REPORT  
LOT 1 : LEMBA BRIDGE  
PLANS FOLDER**

FUNDING : WORLD BANK (IDA)



ACI 2000  
BP 5016  
Bamako - Mali  
Tél.: +223 20 24 32 34/44 90 00 64  
Fax: +223 20 24 15 03/44 90 00 65  
E-mail : cira@cira-sas.com  
www.cira-sas.com



February 2024

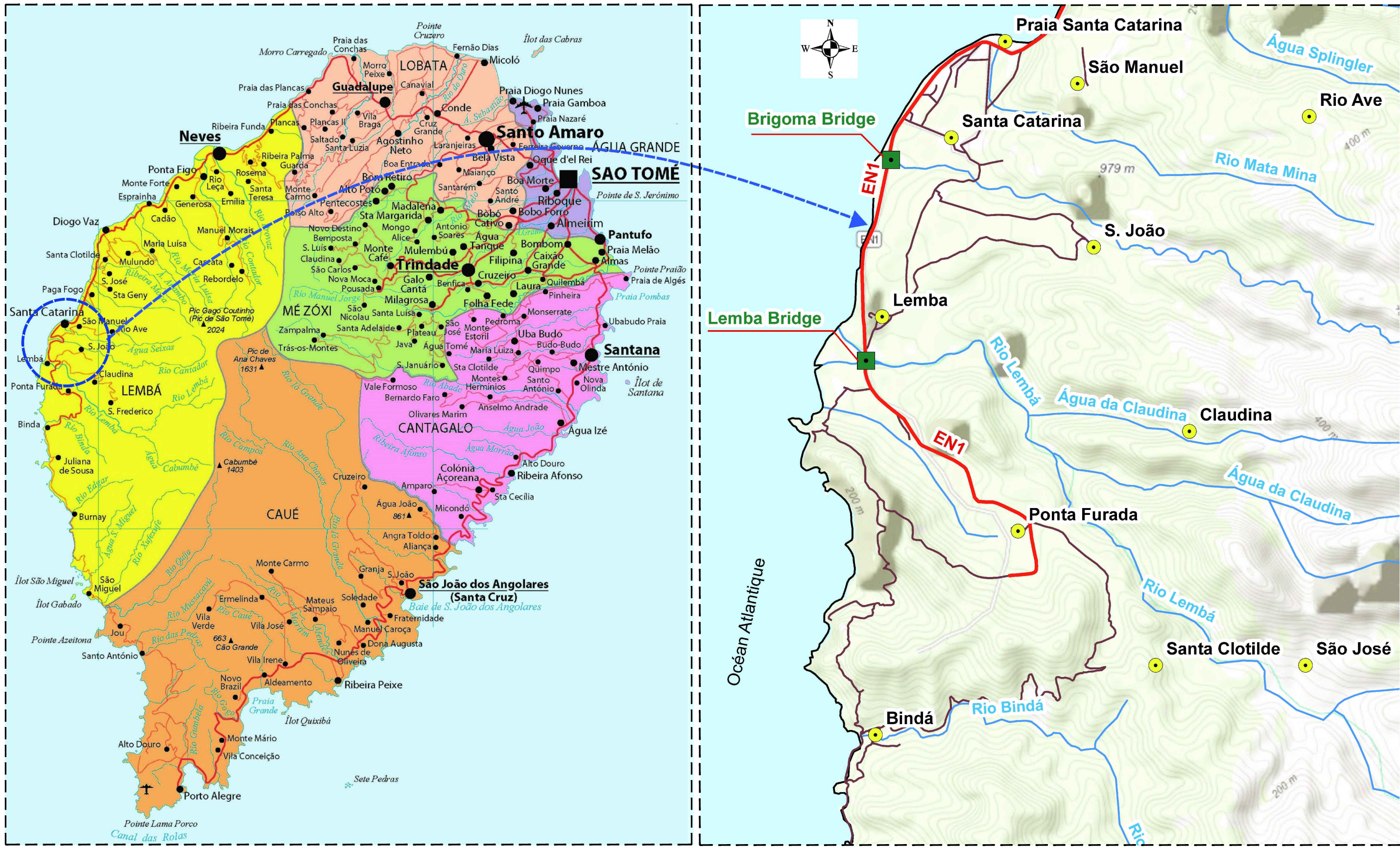


## DRAWING LIST

DR. N°	NAME	SCALES
	<b>I - GENERAL PLANS</b>	
I-1	Location plan	Graphical
I-2	General arrangement	1/2500
I-3	Typical cross section	1/50
	<b>II - LAYOUT</b>	
II-1	Lemba bridge - Road plan, profile and drainage	1/2000-1/200
	<b>III - BRIDGE</b>	
III-1	Overall Plan	1/250
III-2	Deck - Formwork and details (1 à 2)	Various
III-3	Piers - Formwork and details (1 à 2)	Various
III-4	Abutments - Formwork and details (1 à 4)	Various
III-5	Girders - formwork and details	Various
III-6	Butts - Formwork and details (1 à 2)	Various
III-7	Cable trays	1/50
III-8	Girder reinforcement	Various
	<b>IV - TYPICAL PLANS</b>	
IV-1	Embankment downspouts - Typical details (1 to 2)	Various
IV-2	Crash barrier - Typical details	Various
IV-3	Precast cornice - Typical details	1/20
IV-4	Guard-rail type S8 - Typical details	Various
IV-5	Gargoyles - Typical details	1/50

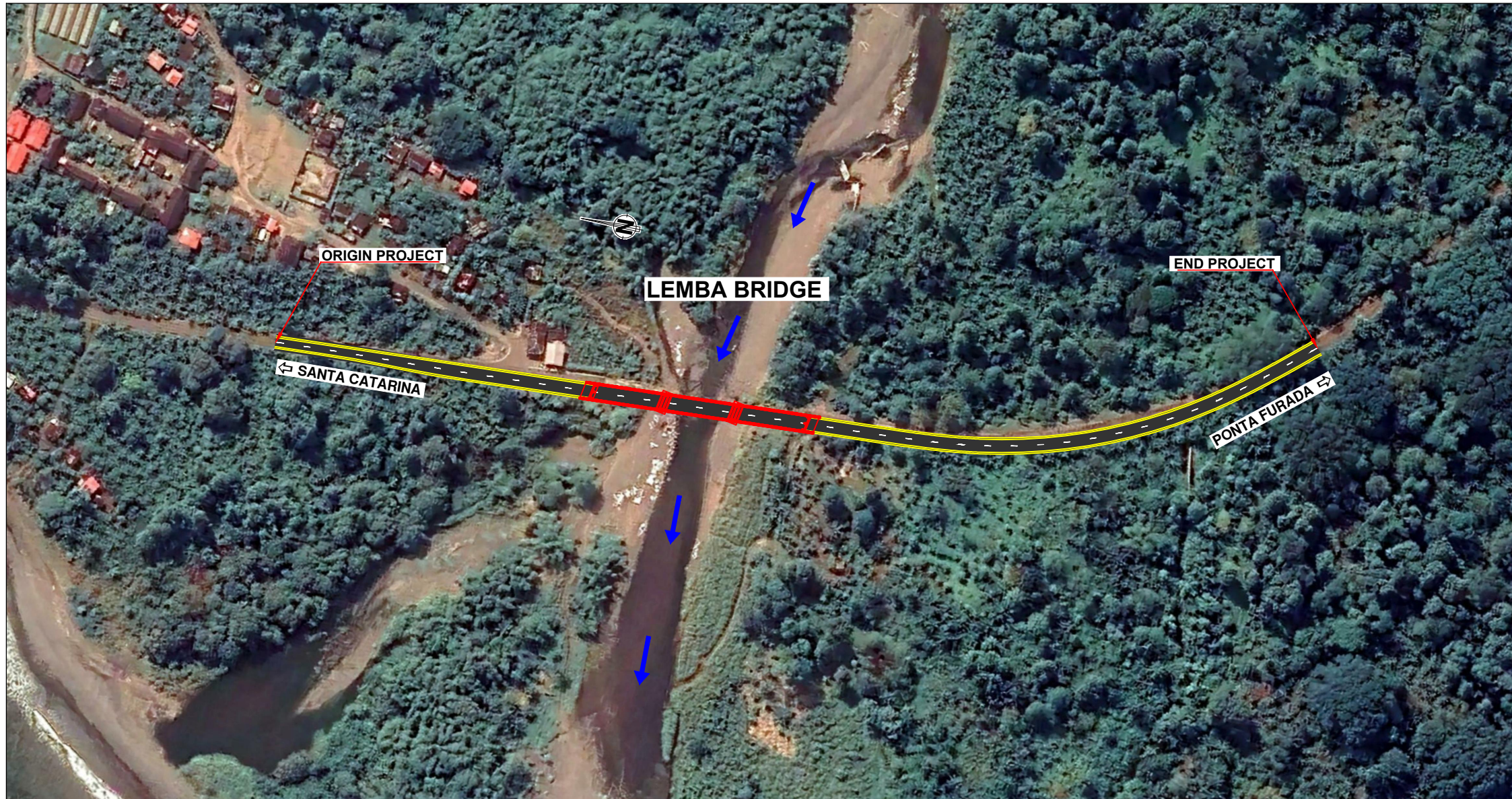
## **I - GENERAL PLANS**





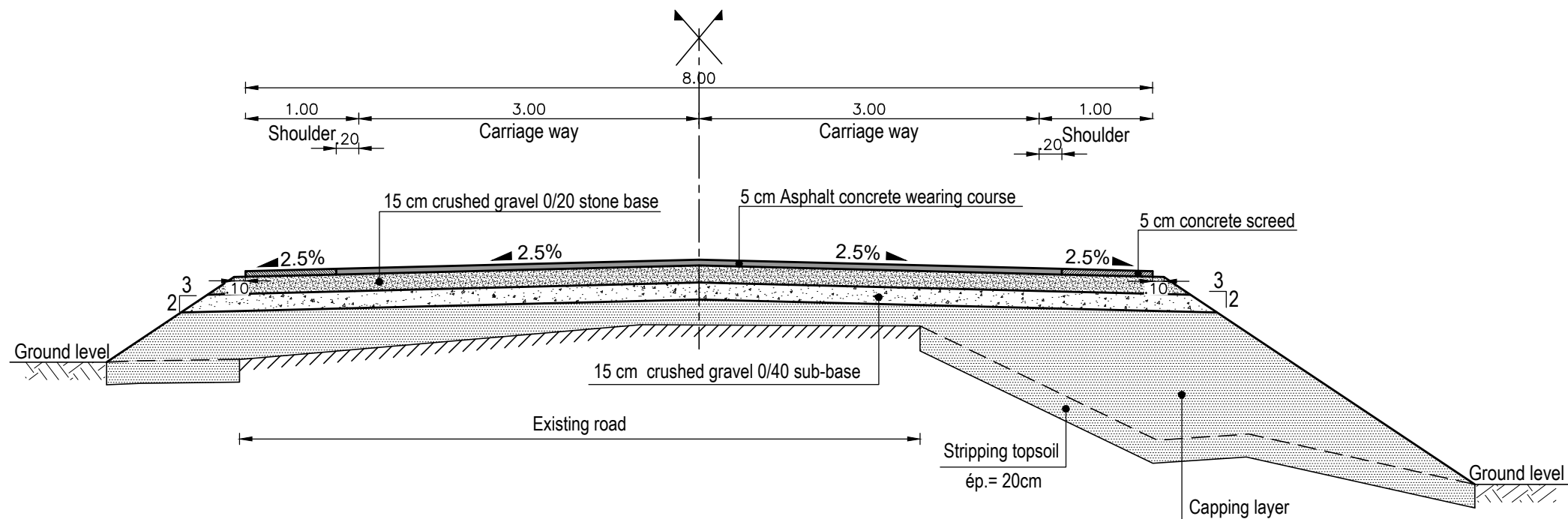
Revision	Date	Modification	Drawn :	Checked :	Approved :
A	Feb. 2024	Original Edition	L.GASMI	L.MANI	R.KHEMIR







**CROSS SECTION TYPE**  
**LEMBA BRIDGE APPROACH ROAD**  
 Scale : 1/50








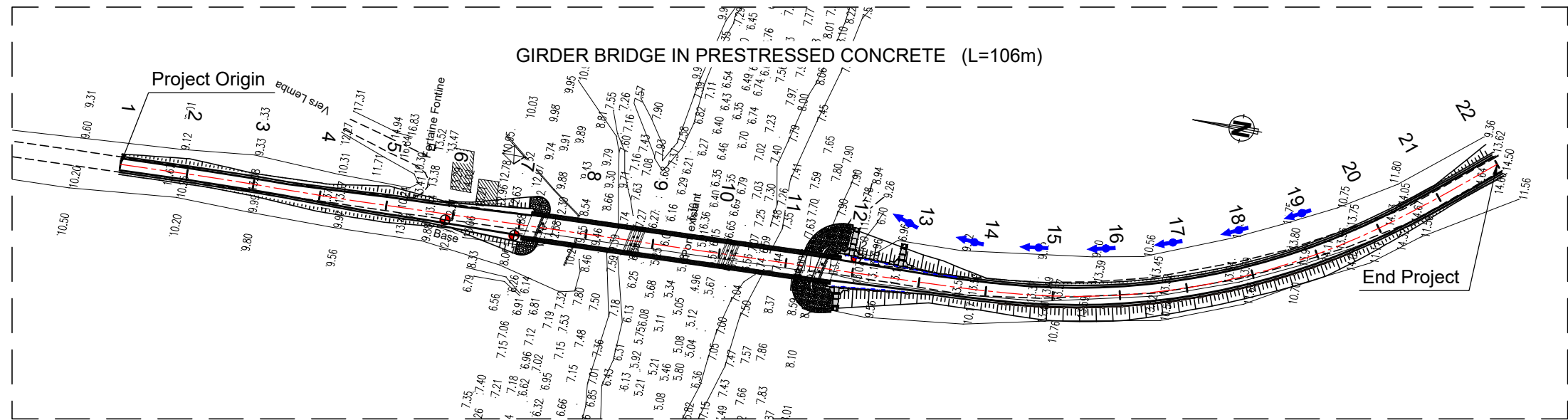
**II - LAYOUT**



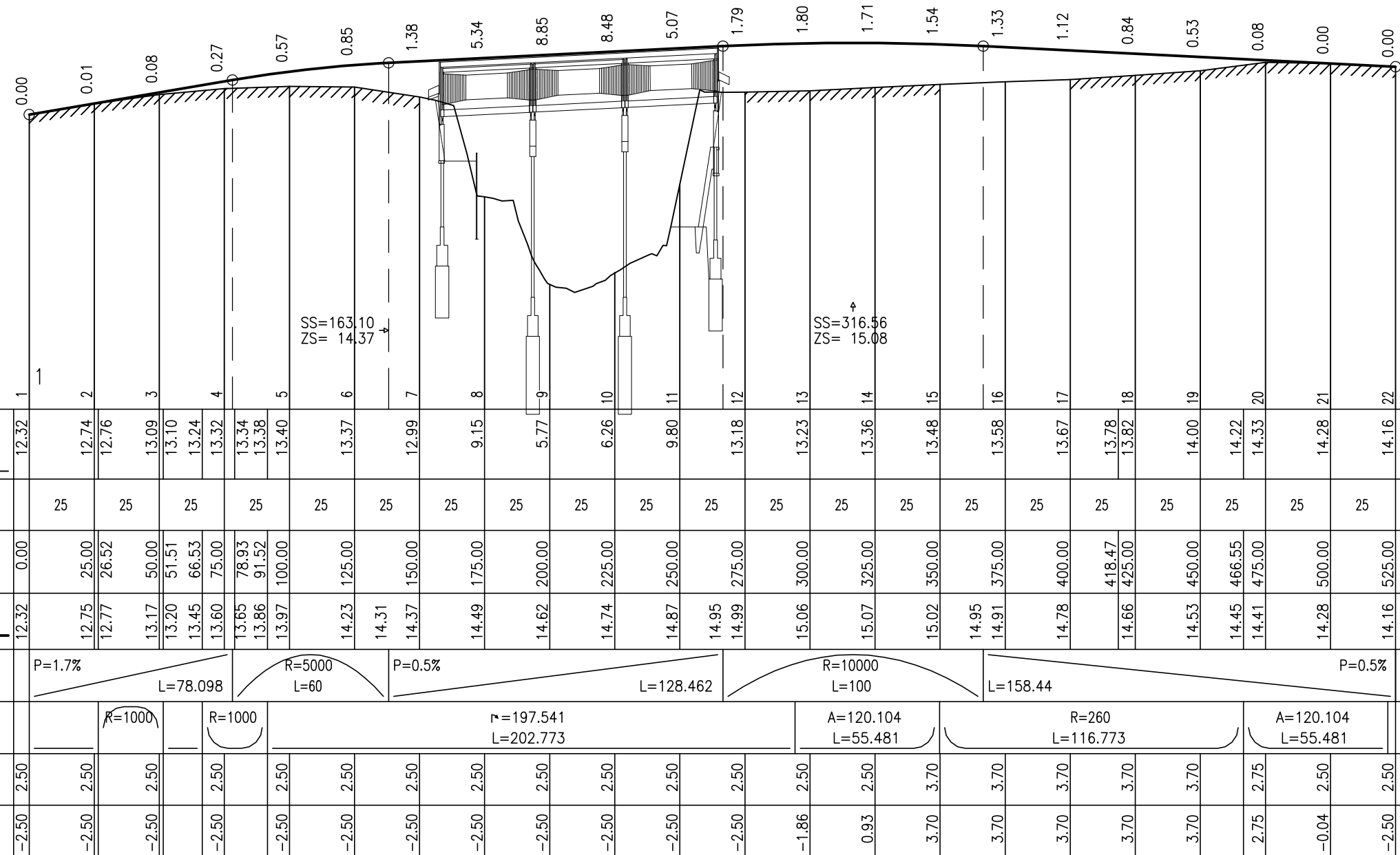
# ROAD PLAN, PROFILE AND DRAINAGE

## LEGEND

	Project Axis
20	SC 20
 B1	Base polygon point
	Rectangular concrete drain (0.8x0.8)



GIRDER BRIDGE IN PRESTRESSED CONCRETE (L=106m)

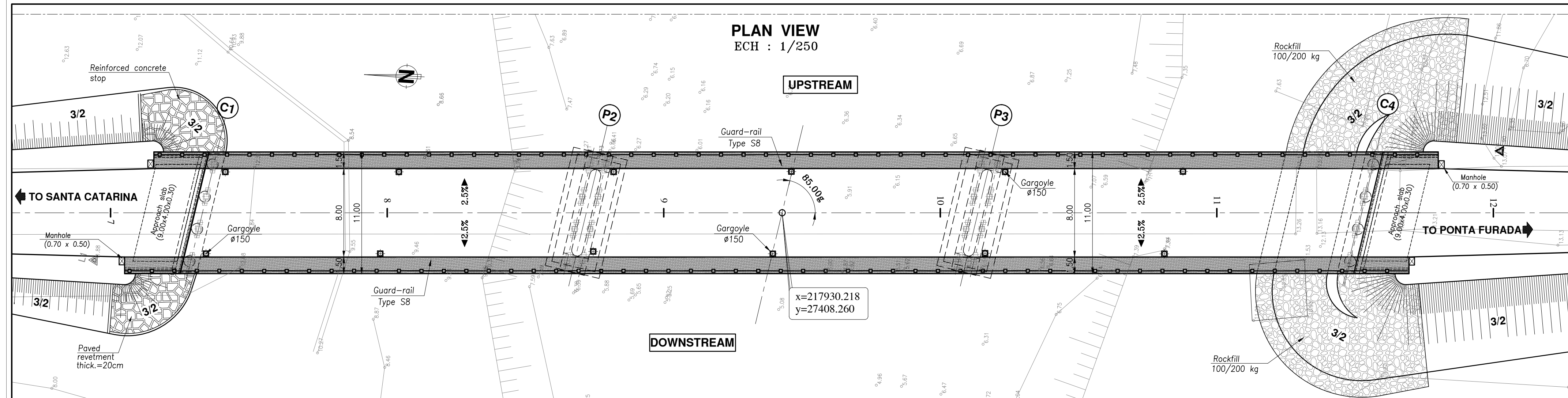


SCALE H : 1/2000  
SCALE L : 1/200  
COMPARISON PLAN

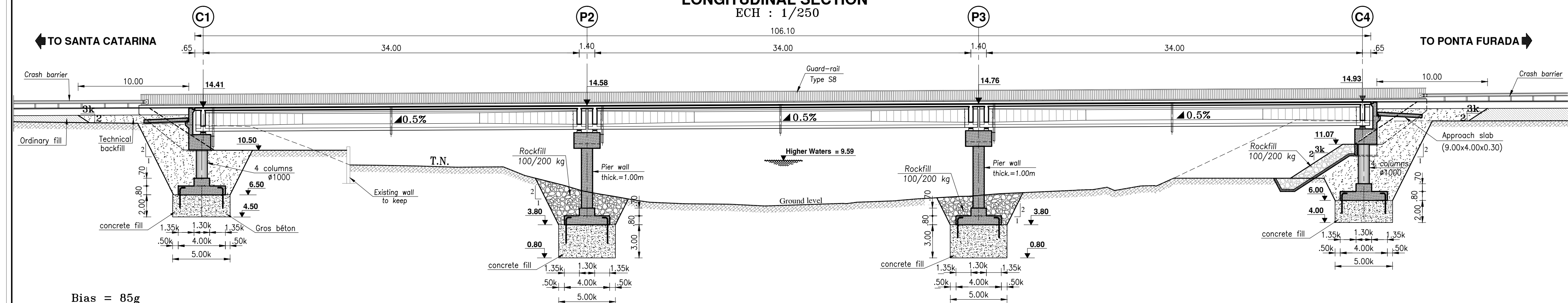


**III - BRIDGE**

**PLAN VIEW**  
ECH : 1/250



**LONGITUDINAL SECTION**  
ECH : 1/250



Bias = 85g

$$K = \frac{1}{\sin 85g} = 1.0284$$

DEMOCRATIC REPUBLIC OF SÃO TOMÉ AND PRÍNCIPE  
Unity - Discipline - Work

THE NATIONAL INSTITUTE OF ROADS (INAE)

ACI 2000  
BP 5016  
Bamako - Mali  
Tél.: +223 20 24 32 34  
Fax.: +223 20 24 15 03  
E-mail: cir@cir-sas.com  
www.cir-sas.com

PREPARATION OF PRELIMINARY DESIGN, ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND BIDDING DOCUMENTS FOR DESIGN-AND-BUILD CONTRACT FOR CONSTRUCTION OF BRIDGE OVER THE RIVER LEMBA AND A BRIDGE BRIGOMA

**FINAL REPORT**

**LEMBA BRIDGE**  
GIRDERS BRIDGE IN  
PRESTRESSED CONCRETE  
OVERALL PLAN

Date : February 2024

Scale : 1/250

N° 23/008/STP/DIT

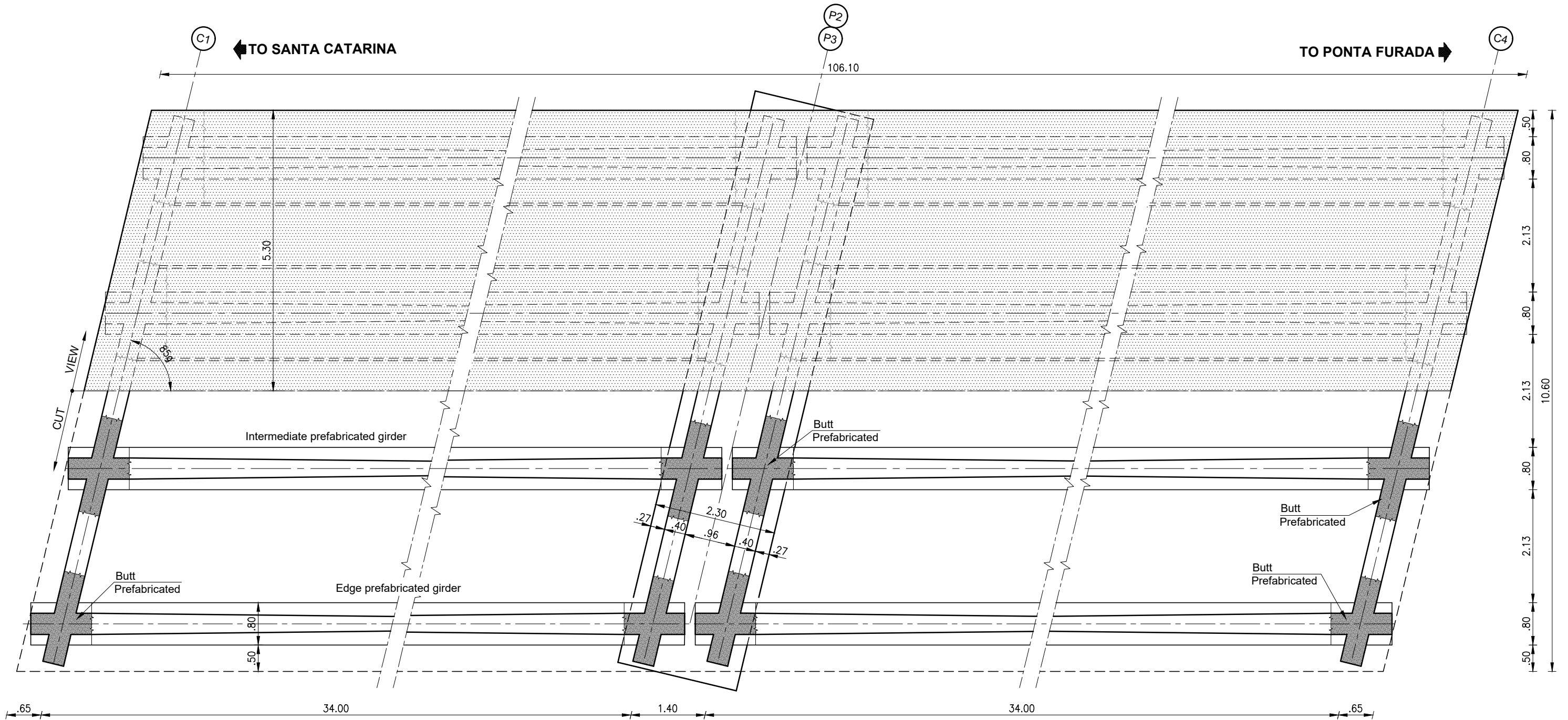
Drawing N° : III-1 Page : 1/1

Revision	Date	Modification	Drawn :	Checked :	Approved :
A	Feb. 2024	Original Edition	E.SASSI	L.MANI	R.KHEMIR



# DECK : PLAN VIEW

SC : 1/75



## NOTE :

- The formwork of the visible facings will be carried out using fine formwork.
- The formwork of the hidden facings will be carried out using ordinary formwork.
- Exposed edges will be chamfered 2.5x2.5cm.
- The concrete will be of C30/37 (B3) quality for the slabs
- The concrete will be of C35/45 (B5) quality for the girders and cross-beams

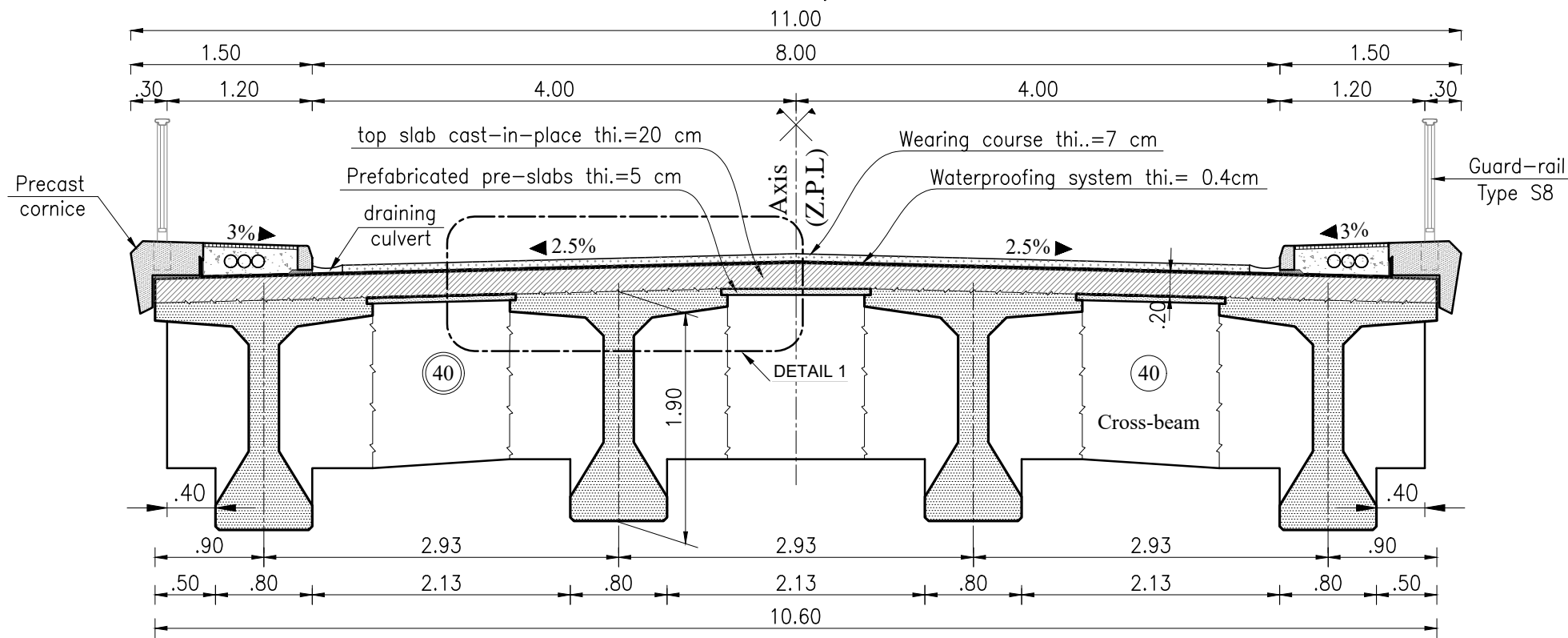
Bias = 85g

$$K = \frac{1}{\sin 85g} = 1.0284$$



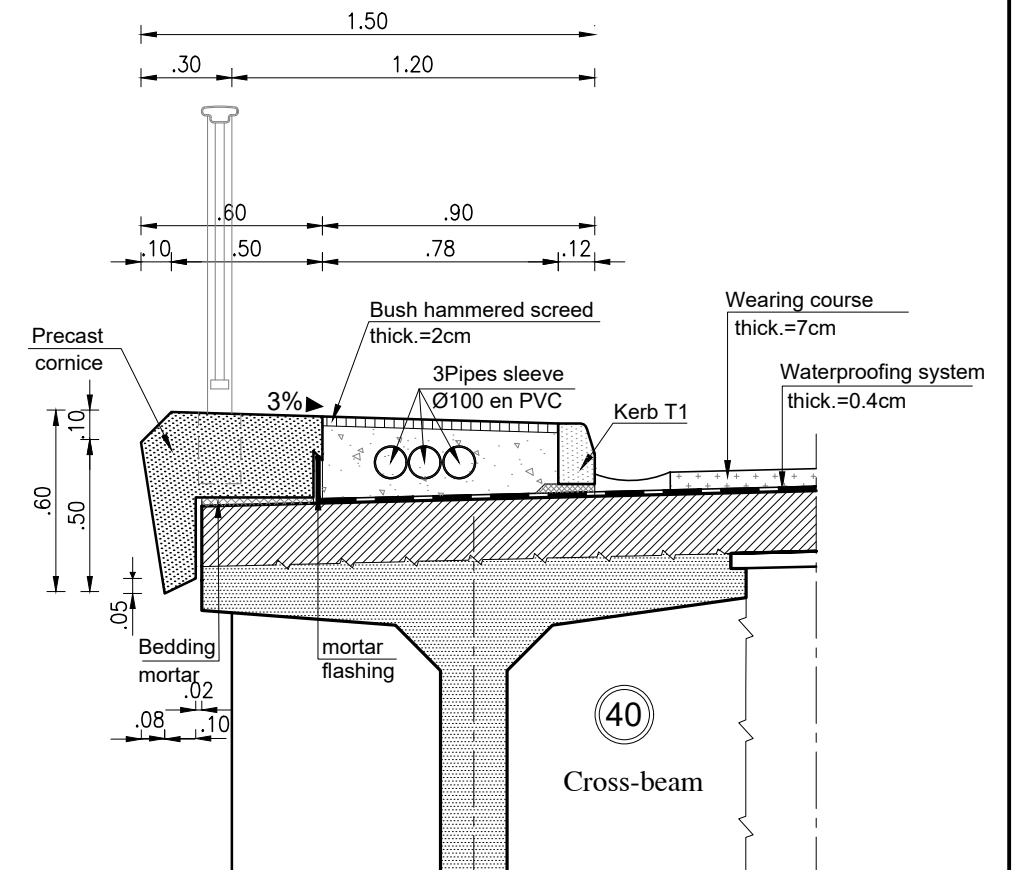
# DECK CROSS SECTION

ÉCH : 1/50



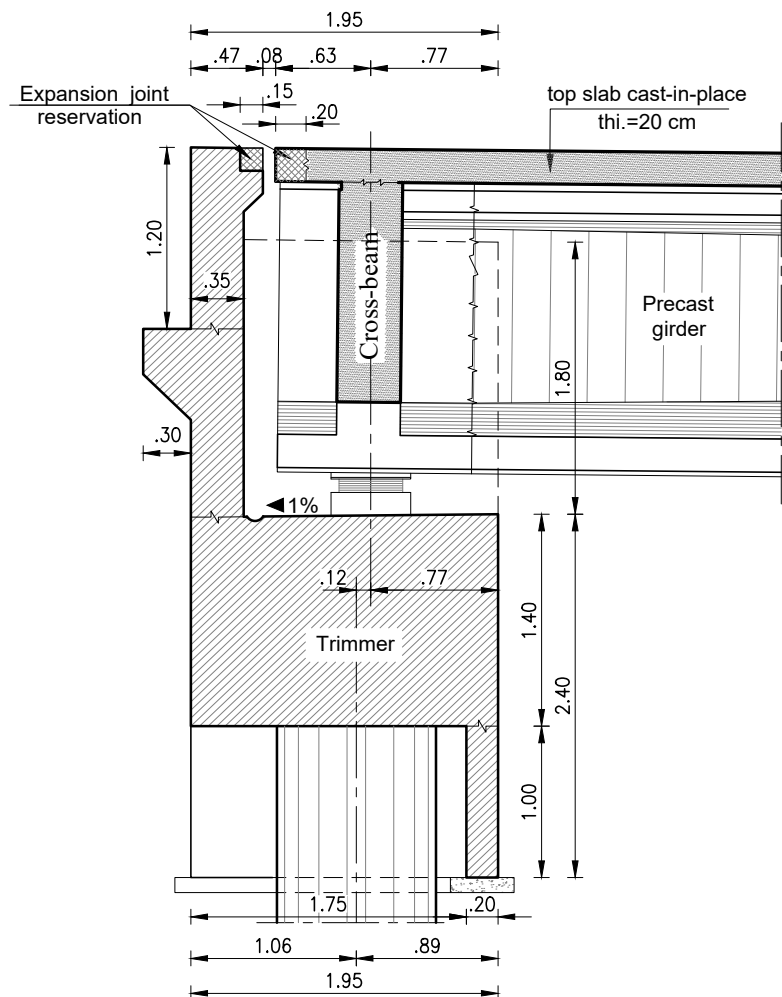
# SIDEWALK AND CORNICE DÉTAIL

SC : 1/25



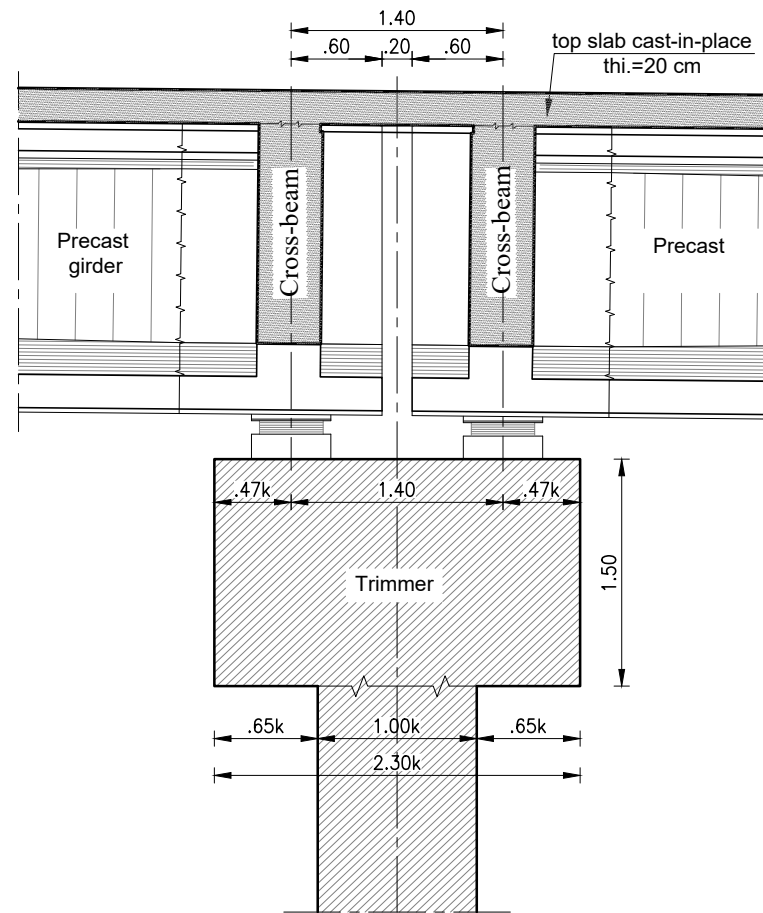
# DETAIL ON ABUTMENT

SC : 1/50



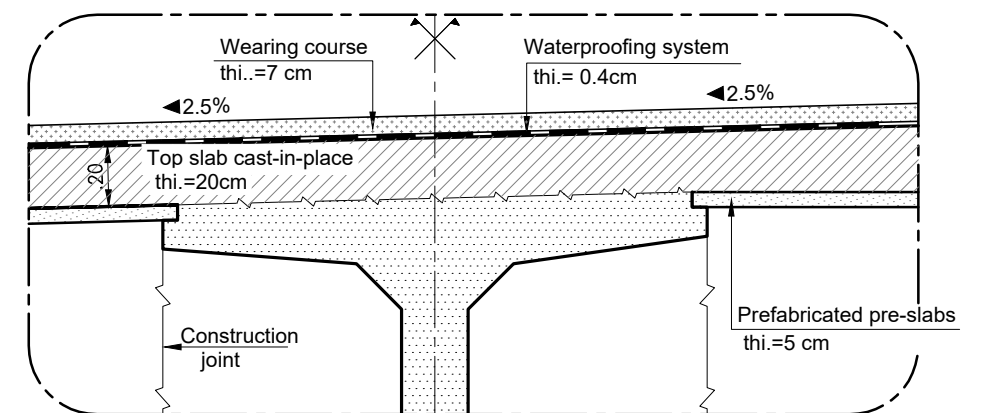
# DETAIL ON PIER

SC : 1/50



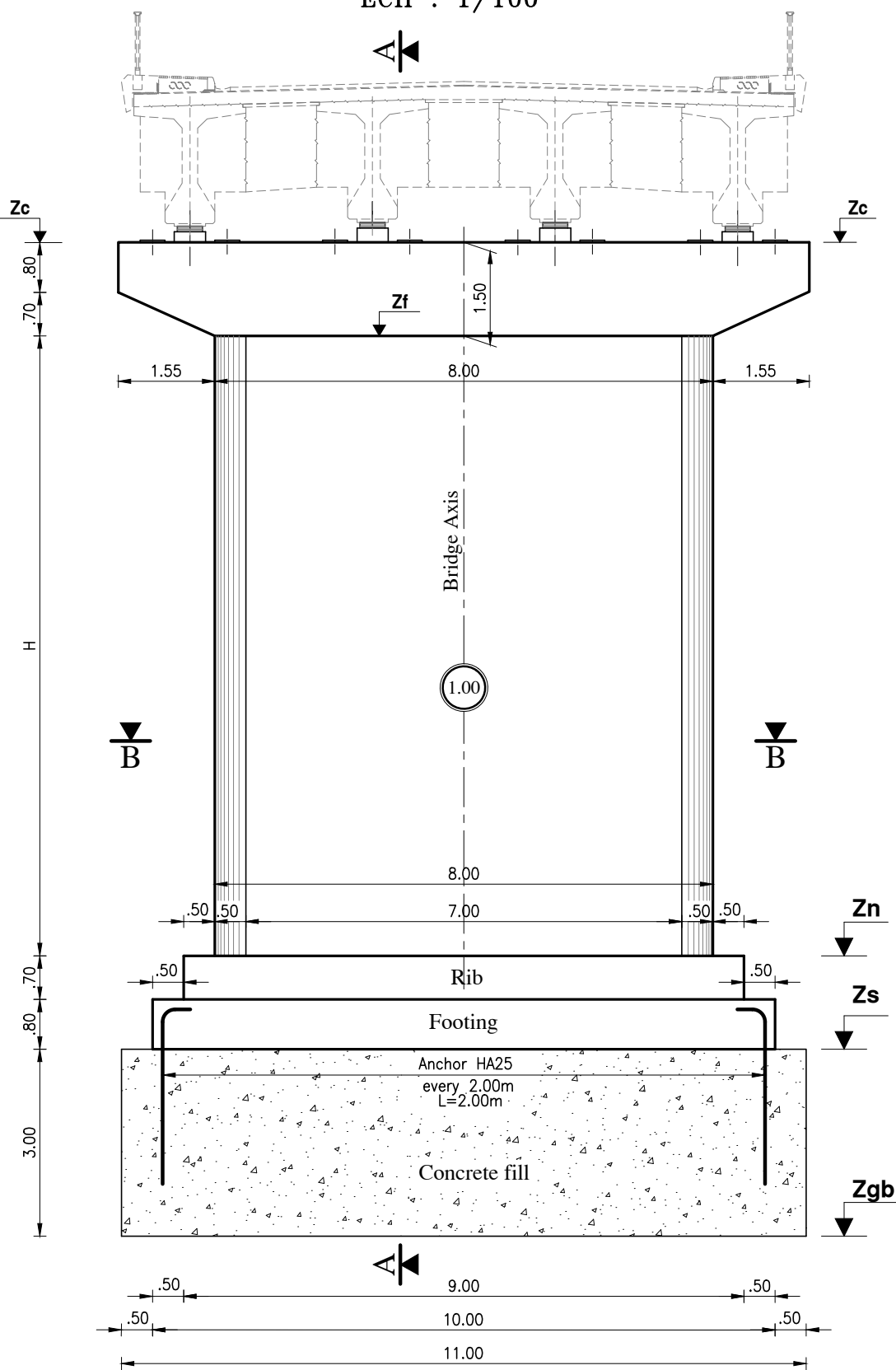
# DETAIL 1

SC : 1/25



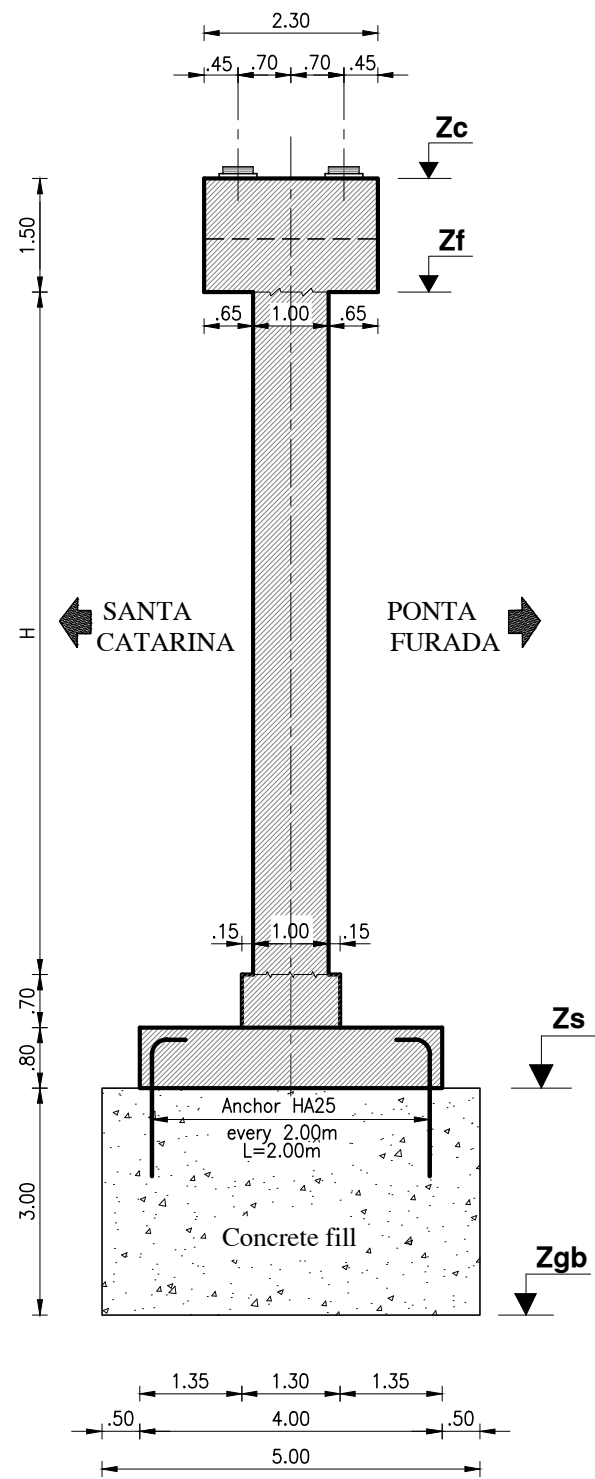
**VIEW BY F1**

ECH : 1/100



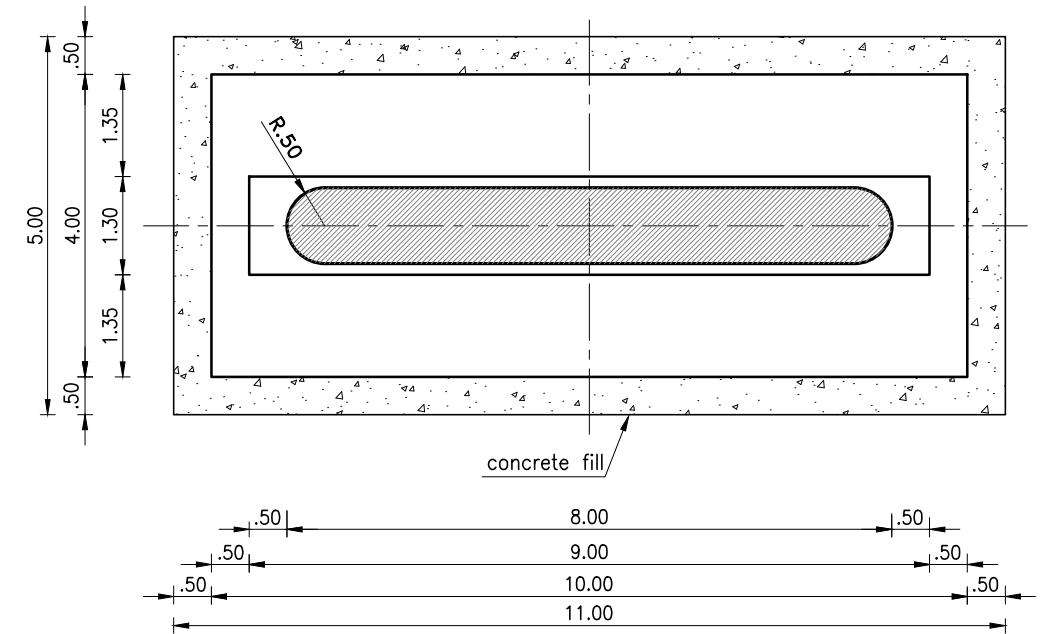
**SECTION A - A**

ECH : 1/100



**SECTION B - B**

ECH : 1/100



**LEVELLING TABLE**

PIER	P2	P3
Zc	11.999	12.179
Zf	10.499	10.679
Zn	5.30	5.30
Zs	3.80	3.80
Zgb	0.80	0.80
H	5.199	5.379

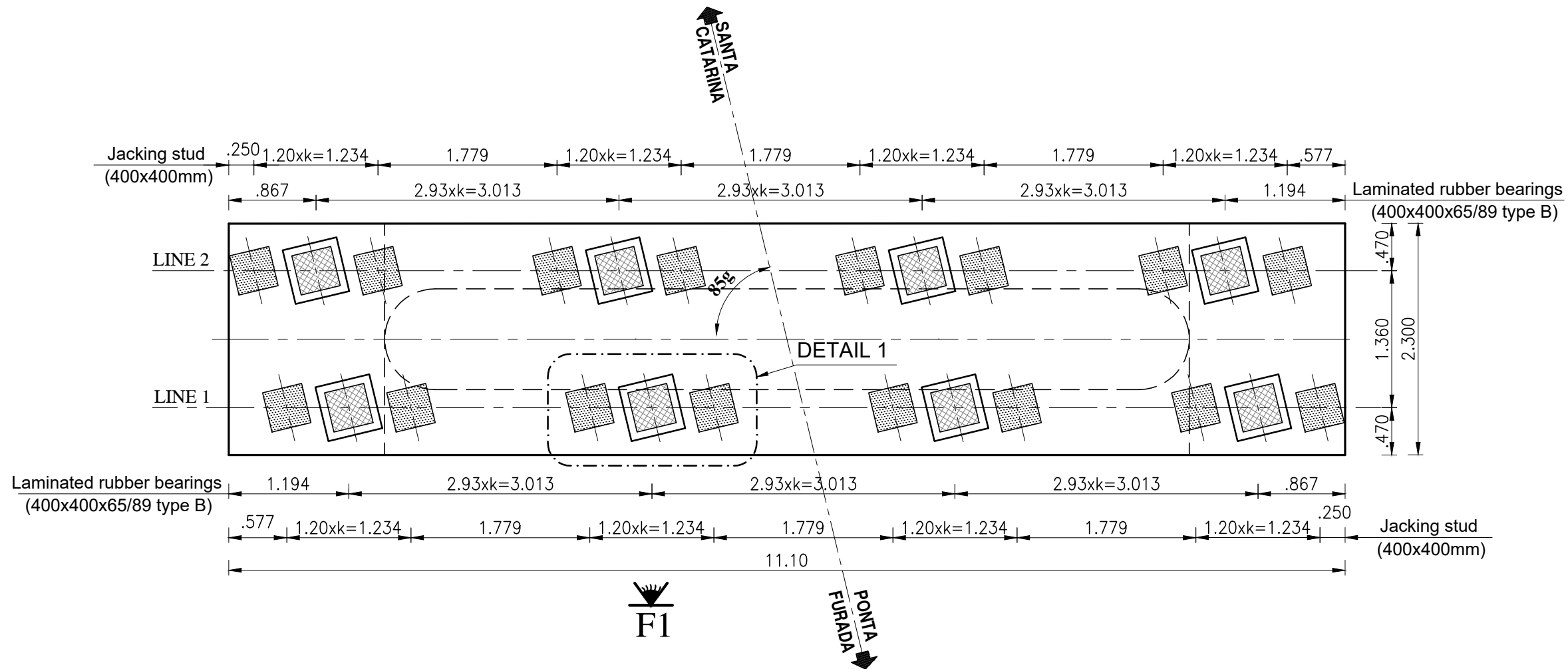
**NOTE :**

- The formwork of the facings seen will be carried out using fine formwork.
- The formwork of the hidden facings will be carried out using ordinary formwork.
- The facings in contact with the backfill will be painted in 3 crossed coats of bituminous paint
- exposed edges will be chamfered 2.5x2.5cm.
- The concrete will be of C25/30 (B2) quality for the crosshead and columns.
- The concrete will be of C30/37 (B4) quality for Footings and Ribs
- the concrete fill will be of C16/20 (B1) quality dosed at 250Kg of cement/m3.
- The mortar for the bush-hammered screed will be dosed at 450Kg/m3.



# CROSSHEAD : PLAN VIEW

ECH : 1/50

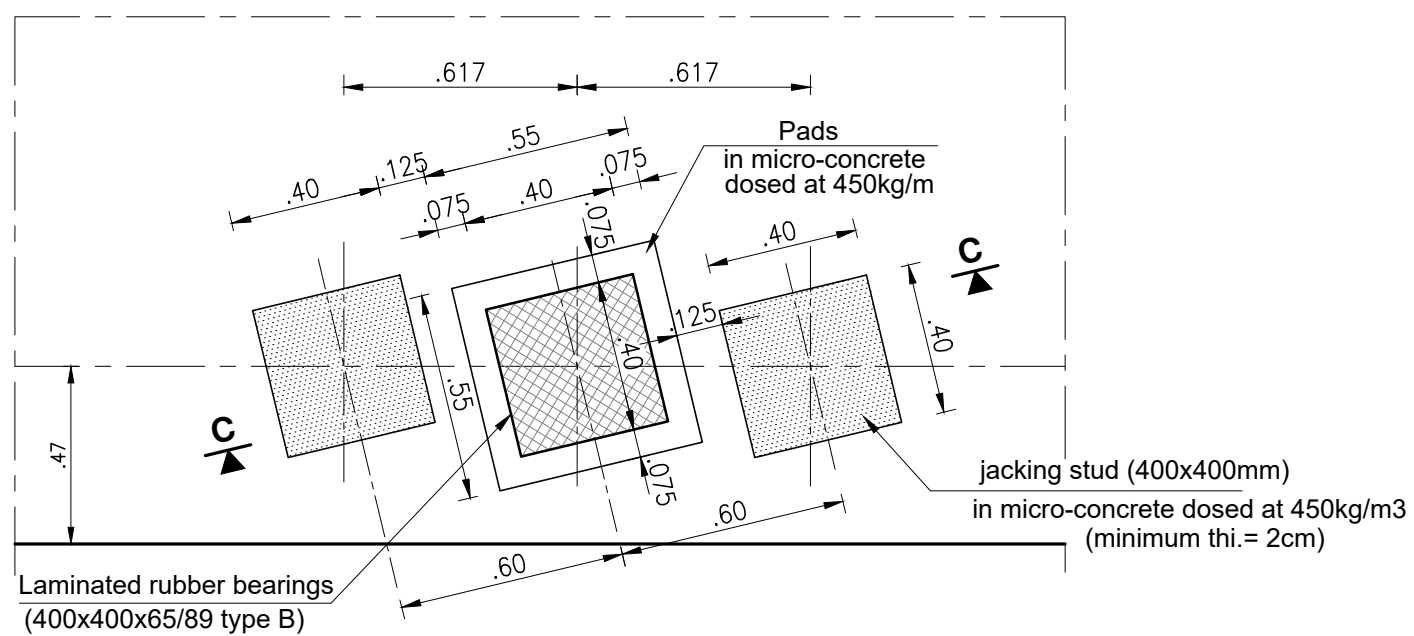


Bias = 85g

$$K = \frac{1}{\sin 85g} = 1.0284$$

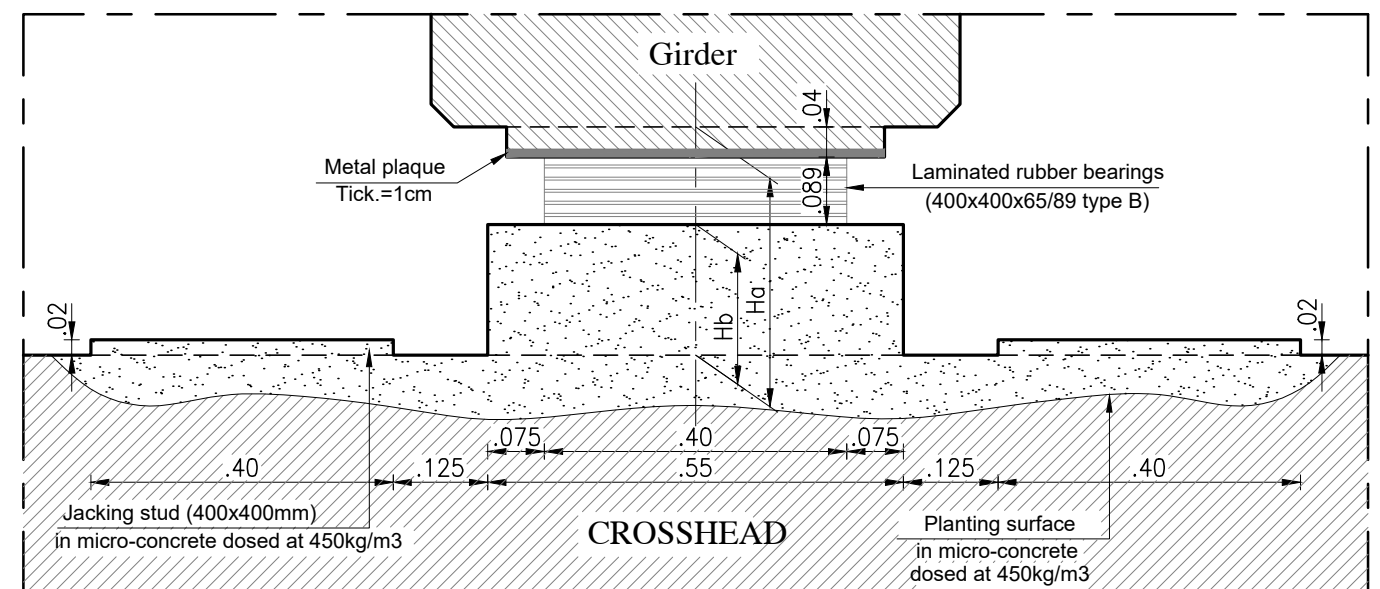
## DETAIL 1

ECH : 1/20



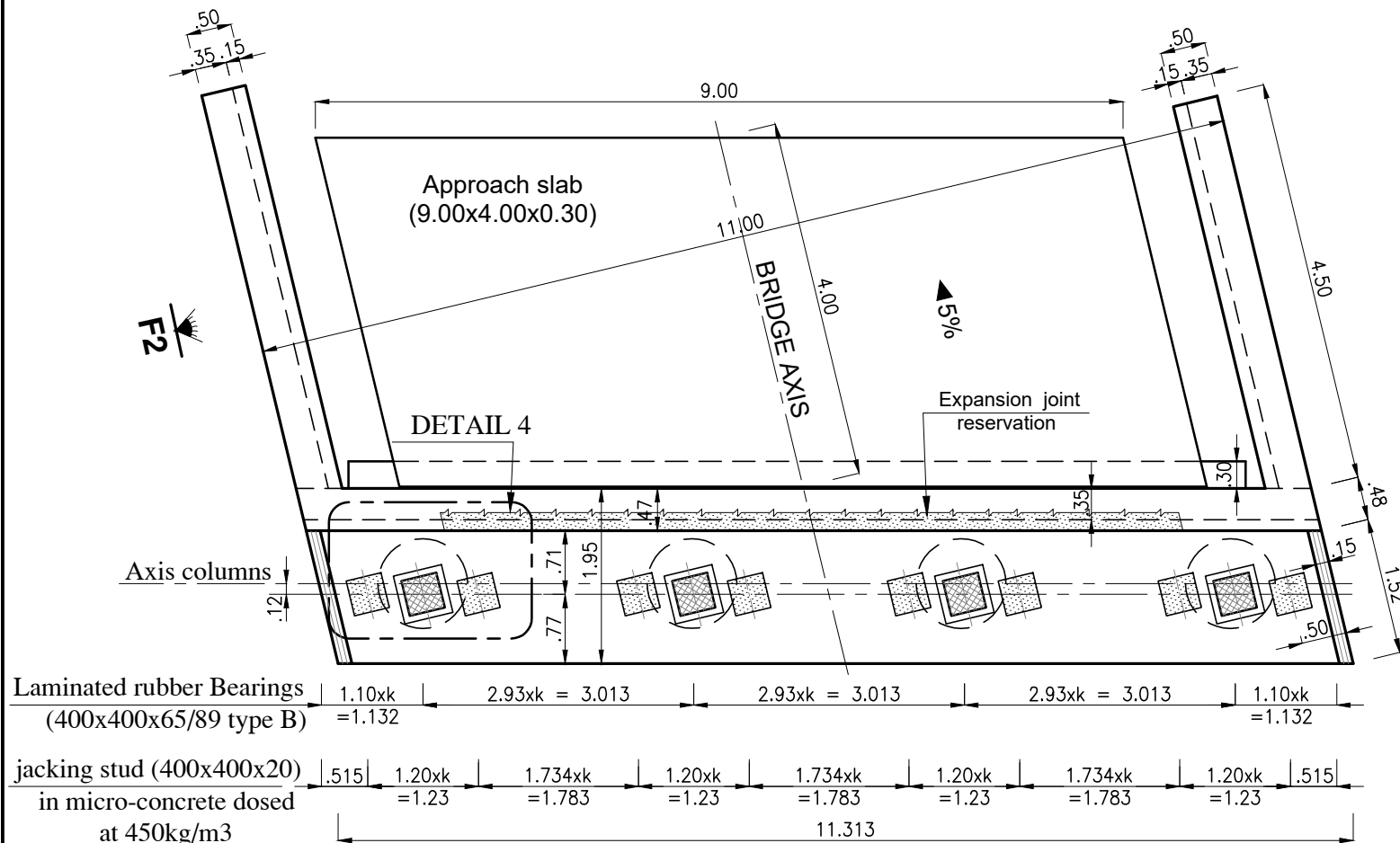
## SECTION C-C

ECH : 1/10



**PLAN VIEW**  
ÉCH : 1/75

**VIEW BY F1**  
SC : 1/75

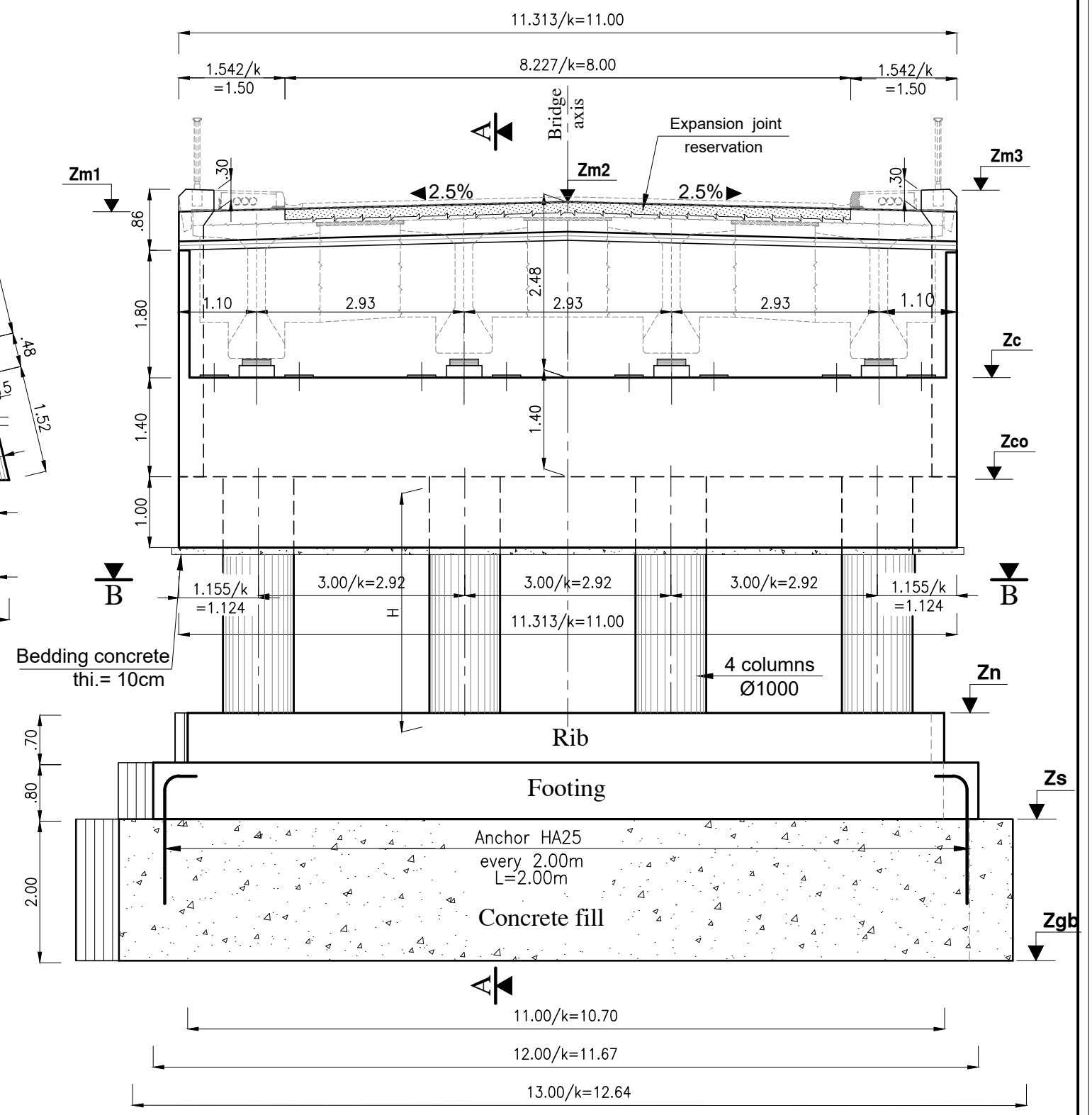


Bias = 85g

$$K = \frac{1}{\sin 85g} = 1.0284$$

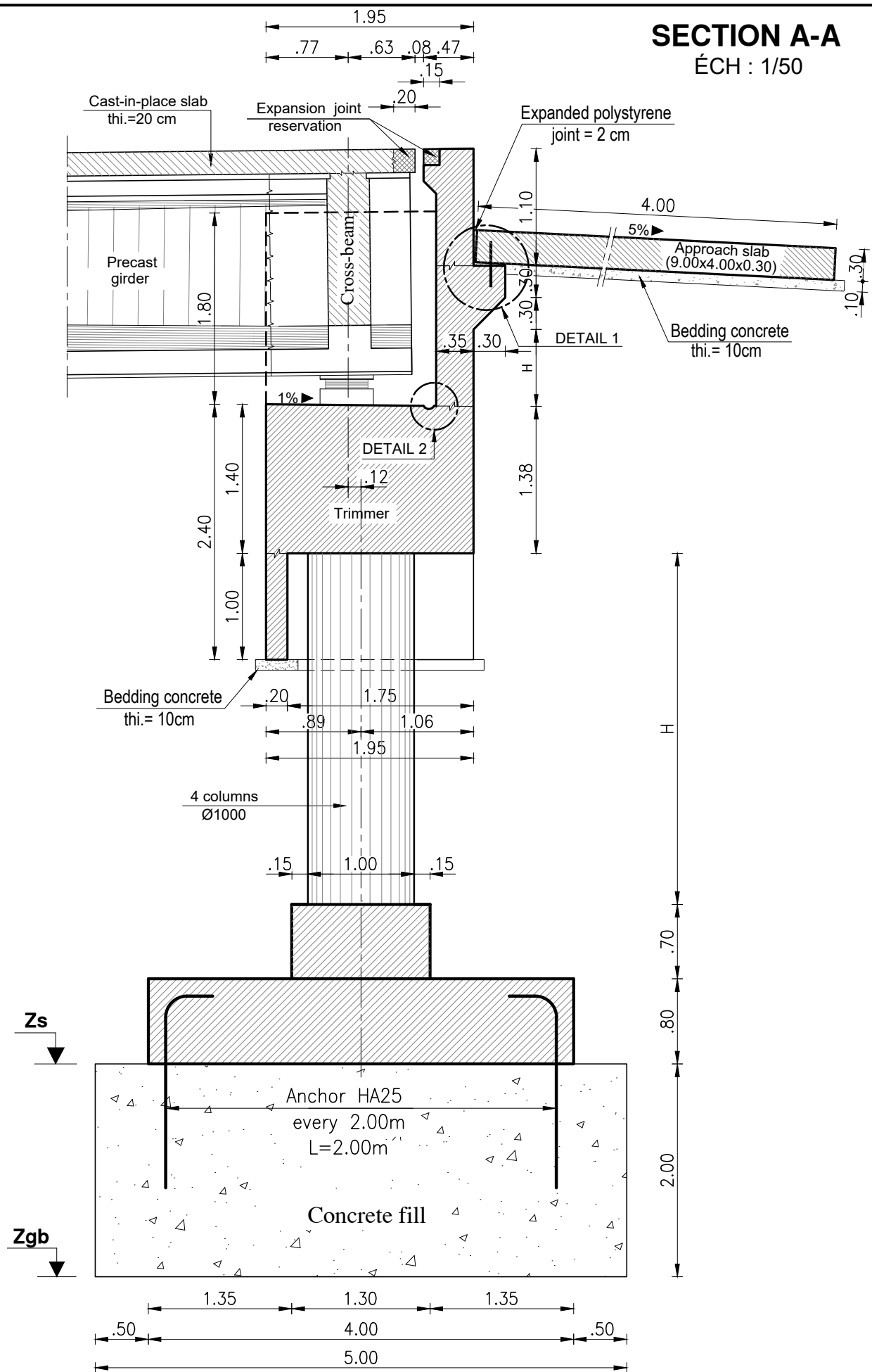
**DIMENSIONS AND LEVELLING OF ABUTMENTS**

Abut.	Zgb	Zs	Zn	Zvf	Zco	Zc	Zc1	Zmc	Zm1	Zm2	Zm3	Zm4	Zm5	H(m)	h(m)
C1	4.50	6.50	8.00	-	10.456	11.856	11.848	13.656	14.188	14.336	14.518	14.493	14.506	2.456	0.757
C4	4.00	6.00	7.50	9.976	10.976	12.376	12.368	14.176	14.727	14.856	15.038	15.063	15.076	3.476	0.753

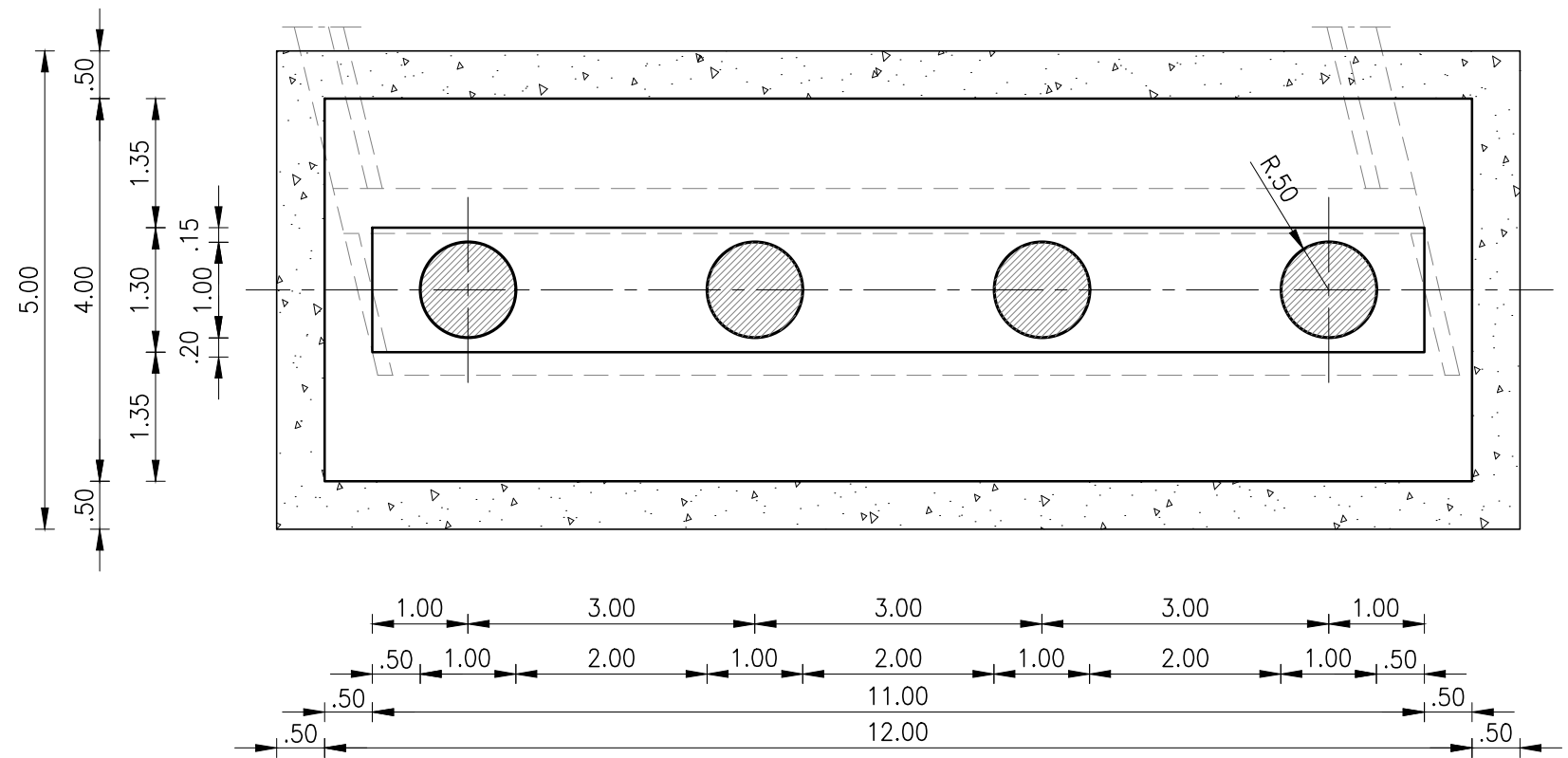




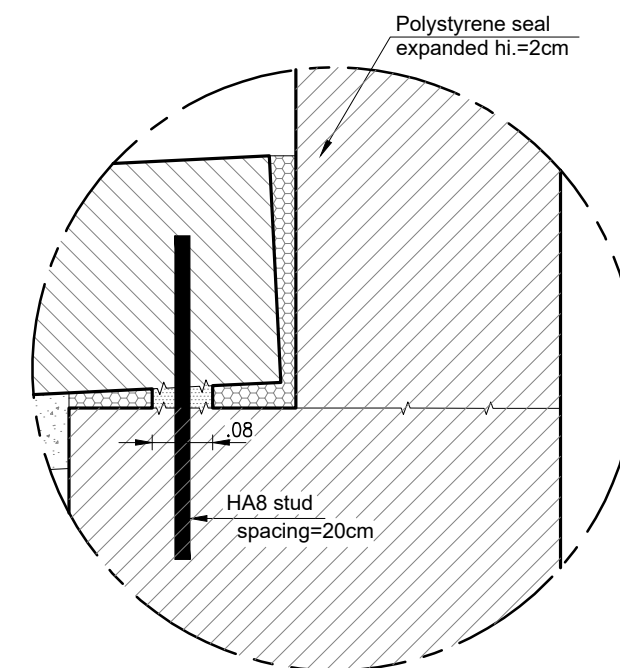
**SECTION A-A**  
ÉCH : 1/50



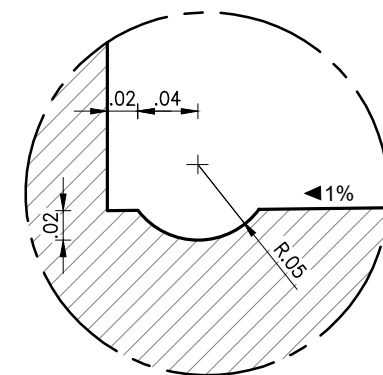
**SECTION B - B**  
SC : 1/75



**DETAIL 1**  
**( Shrink section of concrete )**  
SC : 1/10



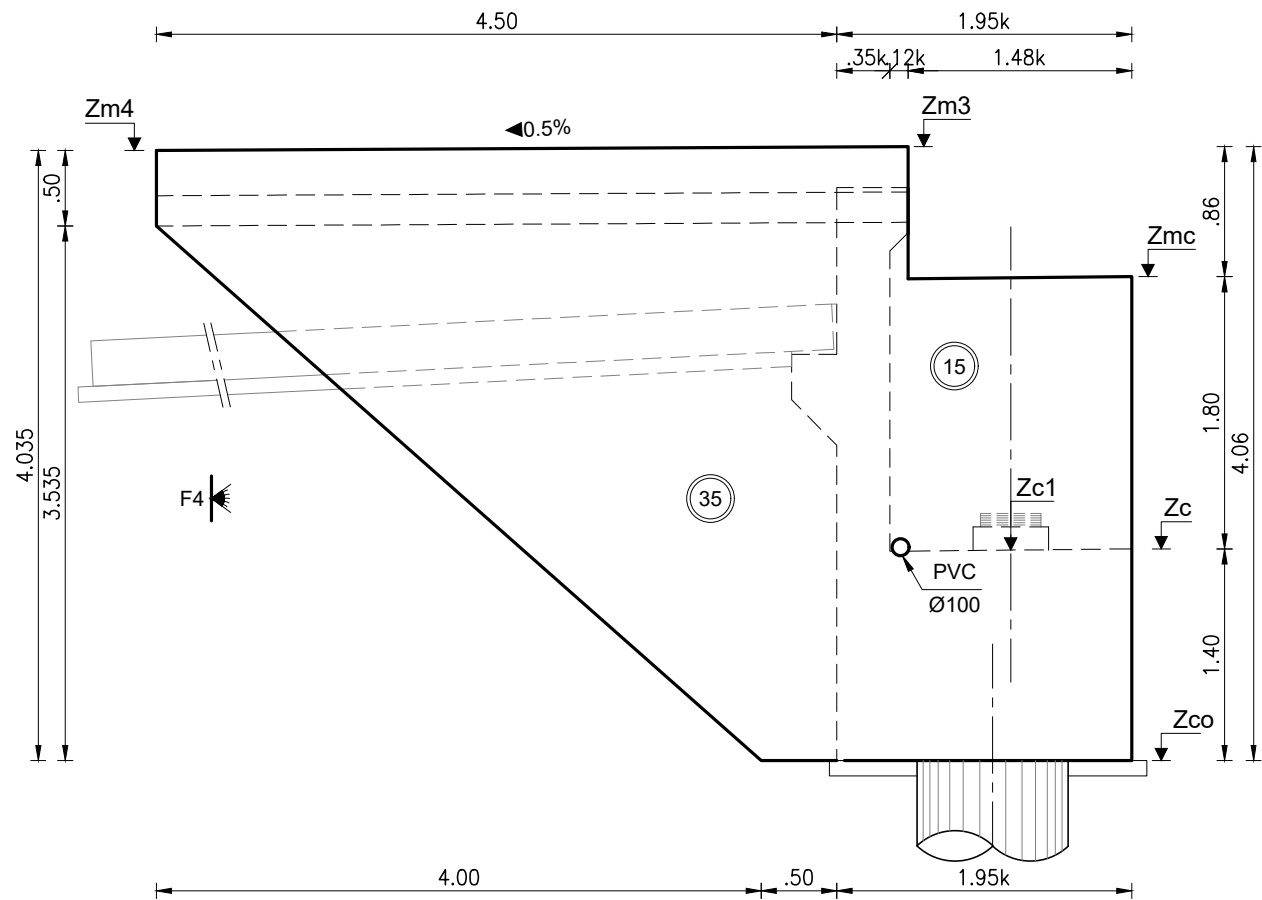
**DETAIL 2**  
SC : 1/5



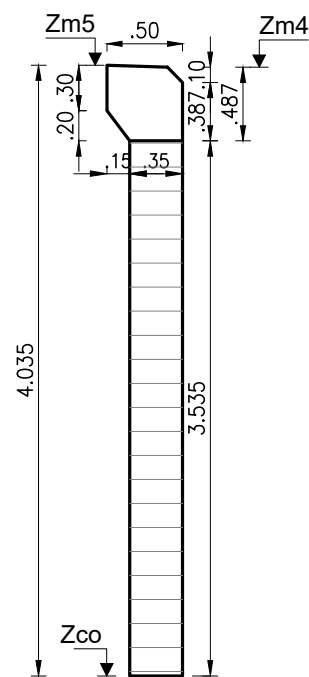
### C1 SIDE WALL DETAILS

ÉCH : 1/50

#### VIEW BY F2



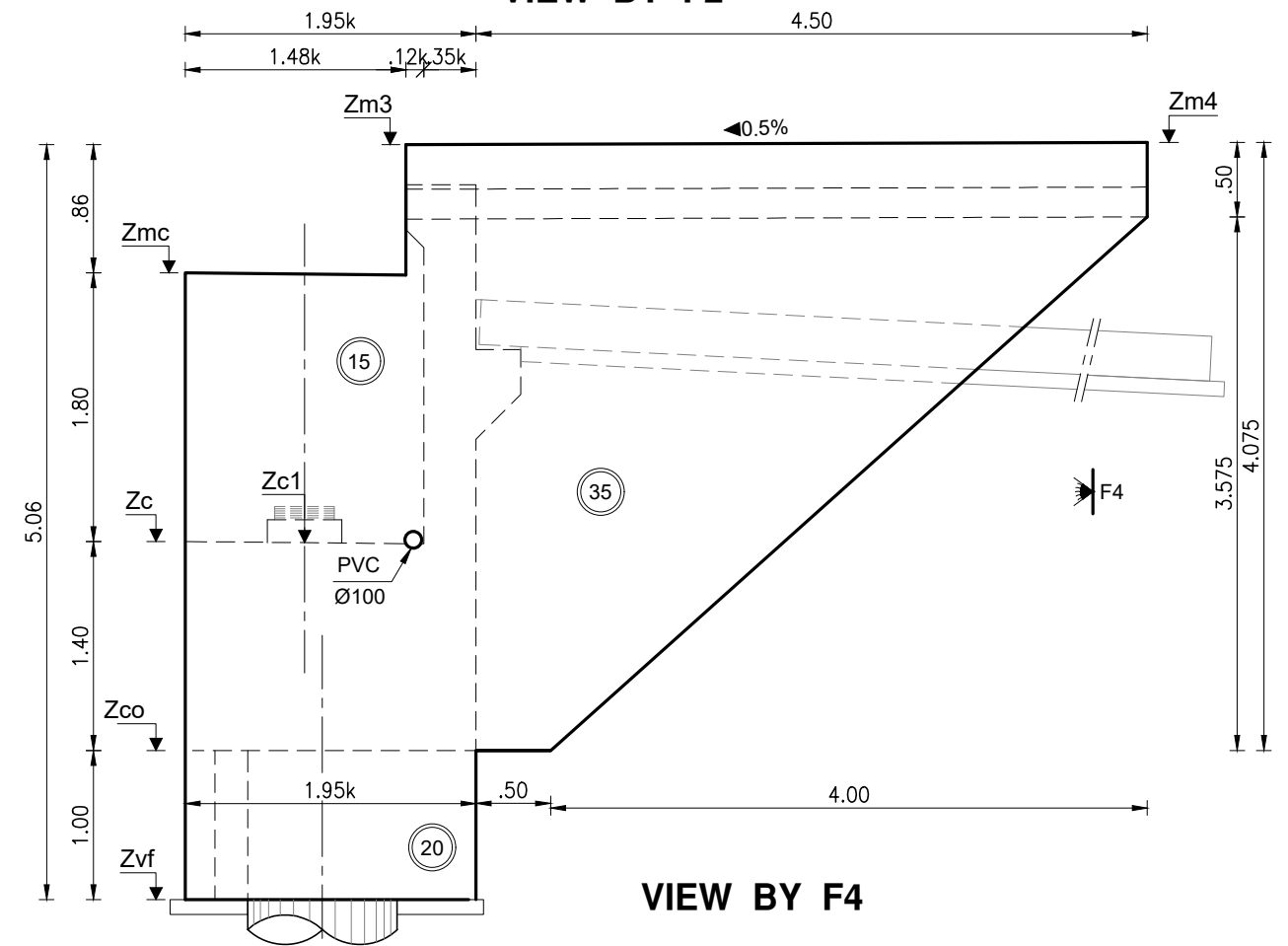
#### VIEW BY F3



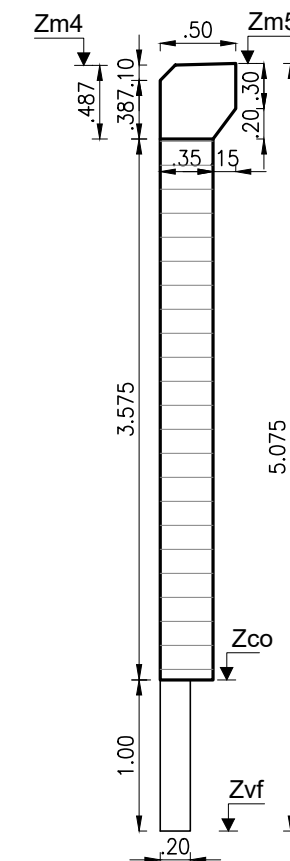
### C4 SIDE WALL DETAILS

ÉCH : 1/50

#### VIEW BY F2

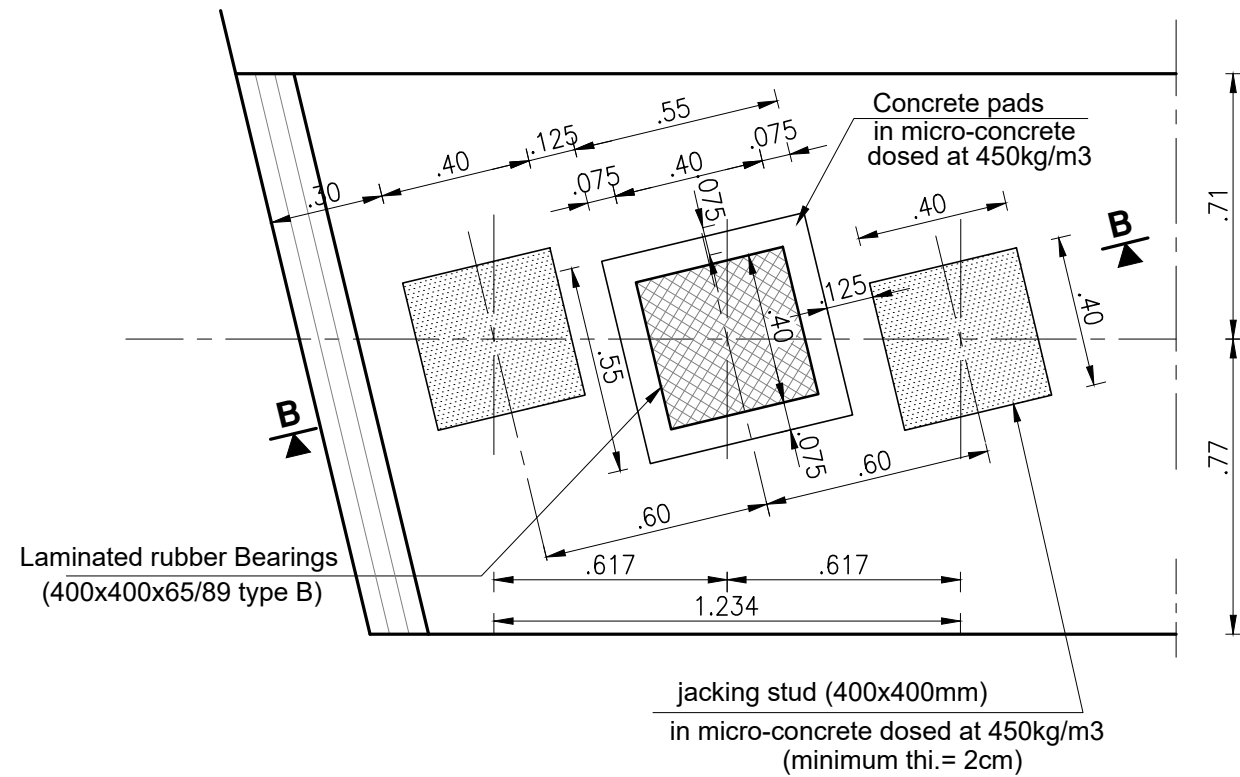


#### VIEW BY F4

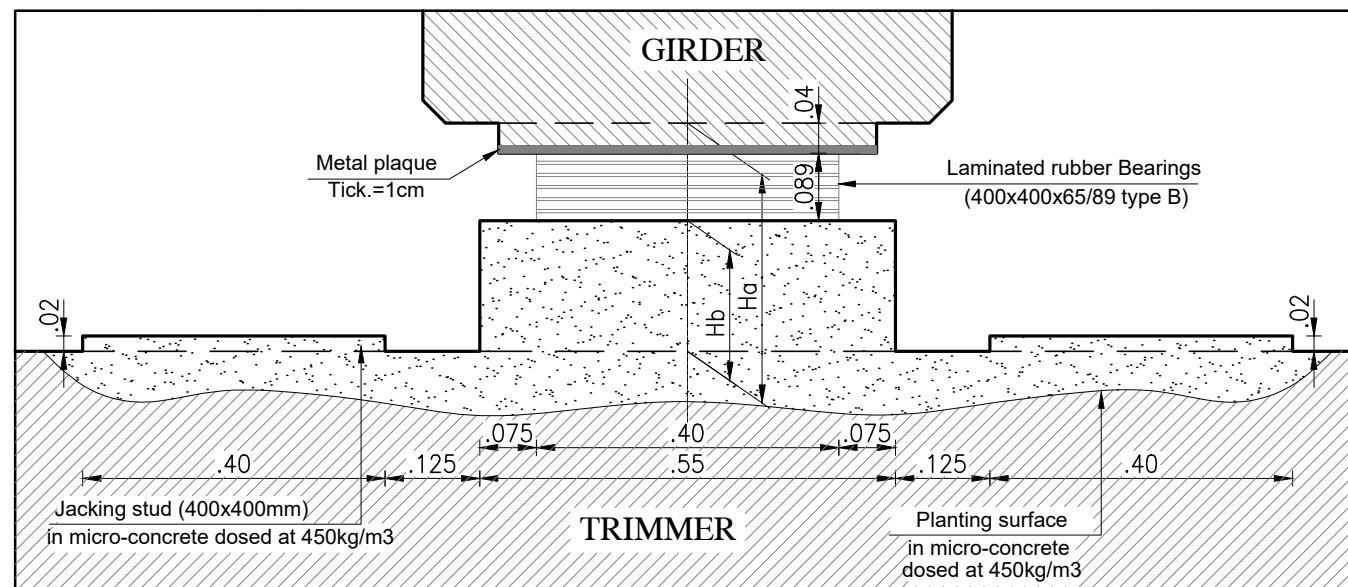




**DETAIL 4**  
SC : 1/20



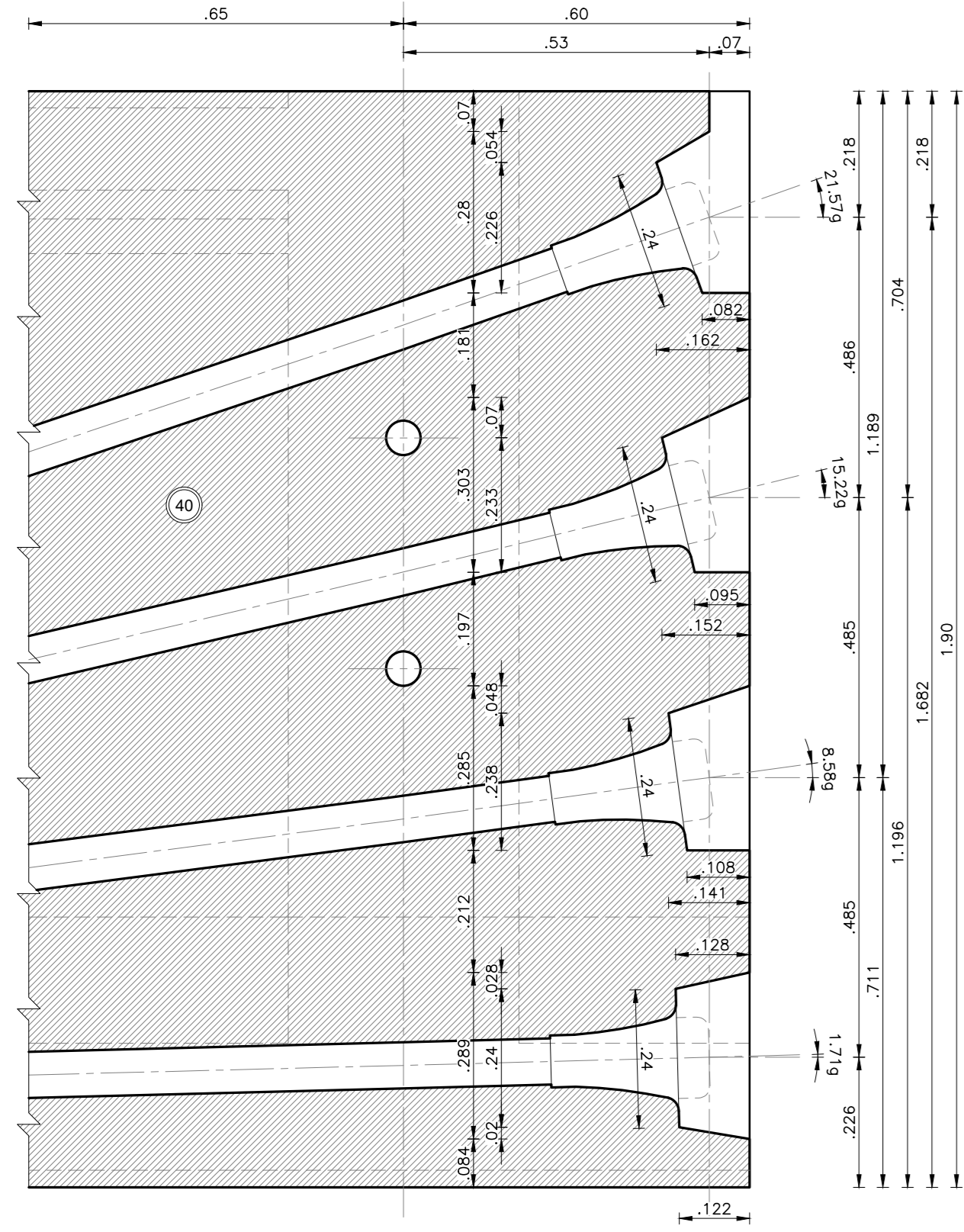
**SECTION B-B**  
SC : 1/10



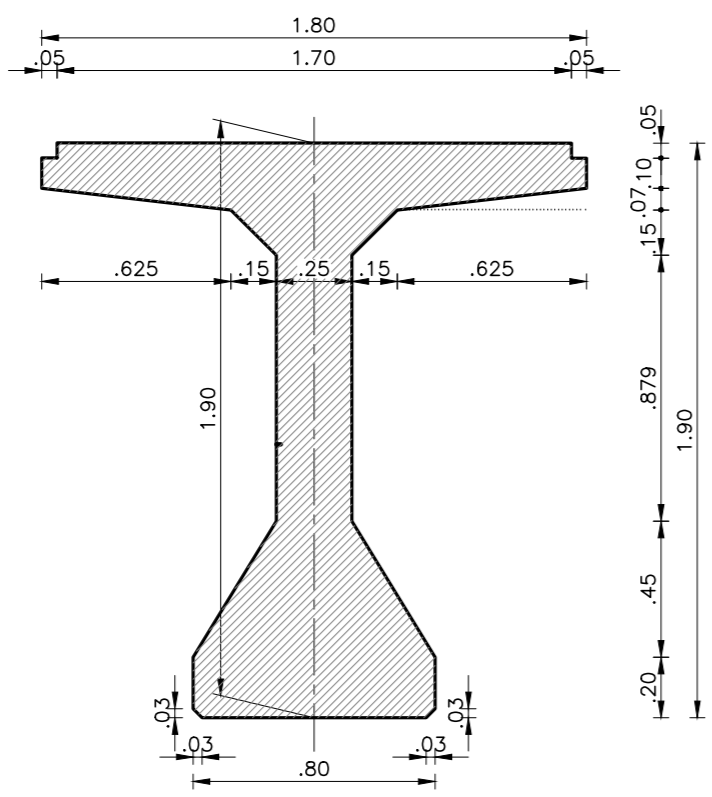
**NOTE :**

- The formwork of the visible facings will be carried out using fine formwork.
- The formwork of the hidden facings will be carried out using ordinary formwork.
- The facings in contact with the backfill will be painted in 3 crossed coats of bituminous paint
- exposed edges will be chamfered 2.5x2.5cm.
- The concrete will be of C25/30 (B2) quality for the trimmers, columns, approach slabs, side walls, guard wall, hidden walls and cornices.
- The concrete will be of quality C30/37 (B4) for the ribs and footings
- The concrete fill will be of C16/20 (B1) quality dosed at 250Kg of cement/m<sup>3</sup>.
- The concrete will be of C16/20 (B0) for bedding concrete.
- Micro-concrete dosed at 450kg/m<sup>3</sup> for the pads.

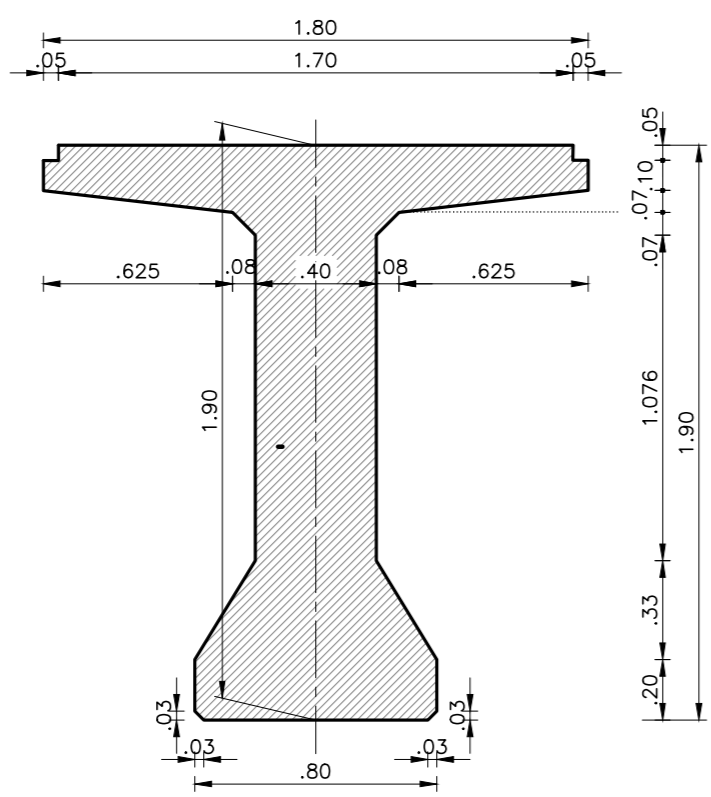
**SECTION A-A**  
SC : 1/10



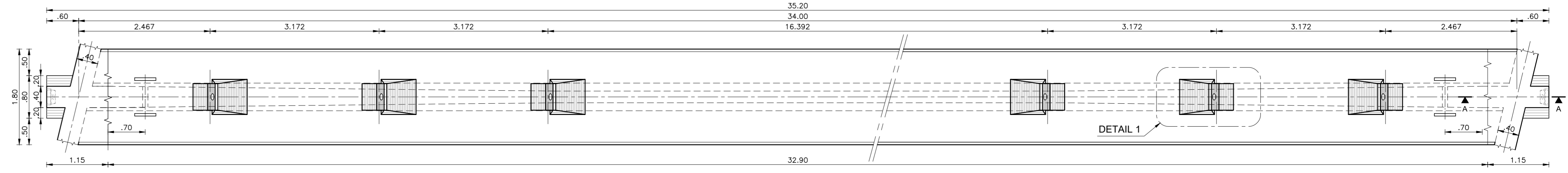
**SPAN SECTION (INTERMEDIATE GIRDER)**  
SC : 1/25



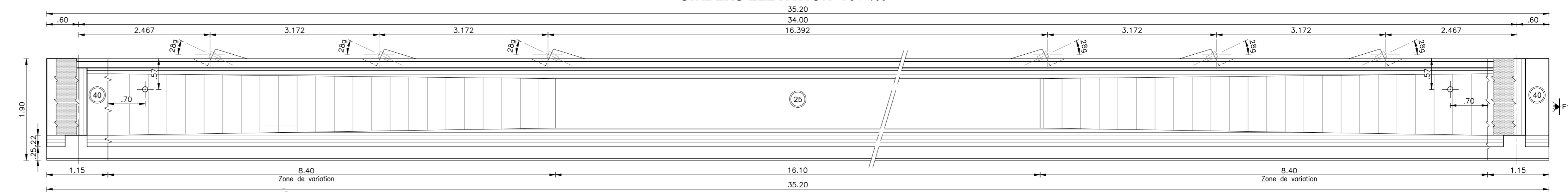
**SECTION ON SUPPORT (INTERMEDIATE GIRDER)**  
SC : 1/25



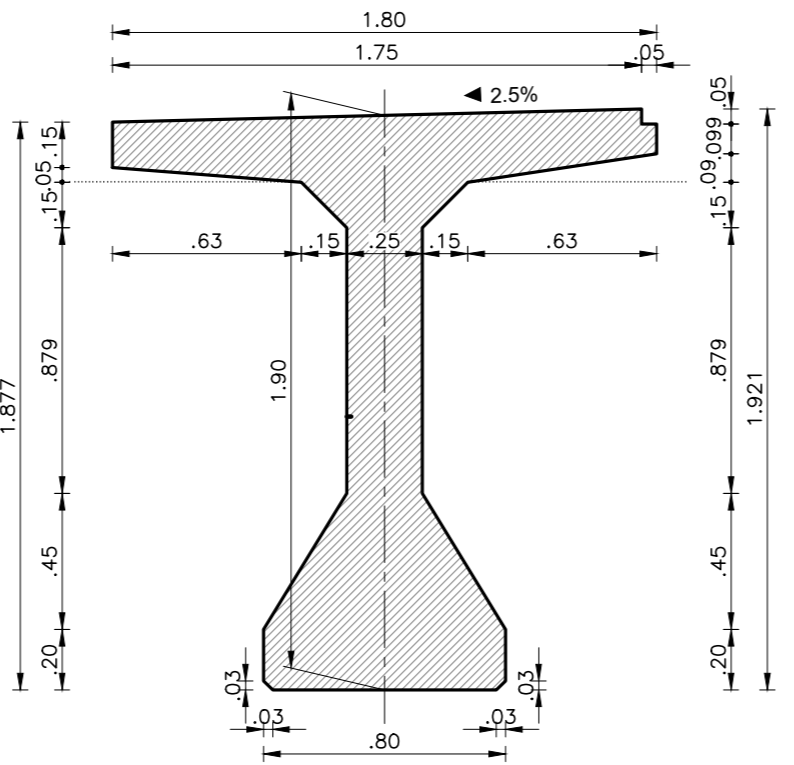
**GIRDERS VIEW PLAN** SC : 1/50



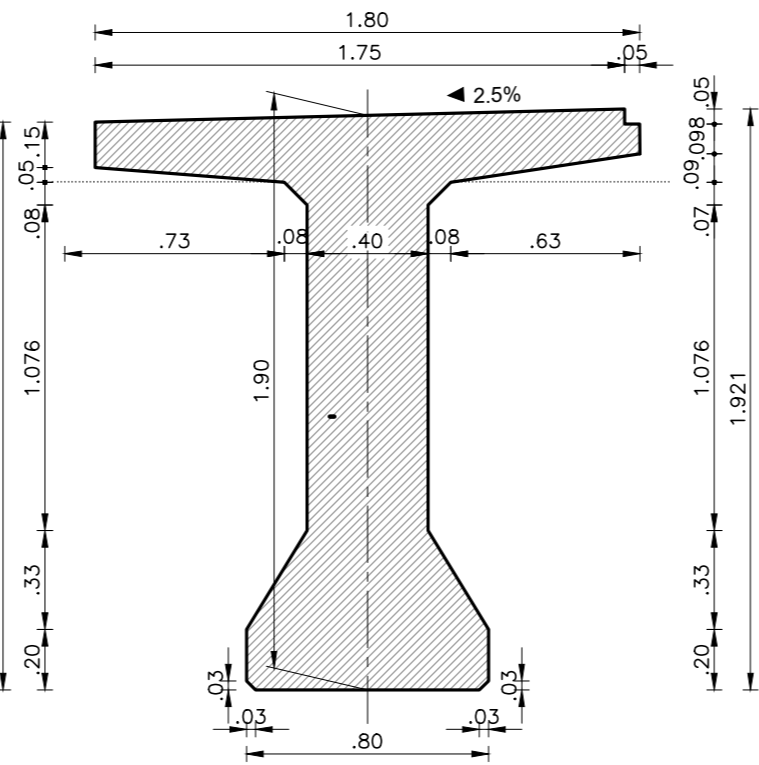
**GIRDERS ELEVATION** SC : 1/50



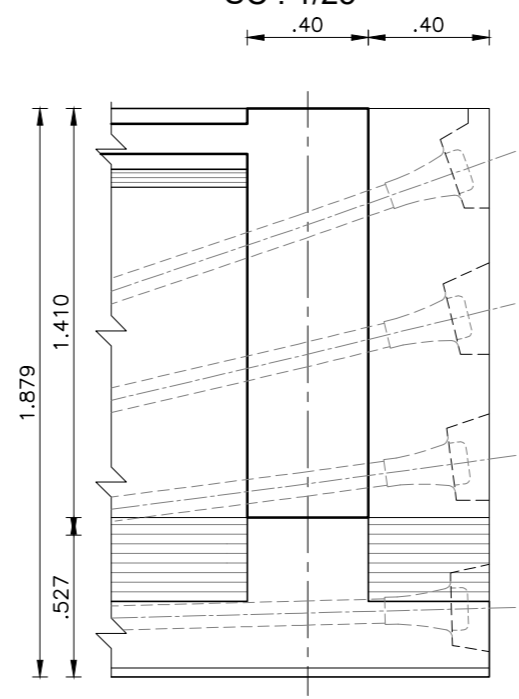
**SPAN SECTION (EDGE GIRDER)**  
SC : 1/25



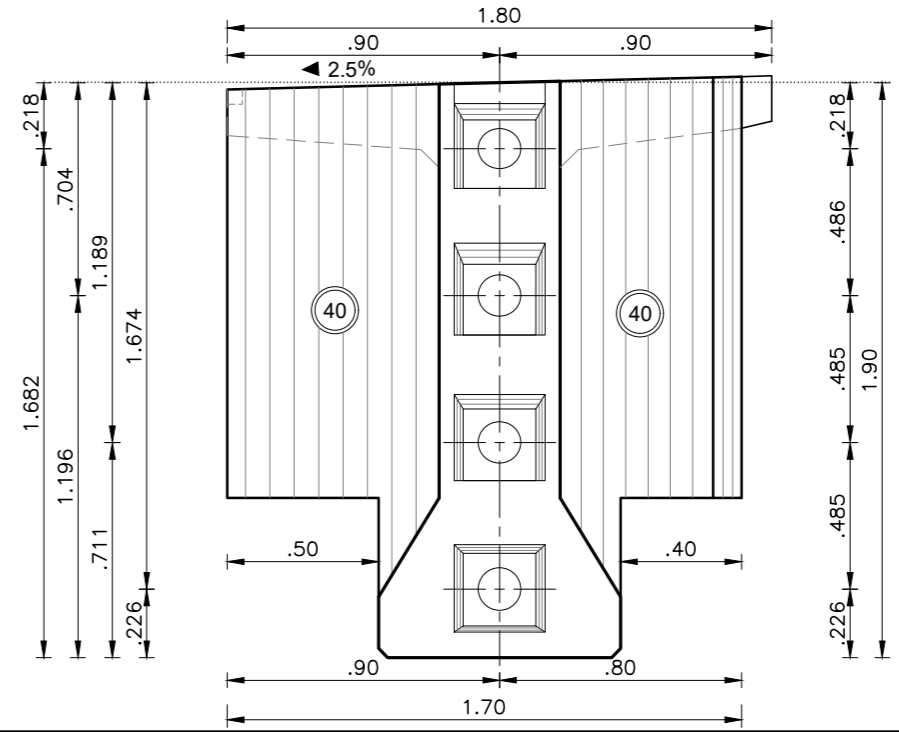
**SECTION ON SUPPORT (EDGE GIRDER)**  
SC : 1/25



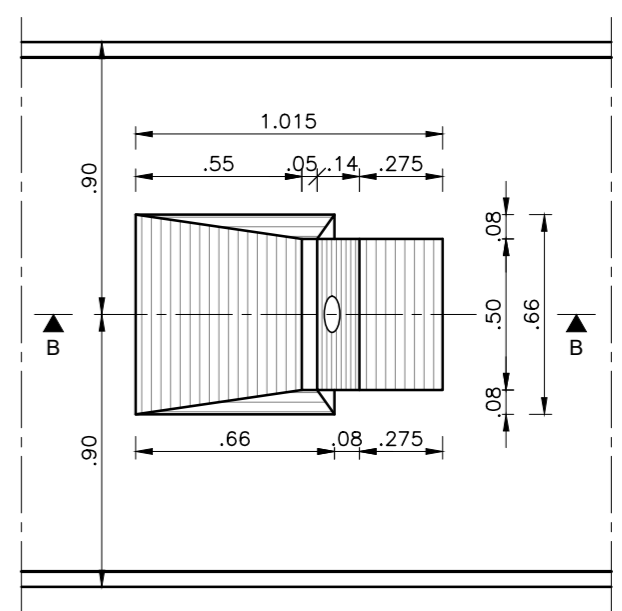
**VIEW BY F2**  
SC : 1/25



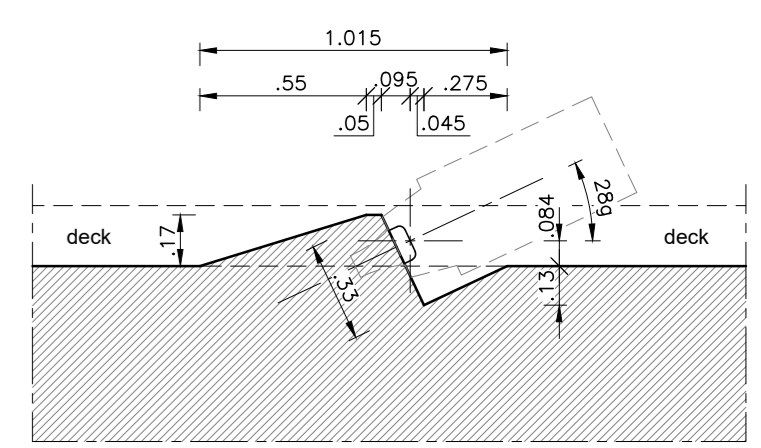
**VIEW BY F1**  
SC : 1/25



**DETAIL 1**  
SC : 1/25



**SECTION B-B**  
SC : 1/25

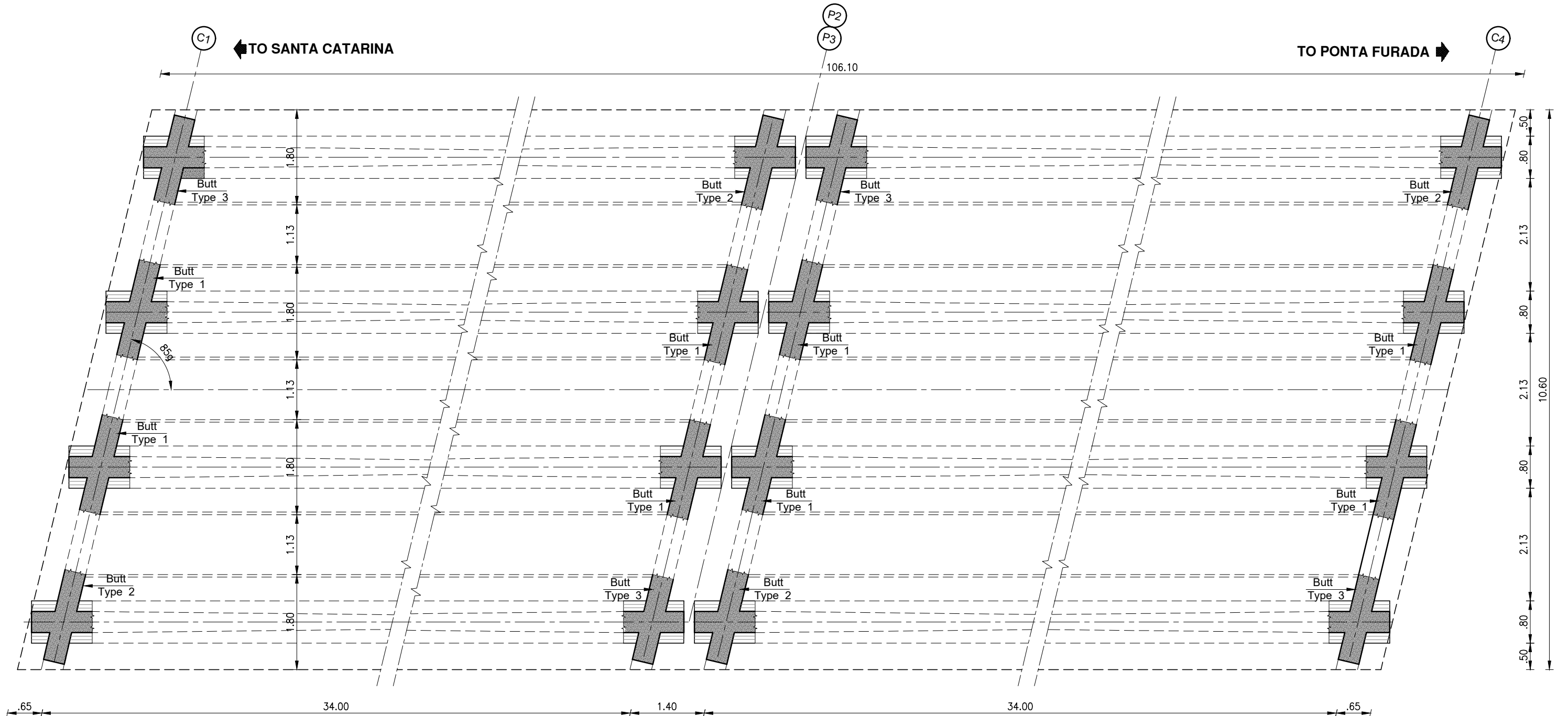


**NOTE :**  
 - The formwork of the visible facings will be carried out using fine formwork.  
 - The formwork of the hidden facings will be carried out using ordinary formwork.  
 - The concrete will be of quality C35/45 (B5) for the girders and cross-beam



**PLAN VIEW**

SC : 1/75



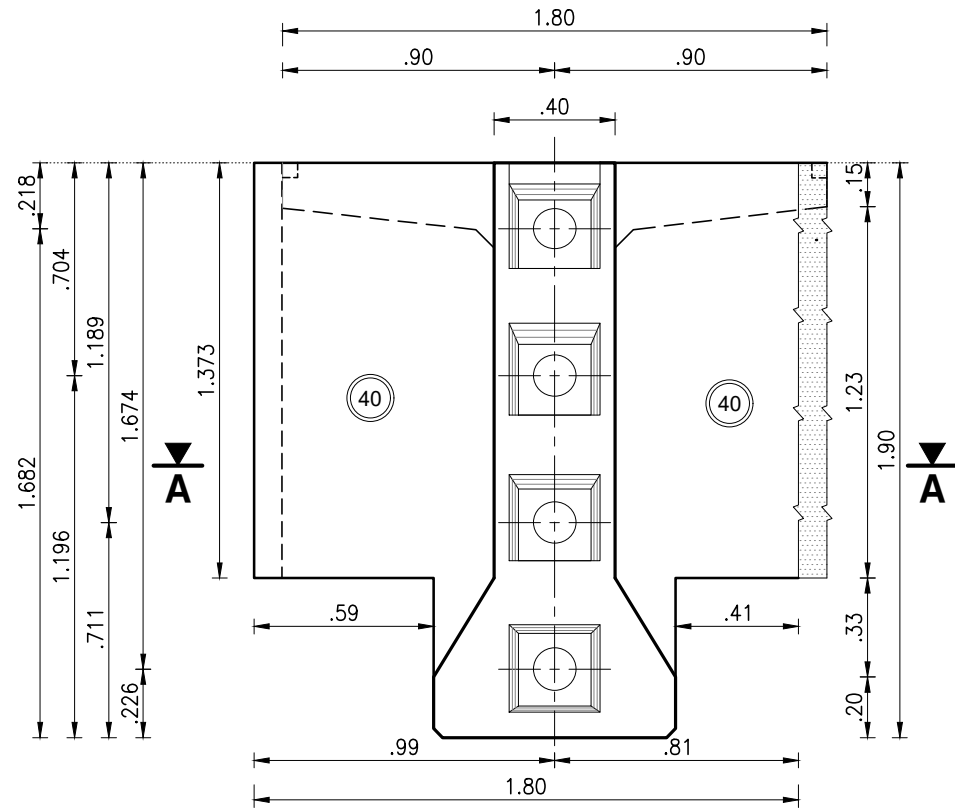
**NOTE :**

- The formwork of the visible facings will be carried out using fine formwork.
- The formwork of the hidden facings will be carried out using ordinary formwork.
- The concrete will be of quality C35/45 (B5) for the girders and cross-beams

Indice	Date	Objet modifications	Réalisé par :	Revu par :	Approuvé par :
A	Feb. 2024	Édition Originale	E.SASSI	L.MANI	R.KHEMIR

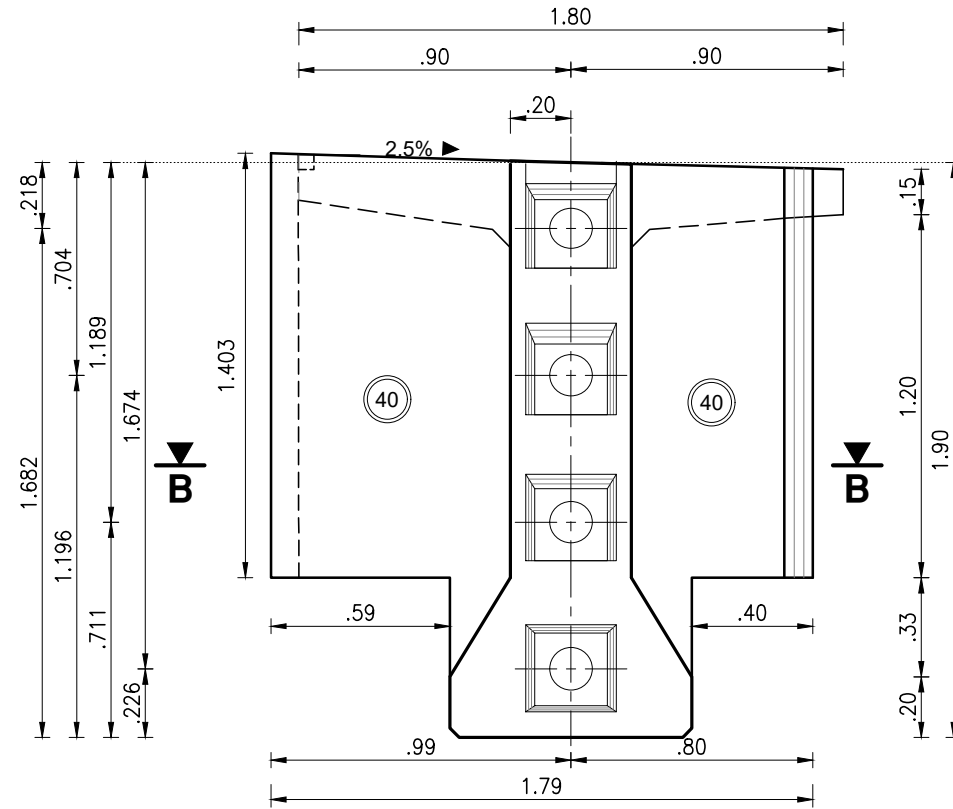
**BUTT TYPE 1**

SC : 1/25



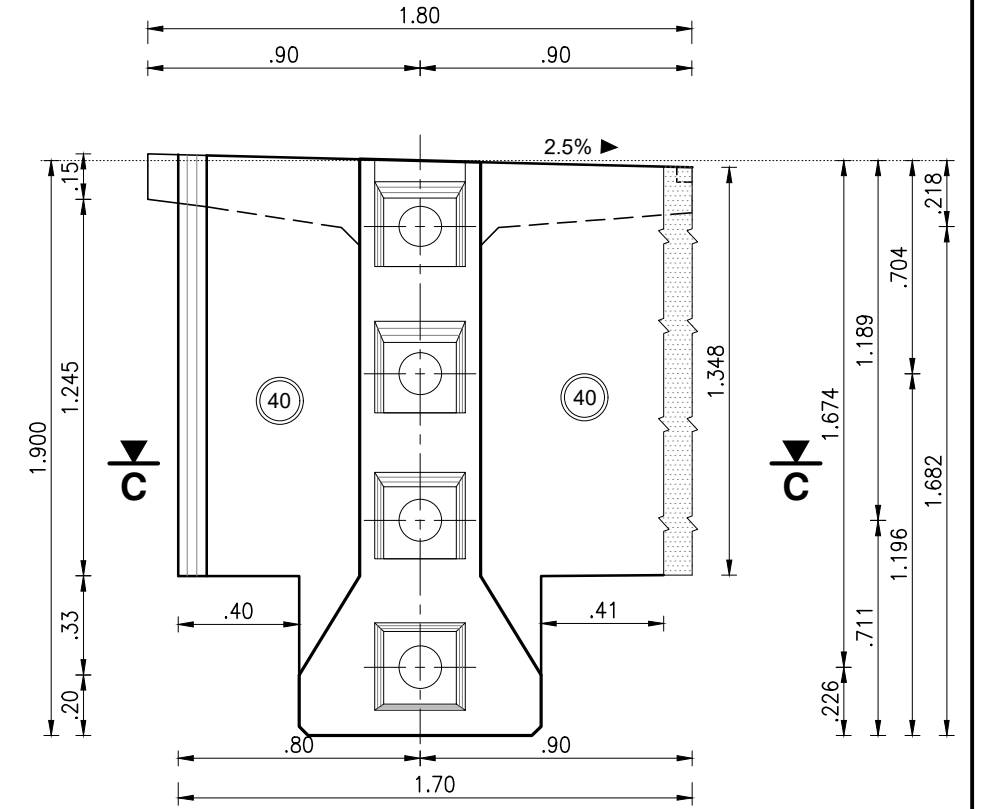
**BUTT TYPE 2**

SC : 1/25



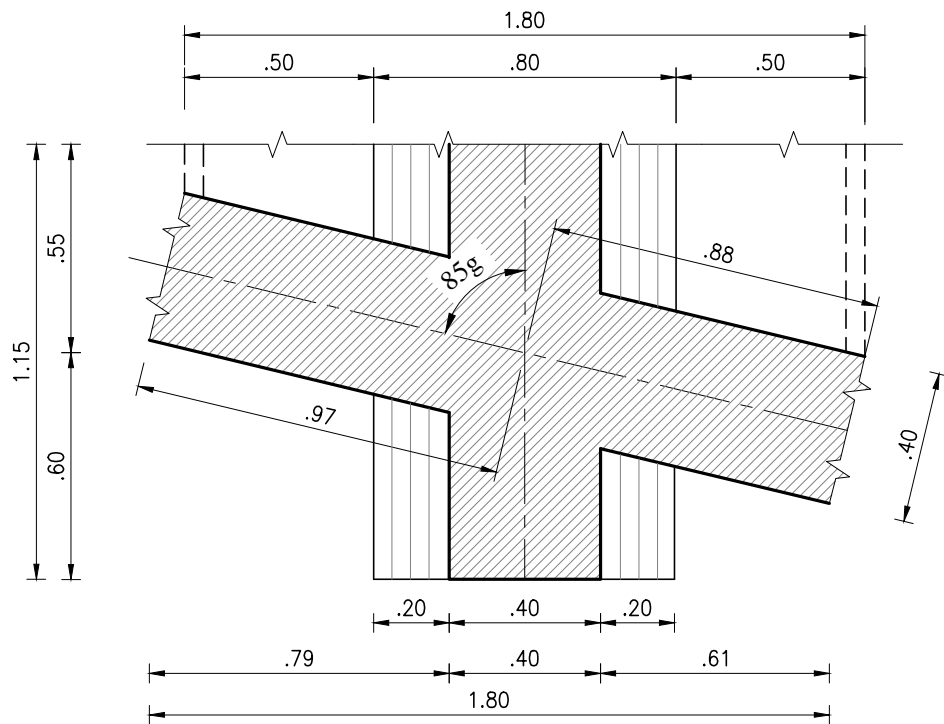
**BUTT TYPE 3**

SC : 1/25



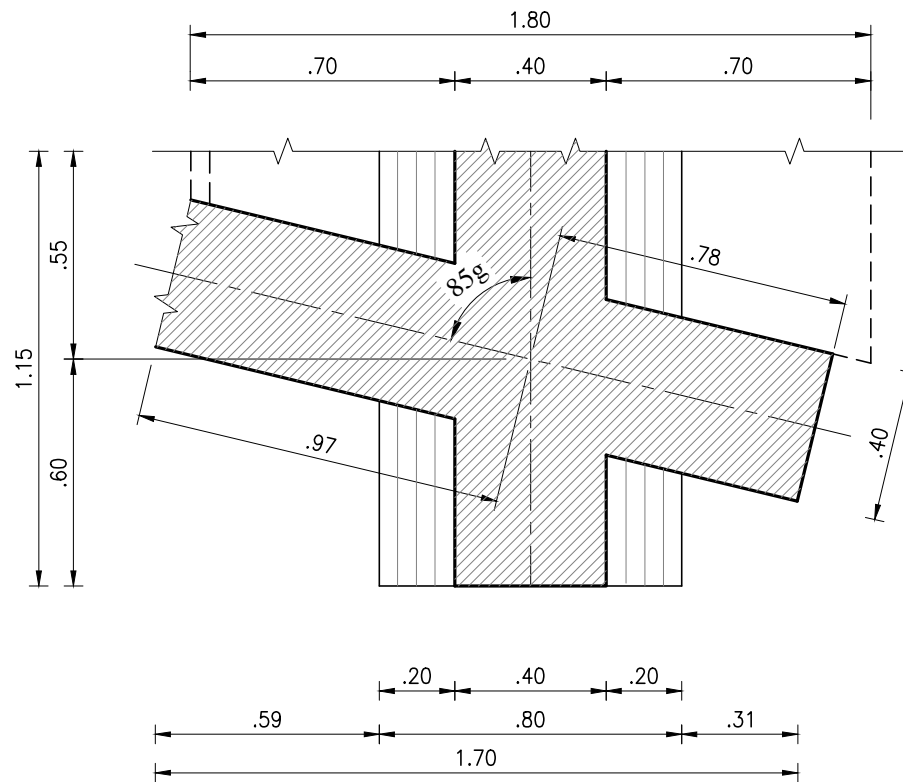
**SECTION A-A**

SC : 1/20



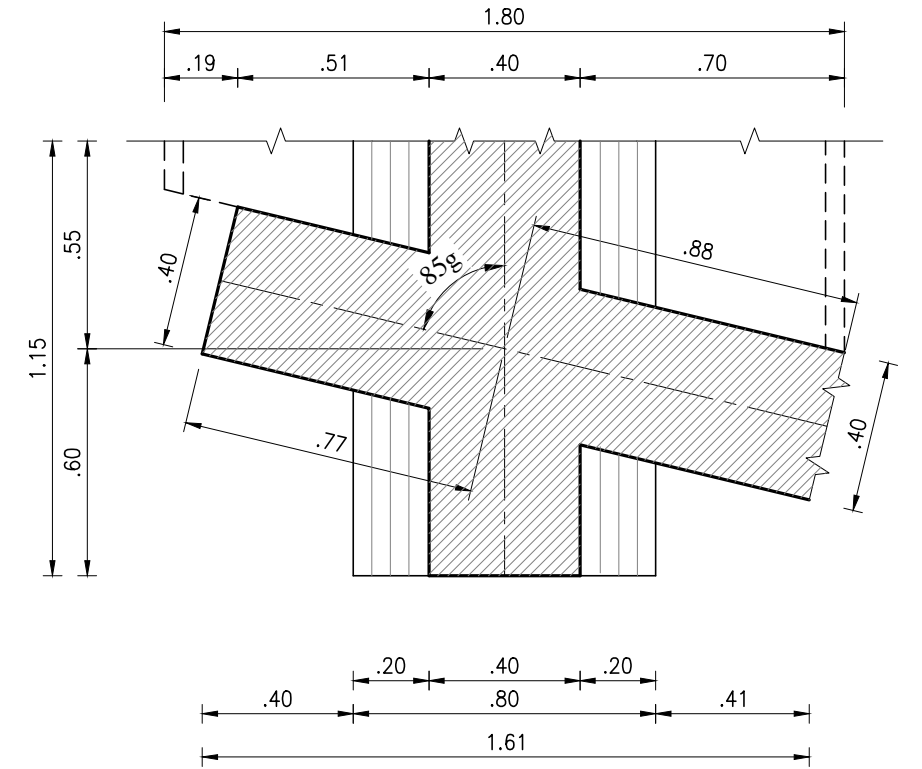
**SECTION B-B**

SC : 1/20

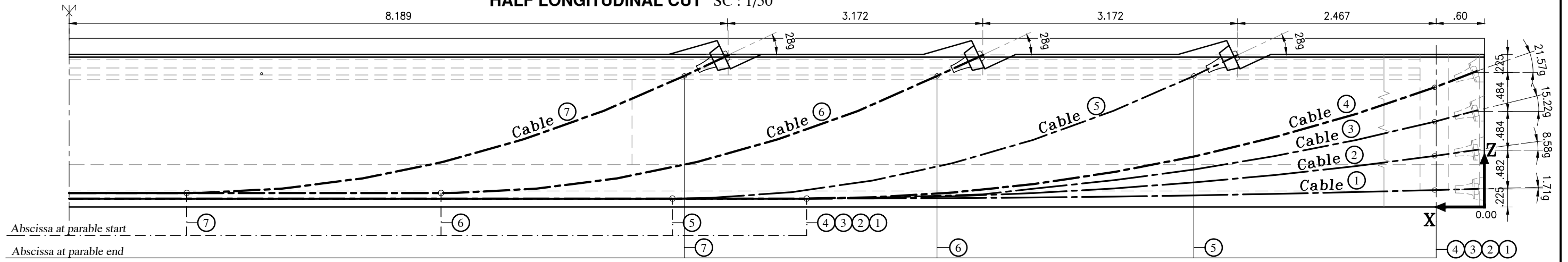


**SECTION C-C**

SC : 1/20



**HALF LONGITUDINAL CUT SC : 1/50**



ABSCISSA (X)	ORDINATES (Z)			
	Cable 1	Cable 2	Cable 3	Cable 4
17.60	.105	.105	.105	.105
17.35	.105	.105	.105	.105
17.10	.105	.105	.105	.105
16.85	.105	.105	.105	.105
16.60	.105	.105	.105	.105
16.35	.105	.105	.105	.105
16.10	.105	.105	.105	.105
15.85	.105	.105	.105	.105
15.60	.105	.105	.105	.105
15.35	.105	.105	.105	.105
15.10	.105	.105	.105	.105
14.85	.105	.105	.105	.105
14.60	.105	.105	.105	.105
14.35	.105	.105	.105	.105
14.10	.105	.105	.105	.105
13.85	.105	.105	.105	.105
13.60	.105	.105	.105	.105
13.35	.105	.105	.105	.105
13.10	.105	.105	.105	.105
12.85	.105	.105	.105	.105
12.60	.105	.105	.105	.105
12.35	.105	.105	.105	.105
12.10	.105	.105	.105	.105
11.85	.105	.105	.105	.105
11.60	.105	.105	.105	.105
11.35	.105	.105	.105	.105
11.10	.105	.105	.105	.105
10.85	.105	.105	.105	.105
10.60	.105	.105	.105	.105
10.35	.105	.105	.105	.105
10.10	.105	.105	.105	.105
9.85	.105	.105	.105	.105
9.60	.105	.105	.105	.105
9.35	.105	.105	.105	.105
9.10	.105	.105	.105	.105
8.85	.105	.105	.105	.105
8.60	.105	.105	.105	.105
8.35	.105	.105	.105	.105
8.10	.105	.105	.105	.105
7.85	.105	.105	.105	.105
7.60	.105	.105	.105	.105
7.35	.105	.105	.105	.105
7.10	.105	.105	.105	.105
6.85	.105	.105	.105	.105
6.60	.105	.105	.105	.105
6.35	.105	.105	.105	.105
6.10	.105	.105	.105	.105
5.85	.105	.105	.105	.105
5.60	.105	.105	.105	.105
5.35	.105	.105	.105	.105
5.10	.105	.105	.105	.105
4.85	.105	.105	.105	.105
4.60	.105	.105	.105	.105
4.35	.105	.105	.105	.105
4.10	.105	.105	.105	.105
3.85	.105	.105	.105	.105
3.60	.105	.105	.105	.105
3.35	.105	.105	.105	.105
3.10	.105	.105	.105	.105
2.85	.105	.105	.105	.105
2.60	.105	.105	.105	.105
2.35	.105	.105	.105	.105
2.10	.105	.105	.105	.105
1.85	.105	.105	.105	.105
1.60	.105	.105	.105	.105
1.35	.105	.105	.105	.105
1.10	.105	.105	.105	.105
0.85	.105	.105	.105	.105
0.60	.105	.105	.105	.105

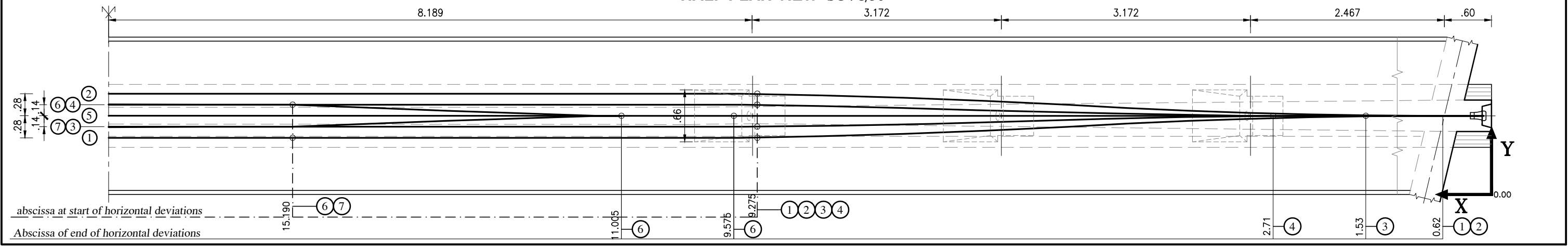
**FEATURES OF PRESTRESSING:**

- Cables 8T15 \$ TBR
- Guaranteed failure limit
- Maximum stress at anchoring :  $f_{pk} = 1860 \text{ MPa}$
- $\sigma_{Pmax.} = 1488 \text{ MPa}$

**Cable tensioning sequence :**

- 1st Phase (Before handling): 1 - 2 - 3 - 4
- 2nd Phase (After deck pouring): 5 - 6 - 7

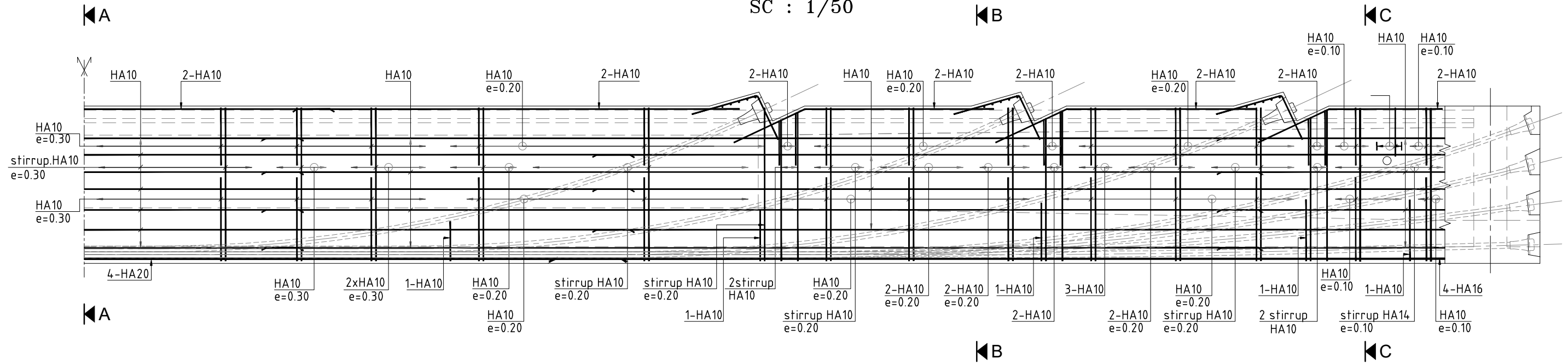
**HALF PLAN VIEW SC : 1/50**





# HALF LONGITUDINAL CUT

SC : 1/50



## NOTE :

- $f_{ck} = 35 \text{ MPa}$
- Ribbed steel  $f_{yk} = 500 \text{ MPa}$ .
- Steel cover :  $e=5\text{cm}$ .

## SECTION A-A

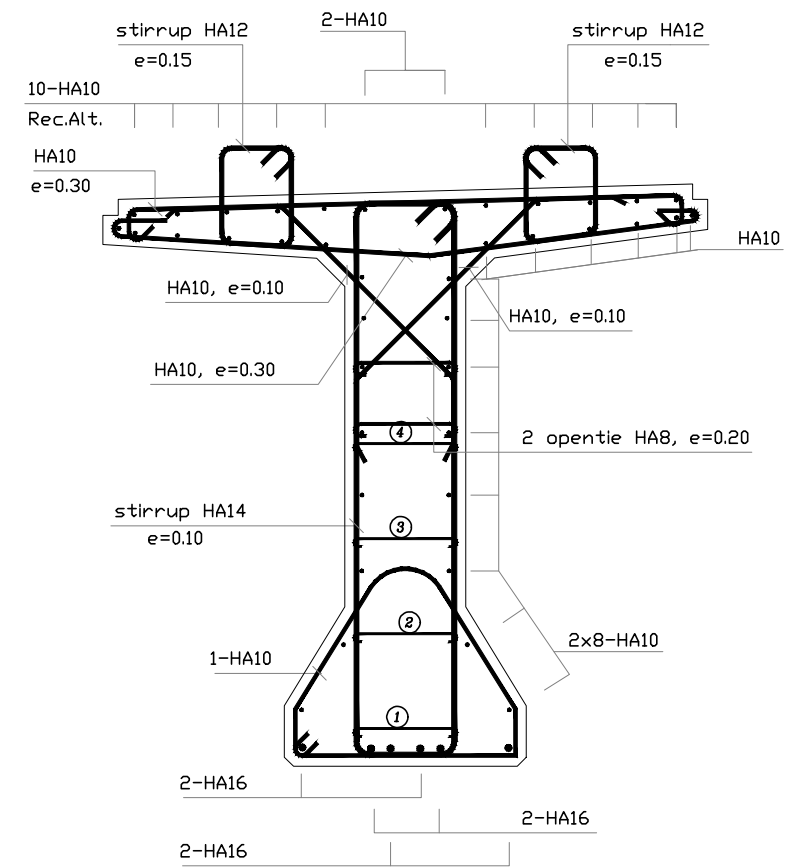
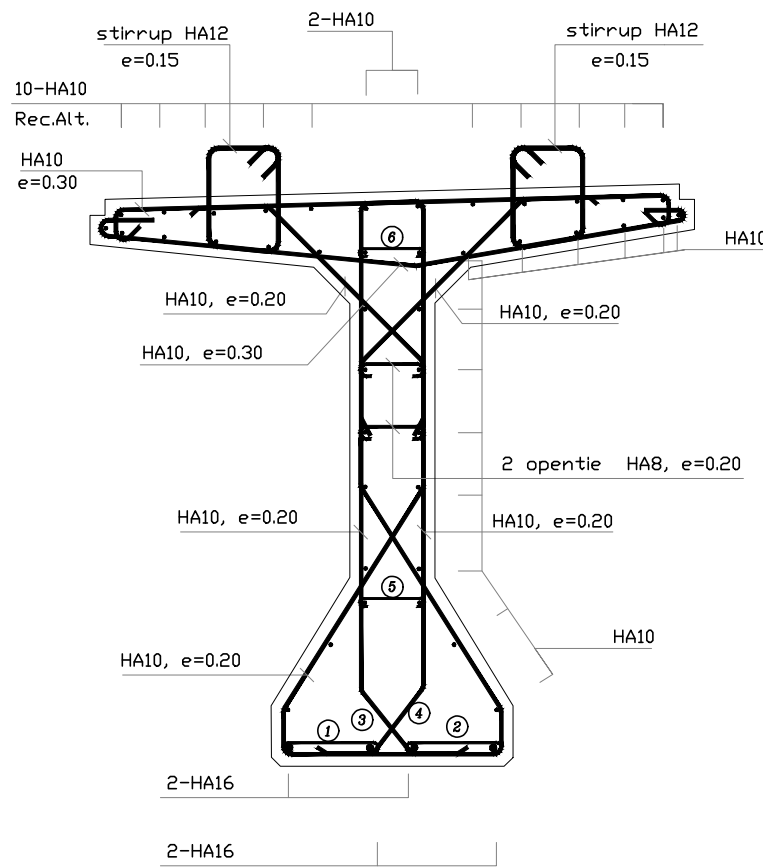
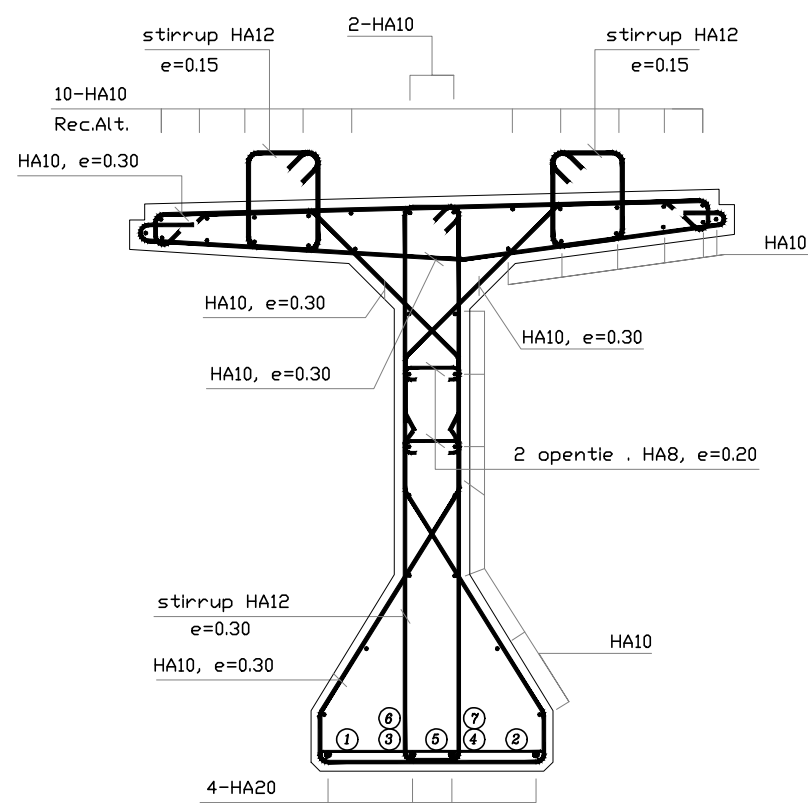
SC : 1/25

## SECTION B-B

SC : 1/25

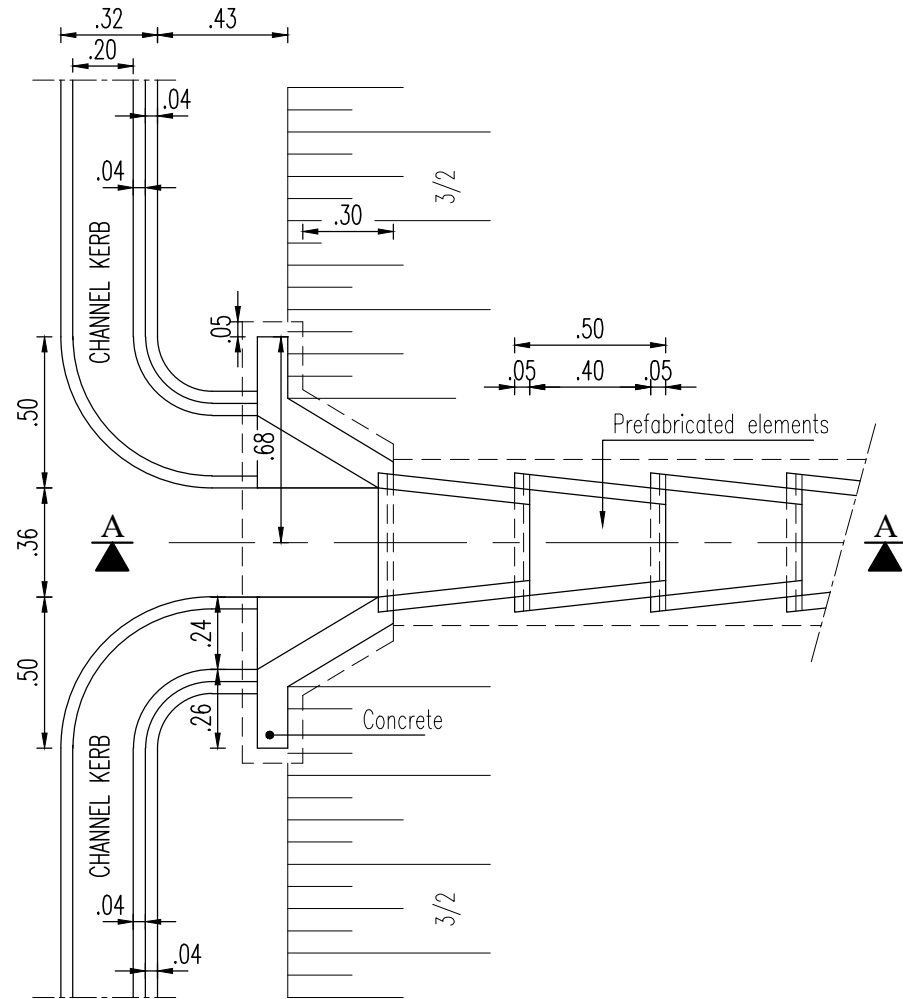
## SECTION C-C

SC : 1/25

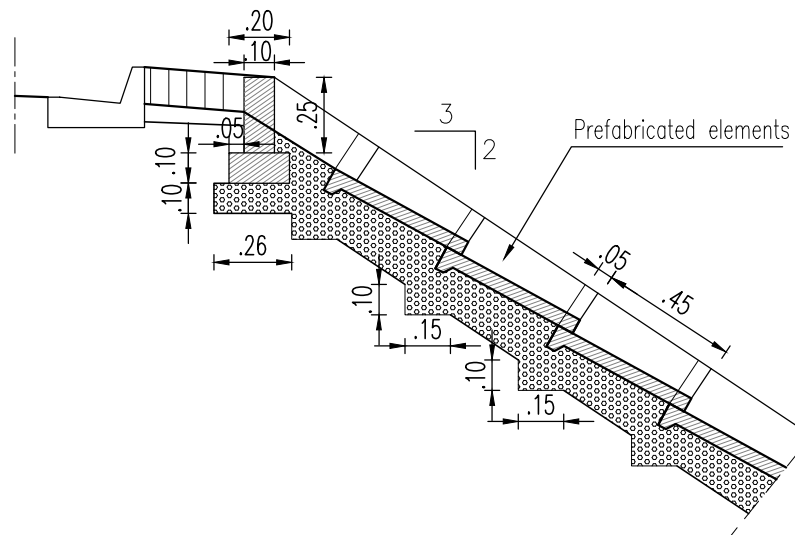


## **IV - TYPICAL PLANS**

# WATER COLLECTION STRUCTURE AT THE TOP OF THE EMBANKMENT

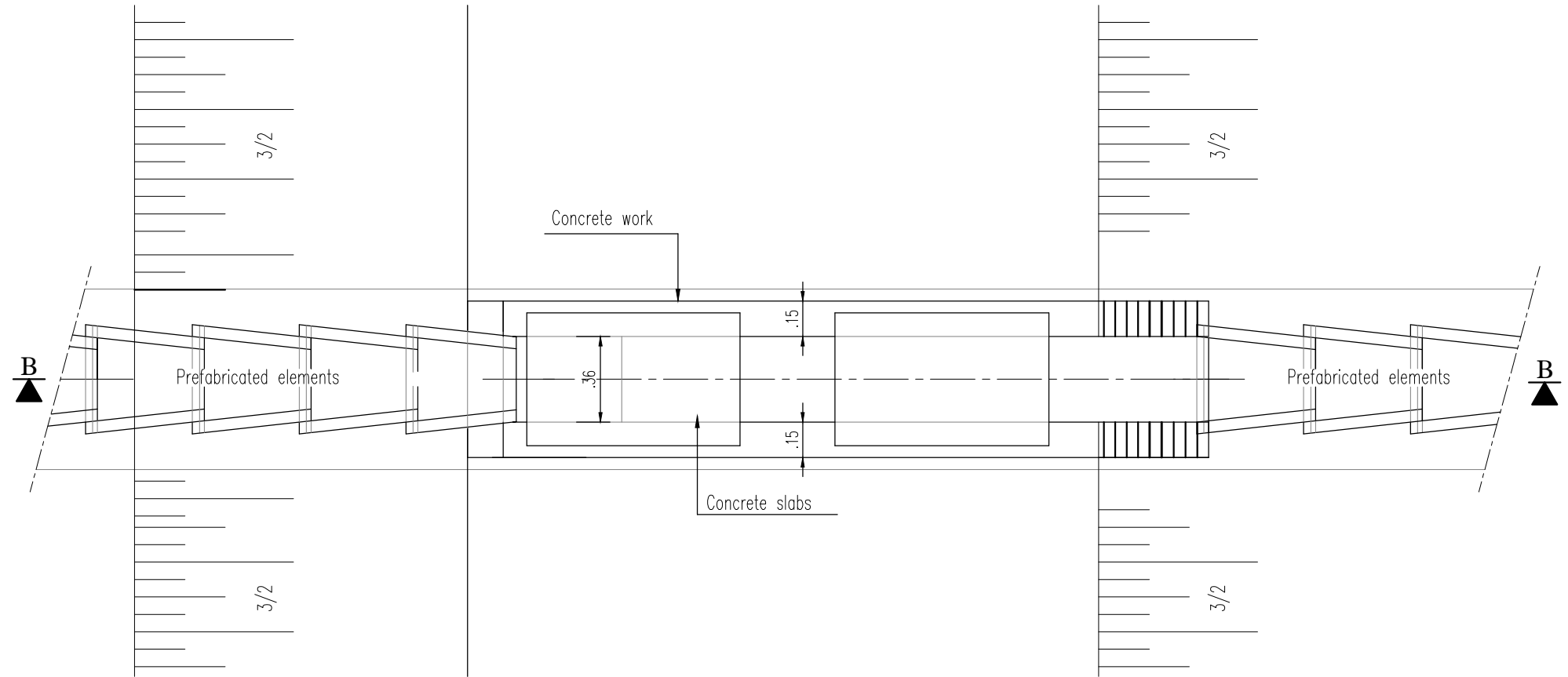


**SECTION A-A**

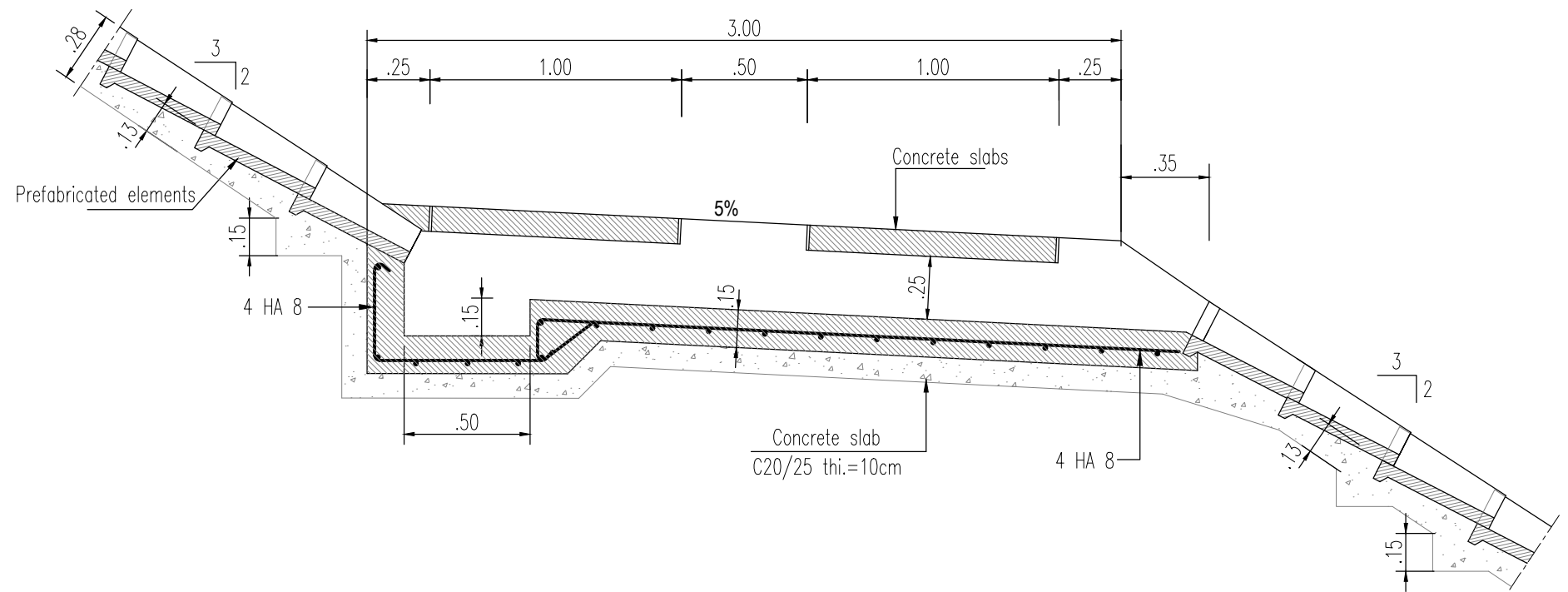


# EMBANKMENT DOWNSPOUTS

**PLAN VIEW**

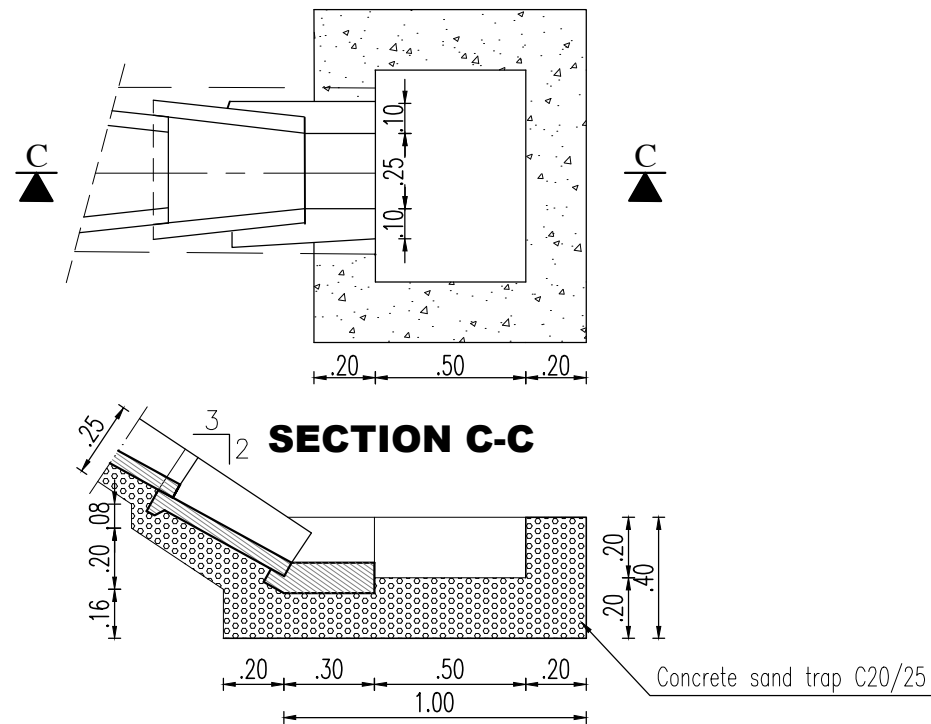


**SECTION B-B**

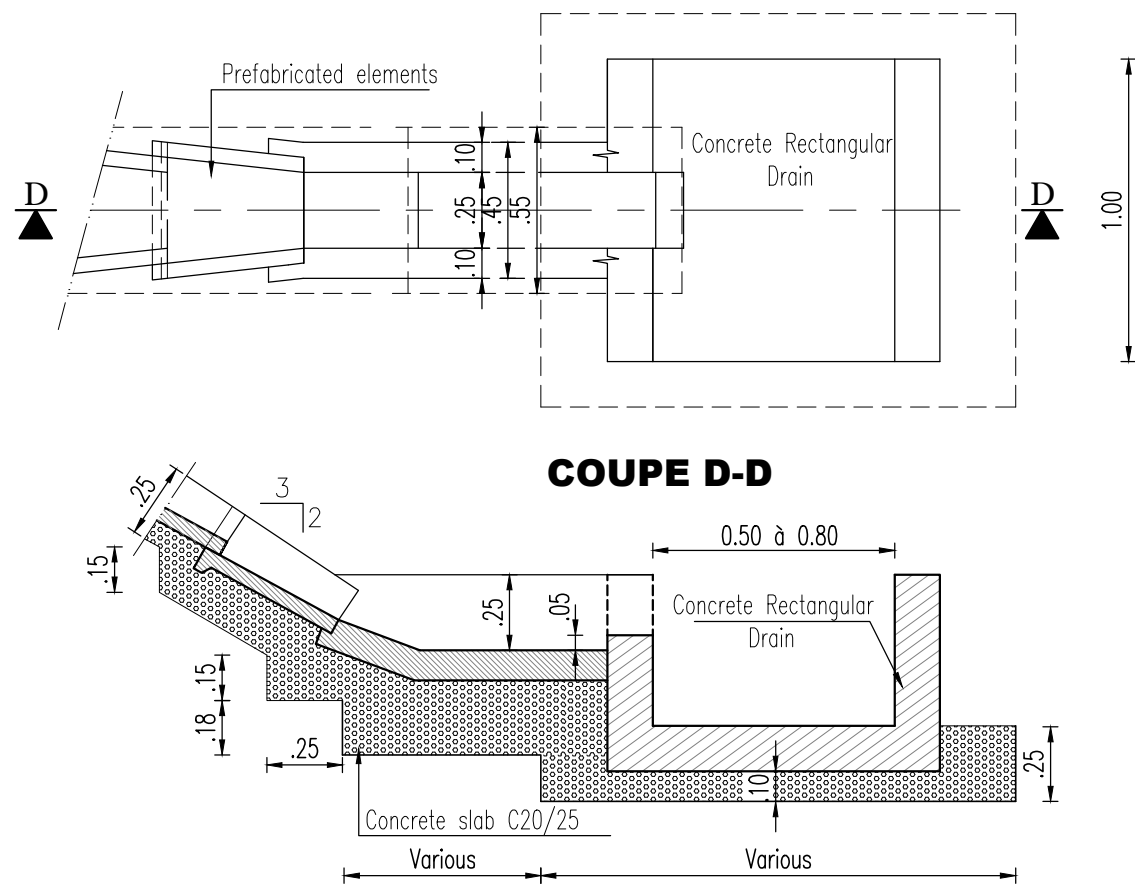




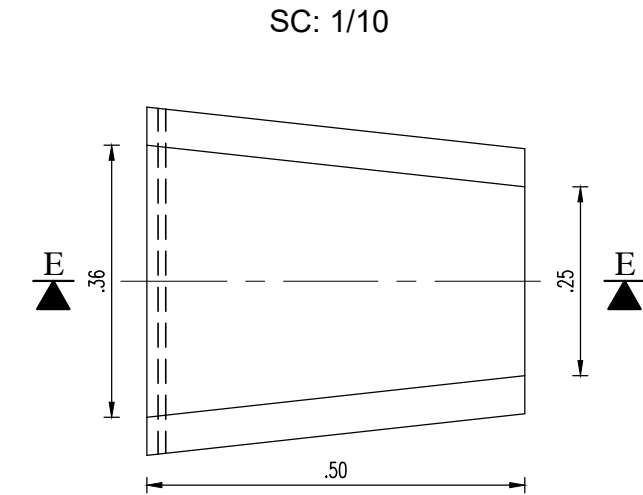
**WATER COLLECTION STRUCTURE AT THE BOTTOM OF THE EMBANKMENT TYPE 1 (CASE WITHOUT DITCH)  
PLAN VIEW**



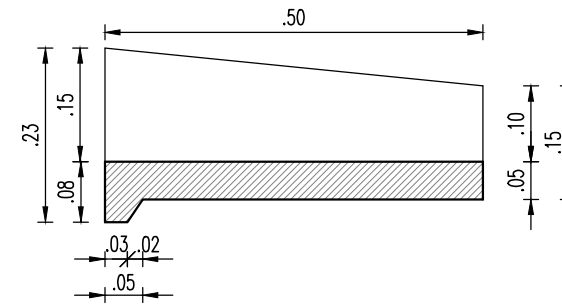
**WATER COLLECTION STRUCTURE AT THE BOTTOM OF THE EMBANKMENT (CASE WITH DITCH)  
PLAN VIEW**



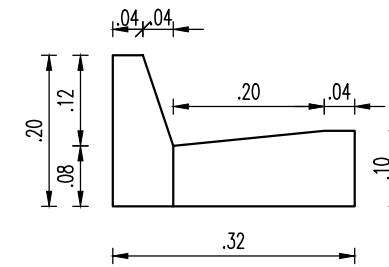
**EMBANKMENT DOWNSPOUTS  
PLAN VIEW**



**SECTION E-E  
SC: 1/10**

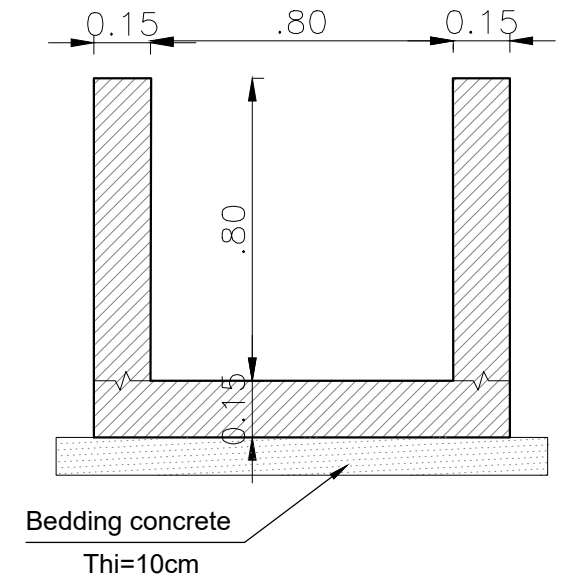


**CHANNEL KERB  
SC: 1/10**



**CONCRETE RECTANGULAR DRAIN**

SC : 1/20  
SYMBOL :



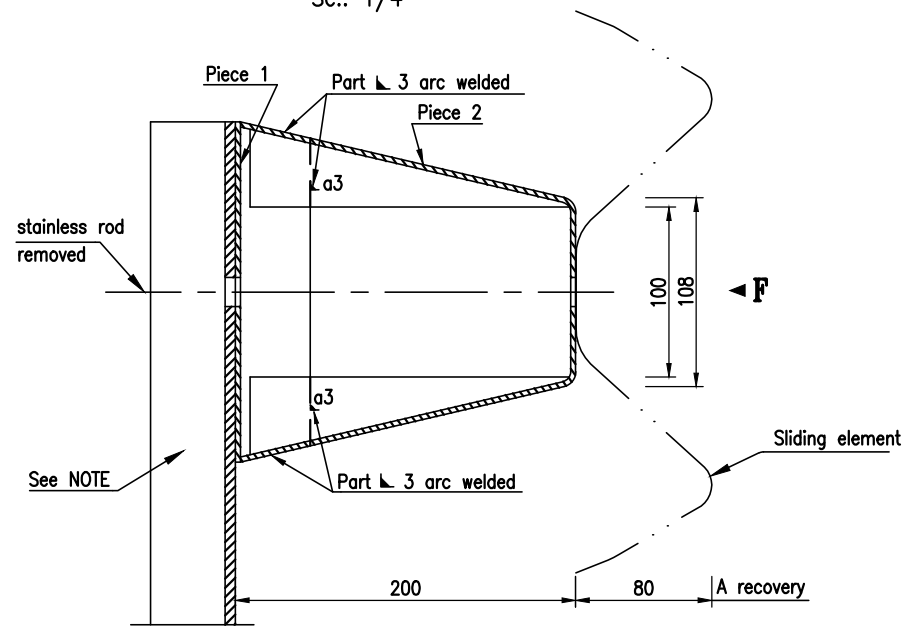
**NOTE :**

- The formwork of the facings seen will be made using fine formwork.
- The formwork for the hidden facings will be made using ordinary formwork.
- The facings in contact with the backfill will be painted in 3 crossed layers.
- The concrete poured on site will be of quality C25/30, dosed at 350kg of cement/m<sup>3</sup> of concrete.
- The Concrete slab will be of quality C20/25, dosed at 250Kg of cement/m<sup>3</sup>.
- The bedding concrete will be of C16/20 quality, dosed at 150Kg of cement/m<sup>3</sup>.

# METAL SPACER DEVICE

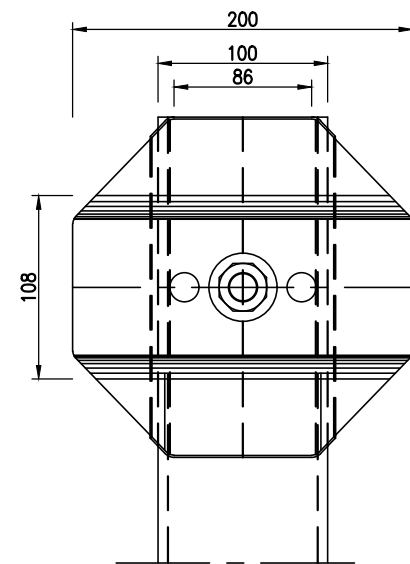
## SECTION A-A

Sc.: 1/4

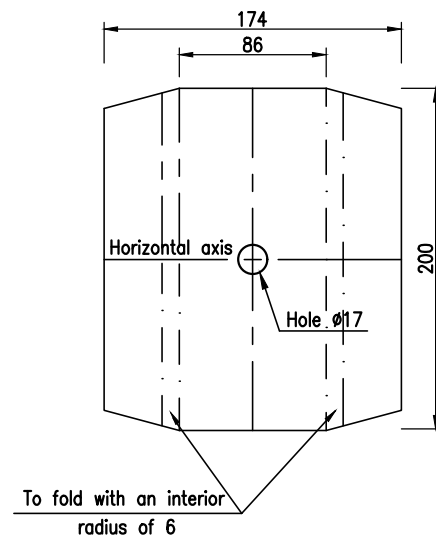


## ELEVATION FROM -F- Piece 1 BEFORE FOLDING

Sc.: 1/4

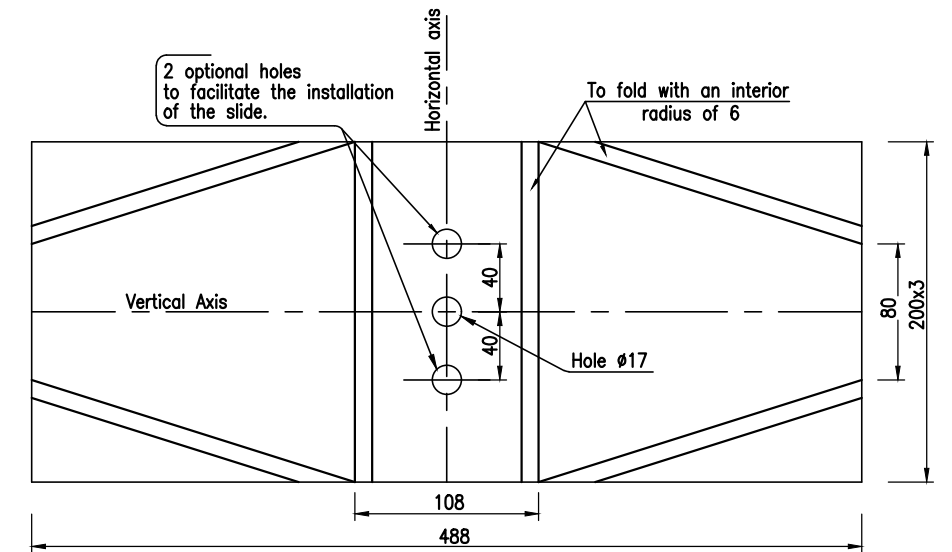


Sc.: 1/4



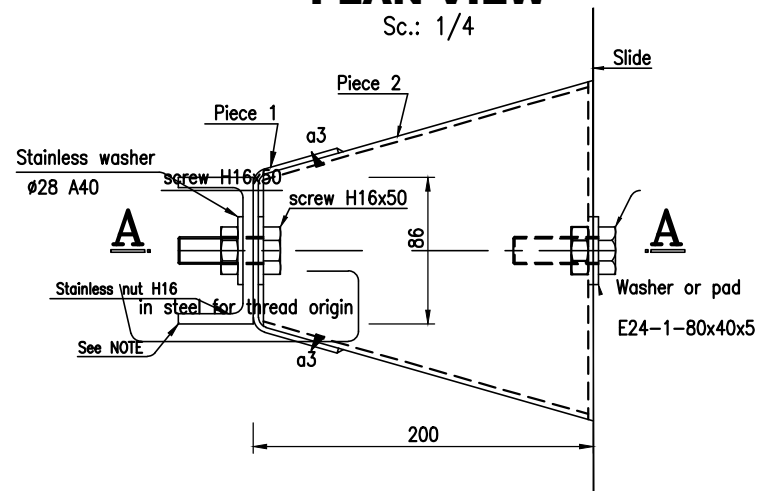
## Piece 2 BEFORE FOLDING

Sc.: 1/4

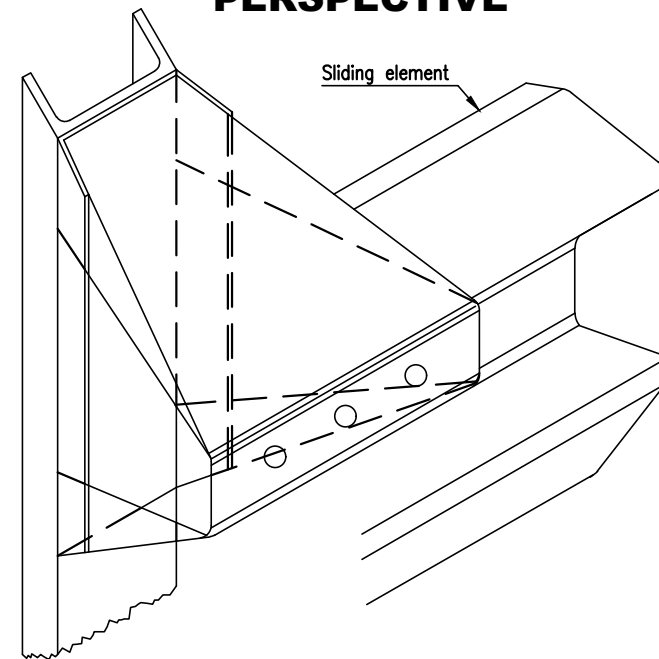


## PLAN VIEW

Sc.: 1/4

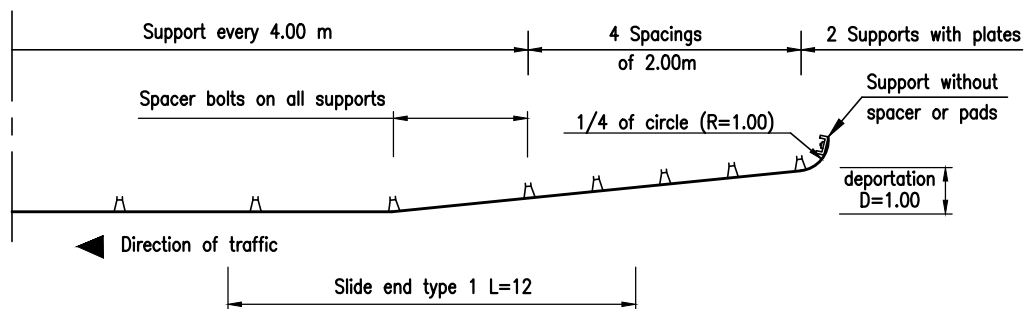


## PERSPECTIVE



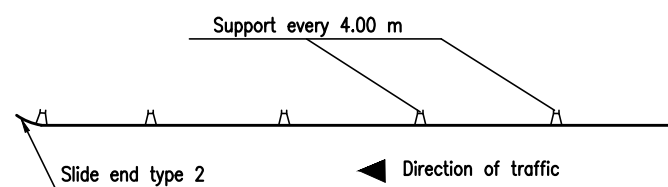
## SLIDE END DETAIL TYPE 1

Sc.: 1/200



## SLIDE END DETAIL TYPE 2

Sc.: 1/200



### NOTA:

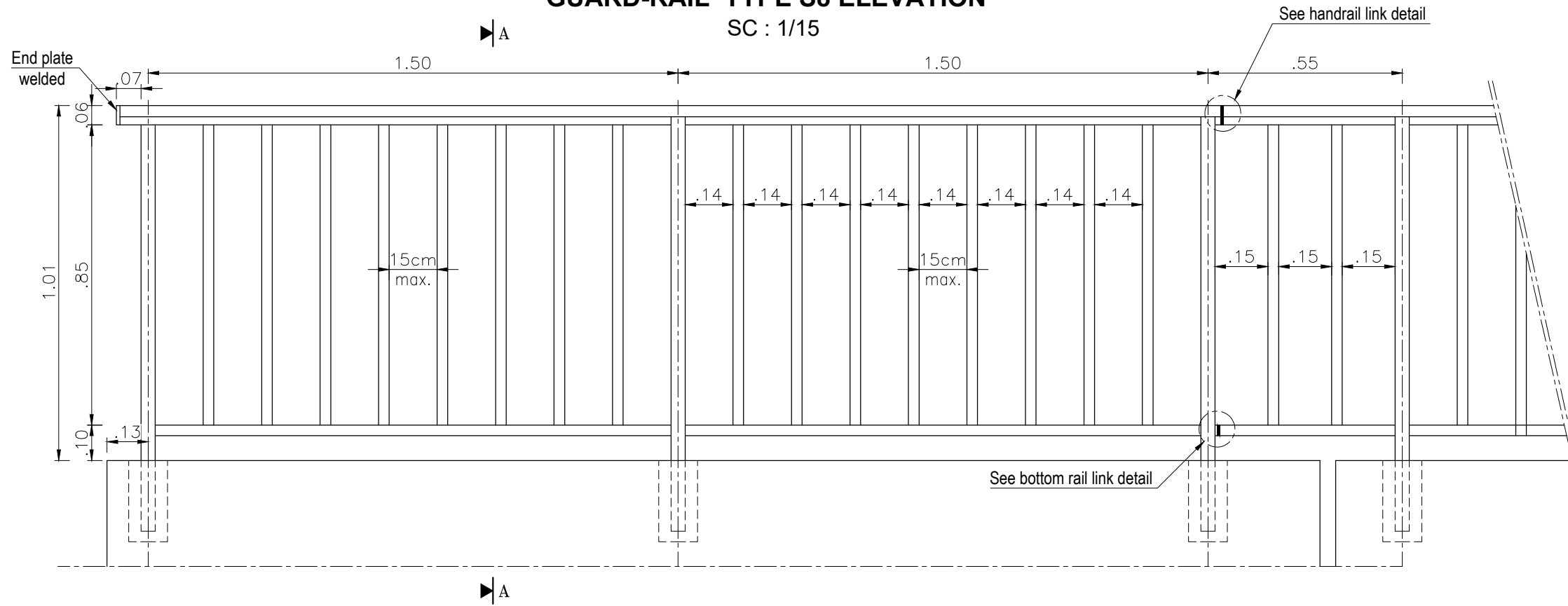
- Supports in UPN 100x50x6 in A33 laminated steel
- Spreading devices: E24-3 steel sheets
- Fixing plates: 80x40x5 mm in E24-1 steel
- The cutting edge of the barrier elements must be installed in the same direction as vehicle traffic





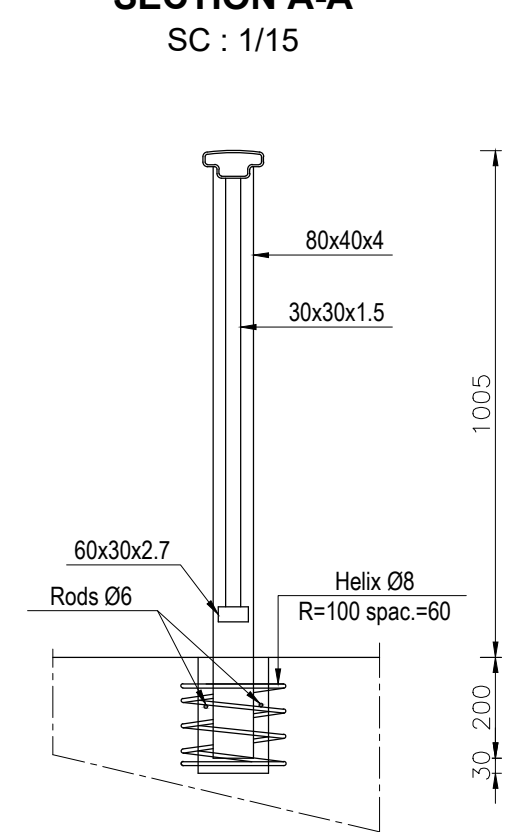
# GUARD-RAIL TYPE S8 ELEVATION

SC : 1/15



# SECTION A-A

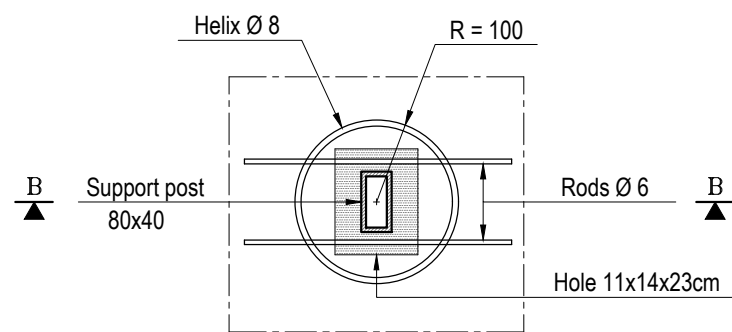
SC : 1/15



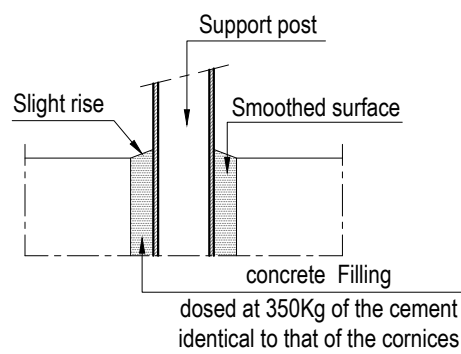
## FIXING DETAIL

SC : 1/10 (cotes in mm)

### PLAN VIEW

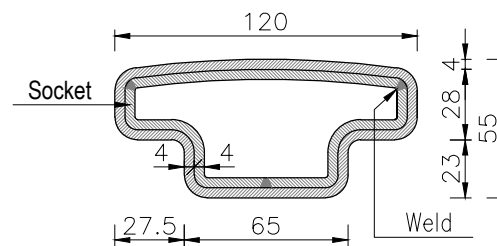
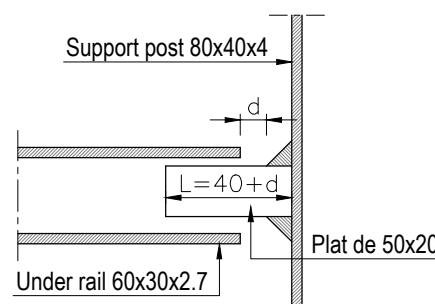
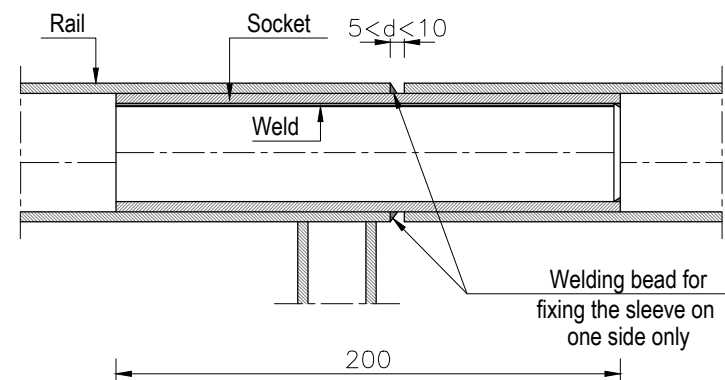


### SECTION B-B



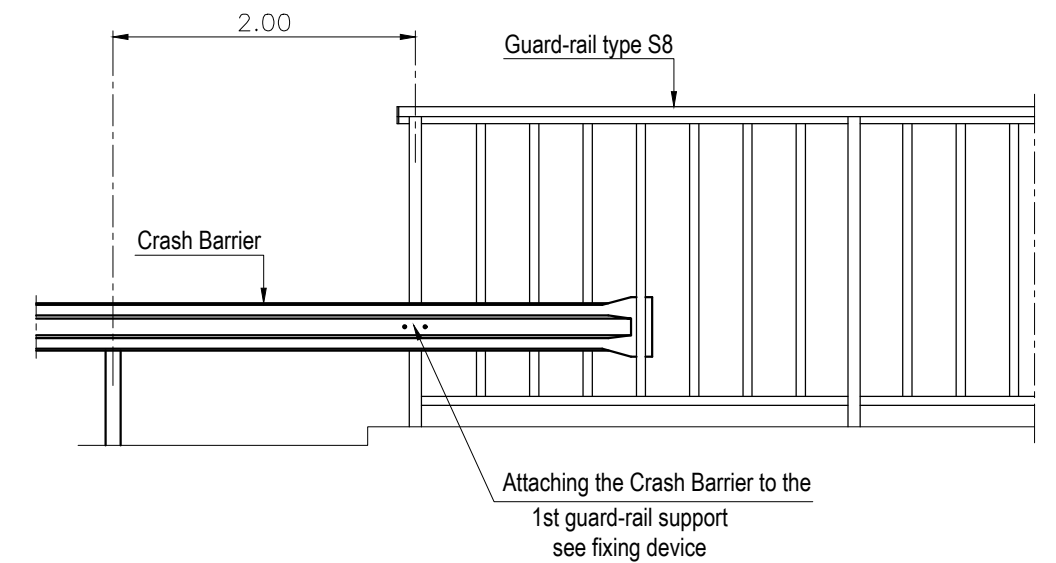
## DETAIL HANDRAIL AND BOTTOM RAIL LINK AT THE SUPPORT POST

SC : 1/3 (cotes in mm)



## CONNECTION CRASH BARRIER\_GUARD-RAIL

SC : 1/50 (cotes in mm)

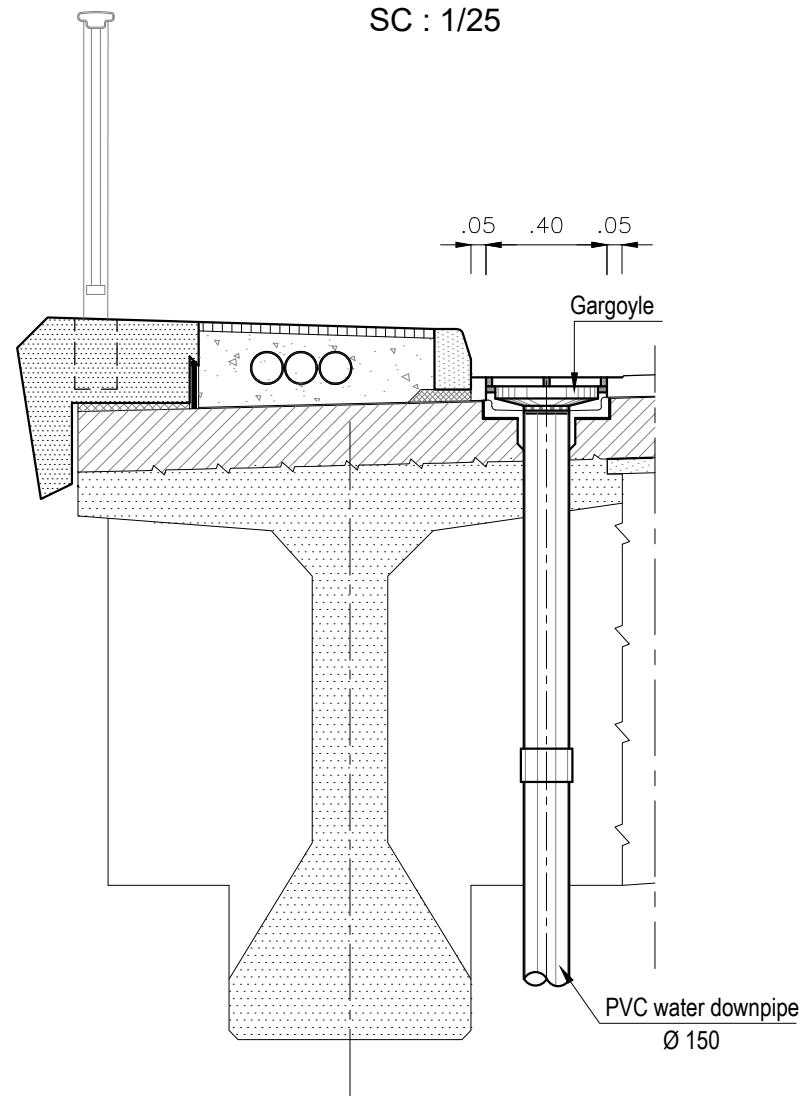


### NOTE :

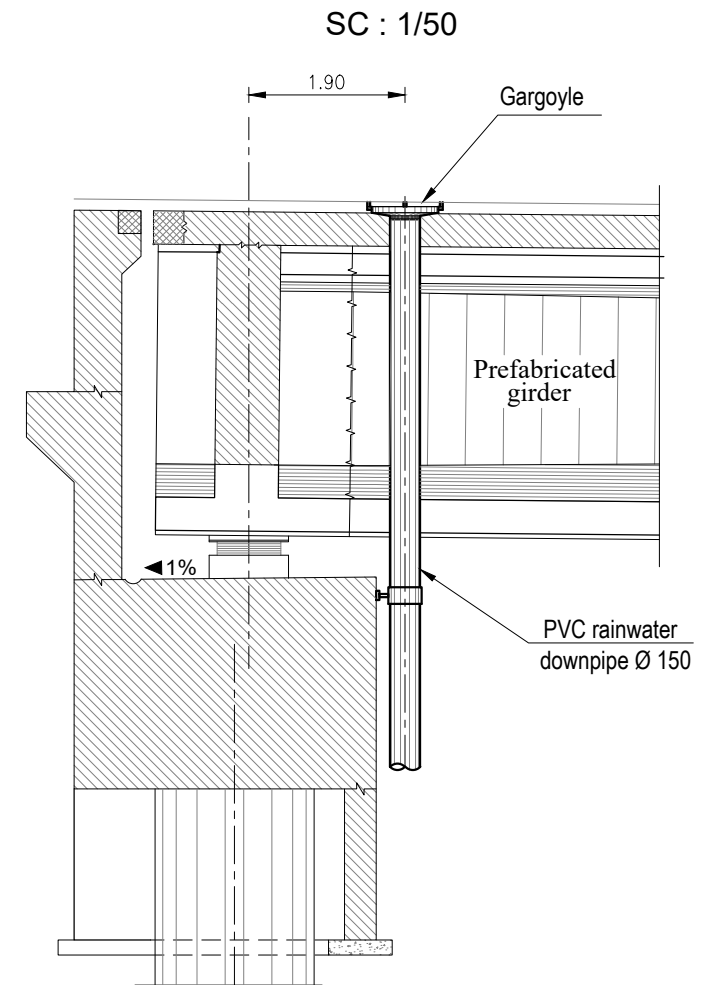
- A socket will be provided at every joint between guard-rail panels.
- Every pannel must have at least support posts without exceeding 6.00m in length.

# GARGOYLE

## GARGOYLE SETTING AT SIDEWALK



## CONNECTION AT ABUTEMENT



## PLAN VIEW GRILLE

SC : 1/25

