



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण

(सड़क परिवहन और राजमार्ग मंत्रालय, भारत सरकार)

NATIONAL HIGHWAYS AUTHORITY OF INDIA

(Ministry of Road Transport and Highways, Govt. of India)

क्षेत्रीय कार्यालय / REGIONAL OFFICE

ई-2/167, अरेरा कॉलोनी, हबीबगंज रेलवे स्टेशन के पास, भोपाल (म.प्र.) 462016

E-2/167, Arera Colony, Near Habibganj Railway Station, Bhopal (M.P.) 462016

दूरभाष/Phone : 0755-2426638, फैक्स /Fax : 0755-2426698, ई-मेल/E-mail : robhopal@nhai.org



भारतमाला
प्रगति के पथ पर अग्रसर
BHARATMALA
ROAD TO PROSPERITY

NHAI/RO-MP/JBP/Canal Crossing/2021/44132

Date: 08.09.2021

Invitation of Public Comments

Sub: Request for ROW Permission for Execution of the Sleemanabad Carrier Canal Tunnel (Bargi Right Bank Canal) of Bargi Diversion project from RD 104 Km to RD 129 Km on Turn-Key Basis commissioning and testing of the canal system through TBM.

- Ref: 1. PD, PIU-Jabalpur letter no. NHAI/PIU-JBP/NH-30/P-2/Canal Permission/ND Devison-05/17693 dated 06.09.2021
2. Executive Engineer, ND Division No.5 Katni letter No. 894 dated 06-09-2021-
3. PIU office letter No. NHAI/PIU/JBP/NH-30/P-12/Slimnabad Canal Crossing/2021/16213 dated 12.01.2021
4. PIU office letter No. NHAI/PIU/Katni/NH-7/P-2/File L&T/2019 /2665 dated 07.03.2020.
5. Executive Engineer, NDD Katni, ज्ञाप क्र.179/कार्य-3/रेल-एन.एच/क-5 दिनांक 28-01-2018
6. MoRT&H Circular No. RW/NH-33044/29/2015/S&R (R), dated 22.11.2016.

The Project Director, PIU-Jabalpur NHAI vide their letter dated 06.09.2021 has submitted the Proposal for ROW Permission for Execution of the Sleemanabad Carrier Canal Tunnel (Bargi Right Bank Canal) of Bargi Diversion project from RD 104 Km to RD 129 Km on Turn-Key Basis commissioning and testing of the canal system through TBM.

2. As per Ministry vide OM No. RW/NH-33044/29/2015/S&R (R) dated 22.11.2016. the Highways Administrator will make available the proposal seeking permission for utility laying for public comments for **30 days** on ground of public interest.

3. In view of the above the comments of public are invited on captioned proposal (copy of application is enclosed) and the same should reach to below mentioned address till **07.10.2021** beyond which no comments will be considered.

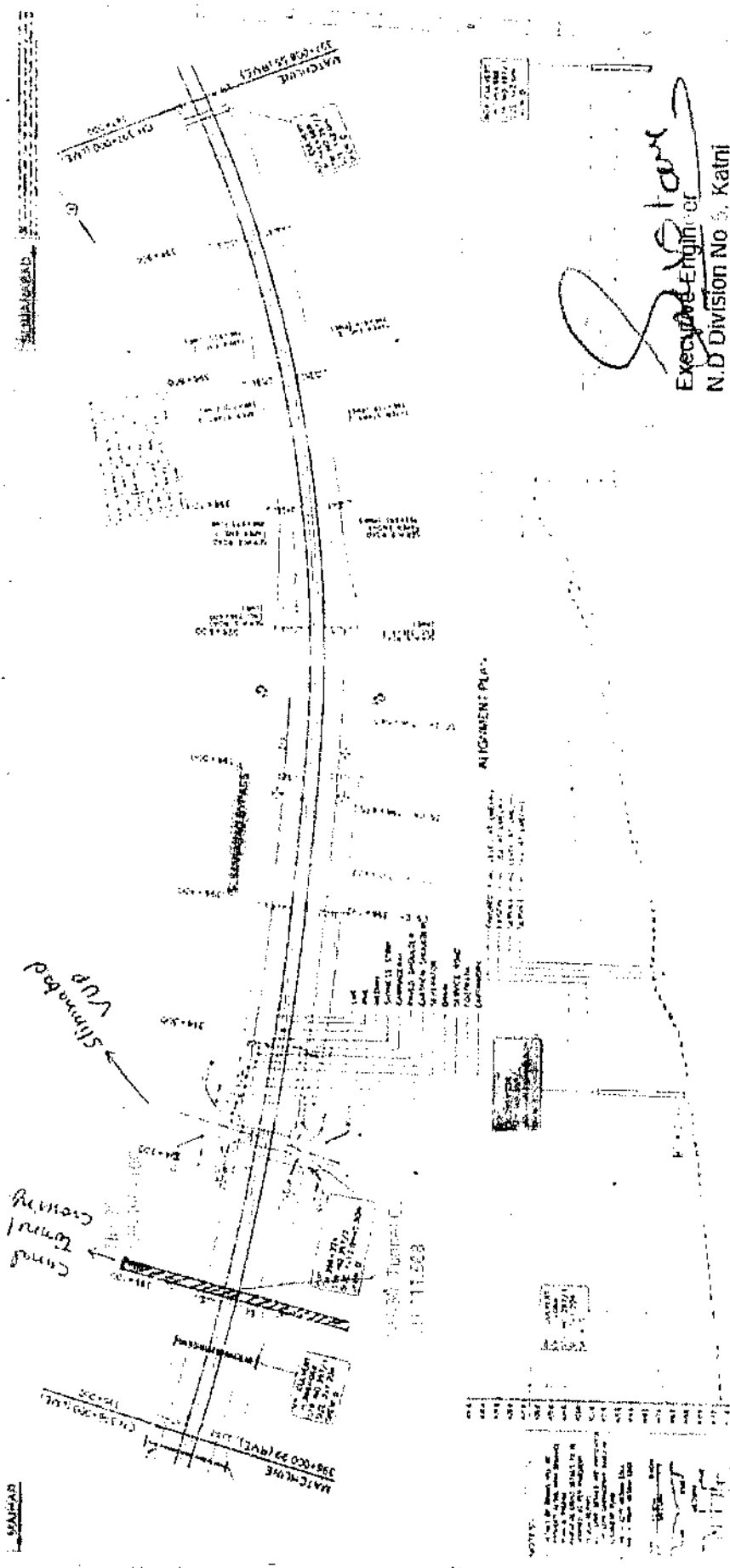
The Highway Administrator
O/o Regional Officer,
National Highways Authority of India
E-2/167, Arera Colony,
Near Habibganj Railway Station,
Bhopal (MP)-462016
E-mail ID:robhopal@nhai.org

4. This issues with the approval of Highways Administrator Cum Regional Officer, NHAI, Bhopal (MP).

Anand Prasad
(Anand Prasad)
Manager (T)

Copy to:

- (i) Web-Admin, nhai.org@gmail.com, NHAI-HQ for uploading on NHAI website.
- (ii) The Senior Technical Director, NIC, Transport Bhawan, New Delhi-110001 for uploading on Ministry's Website.
- (iii) The Project Director, PIU-Jabalpur (MP) for information please.
- (iv) The, Executive Engineer, N.D. Division No. 5 Katni (M.P) for kind information.



S. S. K. Katni
 Executive Engineer of
 N.D. Division No. 5, Katni

LONGITUDINAL SECTION SHEET

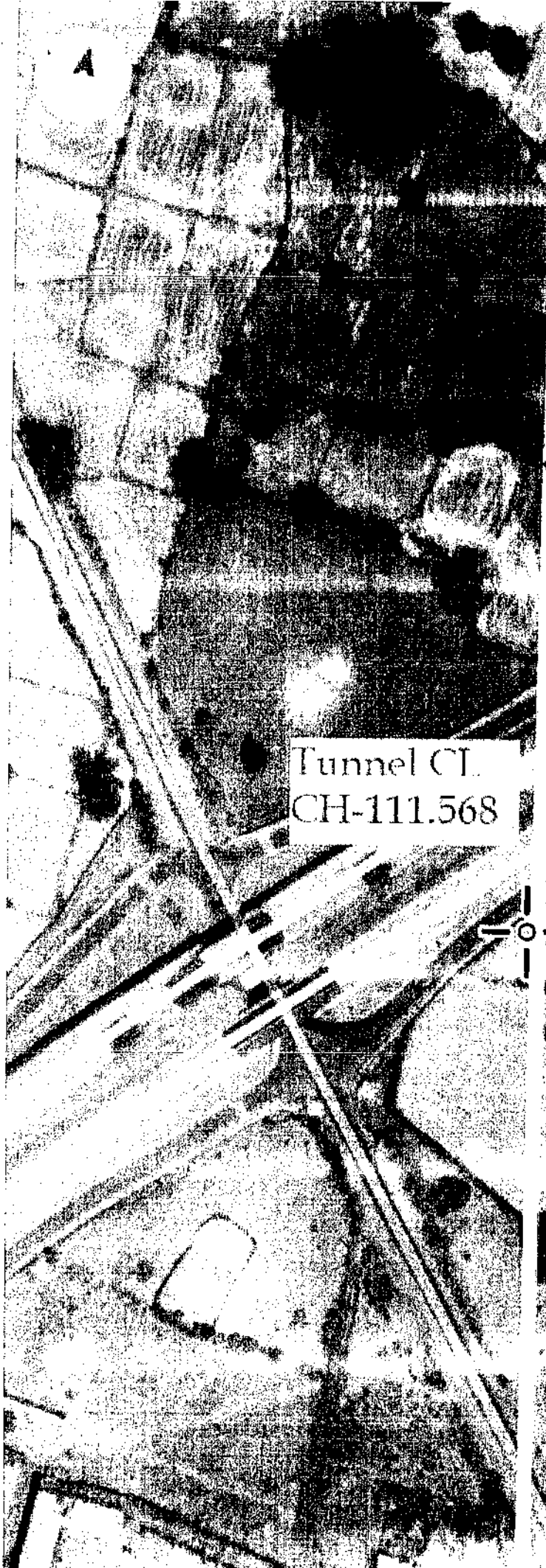
ASBURY DRAWINGS

Project No. 10/11/563
 Date: 10/11/56
 Scale: 1" = 40'

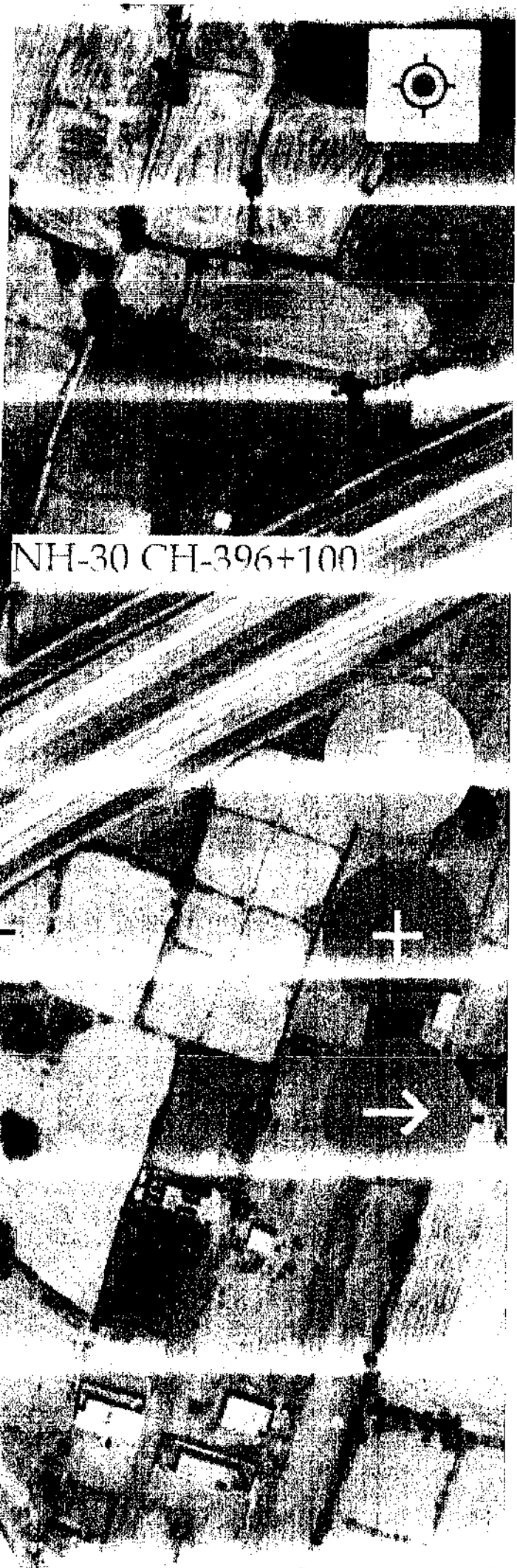
DESIGNED BY: [Signature]
 CHECKED BY: [Signature]
 APPROVED BY: [Signature]

ENGINEER-IN-CHARGE
 NATIONAL INSTITUTE OF ROAD ENGINEERING & TECHNOLOGY
 KANPUR

A



Tunnel CL
CH-111.568



NH-30 CH-396+100



TUNNEL CENTER LINE CH 111568.000

KATNI

NH 30 BAYPASS CH 396+100

JABALPUR

OSI - TUNNEL

S. Mansingh
F.F.



Handwritten labels at the top of the drawing, possibly indicating specific parts or dimensions.

MOUNTING SCALE

COMPOSITE

OPENING FOR HOLES

Methodology of the Geotechnical Instrumentation and Monitoring for NH-30 Crossing.

PROJECT	SLEEMNABAD CARRIER CANAL PROJECT
EMPLOYER	NARMADA VALLEY DEVELOPMENT AUTHORITY
CONTRACTOR	PATEL - SEW - JOINT VENTURE

PROJECT-: Execution of Sleemnabad Carrier Canal (Bargi Right Bank Canal) of Bargi Diversion from RD 104.00 to RD 129.00 KM on Turnkey Basis.

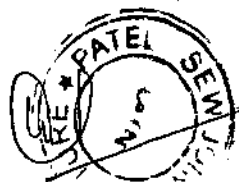
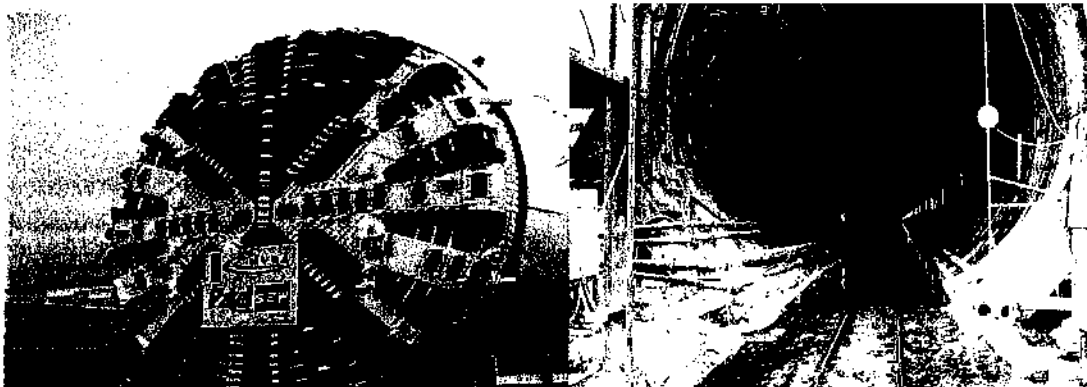
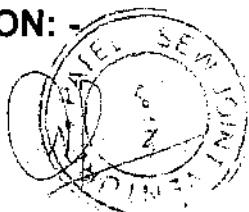


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1. Introduction
2. Purpose
3. Methodology
4. Safety

1. INTRODUCTION: -



Geotechnical Instrumentation and Monitoring (I&M) plan is required to be undertaken before during and after the construction of Sleemnabad Carrier Canal Tunnel Project of NVDA for the protection of all assets including NH-30 Crossing, structures, Buildings, and utilities within the influence zone of the project. The performance of the ground support, the stability of the tunnel excavation and the surrounding ground should be monitored at each stage of construction.

NVDA has proposed a tunnel of about 12 km length and 10 meter dia to cross of the ridge portion between R.D.104.00 to 116.00km, existing railway line & NH-7& NH-30. Tunneling we are doing by **EARTH PRESSURE BALLANCED TUNNEL BORING MACHINE (EPB TBM)**. Our TBM will go from 18.50m below ground level in NH-30. In this zone, TBM will go into full EPB mode.

2. PURPOSE:-

Safety of Roads, Highways, Bridges, & buildings

To provide early warning through regular or continuous monitoring for any Surface/ ground and underground movements affecting the adjoining premises, roads, Bridge structure and utilities like power lines, water lines etc. within the zone of influence of construction. This implementation of preventive remedial actions well within time.

3. METHODOLOGY

A. Settlement Monitoring Point

Surface settlement monitoring points (SMP) shall be installed around the excavations and above the tunnel alignments to monitor ground surface settlements induced due to construction activities.

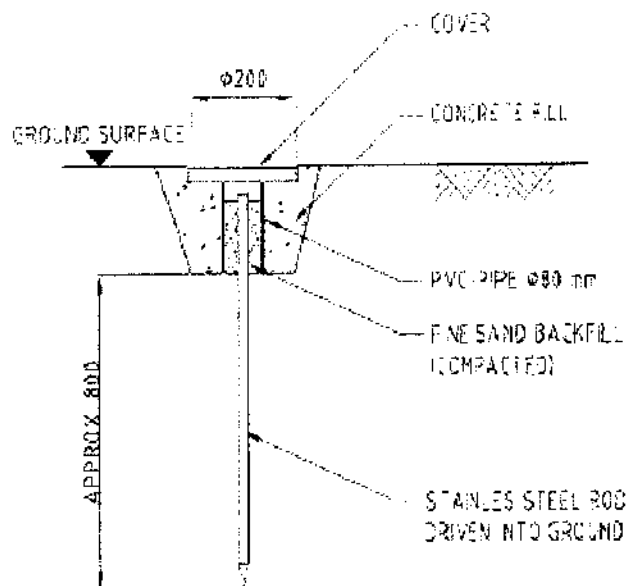
Two types of SMP shall be used depending on the ground conditions.



One for hard pavement and another for soil.

➤ Settlement Monitoring Point for Soil :-

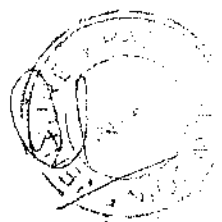
Settlement monitoring point for soil comprises of a steel survey pin having a hemispherical top with a red colored cross mark, MS extension rod approx. 1 m long 16 mm dia., an outer protective PVC pipe having 48 mm o.d. and 37 mm i.d and a MS grouting plate (150 mm dia. x 5 mm). A cover is supplied with each point to protect the top.



Settlement monitoring point for soil installation scheme

Installation

- Make a pit 1075 mm deep and 500 mm x 500 mm square at the top. In case hard rock is encountered at a shallower depth than 1 m, installation depth can be reduced accordingly.
- Pour a little concrete (1:2:4; cement: sand: gravel) at the bottom of the pit to make a resting pad for the grouting plate. Place the assembly comprising of, extension rod, outer PVC pipe and SS survey pin with grouting plate at the bottom of the pit.



- Backfill the void around the outer pipe and pit with excavated material. Compact while backfilling.
- Fill the annular space between the extension rod and outer PVC pipe with dry sand.
- Use necessary shuttering to make a 75 mm deep niche at the top. Grout 250 mm x 250 mm lockable cover on top of the niche to protect the installation. Keep the cover locked when not in use.

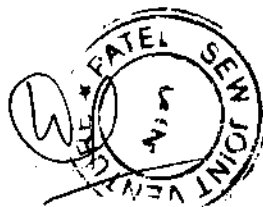
Taking Reading

- Unlock hinged protective cover (In case of settlement marker in soil) with the special key provided. Clean survey pin.
- Elevation of the settlement points will be measured using a digital level optical survey team.
- Precise levelling survey method will be used. Permanent approved benchmarks for the survey works will used for reference. Temporary benchmarks closer to site will be established by survey team.
- Base reading/ initial reading will be established after taking 3 initial readings consecutively.
- To determine settlement, compare subsequent readings with base reading as reference.

➤ Bi-reflex Target: -

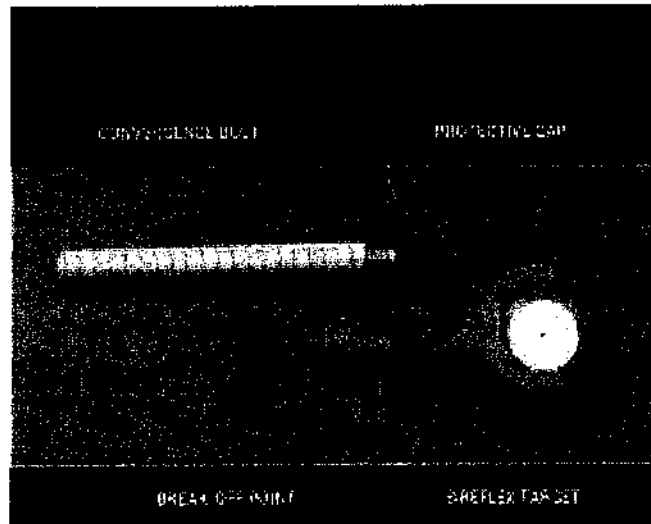
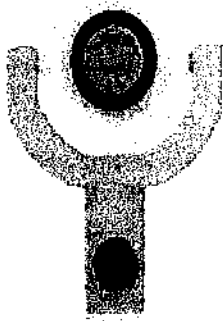
General Description:-

Bireflex target consists of reflector mounted on a robust frame. The target has reflectors on both the sides and is mounted on a universal joint such that it can be oriented in any direction as required. The target has a small center hole to allow precise targeting. The



target interchangeable is made of high performance materials and precise manufacturing processes.

The target components include convergence bolts with protective cap and adaptor with reference break-off point. The break-off point adaptor is required to mount the target on the convergence bolts.



Installation and Readings

Install the 12 mm diameter, 150 mm convergence bolt perpendicular to the surface of the structure by means of drilling and grouting or by grouting only as suitable. Ensure that the red PVC protective cap is secure over the threaded end of the bolt which remains outside. Ensure that sufficient clearance is there between the capped threaded end and the surrounding material to enable easy mounting of bireflex target

- After the stud is set, remove the PVC protective cap and install the break off point. Finally, install the bireflex target over the breakoff point and secure in its final position by means of tightening of the clamp screw.
- Take initial reading with a total station, establish base reading after taking 3 initial Readings consecutively.



- To determine deformation, compare subsequent readings with base reading as reference.

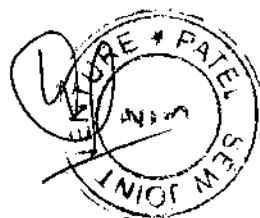
➤ Crack Meter :-

Crack meter shall be used to monitor change in width of existing cracks in critical buildings, located within zone of influence of Sleemnabad Project. Locations of crack meters will be decided after visual inspection of cracks. Crack meter consists of a graduated scale with a resolution of 0.5 mm and a transparent acrylic plate with a hairline cursor mark. The graduated scale and the transparent acrylic plate are assembled across the crack with impact anchor in 5 mm diameter holes drilled to a depth of 30 mm .As the crack opens or closes, the graduated scale and the cursor move relative to each other representing the amount of movement occurring. The reading of the marking is initially noted and is taken as a base. Subsequent readings are then compared with the initial reading to determine the change in the width of the crack.

NOTE: In case crack width is larger, a crack gage with 100 mm marking instead of 50 mm marking will be used.

Installation

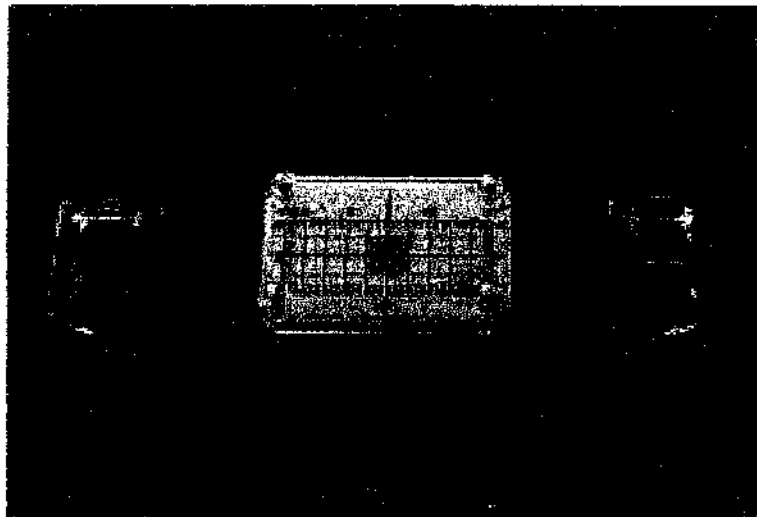
- Drill two 5 mm diameter, 30 mm deep holes on each side of the crack along a line perpendicular to the direction of crack, using drilling template Take care that the holes are drilled perpendicular to the surface of the wall. Clean the holes with a handheld air pump.



- Insert the expandable anchors through the holes provided in the graduated scale.
- Now push the expandable anchors inside the respective drilled holes upto the end.
- Place the screw over the expandable anchors and manually tighten them with the help suitable screwdriver.
- Insert the expandable anchors through the holes provided in the transparent acrylic plate. Now push the expandable anchors inside the respective drilled holes up to the end. Place the screw over the expandable anchor and manually tighten with the help of suitable screwdriver.

Taking Reading

- Note the initial reading as shown by the marker on the acrylic plate. This reading is taken as the base. Also note the ambient temperature.
- Subsequent readings are then compared with the initial reading to determine the change in the width of the crack.



Crack Monitor



4. SAFETY

- All risks are evaluated prior to any works commencing, utilizing the matrices to Determine the level of significance in terms of likelihood of occurrence and severity of Hazard based on the allocated numerical values.

Personal Protective Equipment (PPE) Requirements

All personnel involved in any of the JV's operations are to wear the following PPE:

- Safety Vest
- Safety Helmet
- Safety Footwear
- Eye Protection
- Safety Gloves (Task Dependent)
- Ear Protection (Where Necessary)
- Dust Mask





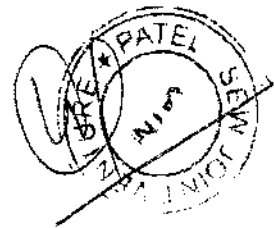
First Aid Facilities

A trained first aider will be available at each station location and will be made known to all associated with the project through the site induction. A first aid kit and eye wash station will be available on site and will be placed within the welfare facility and will be clearly marked.

Thank You



Assistant
N.D. Division
KATNI (M.P.)


Executive Engineer
N.D. Division No. -5, Katni
Chief Engineer,
Upper Normada Zone,
Jabalpur. (M. P.)

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46.00	0.01	-46.00	0.01
47.00	0.01	-47.00	0.01
48.00	0.00	-48.00	0.00

Pandit

Asista (F-13)
N.D. Division No. 5
KATNI (M.P.)

(W)

Singh
Executive Engineer
N.D. Division No.-5, Katni

M. K. S.
Chief Engineer,
Upper Narmada Zone,
Jabalpur. (M. P.)

30.60	0.81	-30.60	0.81
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46.00	0.01	-46.00	0.01
47.00	0.01	-47.00	0.01
48.00	0.00	-48.00	0.00

Pandit

Asstt
N.D. Division No. 5
KATNI (M.P.)

WJ

Singh

Executive Engineer
N.D. Division No.-5, Katni

M. K. S.
Chief Engineer,
Upper Narmada Zone,
Jabalpur. (M. P.)

AFRY

DESIGNED BY: AFRY
CHECKED BY: AFRY
SCALE: 1:100
DATE: 28.08.2023

PROJECT: SLEEMHARD WATER TUNNEL PROJECT
SHEET: S4.1, S4.2, S4.3, S4.4
REINFORCEMENT: TUNNEL LINING PASSING UNDER NH 30

SLEEMHARD WATER TUNNEL PROJECT
SLEEMHARD WATER TUNNEL PROJECT
SLEEMHARD WATER TUNNEL PROJECT

SLEEMHARD WATER TUNNEL PROJECT
SLEEMHARD WATER TUNNEL PROJECT
SLEEMHARD WATER TUNNEL PROJECT

ISSUED FOR CONSTRUCTION

Dr. Bappaditya Manoj
Professor
Department of Civil Engineering
Indian Institute of Technology, Kharagpur
Date: 28.08.2023

IMPORTANT NOTES:

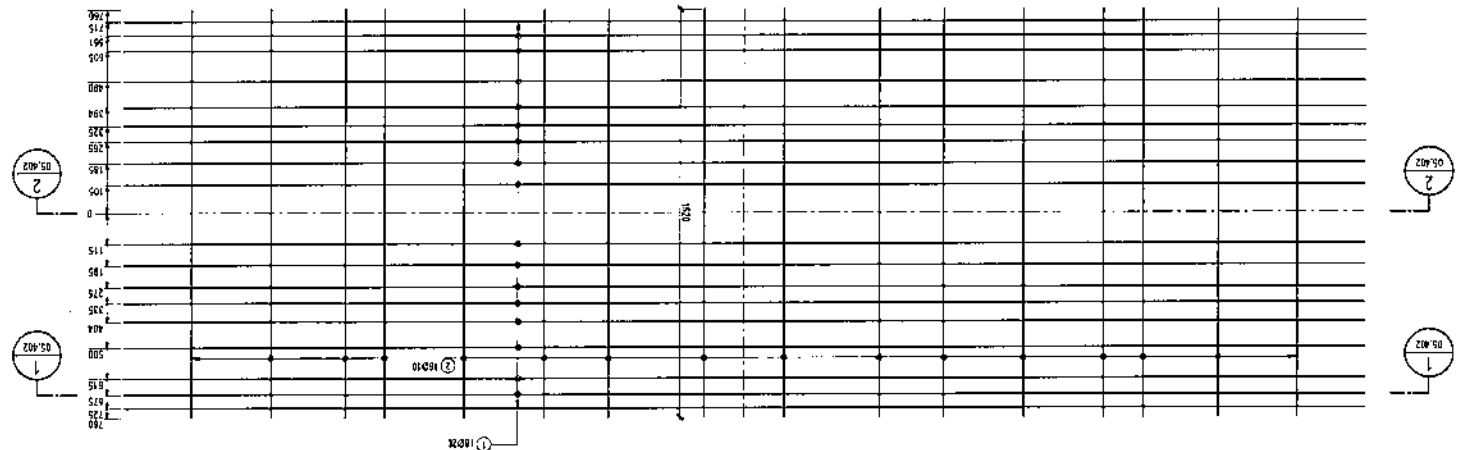
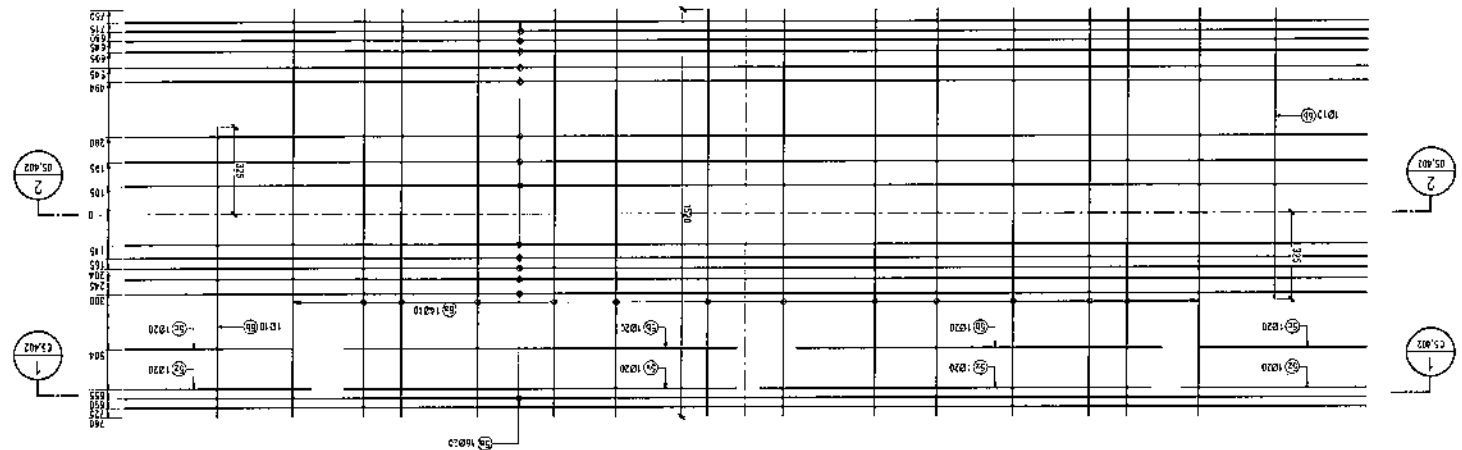
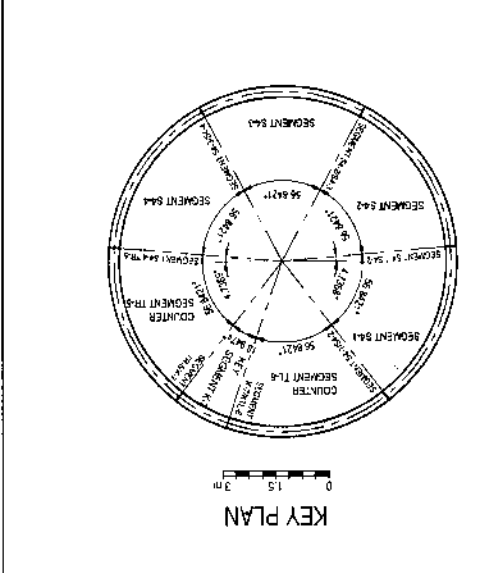
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- ON THE DATE OF THE TUNNEL, BEHIND THE HIGHWAY, ONE MONTH AFTER THE DEFORMATION OF TUNNEL, MEASUREMENTS SHALL BE TAKEN AT REGULAR INTERVALS AT LEAST UP TO 10M ON EACH SIDE OF TUNNEL. MEASUREMENTS SHALL BE TAKEN AT REGULAR INTERVALS AT LEAST UP TO 10M ON EACH SIDE OF TUNNEL. MEASUREMENTS SHALL BE TAKEN AT REGULAR INTERVALS AT LEAST UP TO 10M ON EACH SIDE OF TUNNEL.
- CONCRETE SHALL BE OF GRADE M30 (CONFORMING TO IS 456:2000)
- REINFORCEMENT SHALL BE OF GRADE F300 (CONFORMING TO IS 1786)
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

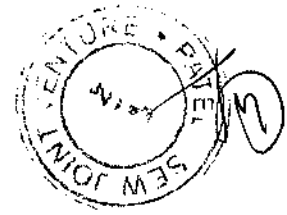
NOTES:

- REINFORCEMENT NOTATION

REFERENCE DRAWINGS:

S.NO.	DRWG. NO.	DRWG. NAME
01	04-01-00-01	SEGMENT S4.1 REINFORCEMENT
02	04-01-00-02	SEGMENT S4.2 REINFORCEMENT
03	04-01-00-03	SEGMENT S4.3 REINFORCEMENT
04	04-01-00-04	SEGMENT S4.4 REINFORCEMENT
05	04-01-00-05	PRECAST CONCRETE LINING
06	04-01-00-06	PRECAST CONCRETE LINING
07	04-01-00-07	PRECAST CONCRETE LINING
08	04-01-00-08	PRECAST CONCRETE LINING

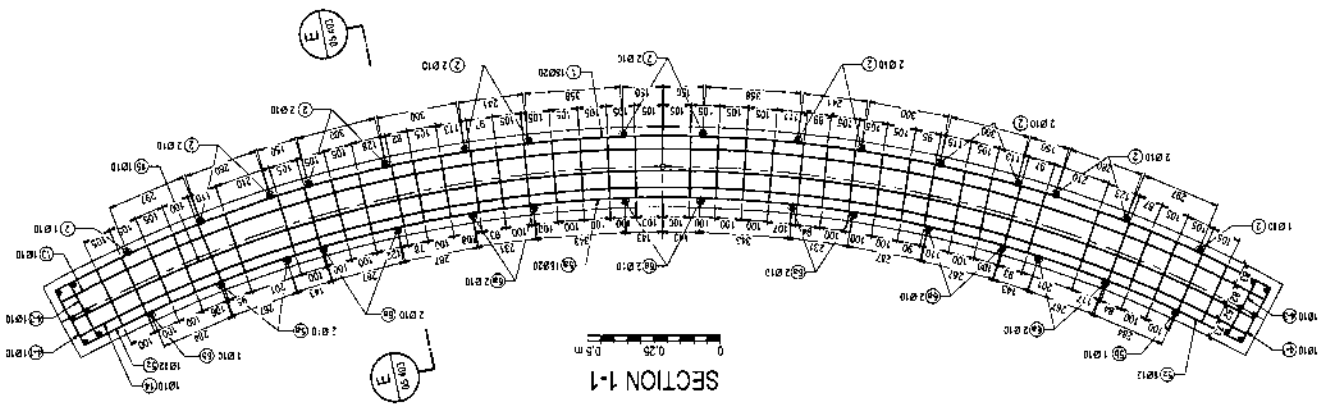
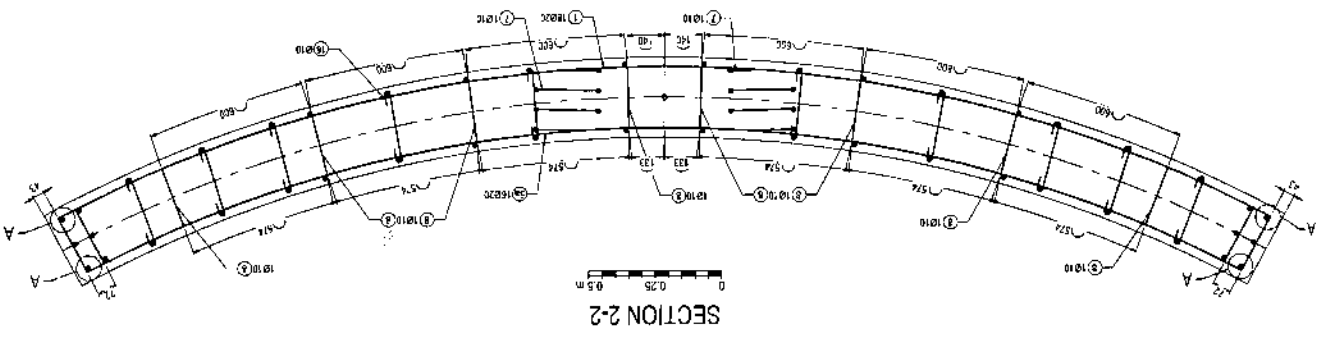




DATE: 25-08-2021		PROJECT: AFRY 4686.06.402	
DESIGNED BY: AFRY	CHECKED BY: AFRY	APPROVED BY: AFRY	SCALE: 1:1
SECTION 1-A 2-2 (SHEET 2 OF 4)			
TUNNEL LINING PASSING UNDER NH 30			
SEGMENT S4-1, S4-2, S4-3, S4-4			
REINFORCEMENT			
PATIL SEW JOINT VENTURE			
SLEEVABAD WATER TUNNEL PROJECT			
PROJECT LOCATION: SLEEVABAD WATER TUNNEL PROJECT			
DRAWN BY: AFRY			
CHECKED BY: AFRY			
APPROVED BY: AFRY			

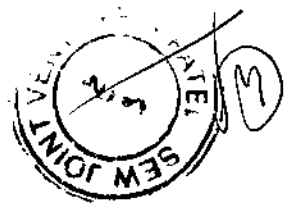
ISSUED FOR CONSTRUCTION

Dr. Bappaditya Mishra
 Professor
 Department of Civil Engineering
 Indian Institute of Technology
 Kharagpur, West Bengal - 721302 (INDIA)
 25-08-2021



NOTES:

1. REINFORCEMENT NOTATION
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE
3. FOR OTHER NOTES AND REFERENCES REFER DWG. NO. AFRY 4686.06.402.



ISSUED FOR CONSTRUCTION

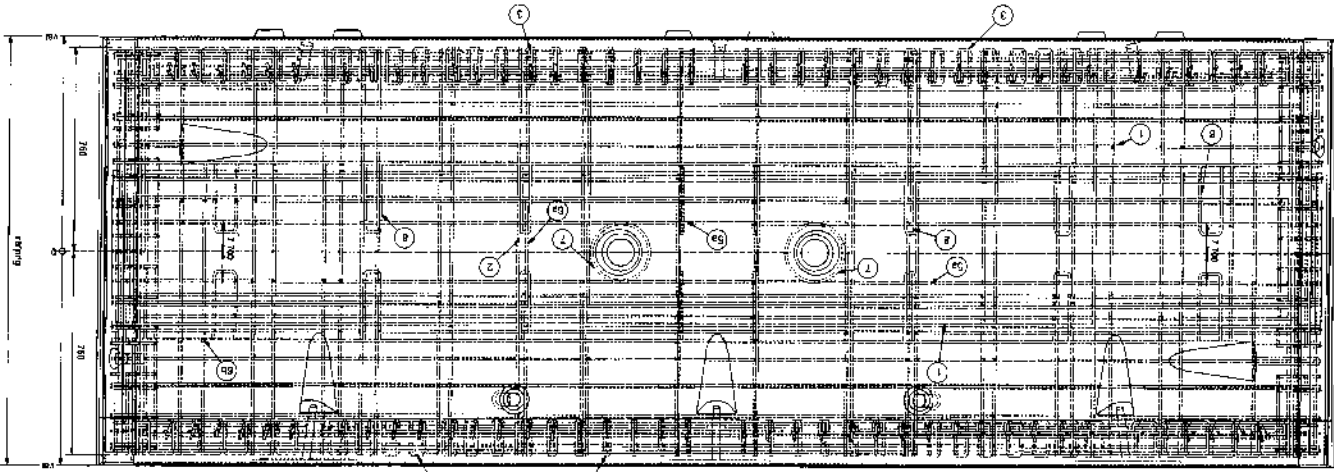
Dr. Bappaditya Mantra
 Professor
 Department of Civil Engineering
 Indian Institute of Technology, Dhanu
 26-04-2023
Mantra Bappaditya

AFRY AFRY India Pvt. Ltd. 10th Floor, 10th Cross, 10th Main, 10th Stage, 10th Block, 10th Sector, 10th Phase, 10th Colony, 10th Area, 10th Zone, 10th Region, 10th Country, 10th World, 10th Universe, 10th Multiverse, 10th Omniverse, 10th Everything.	
PROJECT NO.	AFRY/4686.05.403
DATE	26-04-23
DESIGNED BY	Dr. Bappaditya Mantra
CHECKED BY	Dr. Bappaditya Mantra
DATE	26-04-23
SCALE	As per drawing
PROJECT NO.	AFRY/4686.05.403
DATE	26-04-23

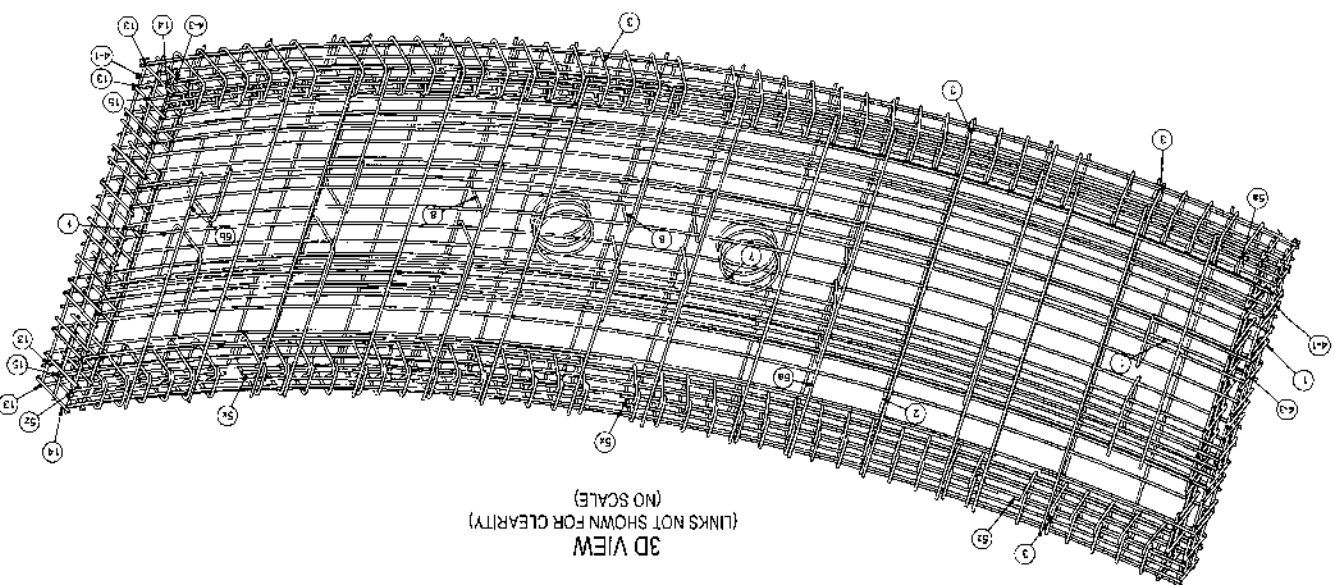
TUNNEL LINING PASSING UNDER NH 30
 SEGMENT S4-1, S4-2, S4-3, S4-4
 REINFORCEMENT
 3D VIEW & SECTION SHEET 3 OF 4

1. REINFORCEMENT NOTATION
 BAR DIAMETER
 BAR MARK

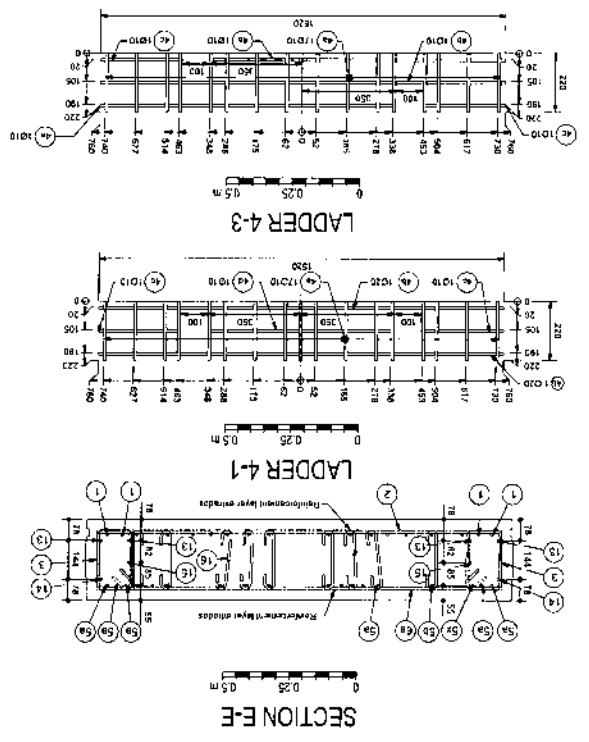
NOTES
 1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 2. FOR OTHER NOTES AND REFERENCES REFER DWG. NO. AFRY/4686.05.403.



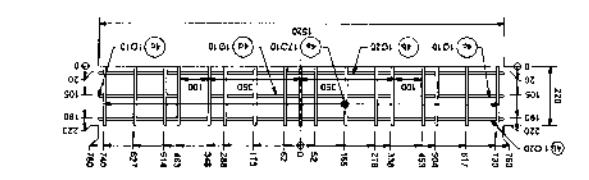
TOP VIEW
 (LINKS NOT SHOWN FOR CLARITY)



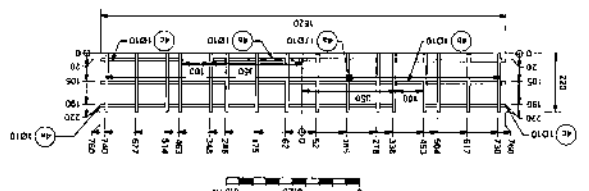
3D VIEW
 (NO SCALE)
 (LINKS NOT SHOWN FOR CLARITY)



SECTION E-E



LADDER 4-1



LADDER 4-3



ISSUED FOR CONSTRUCTION

AFRY
 APPROVED: [Signature]
 CHECKED: [Signature]
 DRAWN: [Signature]
 DATE: 25.08.23
 AFRY 4696.05.404

REINFORCEMENT
 TUNNEL LINING PASSING UNDER NH 30
 SEGMENT S4-1, S4-2, S4-3, S4-4

PATEL-SEM JOINT VENTURE
 SLEMNABAD CARRIAGE CANAL PROJECT
 CIVIL ENGINEERING
 PROJECT NO. 14/2018/2018
 DRAWING NO. AFRY/4696.05.404

POS	NO.	DIA (mm)	Length (m)	Total Length (m)	Weight (kg)
POS.1	16	20	4.732	95.16	212.44
POS.2	18	18	15.28	26.27	14.95
POS.3	88	10	0.906	72.88	44.88
POS.4	88	10	0.220	14.96	8.273
POS.4a	88	10	1.520	9.12	5.822
POS.4b	8	10	0.376	2.48	1.528
POS.4c	2	10	0.706	1.40	0.883
POS.4d	4	10	1.140	4.48	2.717
POS.5	2	20	1.475	2.95	1.715
POS.5a	2	20	0.834	1.67	1.177
POS.5b	2	20	1.312	2.62	1.572
POS.5c	2	20	1.728	3.456	2.072
POS.6	14	18	1.520	21.28	13.18
POS.6a	2	18	1.385	2.77	1.58
POS.6b	2	18	2.130	4.26	2.524
POS.7	2	18	4.28	8.56	5.132
POS.8	20	18	0.730	14.60	8.921
POS.13	4	18	4.703	18.84	11.612
POS.14	2	18	4.98	9.96	5.820
POS.15	2	18	4.827	9.65	5.782
POS.16	88	10	0.340	27.20	14.788
TOTAL				220.24	135.680

NOTES:

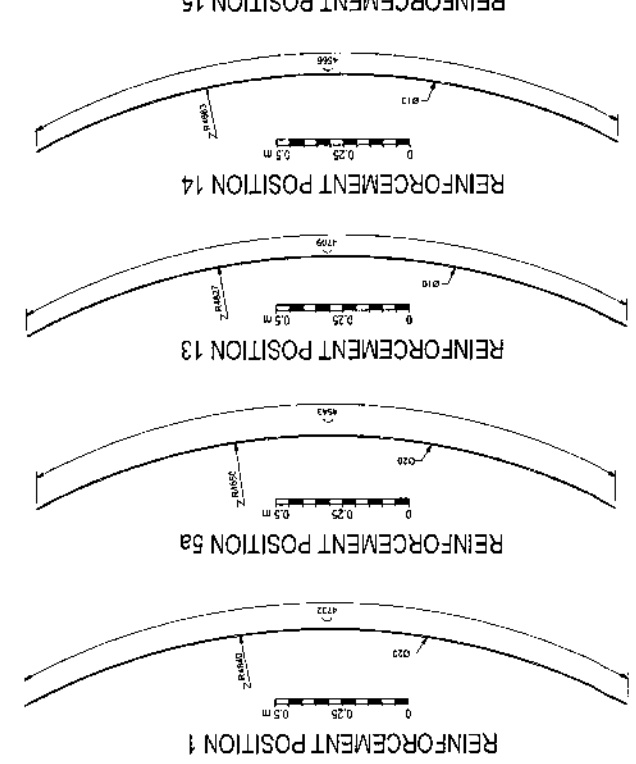
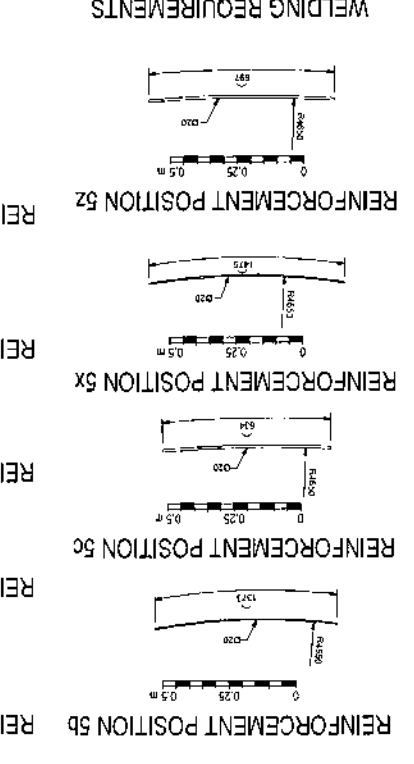
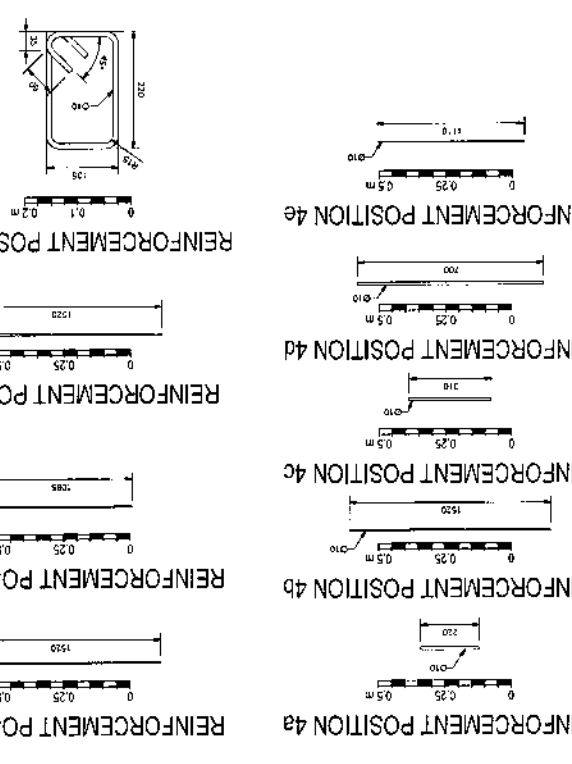
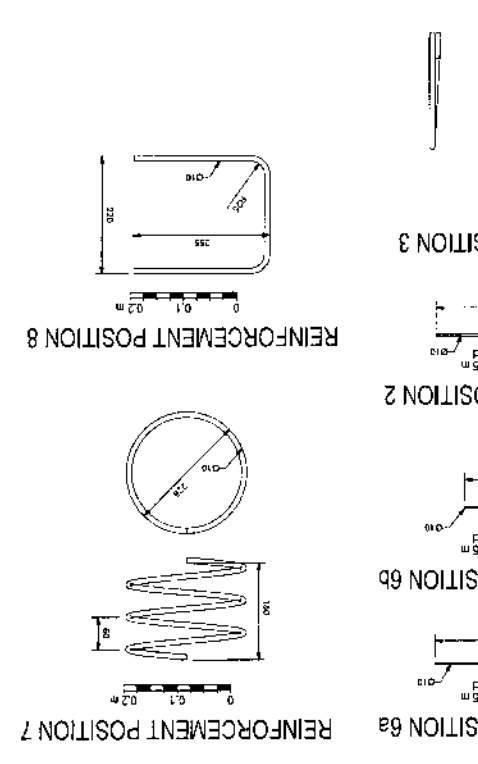
- REINFORCEMENT NOTATION
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
- FOR OTHER NOTES AND REFERENCES REFER TO DRAWING NO. AFRY/4696.05.401.

1. REINFORCEMENT NOTATION

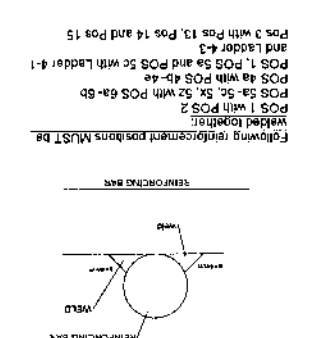
2. SAN QUANTIFIER

3. SAN QUANTIFIER

Item	Quantity	Unit
Reinforcement weight (kg)	135.680	
Reinforcement weight (kg)	246.70	
Reinforcement weight (kg)	555.060	
Reinforcement weight (kg)	15	
Reinforcement weight (kg)	500	
Reinforcement weight (kg)	151.706	
Reinforcement weight (kg)	2.25	
Reinforcement weight (kg)	49	
Reinforcement weight (kg)	32	
Reinforcement weight (kg)	50	



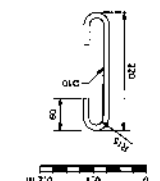
WELDING REQUIREMENTS



Following reinforcement positions must be welded together:
 POS 1 with POS 2
 POS 5a-5c, 5x, 5z with POS 6a-6b
 POS 4a with POS 4b-4e and POS 5c with Ladder 4-1
 POS 5c with POS 13, POS 14 and POS 15
 and Ladder 4-3

Dr. Bappaditya Mani
 Professor of Civil Engineering
 Indian Institute of Technology Patna
 Patna 851 106, India
 26-08-2023

REINFORCEMENT POSITION 16



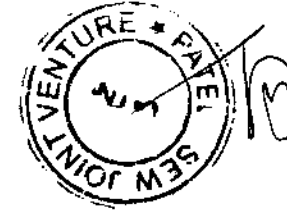
REINFORCEMENT POSITION 15

REINFORCEMENT POSITION 14

REINFORCEMENT POSITION 13

REINFORCEMENT POSITION 5a

REINFORCEMENT POSITION 1



ISSUED FOR CONSTRUCTION

Dr. Bappaditya Mishra
 Professor
 Department of Civil Engineering
 Indian Institute of Technology Delhi
 New Delhi, India - 110016 (India)
 25-08-2022

REV. NO.	DATE	BY	CHKD.	DESCRIPTION
0				

APRY 4686.05.405

SCALE: 1:20

PROJECT: PATIL SEW JOINT VENTURE

PROJECT NO.:

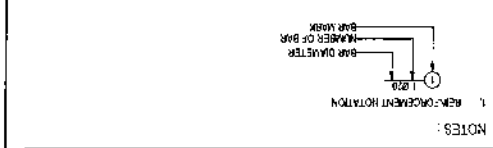
DATE:

2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

3. CONCRETE SHALL BE GRADE M20 (1:1.5:3) WITH 1% MINIMUM SLAB REINFORCEMENT.

4. REINFORCEMENT SHALL BE OF GRADE Fe 415 (AS PER IS:1786).

5. ALL DIMENSIONS MENTIONED IN THESE DRAWINGS SHALL BE VALID FOR THIS DRAWING.



NOTES:

1. REINFORCEMENT NOTATION

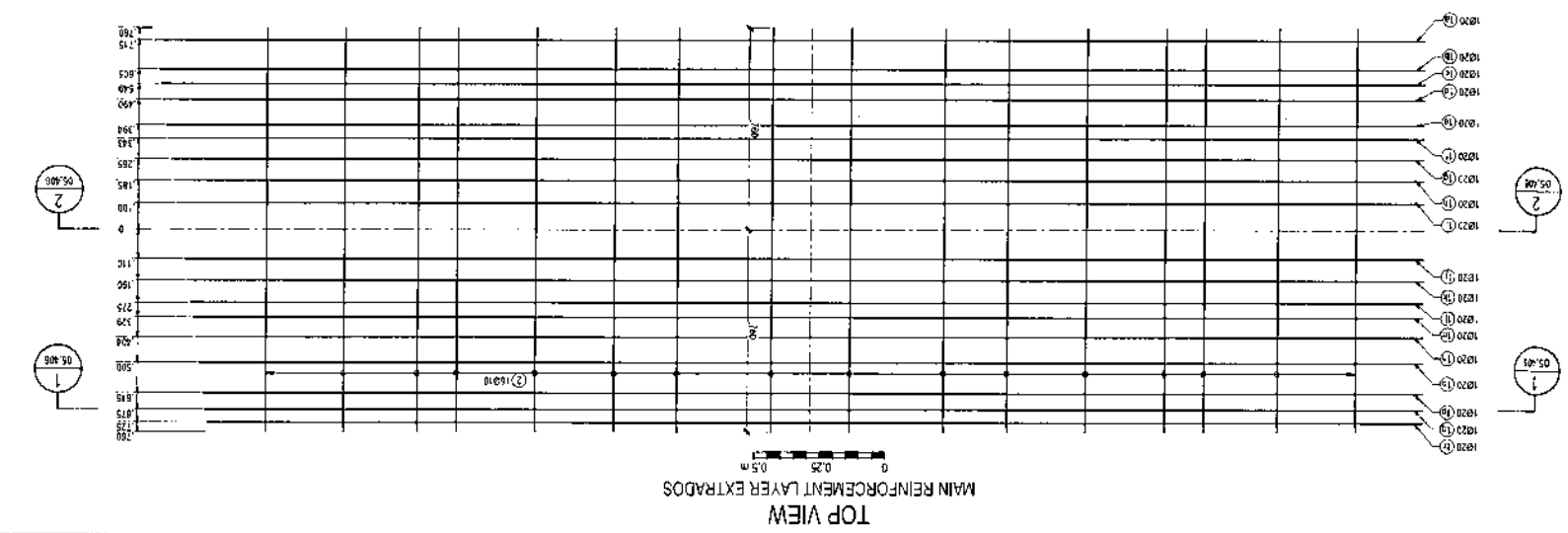
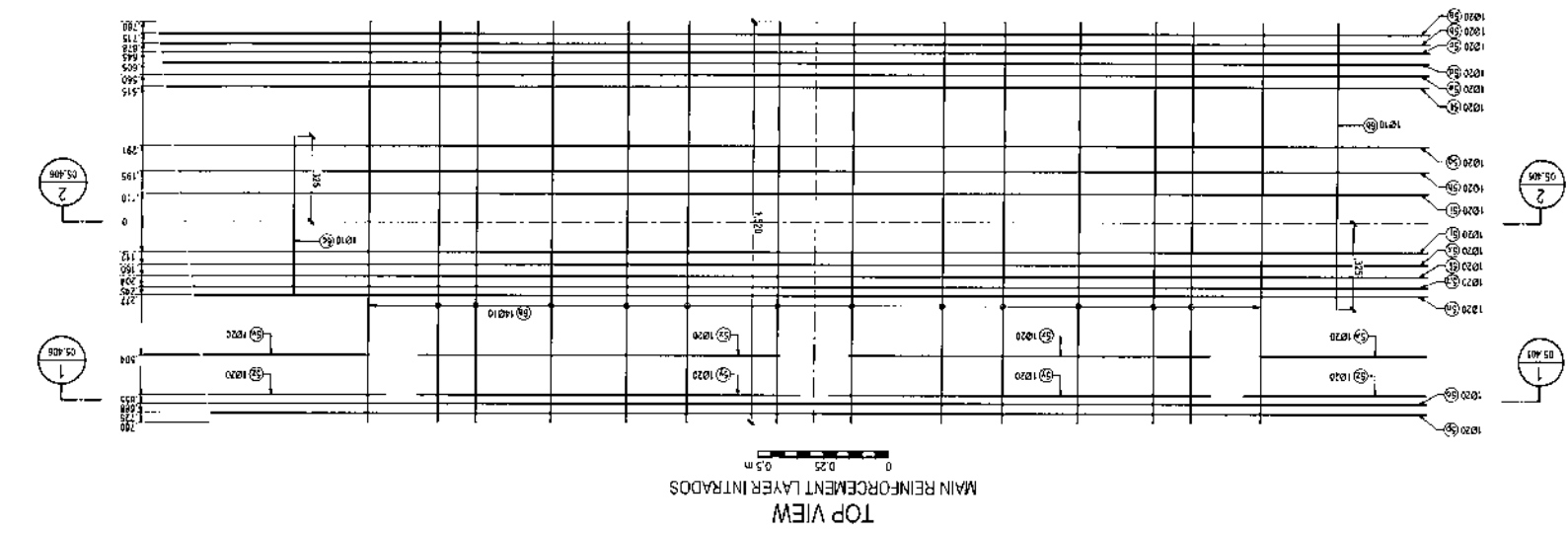
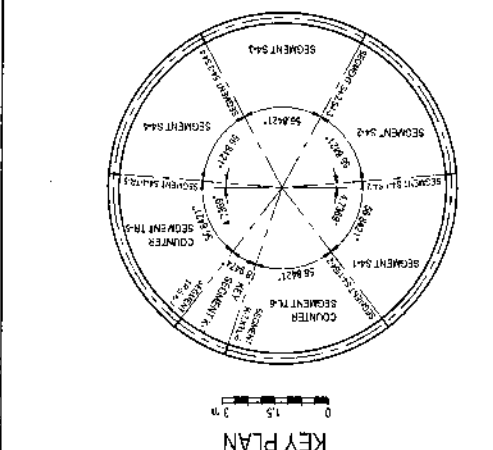
2. DURING EXECUTION OF TUNNEL, DEFORMATION OF THE HIGHWAY SHALL BE MONITORED. IF DEFORMATION OF DEFORMATION OF THE HIGHWAY IS MORE THAN 10MM, DEFORMATION SHALL BE MONITORED AT LEAST UP TO 200MM ON EACH SIDE OF TUNNEL. HIGHWAY SHALL BE REINFORCED ACCORDING TO ORIGINAL PROJECT. OTHERWISE DEFORMATION IS MORE THAN 10MM, IF REQUIRED ADJUSTMENT FROM GEOLOGIST AND ENGINEER-IN-CHARGE IN CASE DEFORMATION IS MORE THAN 10MM.

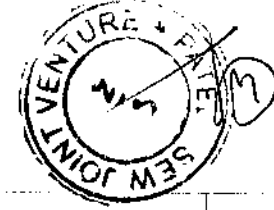
IMPORTANT NOTES:

- THIS DRAWING IS APPLICABLE FROM CHANGHE 111535 (R/S OF N-103) TO CHANGHE 111800 (R/S OF 1st PH OF THE TUNNEL).
- DURING EXECUTION OF TUNNEL, DEFORMATION OF THE HIGHWAY SHALL BE MONITORED. IF DEFORMATION OF DEFORMATION OF THE HIGHWAY IS MORE THAN 10MM, DEFORMATION SHALL BE MONITORED AT LEAST UP TO 200MM ON EACH SIDE OF TUNNEL. HIGHWAY SHALL BE REINFORCED ACCORDING TO ORIGINAL PROJECT. OTHERWISE DEFORMATION IS MORE THAN 10MM, IF REQUIRED ADJUSTMENT FROM GEOLOGIST AND ENGINEER-IN-CHARGE IN CASE DEFORMATION IS MORE THAN 10MM.

REFERENCE DRAWINGS:

S.NO.	DRWG. NO.	DRAWING NAME
01	08/03/2019	SEGMENT S4-1 S4-2 S4-3 S4-4 S4-5 S4-6 REINFORCEMENT
02	08/03/2019	SEGMENT S4
03	08/03/2019	SEGMENT T1-4
04	08/03/2019	SEGMENT T1-5
05	08/03/2019	SEGMENT T1-6
06	08/03/2019	SEGMENT T1-7
07	08/03/2019	SEGMENT T1-8
08	08/03/2019	SEGMENT T1-9
09	08/03/2019	SEGMENT T1-10
10	08/03/2019	SEGMENT T1-11
11	08/03/2019	SEGMENT T1-12
12	08/03/2019	SEGMENT T1-13
13	08/03/2019	SEGMENT T1-14
14	08/03/2019	SEGMENT T1-15
15	08/03/2019	SEGMENT T1-16
16	08/03/2019	SEGMENT T1-17
17	08/03/2019	SEGMENT T1-18
18	08/03/2019	SEGMENT T1-19
19	08/03/2019	SEGMENT T1-20
20	08/03/2019	SEGMENT T1-21
21	08/03/2019	SEGMENT T1-22
22	08/03/2019	SEGMENT T1-23
23	08/03/2019	SEGMENT T1-24
24	08/03/2019	SEGMENT T1-25
25	08/03/2019	SEGMENT T1-26
26	08/03/2019	SEGMENT T1-27
27	08/03/2019	SEGMENT T1-28
28	08/03/2019	SEGMENT T1-29
29	08/03/2019	SEGMENT T1-30
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96	08/03/2019	SEGMENT T1-97
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99	08/03/2019	SEGMENT T1-100



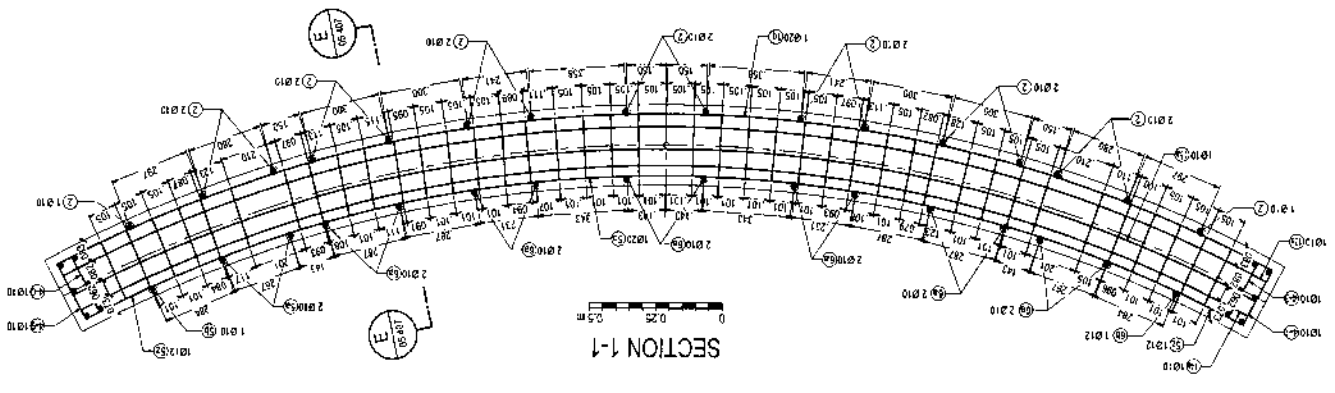
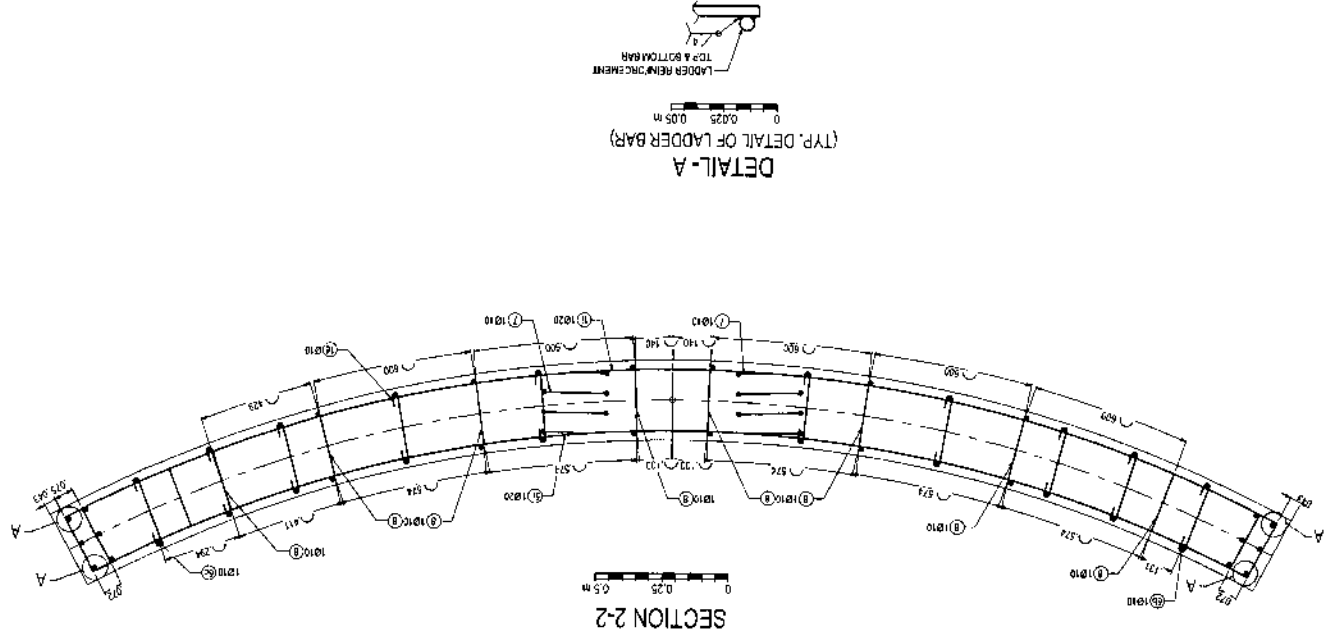


SECTION 1-1 & 2-2 (SHEET 2 OF 4)
TUNNEL LINING PASSING UNDER NH 30 COUNTER SEGMENT TRS REINFORCEMENT
Patel-SEW SLEEMANAND WATER TUNNEL PROJECT
DESIGN & CONSTRUCTION
DATE: 28.08.21
APRY 4888.05.406

ISSUED FOR CONSTRUCTION

Dr. Sappaditya Mann a
26-09-2021

NOTES:
1. REINFORCEMENT NOTATION
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. FOR OTHER NOTES AND REFERENCES REFER DRAWING NO. APRY 4888.05.406.





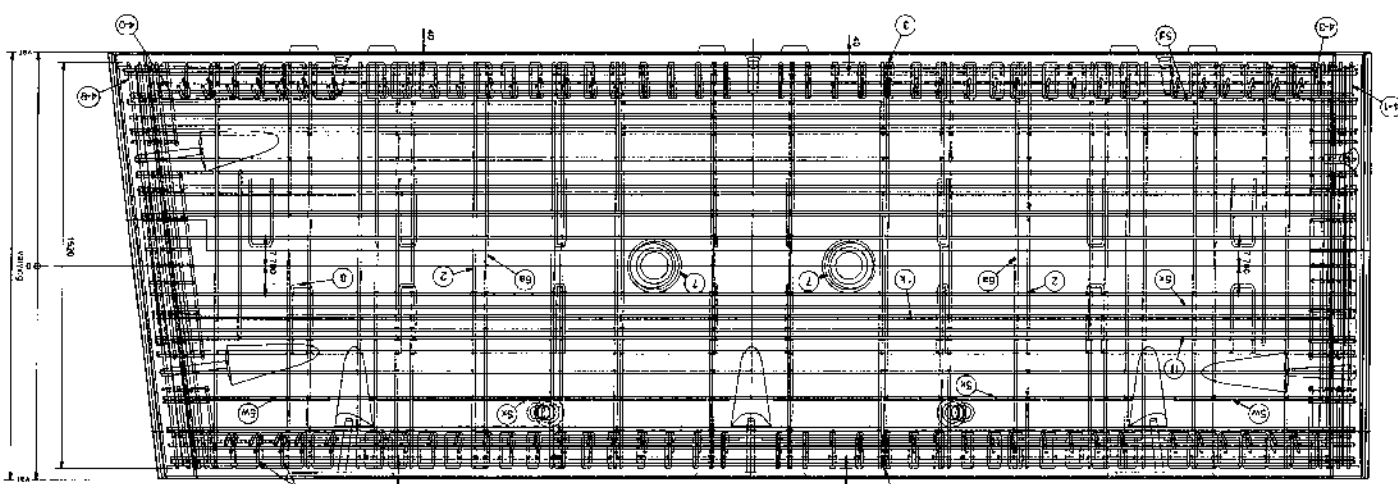
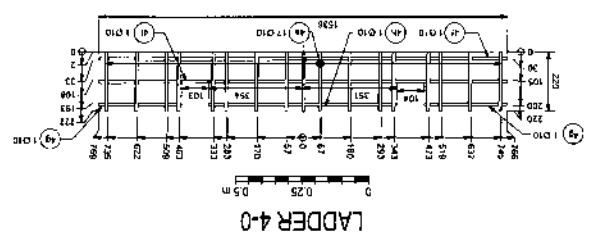
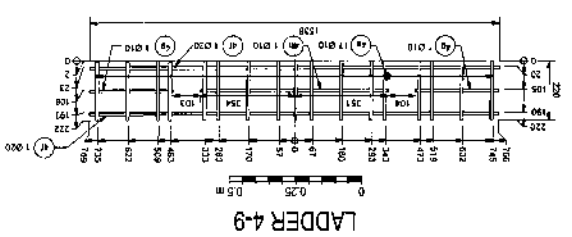
AFRY		PROJECT NO.	AFRY/4686.05.407
AFRY 7-318 PVT. LTD.		DATE	25.09.2023
DESIGNED BY	SCALE	SHEET NO.	
CHECKED BY	1:1	41	
APPROVED BY			
TUNNEL LINING PASSING UNDER NH 30 REINFORCEMENT COUNTER SEGMENT TRS			
SLEMNABAD WATER TUNNEL PROJECT			
PATIL-SEM JOINT VENTURE			
PROJECT LOCATION			
PROJECT DESCRIPTION			
PROJECT STATUS			
PROJECT PHASE			

ISSUED FOR CONSTRUCTION

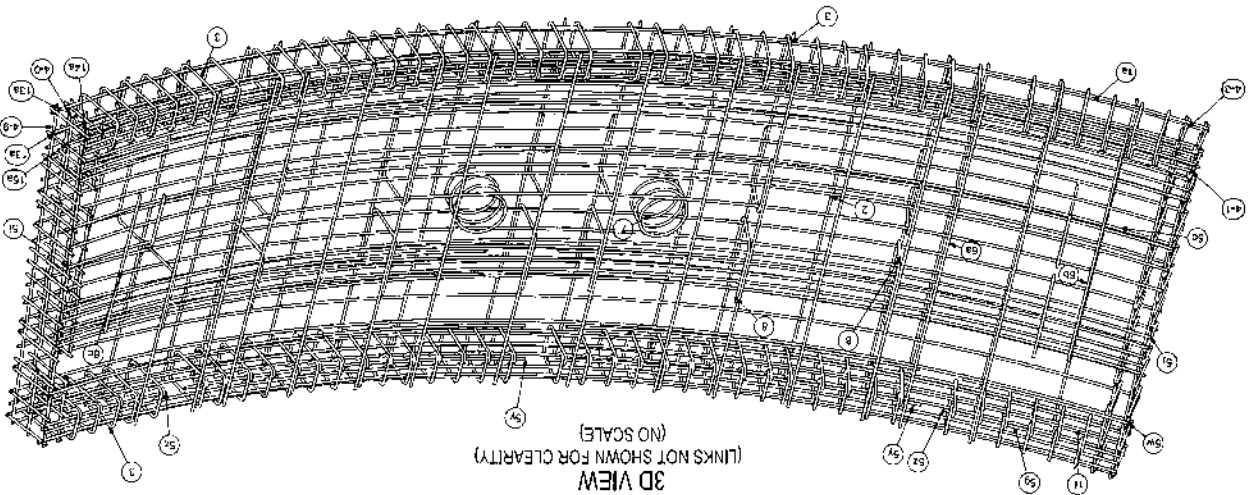
NOTES:

- REINFORCEMENT NOTATION
- FOR OTHER NOTES AND REFERENCES REFER DRAWING NO. AFRY/4686.05

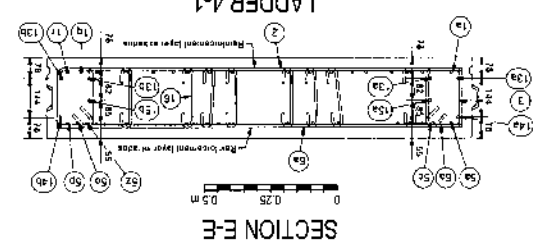
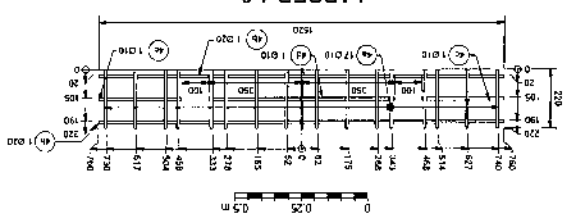
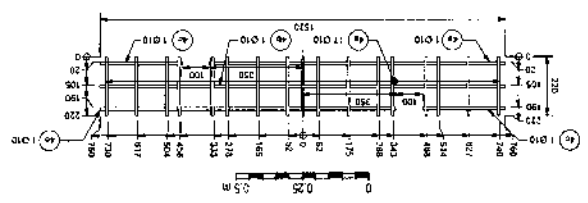
Dr. Bappaditya Mishra
 Design Engineer
 Patil-SEM Joint Venture
 25-09-2023



TOP VIEW
(LINKS NOT SHOWN FOR CLARITY)

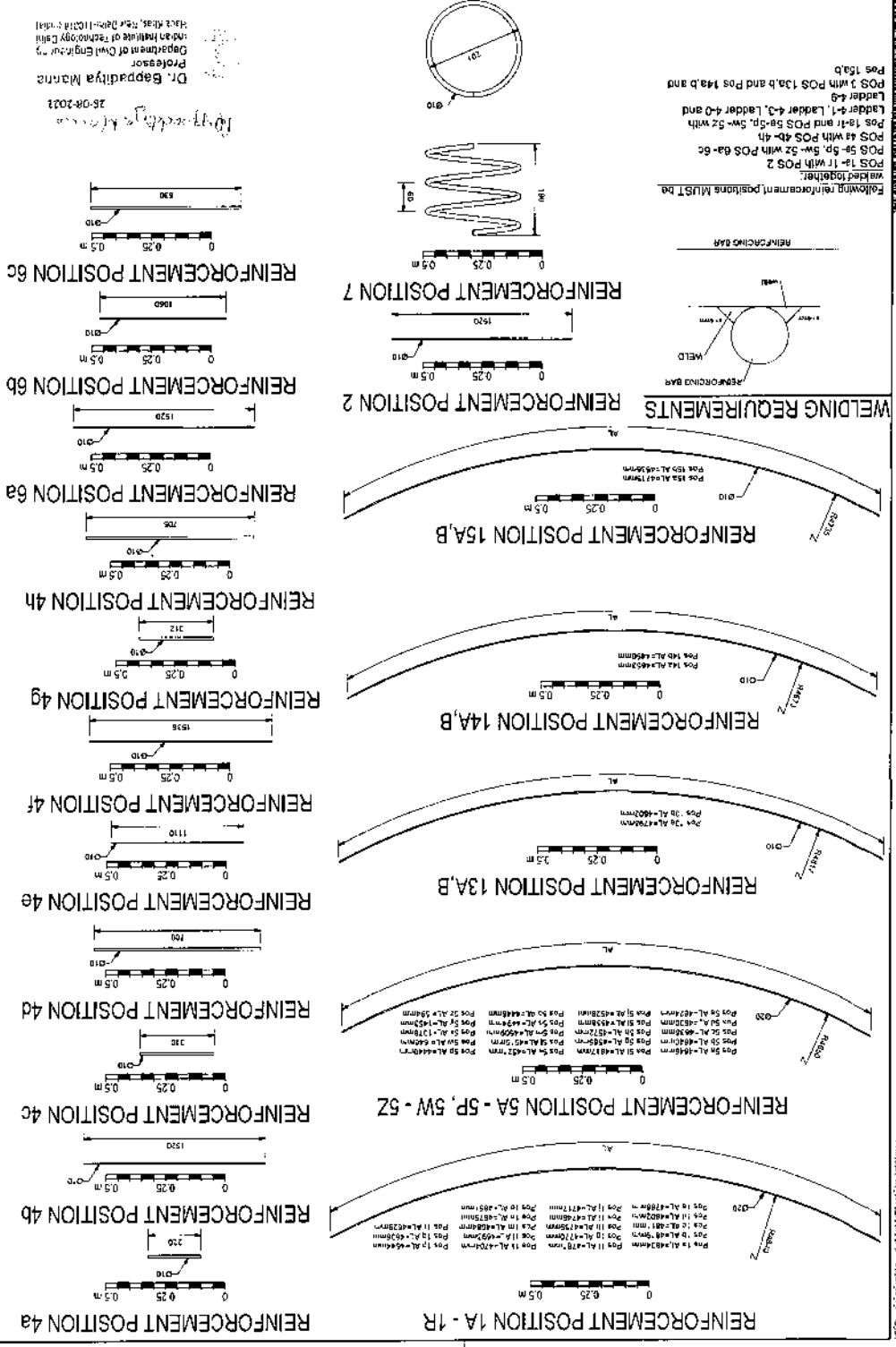


3D VIEW
(NO SCALE)
(LINKS NOT SHOWN FOR CLARITY)





Dr. Gappadiya Manoj
 Professor
 Department of Civil Engineering
 MCAET, Maharashtra Institute of Technology
 Pimpri, Maharashtra - 411004



WELDING REQUIREMENTS

Following reinforcement positions MUST be welded together:

- POS 1A - 1I with POS 2
- POS 5A - 5Z with POS 6A - 6C
- POS 4A with POS 4B - 4H
- POS 1A-I and POS 5A-5Z with Ladder 4-0 and Ladder 5-1
- POS 13A and POS 14A with POS 15A and POS 16

REINFORCEMENT LIST

POS	NO.	DIA (mm)	Length (m)	Total Length (m)	Weight (Kg)
POS 1A	1	20	4.84	4.84	1.921
POS 1B	1	20	4.81	4.81	1.884
POS 1C	1	20	4.82	4.82	1.887
POS 1D	1	20	4.82	4.82	1.887
POS 1E	1	20	4.82	4.82	1.887
POS 1F	1	20	4.82	4.82	1.887
POS 1G	1	20	4.82	4.82	1.887
POS 1H	1	20	4.82	4.82	1.887
POS 1I	1	20	4.82	4.82	1.887
POS 2	1	20	4.82	4.82	1.887
POS 3A	1	20	4.82	4.82	1.887
POS 3B	1	20	4.82	4.82	1.887
POS 3C	1	20	4.82	4.82	1.887
POS 3D	1	20	4.82	4.82	1.887
POS 3E	1	20	4.82	4.82	1.887
POS 3F	1	20	4.82	4.82	1.887
POS 3G	1	20	4.82	4.82	1.887
POS 3H	1	20	4.82	4.82	1.887
POS 3I	1	20	4.82	4.82	1.887
POS 3J	1	20	4.82	4.82	1.887
POS 3K	1	20	4.82	4.82	1.887
POS 3L	1	20	4.82	4.82	1.887
POS 3M	1	20	4.82	4.82	1.887
POS 3N	1	20	4.82	4.82	1.887
POS 3O	1	20	4.82	4.82	1.887
POS 3P	1	20	4.82	4.82	1.887
POS 3Q	1	20	4.82	4.82	1.887
POS 3R	1	20	4.82	4.82	1.887
POS 3S	1	20	4.82	4.82	1.887
POS 3T	1	20	4.82	4.82	1.887
POS 3U	1	20	4.82	4.82	1.887
POS 3V	1	20	4.82	4.82	1.887
POS 3W	1	20	4.82	4.82	1.887
POS 3X	1	20	4.82	4.82	1.887
POS 3Y	1	20	4.82	4.82	1.887
POS 3Z	1	20	4.82	4.82	1.887
POS 4	1	20	4.82	4.82	1.887
POS 4A	1	20	4.82	4.82	1.887
POS 4B	1	20	4.82	4.82	1.887
POS 4C	1	20	4.82	4.82	1.887
POS 4D	1	20	4.82	4.82	1.887
POS 4E	1	20	4.82	4.82	1.887
POS 4F	1	20	4.82	4.82	1.887
POS 4G	1	20	4.82	4.82	1.887
POS 4H	1	20	4.82	4.82	1.887
POS 4I	1	20	4.82	4.82	1.887
POS 4J	1	20	4.82	4.82	1.887
POS 4K	1	20	4.82	4.82	1.887
POS 4L	1	20	4.82	4.82	1.887
POS 4M	1	20	4.82	4.82	1.887
POS 4N	1	20	4.82	4.82	1.887
POS 4O	1	20	4.82	4.82	1.887
POS 4P	1	20	4.82	4.82	1.887
POS 4Q	1	20	4.82	4.82	1.887
POS 4R	1	20	4.82	4.82	1.887
POS 4S	1	20	4.82	4.82	1.887
POS 4T	1	20	4.82	4.82	1.887
POS 4U	1	20	4.82	4.82	1.887
POS 4V	1	20	4.82	4.82	1.887
POS 4W	1	20	4.82	4.82	1.887
POS 4X	1	20	4.82	4.82	1.887
POS 4Y	1	20	4.82	4.82	1.887
POS 4Z	1	20	4.82	4.82	1.887
POS 5A	1	20	4.82	4.82	1.887
POS 5B	1	20	4.82	4.82	1.887
POS 5C	1	20	4.82	4.82	1.887
POS 5D	1	20	4.82	4.82	1.887
POS 5E	1	20	4.82	4.82	1.887
POS 5F	1	20	4.82	4.82	1.887
POS 5G	1	20	4.82	4.82	1.887
POS 5H	1	20	4.82	4.82	1.887
POS 5I	1	20	4.82	4.82	1.887
POS 5J	1	20	4.82	4.82	1.887
POS 5K	1	20	4.82	4.82	1.887
POS 5L	1	20	4.82	4.82	1.887
POS 5M	1	20	4.82	4.82	1.887
POS 5N	1	20	4.82	4.82	1.887
POS 5O	1	20	4.82	4.82	1.887
POS 5P	1	20	4.82	4.82	1.887
POS 5Q	1	20	4.82	4.82	1.887
POS 5R	1	20	4.82	4.82	1.887
POS 5S	1	20	4.82	4.82	1.887
POS 5T	1	20	4.82	4.82	1.887
POS 5U	1	20	4.82	4.82	1.887
POS 5V	1	20	4.82	4.82	1.887
POS 5W	1	20	4.82	4.82	1.887
POS 5X	1	20	4.82	4.82	1.887
POS 5Y	1	20	4.82	4.82	1.887
POS 5Z	1	20	4.82	4.82	1.887
POS 6A	1	20	4.82	4.82	1.887
POS 6B	1	20	4.82	4.82	1.887
POS 6C	1	20	4.82	4.82	1.887
POS 7	1	20	4.82	4.82	1.887
POS 8	1	20	4.82	4.82	1.887
POS 9	1	20	4.82	4.82	1.887
POS 10	1	20	4.82	4.82	1.887
POS 11	1	20	4.82	4.82	1.887
POS 12	1	20	4.82	4.82	1.887
POS 13A	1	20	4.82	4.82	1.887
POS 14A	1	20	4.82	4.82	1.887
POS 15A	1	20	4.82	4.82	1.887
POS 16	1	20	4.82	4.82	1.887
TOTAL			552.822	552.822	216.758

ISSUED FOR CONSTRUCTION

REINFORCEMENT

TUNNEL LINING PASSING UNDER NH 30

COUNTER SEGMENT TRS

PATEL SEW JOINT VENTURE

SLEEPER ROAD WATER TUNNEL PROJECT

DESIGNED BY: AFRY

CHECKED BY: AFRY

DATE: 25/07/2021

PROJECT NO: AFRY/4686/05/408

SHEET NO: 0

NOTES:

- REINFORCEMENT NOTATION
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE
- FOR OTHER NOTES AND REFERENCES REFER DRAW NO. AFRY/4686/05/408

REINFORCEMENT POSITION 3

REINFORCEMENT POSITION 8

REINFORCEMENT POSITION 16

REINFORCEMENT WEIGHT (Kg)	REINFORCEMENT QUANTITY	MIN. TENSILE STRENGTH	MIN. TENSILE STRENGTH (MPa)	MIN. TENSILE STRENGTH (N/mm ²)	MIN. TENSILE STRENGTH (N/mm ²)
245.809	552.822	500	500	500	500



ISSUED FOR CONSTRUCTION

25-09-2021
 Dr. Bappaditya Mahto
 Professor
 Department of Civil Engineering
 Indian Institute of Technology Patna
 Patna, Bihar, India - 800 005

DATE	25.09.21
PROJECT	AFRY 4886.05.409
SCALE	1:20
DRAWN BY	AFRY
CHECKED BY	AFRY
DATE	25.09.21

REINFORCEMENT TYPING

NO.	DESCRIPTION	DATE	BY	CHECKED

NOTES:

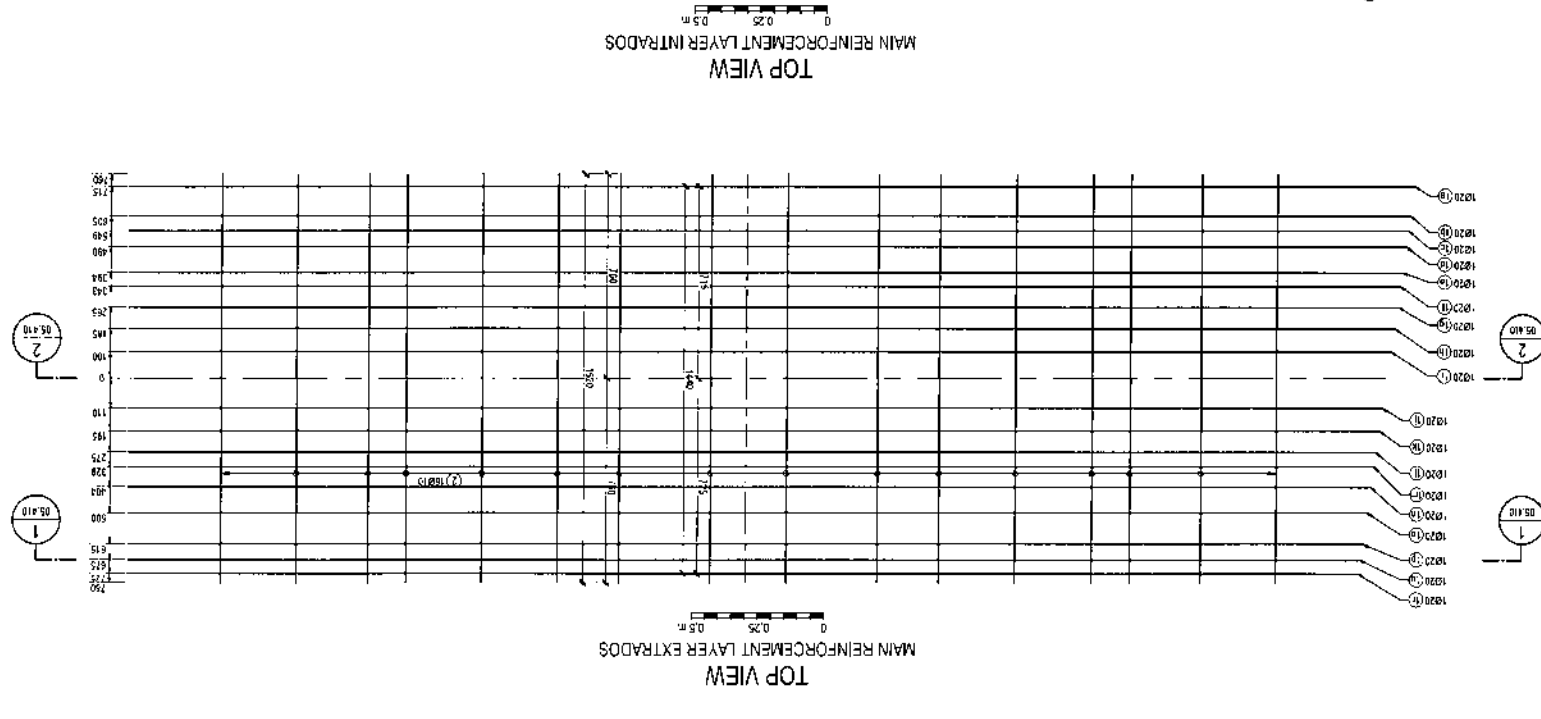
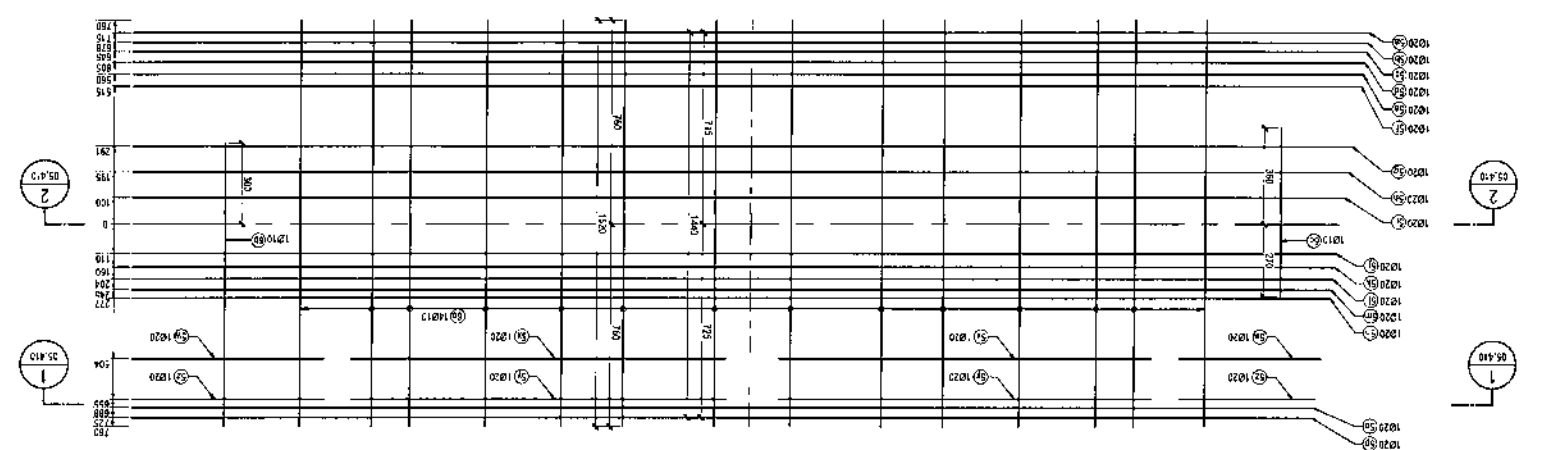
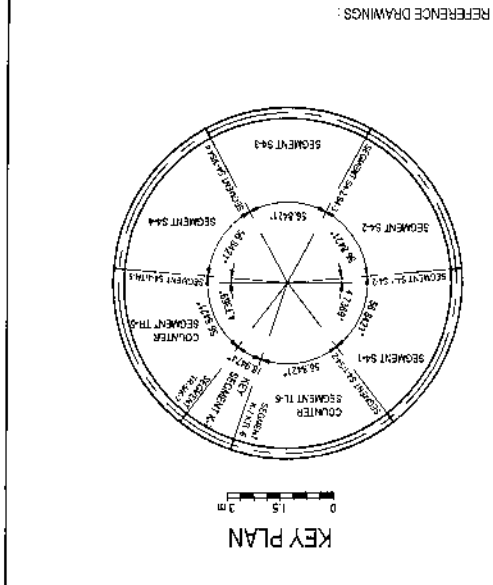
1. THE DRAWING IS APPLICABLE FROM CHANGE 111525 (UP TO HERE) TO CHANGE 111500 (DOWN TO HERE).
2. DURING EXCAVATION OF TUNNEL BENEATH THE HIGHWAY A ONE MONTH THE REALER, BEAL (0.5 OF KM) OF THE TUNNEL.
3. THE POSITION OF DEFORMATION OF THE HIGHWAY SHALL BE CARRIED OUT.
4. DEFORMATION MONITORING INSTRUMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD.
5. DEFORMATION MONITORING INSTRUMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD.
6. DEFORMATION MONITORING INSTRUMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD.
7. DEFORMATION MONITORING INSTRUMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD.
8. DEFORMATION MONITORING INSTRUMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD.
9. DEFORMATION MONITORING INSTRUMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD.
10. DEFORMATION MONITORING INSTRUMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD.

IMPORTANT NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. REINFORCEMENT SHALL BE OF GRADE F80S CONFORMING TO IS 1786.
3. CONCRETE SHALL BE OF GRADE M30 CONFORMING TO IS 456:2000.
4. OTHER NOTES MENTIONED IN EARLIER GOOD FOR CONSTRUCTION DRAWING (SEE REFERENCE DRAWING) SHALL BE VALID FOR THIS DRAWING.

REFERENCE DRAWINGS:

01	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT
02	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT
03	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT
04	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT
05	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT
06	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT
07	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT
08	08-01-00-010	SEGMENT 34-1-34-2-34-3-34-4-REINFORCEMENT



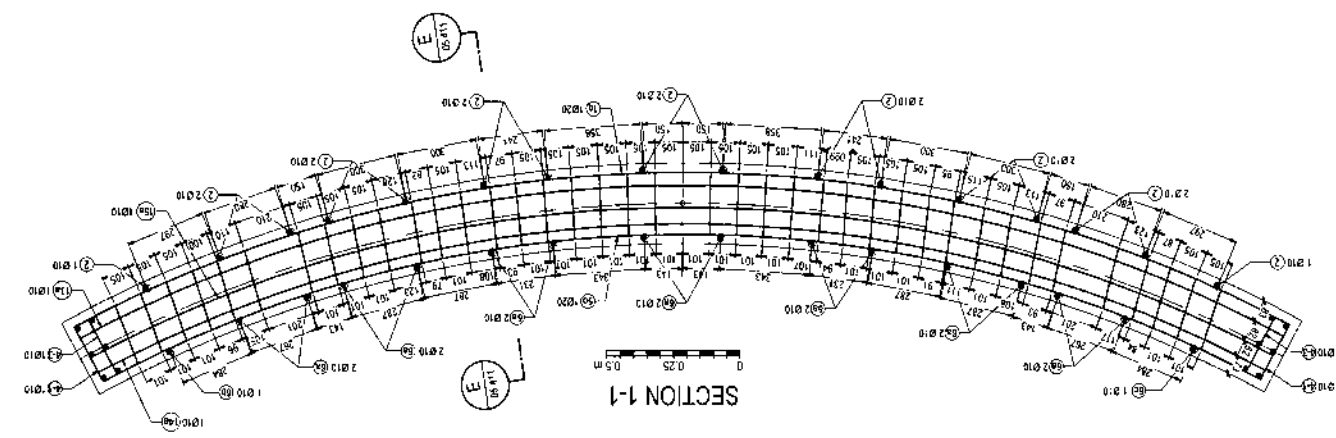
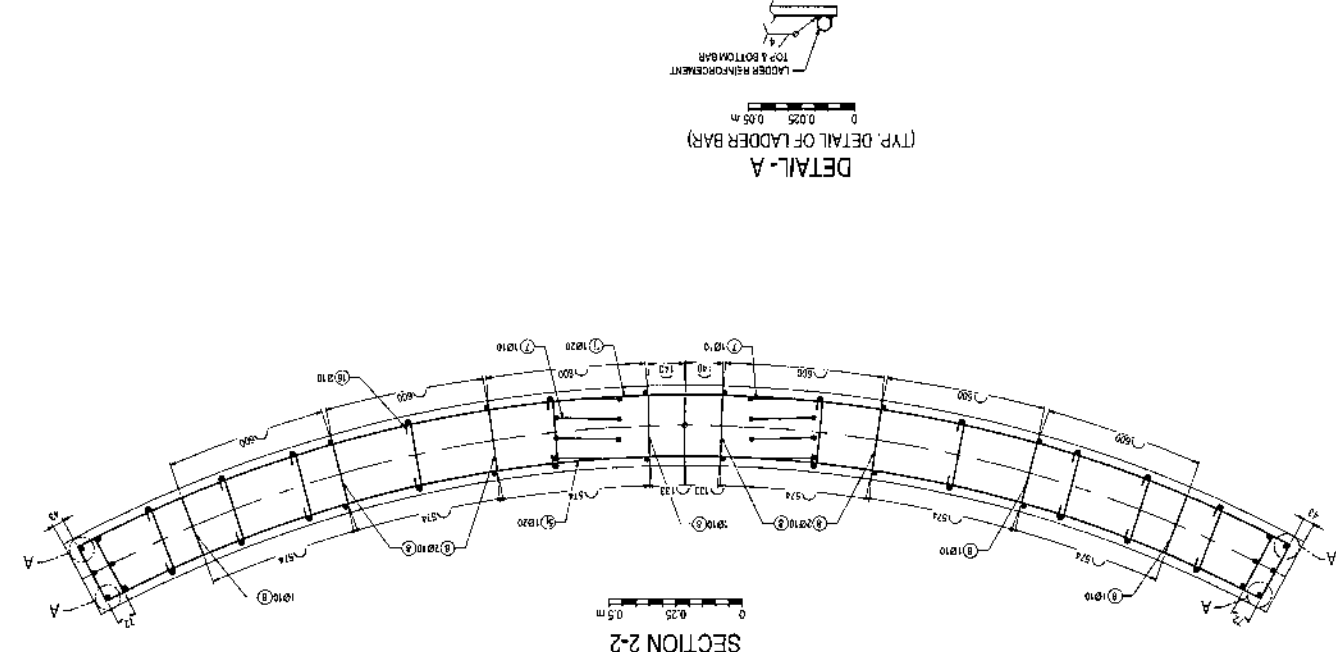


DATE	25.02.22
APPROVED	AFRY India Pvt. Ltd.
CHECKED	AFRY
DRAWN	U. 22 (10)
DESIGNED	U. 22 (10)
SCALE	1:10
PROJECT	SEW JOINT VENTURE
SECTION	SECTION 1-1 & 2-2 (SHEET 2 OF 4)
TUNNEL LINING PASSING UNDER NH 30 COUNTER SEGMENT TL-6 REINFORCEMENT	
PATIL-SEW JOINT VENTURE	
SHEWANARD WATER TUNNEL PROJECT	
PROJECT NO. 100/2019	
PROJECT LOCATION: SHEWANARD WATER TUNNEL PROJECT	
PROJECT NO. 100/2019	
PROJECT LOCATION: SHEWANARD WATER TUNNEL PROJECT	
PROJECT NO. 100/2019	
PROJECT LOCATION: SHEWANARD WATER TUNNEL PROJECT	

ISSUED FOR CONSTRUCTION

Dr. Bappaditya Ghosh
 Professor
 Department of Civil Engineering
 Indian Institute of Technology Delhi
 New Delhi, India (Delhi-110016-15)
 26-08-2021

NOTES:
 1. REINFORCEMENT NOTATION
 2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 3. FOR OTHER NOTES AND REFERENCES REFER DWG. NO. AFRY/ABBS/02.



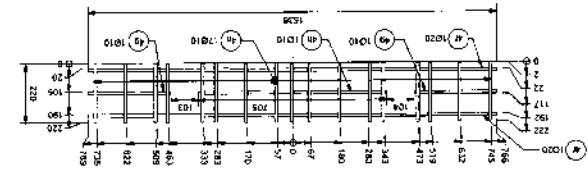
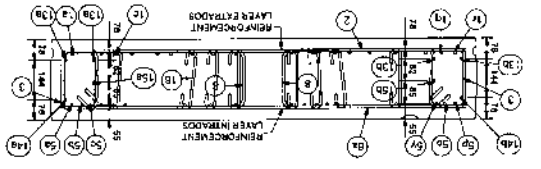
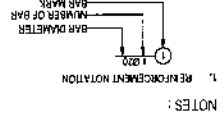


AFRY AFRY India Pvt. Ltd. 15th Floor, 150, Park Road, Connaught Place, New Delhi - 110022, India.		DATE: 15/08/22 APPROVED: [Signature] CHECKED: [Signature] DRAWN: [Signature]
PROJECT: SLEMNABAD WATER TUNNEL PROJECT DRAWING NO: TUNNEL LINING PASSING UNDER NH 30 SHEET NO: REINFORCEMENT	CLIENT: PATEL SEM JOINT VENTURE PROJECT: SLEMNABAD WATER TUNNEL PROJECT DRAWING NO: TUNNEL LINING PASSING UNDER NH 30 SHEET NO: REINFORCEMENT	PROJECT: SLEMNABAD WATER TUNNEL PROJECT DRAWING NO: TUNNEL LINING PASSING UNDER NH 30 SHEET NO: REINFORCEMENT

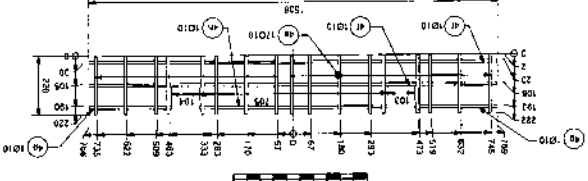
ISSUED FOR CONSTRUCTION

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 2. FOR OTHER NOTES AND REFERENCES REFER DWG. NO. AFRY/4886/05.411

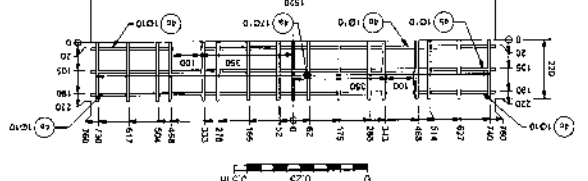
Dr. Bappaditya Manna
 Professor
 Department of Civil Engineering
 Indian Institute of Technology Delhi
 New Delhi, India (110029)
 15-08-2022



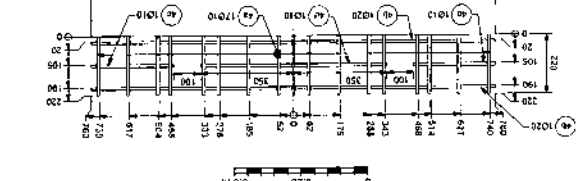
LADDER 4-6



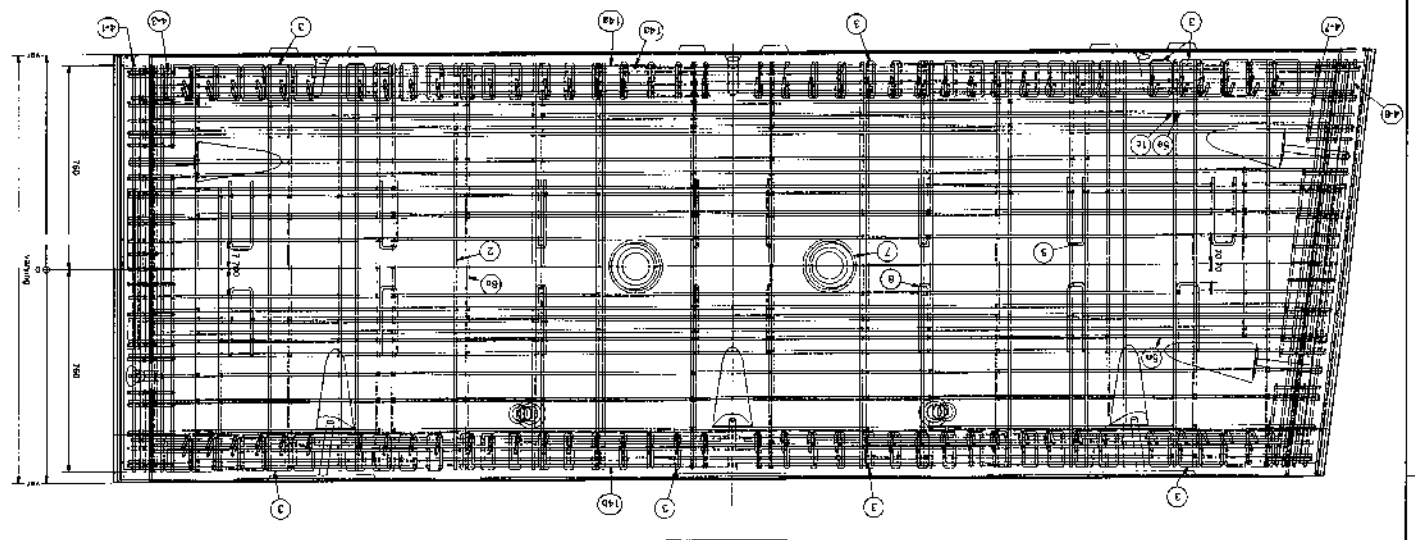
LADDER 4-7



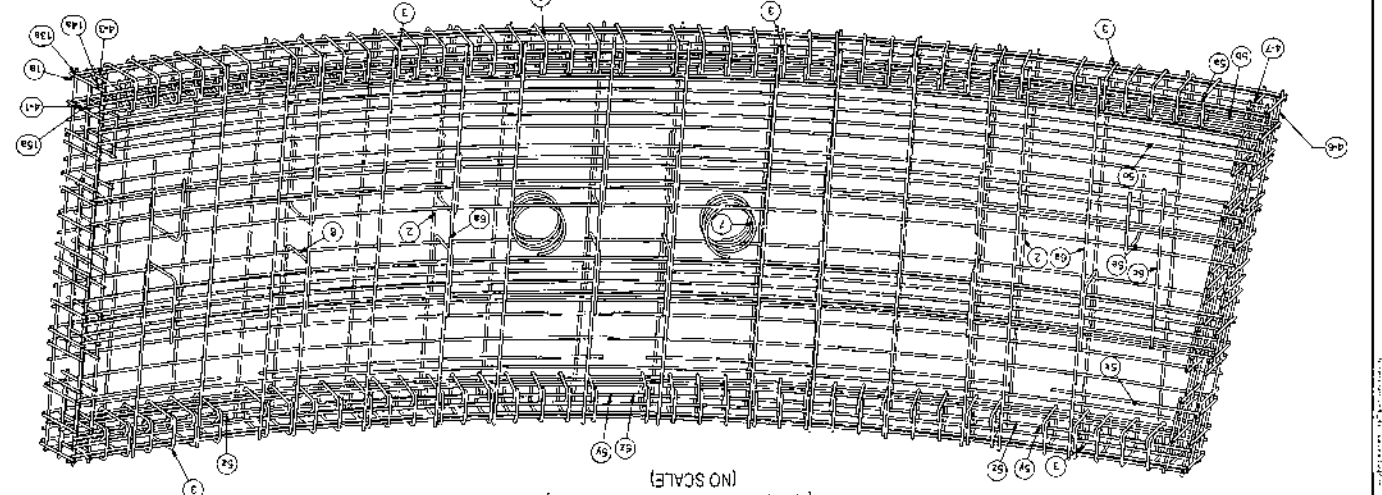
LADDER 4-3



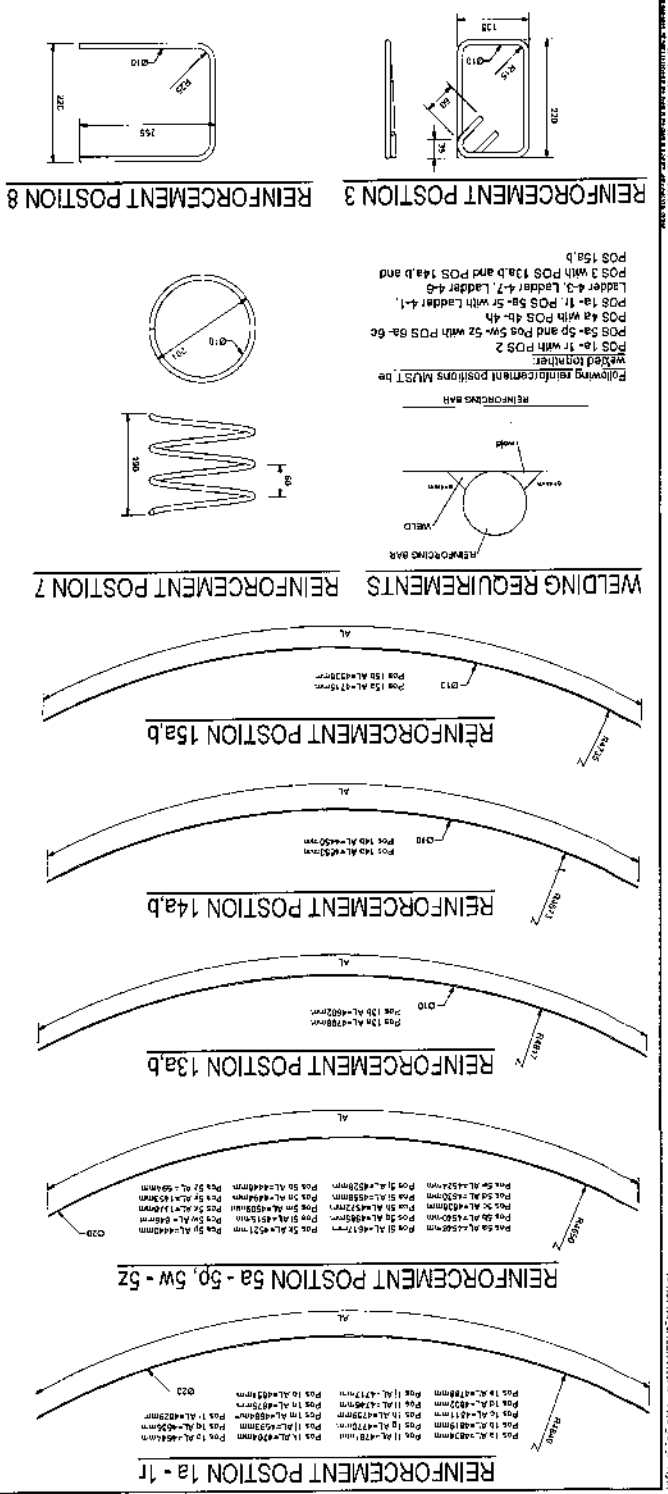
LADDER 4-1



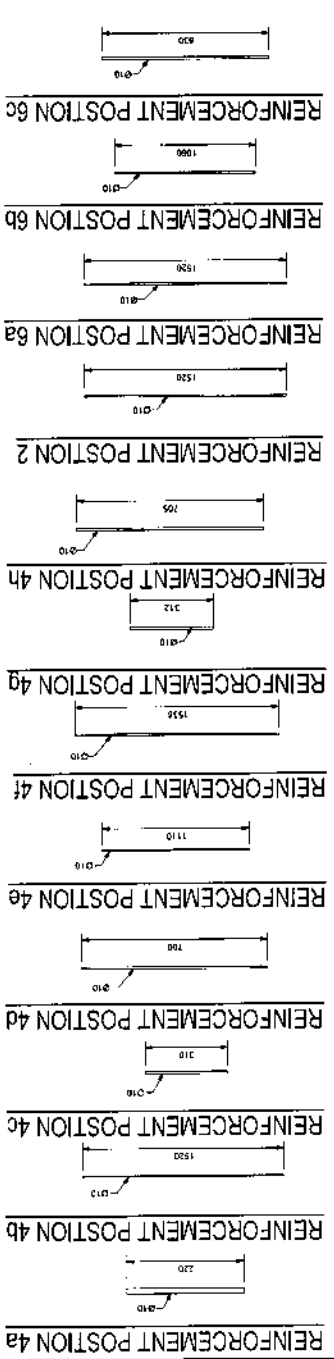
TOP VIEW
 (LINKS NOT SHOWN FOR CLARITY)



3D VIEW
 (LINKS NOT SHOWN FOR CLARITY)
 (NO SCALE)



WELDING REQUIREMENTS
 Following reinforcement positions MUST be welded together:
 POS 1a-1f with POS 2
 POS 5a-5p and POS 5w-5z with POS 6a-6c
 POS 4a with POS 4b-4f
 POS 1a-1f, POS 5a-5p with Ladder 4-1, Ladder 4-2, Ladder 4-3, Ladder 4-4 and POS 14a,b and POS 15a,b



ISSUED FOR CONSTRUCTION

POS	NO.	DI (mm)	LENGTH (m)	TOTAL LENGTH (m)	WEIGHT (kg)
POS 1a	1	20	4.84	4.84	11.92
POS 1b	1	20	4.84	4.84	11.92
POS 1c	1	20	4.84	4.84	11.92
POS 1d	1	20	4.84	4.84	11.92
POS 1e	1	20	4.84	4.84	11.92
POS 1f	1	20	4.84	4.84	11.92
POS 2	1	20	4.84	4.84	11.92
POS 3	1	20	4.84	4.84	11.92
POS 4a	1	20	4.84	4.84	11.92
POS 4b	1	20	4.84	4.84	11.92
POS 4c	1	20	4.84	4.84	11.92
POS 4d	1	20	4.84	4.84	11.92
POS 4e	1	20	4.84	4.84	11.92
POS 4f	1	20	4.84	4.84	11.92
POS 5a	1	20	4.84	4.84	11.92
POS 5b	1	20	4.84	4.84	11.92
POS 5c	1	20	4.84	4.84	11.92
POS 5d	1	20	4.84	4.84	11.92
POS 5e	1	20	4.84	4.84	11.92
POS 5f	1	20	4.84	4.84	11.92
POS 5g	1	20	4.84	4.84	11.92
POS 5h	1	20	4.84	4.84	11.92
POS 5i	1	20	4.84	4.84	11.92
POS 5j	1	20	4.84	4.84	11.92
POS 5k	1	20	4.84	4.84	11.92
POS 5l	1	20	4.84	4.84	11.92
POS 5m	1	20	4.84	4.84	11.92
POS 5n	1	20	4.84	4.84	11.92
POS 5o	1	20	4.84	4.84	11.92
POS 5p	1	20	4.84	4.84	11.92
POS 5q	1	20	4.84	4.84	11.92
POS 5r	1	20	4.84	4.84	11.92
POS 5s	1	20	4.84	4.84	11.92
POS 5t	1	20	4.84	4.84	11.92
POS 5u	1	20	4.84	4.84	11.92
POS 5v	1	20	4.84	4.84	11.92
POS 5w	1	20	4.84	4.84	11.92
POS 5x	1	20	4.84	4.84	11.92
POS 5y	1	20	4.84	4.84	11.92
POS 5z	1	20	4.84	4.84	11.92
POS 6a	1	20	4.84	4.84	11.92
POS 6b	1	20	4.84	4.84	11.92
POS 6c	1	20	4.84	4.84	11.92
POS 7	1	20	4.84	4.84	11.92
POS 8	1	20	4.84	4.84	11.92
POS 15a	1	20	4.84	4.84	11.92
POS 15b	1	20	4.84	4.84	11.92
TOTAL			580.839		18.189

REINFORCEMENT LIST

AFRY
 AFRY BLD PVT. LTD.
 23/02/17
 AFRY 4686.05.412
 0

DESIGNED: OMA
 CHECKED: TAX
 DRAWN: SUT
 SCALE: 1/25
 SHEET: A1

REINFORCEMENT
 TUNNEL LINING PASSING UNDER NH 30
 COUNTER SEGMENT TL-6

PATEL SEW JOINT VENTURE
 SILEEMABAD WATER TUNNEL PROJECT

PROJECT LOCATION: SILEEMABAD WATER TUNNEL PROJECT
 CLIENT: PATEL SEW JOINT VENTURE
 DRAWING NO: TL-6
 DATE: 23/02/17

ISSUED FOR CONSTRUCTION

REINFORCEMENT NOTATION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 2. FOR OTHER NOTES AND REFERENCES REFER DWG. NO. AFRY 4686.05.412.

DR. BAPPADITYA MANNA
 26-08-2021

REINFORCEMENT POSITION 16

REINFORCEMENT LIST

POS	NO.	DI (mm)	LENGTH (m)	TOTAL LENGTH (m)	WEIGHT (kg)
POS 16	1	20	4.84	4.84	11.92
POS 17	1	20	4.84	4.84	11.92
POS 18	1	20	4.84	4.84	11.92
POS 19	1	20	4.84	4.84	11.92
POS 20	1	20	4.84	4.84	11.92
POS 21	1	20	4.84	4.84	11.92
POS 22	1	20	4.84	4.84	11.92
POS 23	1	20	4.84	4.84	11.92
POS 24	1	20	4.84	4.84	11.92
POS 25	1	20	4.84	4.84	11.92
POS 26	1	20	4.84	4.84	11.92
POS 27	1	20	4.84	4.84	11.92
POS 28	1	20	4.84	4.84	11.92
POS 29	1	20	4.84	4.84	11.92
POS 30	1	20	4.84	4.84	11.92
POS 31	1	20	4.84	4.84	11.92
POS 32	1	20	4.84	4.84	11.92
POS 33	1	20	4.84	4.84	11.92
POS 34	1	20	4.84	4.84	11.92
POS 35	1	20	4.84	4.84	11.92
POS 36	1	20	4.84	4.84	11.92
POS 37	1	20	4.84	4.84	11.92
POS 38	1	20	4.84	4.84	11.92
POS 39	1	20	4.84	4.84	11.92
POS 40	1	20	4.84	4.84	11.92
POS 41	1	20	4.84	4.84	11.92
POS 42	1	20	4.84	4.84	11.92
POS 43	1	20	4.84	4.84	11.92
POS 44	1	20	4.84	4.84	11.92
POS 45	1	20	4.84	4.84	11.92
POS 46	1	20	4.84	4.84	11.92
POS 47	1	20	4.84	4.84	11.92
POS 48	1	20	4.84	4.84	11.92
POS 49	1	20	4.84	4.84	11.92
POS 50	1	20	4.84	4.84	11.92
POS 51	1	20	4.84	4.84	11.92
POS 52	1	20	4.84	4.84	11.92
POS 53	1	20	4.84	4.84	11.92
POS 54	1	20	4.84	4.84	11.92
POS 55	1	20	4.84	4.84	11.92
POS 56	1	20	4.84	4.84	11.92
POS 57	1	20	4.84	4.84	11.92
POS 58	1	20	4.84	4.84	11.92
POS 59	1	20	4.84	4.84	11.92
POS 60	1	20	4.84	4.84	11.92
POS 61	1	20	4.84	4.84	11.92
POS 62	1	20	4.84	4.84	11.92
POS 63	1	20	4.84	4.84	11.92
POS 64	1	20	4.84	4.84	11.92
POS 65	1	20	4.84	4.84	11.92
POS 66	1	20	4.84	4.84	11.92
POS 67	1	20	4.84	4.84	11.92
POS 68	1	20	4.84	4.84	11.92
POS 69	1	20	4.84	4.84	11.92
POS 70	1	20	4.84	4.84	11.92
POS 71	1	20	4.84	4.84	11.92
POS 72	1	20	4.84	4.84	11.92
POS 73	1	20	4.84	4.84	11.92
POS 74	1	20	4.84	4.84	11.92
POS 75	1	20	4.84	4.84	11.92
POS 76	1	20	4.84	4.84	11.92
POS 77	1	20	4.84	4.84	11.92
POS 78	1	20	4.84	4.84	11.92
POS 79	1	20	4.84	4.84	11.92
POS 80	1	20	4.84	4.84	11.92
POS 81	1	20	4.84	4.84	11.92
POS 82	1	20	4.84	4.84	11.92
POS 83	1	20	4.84	4.84	11.92
POS 84	1	20	4.84	4.84	11.92
POS 85	1	20	4.84	4.84	11.92
POS 86	1	20	4.84	4.84	11.92
POS 87	1	20	4.84	4.84	11.92
POS 88	1	20	4.84	4.84	11.92
POS 89	1	20	4.84	4.84	11.92
POS 90	1	20	4.84	4.84	11.92
POS 91	1	20	4.84	4.84	11.92
POS 92	1	20	4.84	4.84	11.92
POS 93	1	20	4.84	4.84	11.92
POS 94	1	20	4.84	4.84	11.92
POS 95	1	20	4.84	4.84	11.92
POS 96	1	20	4.84	4.84	11.92
POS 97	1	20	4.84	4.84	11.92
POS 98	1	20	4.84	4.84	11.92
POS 99	1	20	4.84	4.84	11.92
POS 100	1	20	4.84	4.84	11.92



ISSUED FOR CONSTRUCTION

Dr. Bappaditya Mananna
 Professor
 Department of Civil Engineering
 Indian Institute of Technology
 (IIT) Kharagpur, Kharagpur-721302 (India)
 25-08-2023

REV. NO.	DATE	DESCRIPTION
0	25/08/23	ISSUED FOR CONSTRUCTION

APPRY.4686.05.413

PROJECT: STEENABAD WATER TUNNEL PROJECT
 CLIENT: PATELSEW JAWNT VENTURE

KEY SEGMENT K-7
 TUNNEL LINING PASSING UNDER NH 30
 REINFORCEMENT

SCALE: 1:100 (SECTION 1-1 & 2-2) (SHEET 1 OF 3)

IMPORTANT NOTES:

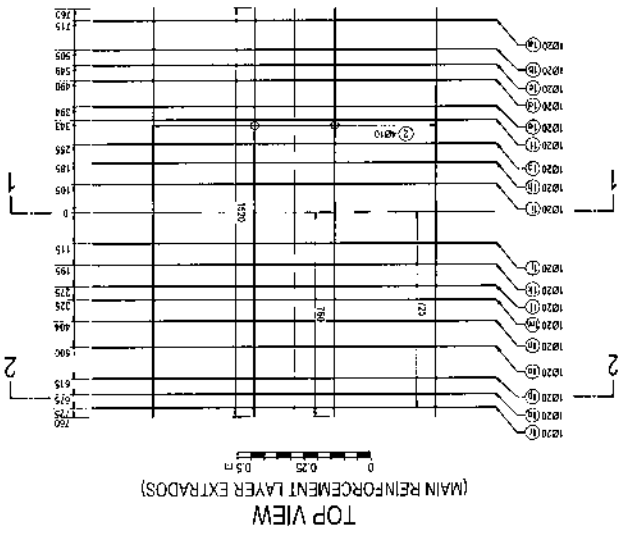
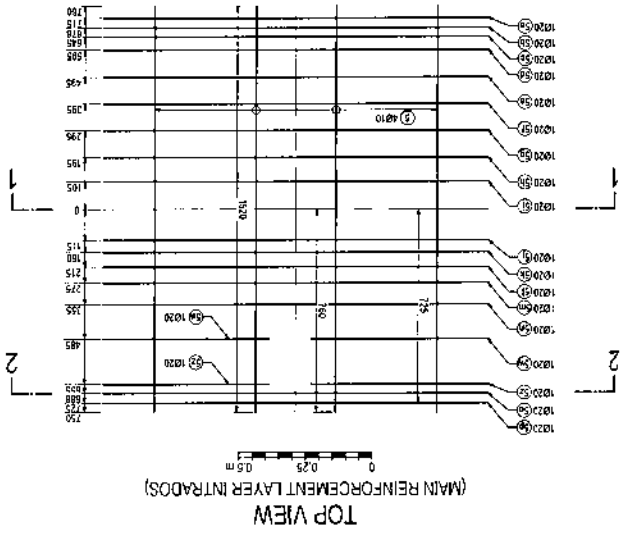
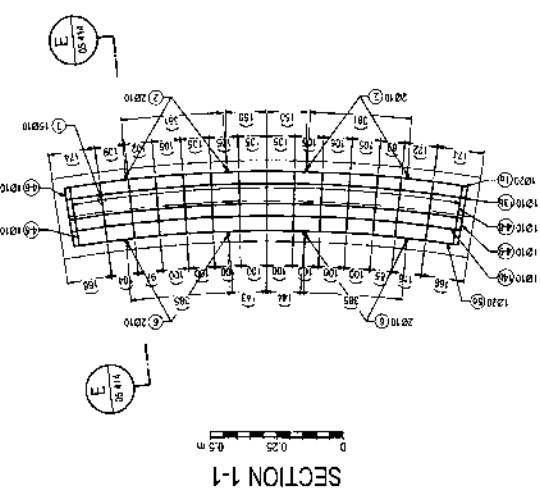
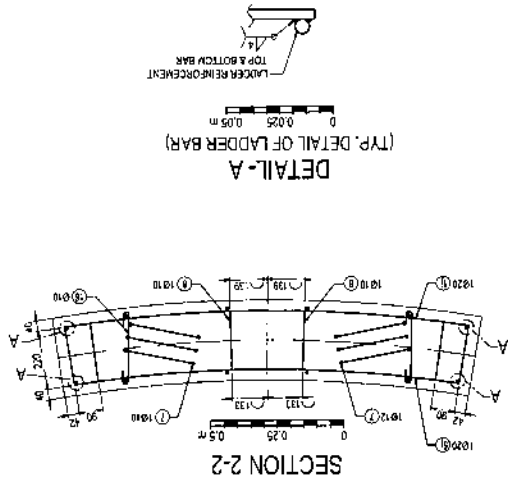
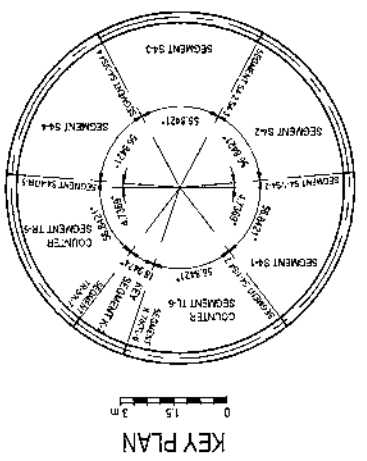
- THIS DRAWING IS APPLICABLE FROM CHANGING 111525 (R/S OF NH30) TO CHANGING 111800 (R/S OF NH30) OF THE TUNNEL.
- DURING EXECUTION OF TUNNEL BENEATH THE HIGHWAY & ONE NORTH THEREAFTER, REAL TIME MONITORING OF DEFORMATION SHALL BE KEPT ON EACH SIDE OF THE ROAD. DEFORMATION MEASUREMENTS SHALL BE KEPT ON EACH SIDE OF THE ROAD. DEFORMATION SHALL BE RESTORED TO ORIGINAL POSITION IF OBSERVED DEFORMATION IS MORE THAN 10MM. IF REQUIRED ADEQUATE CAUTION MEASURES AND ENGINEER'S CHANGE SHALL BE TAKEN INTO ACCOUNT. VARIOUS DEFORMATION MEASUREMENTS SHALL BE TAKEN AT REGULAR INTERVALS.
- DEFORMATION IS MORE THAN 10MM.

NOTES:

- REINFORCEMENT NOTATION
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
- CONCRETE SHALL BE OF GRADE M30 COMPILING TO IS 456:2000.
- REINFORCEMENT SHALL BE OF GRADE E250 COMPILING TO IS 1786.
- ALL OTHER NOTES ARE TYPED IN CAPITALS GOOD FOR CONSTRUCTION DRAWING. SEE REFERENCE DRAWING(S) SHALL BE VALID FOR THIS DRAWING.

S.NO.	DWG. NO.	DRAWING NAME
01	APR010010	SEGMENT 9A-1, 9A-2, 9A-3, 9A-4 REINFORCEMENT
02	APR010010	SEGMENT 7A
03	APR010010	SEGMENT 7B
04	APR010010	SEGMENT 7C
05	APR010010	PRECAST CONCRETE LINING
06	APR010010	PRECAST CONCRETE LINING
07	APR010010	PRECAST CONCRETE LINING
08	APR010010	PRECAST CONCRETE LINING

REFERENCE DRAWINGS:





ISSUED FOR CONSTRUCTION

REV. NO.	0
DATE	25.08.22
APPROVED BY	APRY, 4686,05,414
DESIGNED BY	
CHECKED BY	
DATE	
FORM NO.	41
SCALE	1:10
FORM	41

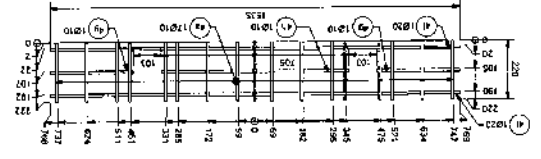
AFRY
 3D VIEW & SECTIONS (SHEET 2 OF 3)
 TUNNEL LINING PASSING UNDER NH 30
 KEY SEGMENT K-7
 REINFORCEMENT

STEEWARD WATER TUNNEL PROJECT
 PATEL-SEW JOINT VENTURE

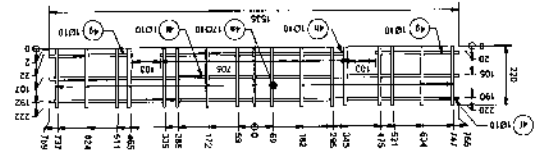
PROJECT LOCATION: STEWARD WATER TUNNEL PROJECT
 PROJECT NO: 4686,05,414
 DRAWING NO: 41
 SCALE: 1:10
 DATE: 25.08.22

1. REINFORCEMENT NOTATION
 2. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE
 3. FOR OTHER NOTES AND REFERENCES REFER DWS, MCL, ARMY, 4686,05,414

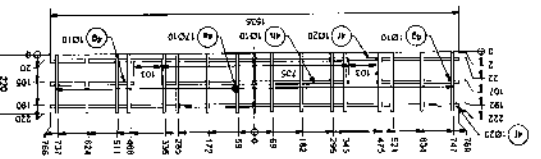
Dr. Bappaditya Bhandari
 Professor
 Department of Civil Engineering
 Indian Institute of Technology Delhi
 New Delhi-110016 (India)
 26-08-2022



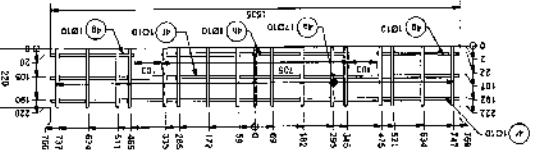
LADDER 4-9



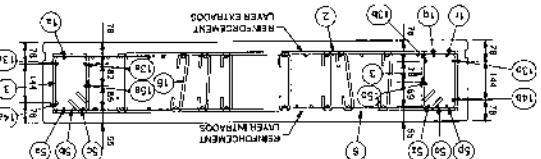
LADDER 4-8



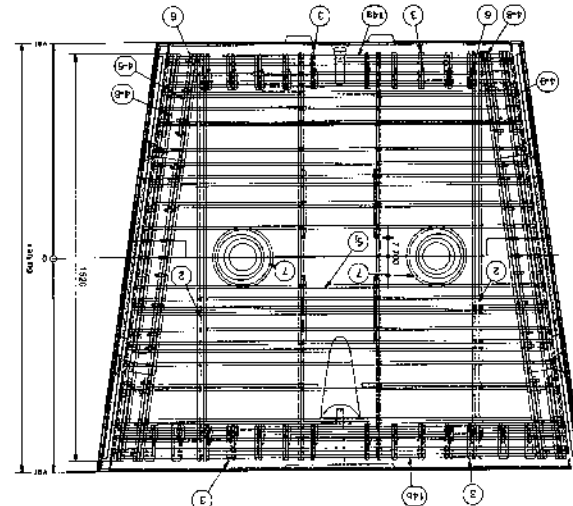
LADDER 4-6



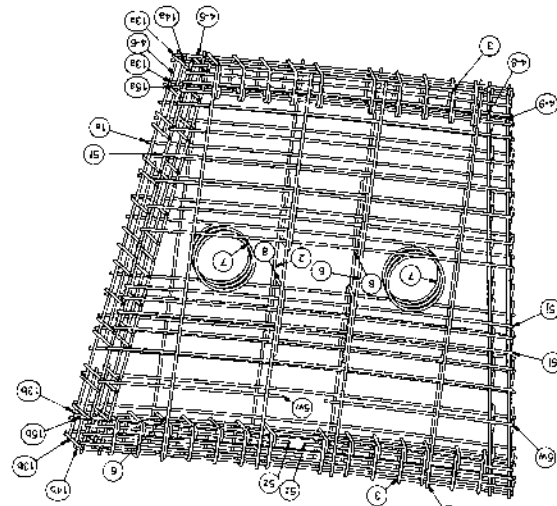
LADDER 4-5



SECTION E-E



TOP VIEW
 (LINKS NOT SHOWN FOR CLARITY)



3D VIEW
 (LINKS NOT SHOWN FOR CLARITY)
 (NO SCALE)



Assistant Engineer (F-13)
N.D. Division No. 5
KATNI (M.P.)

Executive Engineer
N.D. Division No. 5, Katni

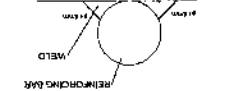
Chief Engineer,
Upper Narunda Zone,
Subapur, (M.P.)

Min. cube strength (N/mm ²)	50
Max. grain size (mm)	32
Concrete cover (mm)	40
Specimen Volume (m ³)	0.25
Reinforcement quality (IS: 4500)	IS: 1786
Min. bond strength (N/mm ²)	500
Minimum bond length (mm)	15
Reinforcement weight (kg)	184.243
Reinforcement weight (kg)	184.243
Reinforcement weight (kg)	184.243

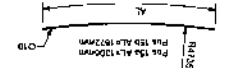
Pos 13a,b
Pos 3 with Pos 13a,b, Pos 14a,b and
4-8, Ladder 4-9
with Ladder 4-5, Ladder 4-6, Ladder
POS 1a-1i and POS 5a-5i, SW 5z
POS 4a with POS 4i-4h

POS 5a-5i, SW 5z with POS 2
POS 1a-1i, 1j with POS 2
LIST DE WELDED TOGETHER

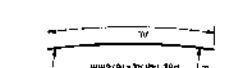
Following reinforcement positions
REINFORCEMENT DATA



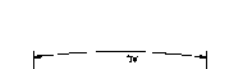
WELDING REQUIREMENTS



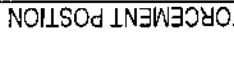
REINFORCEMENT POSITION 13a,b



REINFORCEMENT POSITION 14a,b



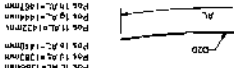
REINFORCEMENT POSITION 13a,b



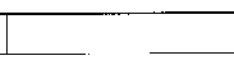
REINFORCEMENT POSITION 5a-5i, SW 5z



REINFORCEMENT POSITION 1a-1i



REINFORCEMENT POSITION 2



REINFORCEMENT POSITION 3



REINFORCEMENT POSITION 4



REINFORCEMENT POSITION 4a

REINFORCEMENT POSITION 4b

REINFORCEMENT POSITION 5

REINFORCEMENT POSITION 5a

REINFORCEMENT POSITION 5b

REINFORCEMENT POSITION 5c

REINFORCEMENT POSITION 5d

REINFORCEMENT POSITION 5e

REINFORCEMENT POSITION 5f

REINFORCEMENT POSITION 5g

REINFORCEMENT POSITION 5h

REINFORCEMENT POSITION 5i

REINFORCEMENT POSITION 5j

REINFORCEMENT POSITION 5k

REINFORCEMENT POSITION 5l

REINFORCEMENT POSITION 5m

REINFORCEMENT POSITION 5n

REINFORCEMENT POSITION 5o

REINFORCEMENT POSITION 5p

REINFORCEMENT POSITION 5q

REINFORCEMENT POSITION 5r

REINFORCEMENT POSITION 5s

REINFORCEMENT POSITION 5t

REINFORCEMENT POSITION 5u

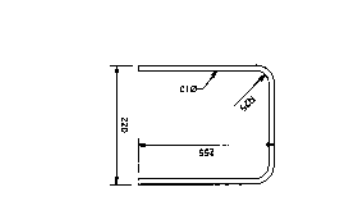
REINFORCEMENT POSITION 5v

REINFORCEMENT POSITION 5w

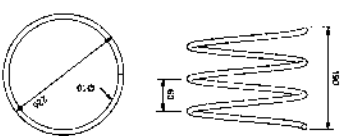
REINFORCEMENT POSITION 5x

REINFORCEMENT POSITION 5y

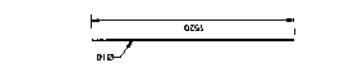
REINFORCEMENT POSITION 5z



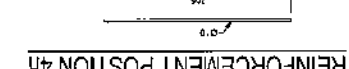
REINFORCEMENT POSITION 8



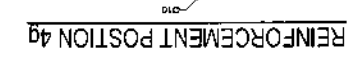
REINFORCEMENT POSITION 7



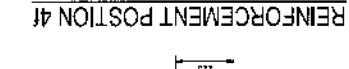
REINFORCEMENT POSITION 6



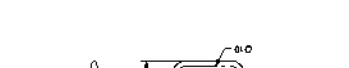
REINFORCEMENT POSITION 4



REINFORCEMENT POSITION 4a



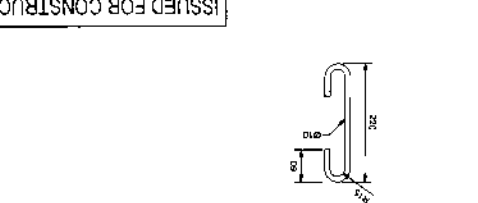
REINFORCEMENT POSITION 4b



REINFORCEMENT POSITION 3



REINFORCEMENT POSITION 2



REINFORCEMENT POSITION 18

POS	NO.	DA (mm)	LENGTH (m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
POS 1a	1	20	1.350	1.350	3.220
POS 1b	1	20	1.350	1.350	3.220
POS 1c	1	20	1.350	1.350	3.220
POS 1d	1	20	1.350	1.350	3.220
POS 1e	1	20	1.350	1.350	3.220
POS 1f	1	20	1.350	1.350	3.220
POS 1g	1	20	1.350	1.350	3.220
POS 1h	1	20	1.350	1.350	3.220
POS 1i	1	20	1.350	1.350	3.220
POS 1j	1	20	1.350	1.350	3.220
POS 1k	1	20	1.350	1.350	3.220
POS 1l	1	20	1.350	1.350	3.220
POS 1m	1	20	1.350	1.350	3.220
POS 1n	1	20	1.350	1.350	3.220
POS 1o	1	20	1.350	1.350	3.220
POS 1p	1	20	1.350	1.350	3.220
POS 1q	1	20	1.350	1.350	3.220
POS 1r	1	20	1.350	1.350	3.220
POS 1s	1	20	1.350	1.350	3.220
POS 1t	1	20	1.350	1.350	3.220
POS 1u	1	20	1.350	1.350	3.220
POS 1v	1	20	1.350	1.350	3.220
POS 1w	1	20	1.350	1.350	3.220
POS 1x	1	20	1.350	1.350	3.220
POS 1y	1	20	1.350	1.350	3.220
POS 1z	1	20	1.350	1.350	3.220
POS 2	1	20	1.520	1.520	3.487
POS 3	1	20	1.410	1.410	3.410
POS 4	1	20	1.250	1.250	3.090
POS 5	1	20	1.250	1.250	3.090
POS 6	1	20	1.250	1.250	3.090
POS 7	1	20	1.250	1.250	3.090
POS 8	1	20	1.250	1.250	3.090
POS 9	1	20	1.250	1.250	3.090
POS 10	1	20	1.250	1.250	3.090
POS 11	1	20	1.250	1.250	3.090
POS 12	1	20	1.250	1.250	3.090
POS 13	1	20	1.250	1.250	3.090
POS 14	1	20	1.250	1.250	3.090
POS 15	1	20	1.250	1.250	3.090
POS 16	1	20	1.250	1.250	3.090
POS 17	1	20	1.250	1.250	3.090
POS 18	1	20	1.250	1.250	3.090
POS 19	1	20	1.250	1.250	3.090
POS 20	1	20	1.250	1.250	3.090
POS 21	1	20	1.250	1.250	3.090
POS 22	1	20	1.250	1.250	3.090
POS 23	1	20	1.250	1.250	3.090
POS 24	1	20	1.250	1.250	3.090
POS 25	1	20	1.250	1.250	3.090
POS 26	1	20	1.250	1.250	3.090
POS 27	1	20	1.250	1.250	3.090
POS 28	1	20	1.250	1.250	3.090
POS 29	1	20	1.250	1.250	3.090
POS 30	1	20	1.250	1.250	3.090
POS 31	1	20	1.250	1.250	3.090
POS 32	1	20	1.250	1.250	3.090
POS 33	1	20	1.250	1.250	3.090
POS 34	1	20	1.250	1.250	3.090
POS 35	1	20	1.250	1.250	3.090
POS 36	1	20	1.250	1.250	3.090
POS 37	1	20	1.250	1.250	3.090
POS 38	1	20	1.250	1.250	3.090
POS 39	1	20	1.250	1.250	3.090
POS 40	1	20	1.250	1.250	3.090
POS 41	1	20	1.250	1.250	3.090
POS 42	1	20	1.250	1.250	3.090
POS 43	1	20	1.250	1.250	3.090
POS 44	1	20	1.250	1.250	3.090
POS 45	1	20	1.250	1.250	3.090
POS 46	1	20	1.250	1.250	3.090
POS 47	1	20	1.250	1.250	3.090
POS 48	1	20	1.250	1.250	3.090
POS 49	1	20	1.250	1.250	3.090
POS 50	1	20	1.250	1.250	3.090
POS 51	1	20	1.250	1.250	3.090
POS 52	1	20	1.250	1.250	3.090
POS 53	1	20	1.250	1.250	3.090
POS 54	1	20	1.250	1.250	3.090
POS 55	1	20	1.250	1.250	3.090
POS 56	1	20	1.250	1.250	3.090
POS 57	1	20	1.250	1.250	3.090
POS 58	1	20	1.250	1.250	3.090
POS 59	1	20	1.250	1.250	3.090
POS 60	1	20	1.250	1.250	3.090
POS 61	1	20	1.250	1.250	3.090
POS 62	1	20	1.250	1.250	3.090
POS 63	1	20	1.250	1.250	3.090
POS 64	1	20	1.250	1.250	3.090
POS 65	1	20	1.250	1.250	3.090
POS 66	1	20	1.250	1.250	3.090
POS 67	1	20	1.250	1.250	3.090
POS 68	1	20	1.250	1.250	3.090
POS 69	1	20	1.250	1.250	3.090
POS 70	1	20	1.250	1.250	3.090
POS 71	1	20	1.250	1.250	3.090
POS 72	1	20	1.250	1.250	3.090
POS 73	1	20	1.250	1.250	3.090
POS 74	1	20	1.250	1.250	3.090
POS 75	1	20	1.250	1.250	3.090
POS 76	1	20	1.250	1.250	3.090
POS 77	1	20	1.250	1.250	3.090
POS 78	1	20	1.250	1.250	3.090
POS 79	1	20	1.250	1.250	3.090
POS 80	1	20	1.250	1.250	3.090
POS 81	1	20	1.250	1.250	3.090
POS 82	1	20	1.250	1.250	3.090
POS 83	1	20	1.250	1.250	3.090
POS 84	1	20	1.250	1.250	3.090
POS 85	1	20	1.250	1.250	3.090
POS 86	1	20	1.250	1.250	3.090
POS 87	1	20	1.250</		

GL 413.400M

GL 413.456M

GL 413.462M

JABALPUR

ROAD OGL LEVEL 413.456M

KATNI

ROAD TOP LEVEL 419.700M

18.0370

18.03M
OVERBURDEN
AT NH
-30BAYPASS
CROSSING

9.200
8.200

TUNNEL
CC
LINING-0.300M
THICK

EXCAVATION LEVEL 395.425

FSL 393.955

CROWN LEVEL 394.955

9.200
8.1991

SECTION AT-AA

CBL 385.755

SECTION AT-BB

CBL 385.755

