Bid Documents
For

DESIGN, MANUFACTURING, SUPPLY, TESTING, COMMISSIONING AND TRAINING OF PLANT AND EQUIPMENT FOR RAILWAY TRACK AND ELECTRIC OVER HEAD EQUIPMENT (OHE) ON DADRI-REWARI-JNPT NETWORK OF WDFC

PLANT AND EQUIPMENT WORKS
Package – 6

Issued on: 1st Dec. 2017

ICB No. PE P-6

VOLUME III
Attachments and Reference Technical Specifications

Employer:
Dedicated Freight Corridor Corporation of India Limited
(A Government of India Enterprise)
NK Consortium
NK – JARTS – PBJ – NKI
Consulting Engineers

Ministry of Railways
Government of India

BID Documents
FOR

PLANT AND EQUIPMENT WORKS

ICB No. PE P-6

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2	Ballast Regulating Machine for BG (1676mm Gauge)	Specification No. 2
3	Shoulder Ballast Cleaning Machine	Specification No. 3
4	Heavy Duty on Track Tampers for Tamping Plain Track and Points & Crossing for BG (1676 mm Gauge)	Specification No. 4
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ATTACHMENT-1

(Technical Parameters for the WDFC Project)

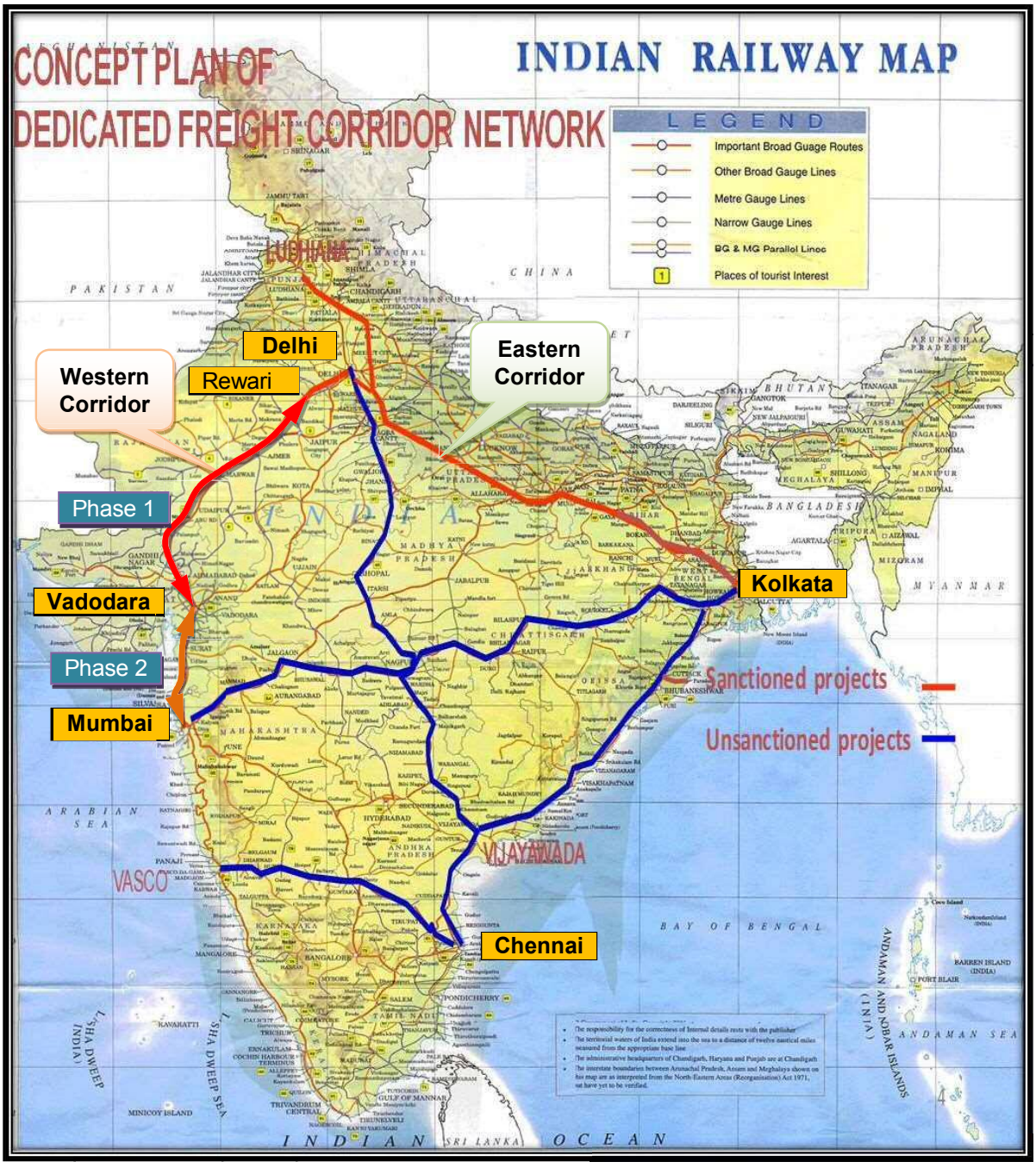


Figure Error! No text of specified style in document.**-1 Dedicated Freight Corridor Network**

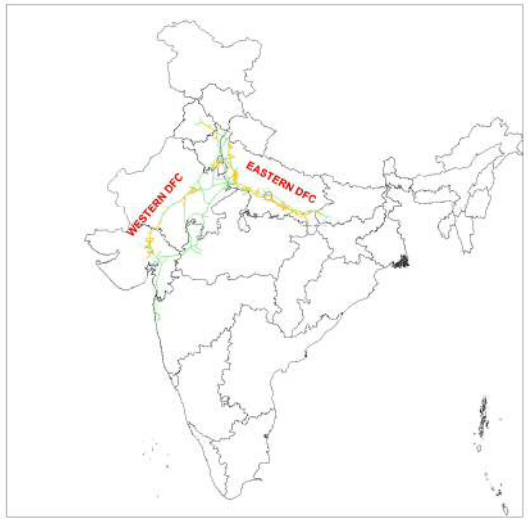
1.1.1 Technical Parameters for WDFC Project

Technical Parameters for the WDFC Project (Phase-1&2) are presented in Table Error**! No text of specified style in document.**-1.

Table Error! No text of specified style in document.**-1 Technical Parameters for the WDFC Project**

Items	Scope	
Railway Construction	**Phase-1**	**Phase-2**
- Section	Vadodara – Rewari	JNPT-Vadodara & Rewari - Dadri
- Route Length (Detour Route Length)	Approx. 914 Km (Approx. 187 Km)	Approx. 546 Km (Approx. 245 Km)
- At Grade	868.938 Km	518.430 Km
- Under Ground	0 Km	1.75 Km
- Bridges (exclude ROB)	21.138 Km	13.876 Km
- ROB(Re-construction)	2 nos.	7 nos.
- ROB(New)	8 nos.	18 nos.
- RUB	618 nos.	355 nos.
Gradient		
- Ruling gradient	1 in 200 (5/1000)	
- Steepest gradient in yards	1 in 600 (1.667/1000) 1 in 400 (2.5/1000) exceptional case	
Standards of construction		
- Gauge	1,676 mm	
- Rails	Zu 1-60, 1080 HH Rail, 1 in 12 curved thick web switches with weldable CMS Crossings on PSC Sleepers layout	
- Sleepers	PSC Mono-block, 60Kg with 1 in 20 cant for the rail seat (The rail seat of PSC Sleeper will be able to cater to 68Kg/m and 60 Kg/m rail sections by providing suitable liners.)	
- Points & crossings	60 kg rails, 1 in 12 with thick switches and weldable CMS crossings on PSC fan shaped sleepers Minor loop lines and non-running lines, 1 in 8½ turnout	
- Ballast	350 mm cushion	
- Maximum operating speed	100 km/h	
- Type of traffic and axle load	Double stack container movement on wagon and 5800 tonne train hauling with 32.5 tonne axle load	
Formation (Detour Route)		
- Bank width for double line	13.5 m	
- Slope of embankment	2H: 1V	
- Cutting width for double line	12.9 m	
- Slope of cutting	1:1	
- Blanketing	0.60 m depth	
- Prepared Subgrade	SQ2 soil CBR ≥ 8 0.6m depth or in exceptional cases SQ2 soil CBR ≥ 5 but less than 8 1 m depth	
Curves		
- Maximum degree of curvature	2.5 degree curve (700 m radius)	
- Curve compensation	At the rate of 0.04 % per degree of curvature	
Moving dimensions		
- Vertical MMD	As per latest policy issued by MOR vide letter No.2000/PL19/13Pt.4 dated 3.6.09, Double Stack container is to run on Wagon. MMD being fixed as per this provision.	
Vertical SOD		

Items	Scope	
- Vertical SOD	As per latest policy issued by MOR vide letter No.2000/PL19/13Pt.4 dated 3.6.09, Double Stack container is to run on Wagon. SOD being fixed as per this provision.	
Track centres (Minimum)		
Between two tracks of DFC	6.0 m	
Between existing track and DFC	Recommended 7.0 m, in exceptional cases 6.0 m	
Bridges (Including RUBs, Subways, etc.)		
- Standard of loading	32.5 tonne axle load, 12 tonne/m trailing load	
Total linear water way of **important bridges (Number)**	5714 m (18 bridges)	3427 m (5 bridges)
Total linear water way of **major bridges (Number)**	7258.85 m (203 bridges)	3808 m (72 bridges)
Total linear water way of **Minor Bridges (Number)**	5206.46 m (1223 bridges)	3370.09 m (698 bridges)
Road crossings		
Total nos. of Semi-Automatic Railway Crossing	250 (On parallel section, these would be manned with Track Circuiting instead of Automatic)	
Rail flyover		
- Total nos. of rail flyover	21 (Including flyovers at Jn. stations)	10 (Including flyovers at Jn. stations)
Stations		
- Junction stations	10 stations	15 stations
- Crossing stations	21 stations	12 stations
Signaling System		
- Control System	Computerized operation control systems	
- Traffic Control Center	1	
- Type of signaling	Automatic signaling using AF track circuit/Digital Axle Counter	
- Type of Train Protection System	ETCS Level1 or ATS-P (to be decided by IR)	
- Section length on double line	2 km between signals	
- Telecommunication system	GSM-R system	
Train Traction System		
- Electrification system	2 x 25 kV AC	
- Type of feeding system	AT feeding system (2 x 25kV)	
- Substation spanning	60km	
- Total nos. of Substation	16	
ICD/Depot/Maintenance Construction		
- Inland container depot (out of scope)	IR has approved for conducting feasibility study for Logistic Park at Rewari and Ahmedabad by DFCC	
- Locomotive maintenance depot (out of scope)	1 location (to be decided by IR)	
Rolling Stock		
- Operation Type	Asstt. Driver and Driver without Guard and with provision of Last Vehicle Check Device (LVCD)	
- Maximum speed	100 km/h	
- Power	9,000Hp (6 axles locomotive) (To be confirmed by IR)	
- Total nos. of electric locomotive (8 axles/ 6axles locomotive)	150 (To be confirmed by IR)	
- Train length	750 m extendable to 1500 m in future	



PHASE- 2
PACKAGE-1
284km
128km
PACKAGE-14
PHASE -1
PACKAGE-2
341km
PACKAGE-3(R)
289km
DELHI
REWARI
DADRI
AJMER
PACKAGE 15C
3 BRIDGES
PALANPUR
PACKAGE 3A(R)
1 BRIDGE
AHMEDABAD
PACKAGE 3A(R)
1 BRIDGE
PHASE-2
PACKAGE-12
PACKAGE-13
134km
186km
VADODARA
MAKARPURA
SACHIN
PACKAGE 15B
2 BRIDGES
102km
PACKAGE-11
VAITARANA
PACKAGE 15A
8 BRIDGES
JNPT

LEGEND

NK CONSORTIUM

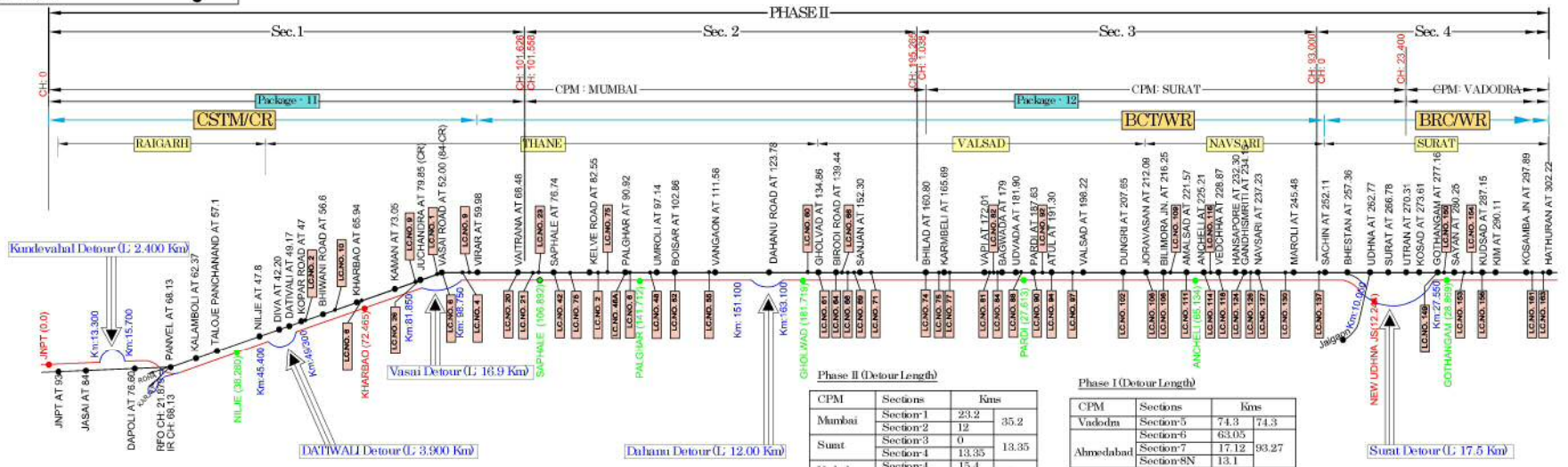
Project Title : Dedicated Freight Corridor Project (Western Corridor Phase-2: Dadri - Rewari & Vadodara - JNPT Section)	Client : Dedicated Freight Corridor Corporation of India 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001. INDIA	Drawing Title : GENERAL MAP OF WDFC	Drawing Number : Scale : Reference : Drawn By : / Checked By : / Approved By :	Consultant : NK Consortium 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001. INDIA

WESTERN DEDICATED FREIGHT CORRIDOR (1/2)

(PHASE 1 & 2)

LEGEND

- IR TRACK
- DFC ALIGNMENT (PARALLEL)
- DFC ALIGNMENT (DETOUR)
- JUNCTION STATIONS
- X-ING STATIONS
- IR STATIONS



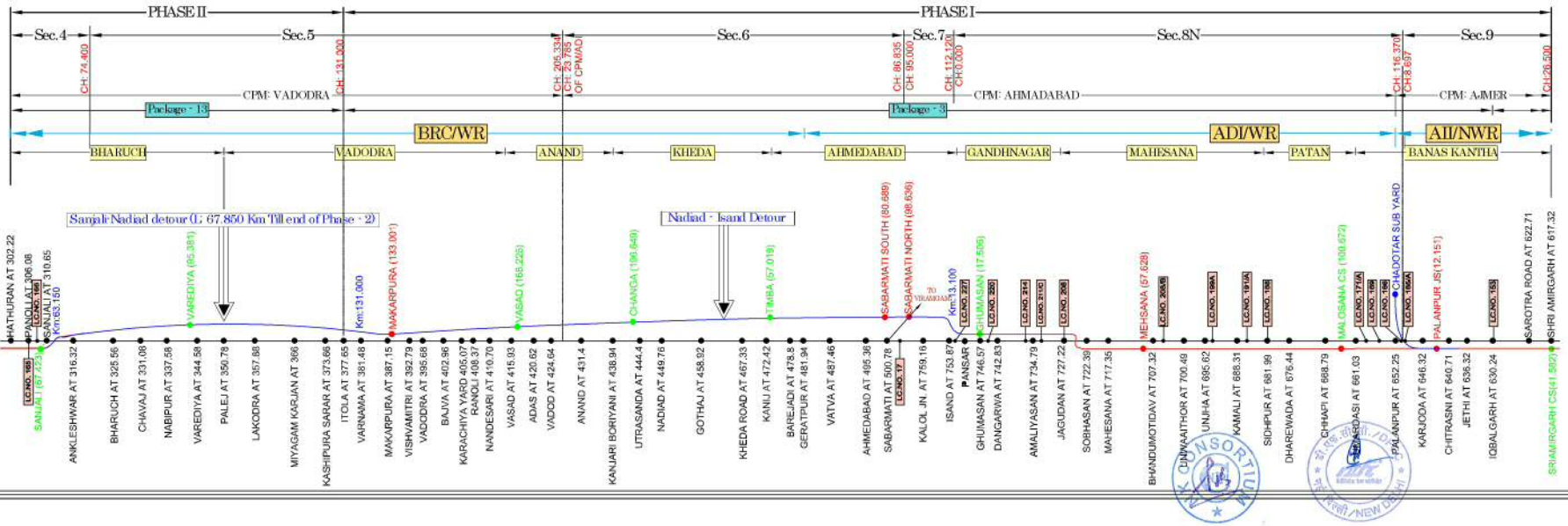
Phase II (Detour Length)

CPM	Sections	Kms	
Mumbai	Section-1	23.2	35.2
	Section-2	12	
Surat	Section-3	0	13.35
	Section-4	13.35	
Vadodra	Section-4	15.4	72
	Section-5	56.6	
Rewari-Dadri	Section-15RD	68	124.3
	Section-16	56.3	
	Total	244.85	

Phase I (Detour Length)

CPM	Sections	Kms	
Vadodra	Section-5	74.3	74.3
Ahmedabad	Section-6	63.05	93.27
	Section-7	17.12	
	Section-8N	13.1	
Ajmer	Section-9	0	0
	Section-10-12	0	
Jaipur	Section-12	0	7.1
	Section-13	7.1	
	Section-14-15	0	
Rewari-Dadri	Section-15RD	9.4	9.4
	Total	184.07	

Total 244.85+184.07= 428.92Km

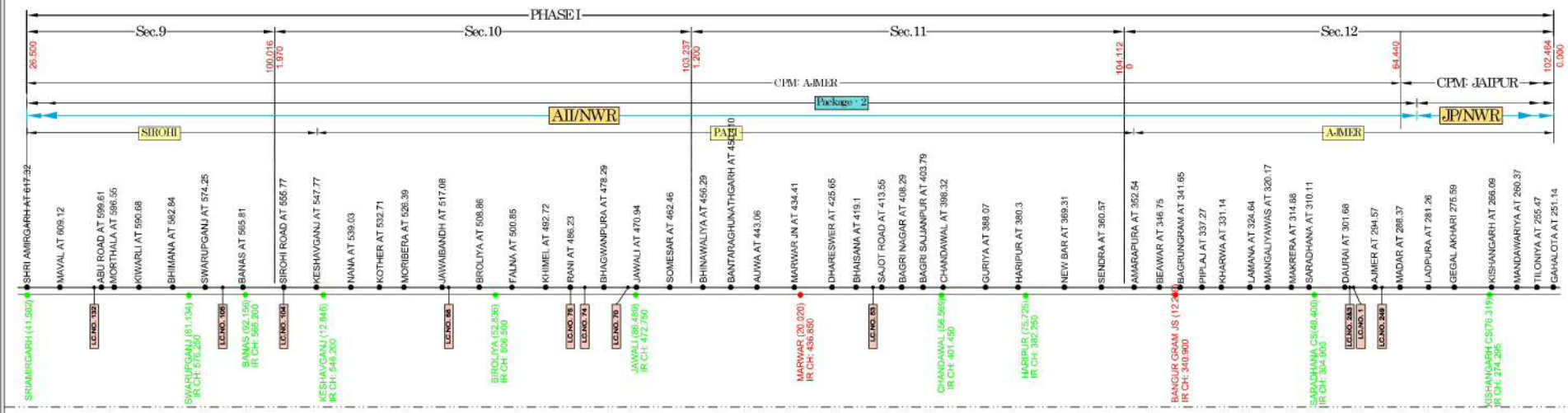


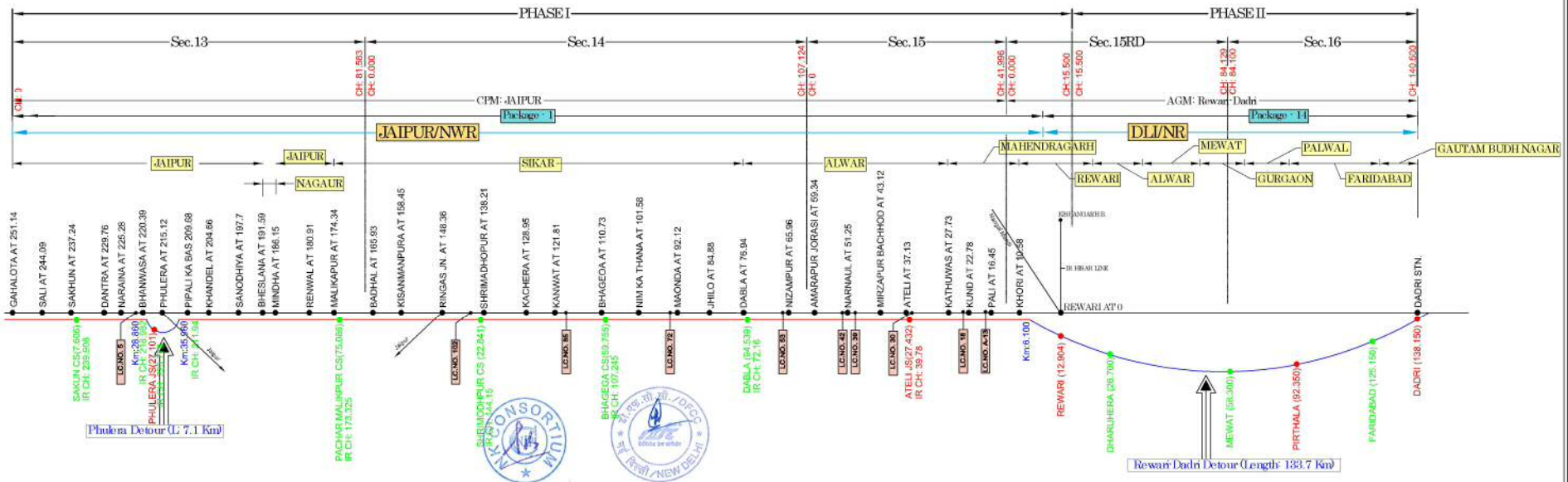
WESTERN DEDICATED FREIGHT CORRIDOR (2/2)

(PHASE 1 & 2)

LEGEND

- IR TRACK
- DFC ALIGNMENT (PARALLEL)
- DFC ALIGNMENT (DETOUR)
- JUNCTION STATIONS
- X-ING STATIONS
- IR STATIONS



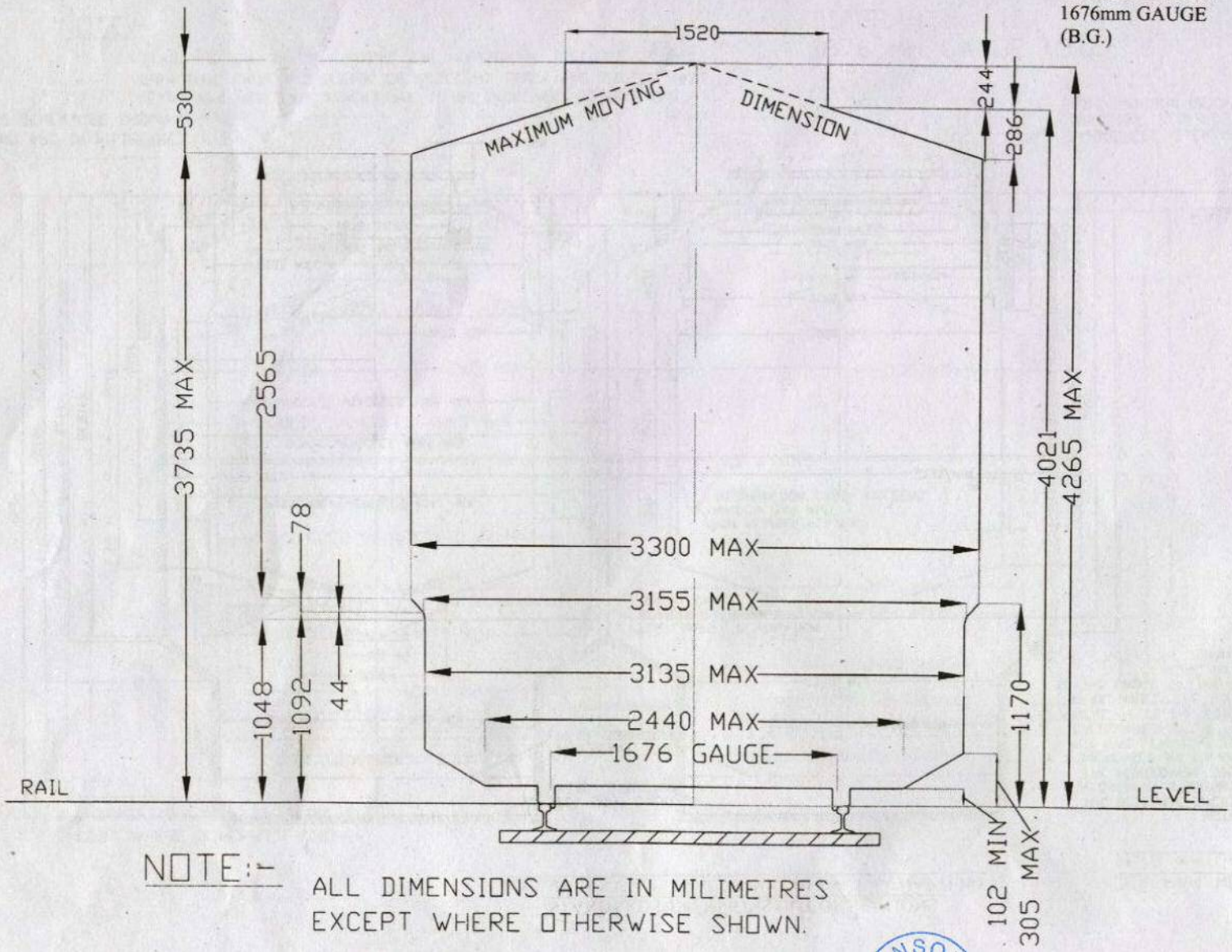


ATTACHMENT-2

(Maximum Moving Dimensions of IR and WDFC)

MAXIMUM MOVING DIMENSIONS OF THE PROFILE PROPOSED FOR REVISED SCHEDULE OF DIMENSIONS.

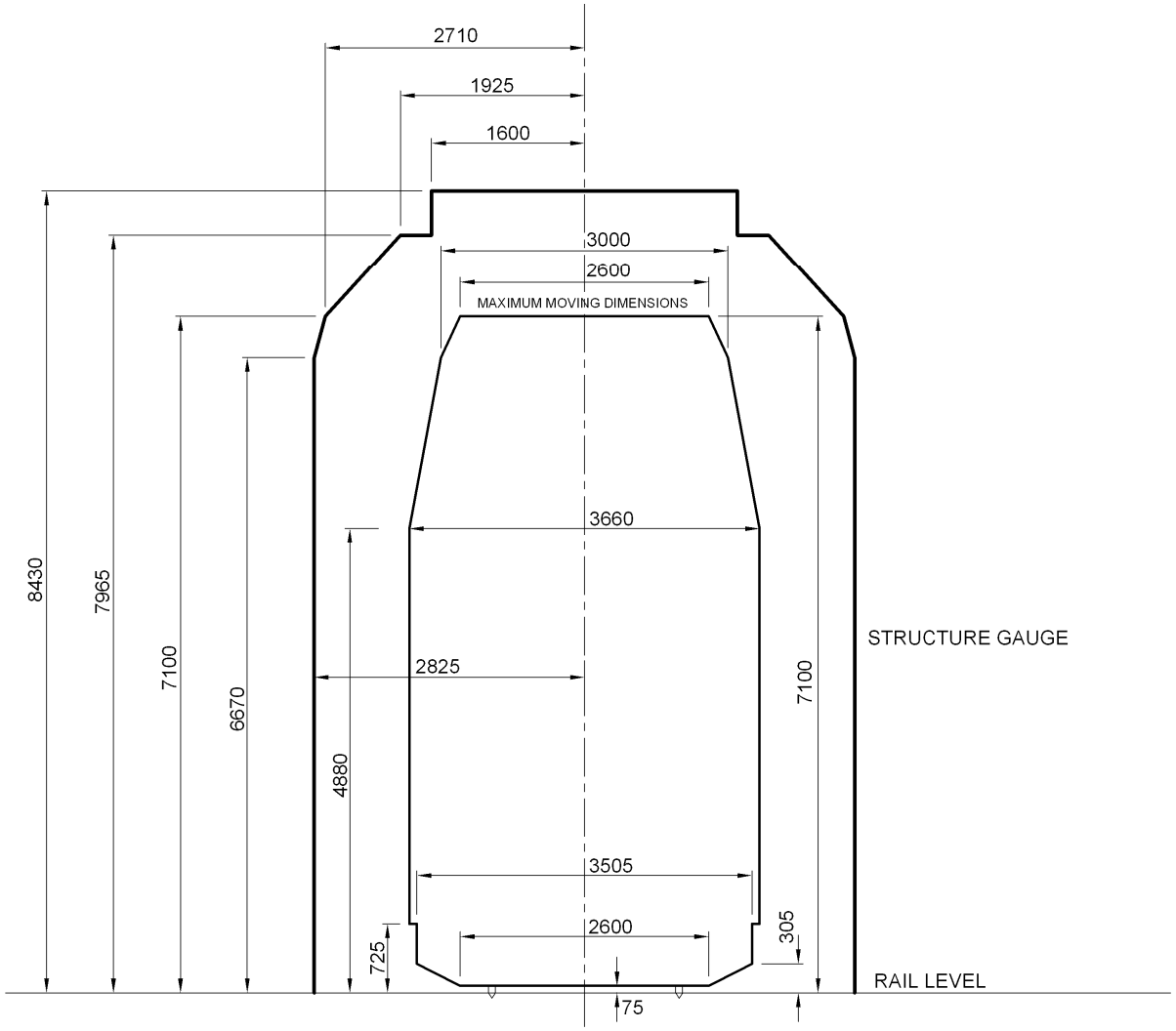
DIAGRAM No.1D
1676mm GAUGE
(B.G.)



NOTE:-

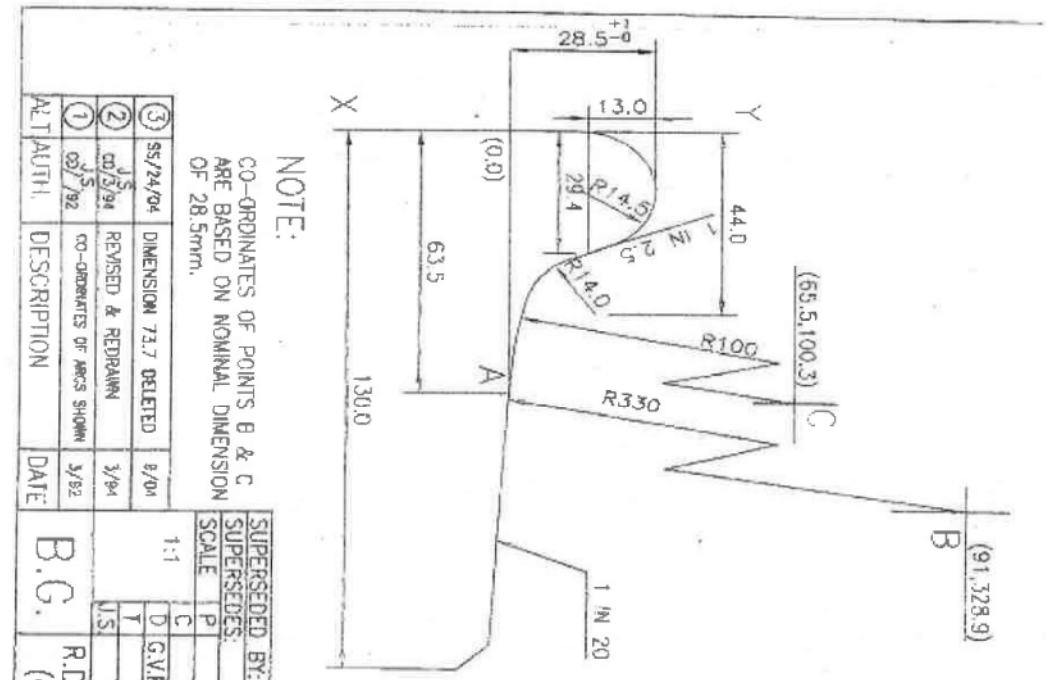
ALL DIMENSIONS ARE IN MILIMETRES
EXCEPT WHERE OTHERWISE SHOWN.

Maximum Moving Dimension and Structure Gauges



ATTACHMENT-3

(Worn wheel profile for adoption to the wheels provided on the rail vehicle)



PROCEDURE OF DRAWING:-

1. DRAW A VERTICAL LINE X-Y
2. DRAW SEMI-CIRCLE OF 14.5R TANGENTIAL TO LINE X-Y.
3. DRAW LINE 1:2.5 TANGENTIALLY TO 14.5R SEMI-CIRCLE.
4. DRAW A HORIZONTAL LINE AT 28.5mm FROM THE TOP OF THE FLANGE. AND LOCATE Pt. 'A' AT 63.5mm FROM THE LINE X-Y.
5. FROM Pt. A LOCATE CENTRE 'B' OF ARC OF 330R ON A VERTICAL LINE AT 91mm FROM X-Y.
6. DRAW ARC OF 330R FROM CENTRE 'B'
7. LOCATE CENTRE 'C' ON VERTICAL LINE AT / HORIZONTAL DISTANCE OF 65.5mm FROM THE LINE X-Y SUCH THAT BC= (330-100) ie 230mm.
8. DRAW ARC OF 100R WITH CENTRE AS 'C'
9. DRAW ARC OF RADIUS 14mm TANGENTIALLY TO 100R ARC AND LINE 1:2.5.
10. DRAW LINE 1:20 TANGENTIALLY TO 330R ARC.
11. DRAW A VERTICAL LINE AT A DISTANCE OF 30mm FROM THE FLANGE END.

NOTE:

CO-ORDINATES OF POINTS B & C ARE BASED ON NOMINAL DIMENSION OF 28.5mm.

③	SS/24/04	DIMENSION 73.7 DELETED	8/04
②	JS CD/3/94	REVISED & REDRAWN	3/94
①	JS CD/1/92	CO-ORDINATES OF ARCS SHOWN	3/92
ALT/AUTH		DESCRIPTION	DATE

SUPERSEDED BY:
SUPERSEDES:
SCALE 1:1

C	
D	G.V.RAMAN
T	
J.S	

B.G.

R.D.S.O. (C)

GROUP

WORN WHEEL PROFILE

SHEET 1 OF 1

ATTACHMENT-4

(Design report on Civil and Track Works)

CHAPTER 1 DESIGN REPORT ON CIVIL AND TRACK WORKS

1. The Dedicated Freight Corridor (DFC) Project

Ministry of Railways (MOR), Government of India has planned to construct a High Axle Load Dedicated Freight Corridor (DFC) covering about 3325 Km on two corridors, Eastern and Western Corridors. The Western Corridor is planned from Jawaharlal Nehru Port, Mumbai to Tughlakabad/Dadri near Delhi. The Western corridor of DFC Project covers a length of 1,483 Km (JNPT – Ahmadabad – Palanpur – Rewari – Asaoti - Dadri). Western Corridor is planned to be implemented in two Phases. The first phase envisages construction of 935 Km between Vadodara and Rewari.

The project entails construction of double-track electrified railway lines capable of handling 32.5 ton axle load, longer trains and double stack con tainers. The bridges and other structures will be designed to allow movement of 32.5 ton axle load while the track structure will be designed for 25 ton axle load operating at maximum train speed of up to 100 Km/hr.

2. Design Criteria Approved by the Employer

2.1 Geometric Criteria

In terms of Paragraph 401 of Indian Railway Permanent way Manual, the horizontal curve is the radius of a circular curve is determined by measuring the Versine on a chord of known length, from the equation,

$$R = 125 \times C^2 / V$$

Where,

R = Radius in meters;
C = Chord length in meters; and
V = Versine in millimeters.

The Curves can be designated by the radius in meters or by its degree. The angle subtended at the center by a chord of 30.5 meters, is the degree of the curve.

A one degree (1°) curve is thus of (360 x 30.5) / 2π = 1750 meter radius

A two degree (2°) curve has a radius of 1750 / 2 =875 meters and so on.

Curves shall be described invariably by the radius in meters [700 m for 2.5 degree, 1167 m for 1.5 degree].

The following curve parameters have been followed for this project:

Minimum curve radius

Main Track: 700 m (2.5 degrees)

Siding and connecting track: 438 m (4 degrees)

For reverse curves, it is preferable to maintain a radius of 875 m or more to enable application of long welded rails.

The actual radius of both the tracks shall remain same. This will be achieved by shifting the centre of the curve suitably.

Minimum length of straight length between adjacent curves:

Desirable straight length between is 50m. In cases, where there is space constraint, both transitions can meet each other by suitable extending the lengths ensuring that rate of change of cant and versine along the two transitions so extended is kept the same.

However, in exceptional cases, minimum straight of at least one wagon length (20 m) be kept particularly for reverse curves or between two curves with specific approval of DFCCIL.

1) Cant

Actual cant is defined by the following formula $Ca = GV^2/127R$

Where,

Ca: Actual Cant (mm)
G: Dynamic gauge in mm (= 1750 mm)
V: Standard speed (km/hr)
R: Radius of curve (meter)

The standard speed for actual cant shall be defined by considering the maximum permissible speed (100 km/hr), speed restriction, gradient and train operation plan.

Table 1 Standard Speed by Type of Section

Type of section	Standard speed
i. General Sections	85 km/hr (equilibrium speed)
ii. Sections near station	As per train operation plan
iii. Long ascending section	

The cant computed shall be rounded off to nearest 5 mm

Maximum cant: 140 mm

Maximum cant deficiency: 75 mm

Cant Excess* (maximum): 75 mm

Cant transition: Straight ramp

The Cant Excess practically may be equal to actual Cant provided when the train stops or exceed 75mm in case the train operates at low speed.

2) Transition Curve

Transition curve is an easement curve, in which the change of radius is progressive throughout its length and is usually provided in a shape of a cubic parabola at each end of the circular curve. It affords a gradual increase of curvature from zero at the tangent point to the specified radius of circular arc and permits a gradual increase of super-elevation, so that the full super-elevation is attained simultaneously with the curvature of the circular arc.

Type of transition curve: Cubic parabola

Transition curve length is defined by the maximum of the following three values:

Standard Length

L= 0.008Ca x Vm
L= 0.008Cd x Vm
L= 0.72Ca

Where:
L: Length of transition curve in meters
Vm: Maximum permissible speed 100 km/hr
Ca: Actual cant in mm
Cd: Cant deficiency for Vm in mm

Note:

Minimum length in exceptional case (Para 407 (3) of IRPWM) As an exceptional case: (a) and (b) can be reduced up to 2/3 of the standard length and (c) can be reduced up to 1/2.

The transition length shall be rounded off to 5 meter.

Cant Gradient: maximum 1 in 720, however, in exceptional cases it can be 1 in 360.

There should be no change of grade in the transition curve.

There should be no transition curve at level crossings and within 100 m of un-ballasted deck bridges.

Note: Chainage of IP and transition curves

The Chainage of the IPs and transition curves are referential. The chainage on the plan and profile is for reference only.

3) Gradient

Maximum gradient: 1/200 (=0.5%) [Compensated]

Curve compensation: 70/R (%) where,

R= horizontal curve radius in metre

Maximum gradient in yard
Standard: 1/1200 (=0.083%)
Exceptional case: 1/400 (=0.25%)

No change of gradient in transition curve and within 30 m of any points and crossings.

4) Vertical Curves

Vertical curve is applied only at the junction of the two grades where the algebraic difference in change of grade is equal to or more than 0.4%

Minimum Radius to be 4,000 m

5) Minimum distance between adjoining tracks

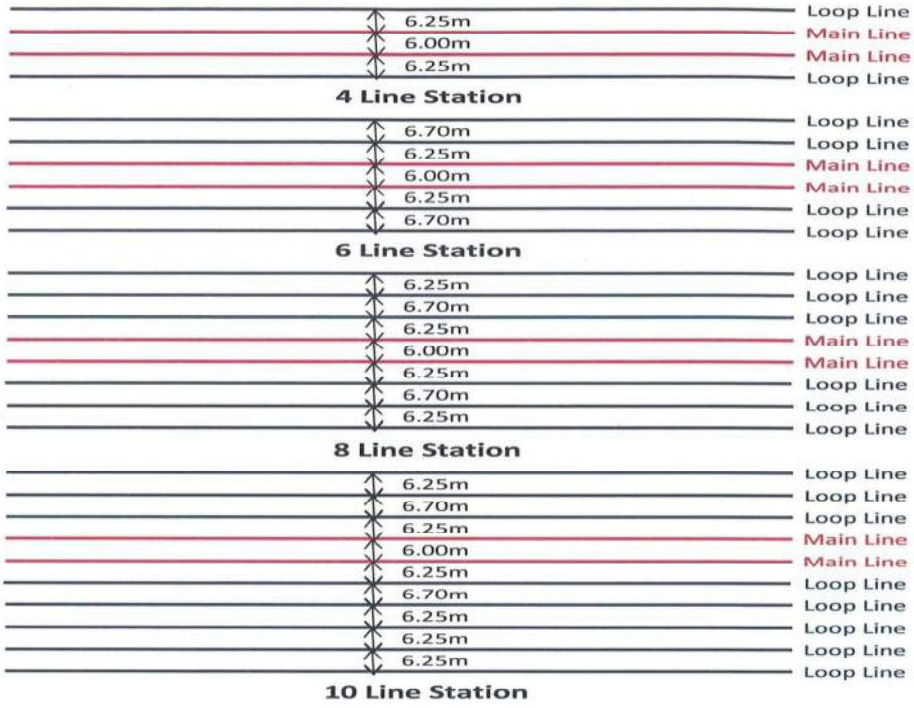
(i) The distance between the track centers of two DFC Main Line tracks shall not be less than 6.0m

(ii) In case of Station Yards :

a) A minimum distance of 6.25m shall be kept between Main Line to Loop Line and between two loop lines, to accommodate LED based Signalling system,

b) Since the maximum length of TRD portal is planned to be 32m, it can accommodate a maximum of 5 lines. Accordingly after every 4th line, a distance of 6.7m shall be provided to accommodate TRD portal avoiding location of such portals between two Loop / Adjacent Line.

The schematic diagrams of the track centers in the various types of Station Yards are explained below:



(iii) Generally the distance between DFC track center (the DFC track nearest to the existing IR tracks) and the existing IR line track centre shall be 7 meters, which may be reduced to 6 meters in exceptional cases (subject to consent of Engineer and approval of Employer).

(iv) Extra clearances on curves shall be as per Appendix to the DFC Draft Schedule of Dimensions. However extra clearance upto 5 degree has been accounted for in the above spacing requirement.

6) Station Yards

Clear Standing Room (CSR) of Loops 1500m at Junction Stations and staggered 750m long loops at the Crossing Stations.

Turnouts

Type of turnout:

Main tracks and auxiliary main tracks: 1 in 12 with curved thick web switch with CMS Crossing.
Sidings: 1 in 8.5 with curved thick web switch with CMS Crossing

Turnouts should not take off from the transition portion of the curve.

The practice of turnouts not taking off from curves should be adopted to reduce the maintenance inputs and improve the riding quality.

There will be no change of grades within 30 m of any points and crossings.

Turnouts will be laid on PSC fan shaped sleepers.

7) Level Crossings

There will be no level crossings in yards on the proposed DFC alignment.

Wherever the DFC alignment is parallel to the existing IR track and the level crossings are being extended, depending upon the classification of level crossing, category of road, necessary provision of grades, approach indicators shall be provided as per Chapter 9 of Indian Railways Permanent Way Manual.

2.2 Vertical Clearances

1) Minimum height above rail level

Minimum height above rail level for a distance of 1600 mm on either side of centre of track shall be:

1) Case I: When lower track line is DFC line

Light overhead structure such as FOB etc. and for heavy overhead structure at turnouts, etc. = 8430 mm

Heavy overhead structure such as Flyover or ROBS = 8050 mm

2) Case II: When DFC tracks are crossing over IR Lines;

Vertical clearances to be observed as per IR SOD – Para 10 (iii)
- Light overhead structure such as FOB = 6250 mm
- Heavy overhead structure such as Flyover or ROBS = 5870 mm

Note:

In case IR track is nominated for Double Stack Container (DSC), vertical clearance shall be provided as per Sub-Para (1), Case I above.

On Lines proposed to be electrified on 25kV AC System, necessary provision made in overhead structures and overhead equipment if necessary by using longer traction overhead equipment masts to permit possible raising of the track by 275 mm in future to cater for increased ballast cushion, larger sleeper thickness and deeper rail sections.

(2) Track Structure for 32.5 Ton Axle Load

The Consultant's understanding of the track structure subject to 25 ton axle load and 32.5 ton in respect of the vertical clearance is given in the table below:

Table 2: Track Structure Dimension by Axle Load

Description / Axle Load	25.0 tons	32.5 tons	Remarks
Thickness of Rail (mm)	172 #2)	186 #1)	#1) UIC68Kg/m Rly. Bd. Letter 2006/Infra/6/3 of 23/6/08 #2) UIC60Kg/m, 90 UTS conforming to T-12-2009 as per Railway Board Notice 2000/PL19/13 Pt.4, dated 3 June 2009.

Description / Axle Load	25.0 tons	32.5 tons	Remarks
Thickness of rail pad (mm)	6 #3)	10	#3) Assumed
Thickness PC Sleeper at rail seat (mm)	210	250 #4)	#4) Assumed [Sleeper Density : 1660 Sleeper/Km]
Ballast Thickness (mm)	350 #5)	350	#5) IRPWM Correction Slip 117 Para 263 (2) Dated 19th May 2009
Future Margin (mm)	275	217 #6)	#6) IR SOD Note: Item 10, and DFCC SOD Item 9B, Note (b)
Total Thickness #4)(mm)	1013	1013	

2.3 Track Structure

Following technical parameters in respect of track structure corresponding to 25 tonne axle load as the first stage of DFC project will be adopted:

Table 3: Technical Parameters of Track Structure

S. N	Technical Parameter	Value
1	Gauge	1676mm (BG)
2	Spacing of Tracks	
2.1	Minimum Distance: Centre to centre of DFC Tracks	6.0 Meter
2.2	Minimum distance centre to centre from existing IR to DFC Track	7.0 Meter [6 Meter in exceptional cases]
3.0	Rails	UIC60Kg - 90UTS
4.0	Points & Crossings – Main Line, Auxiliary Main Tracks and running Loops.	60 kg Rail, 1 in 12 curved thick web switches with CMS Crossings on Fan shaped PSC Sleepers layout.
4.1	Points & Crossings – Minor Loops and non-running lines	60 kg Rail, 1 in 8 1/2 curved thick web switches with CMS Crossings on Fan shaped PSC Sleepers layout.
5.0	Check Rail Clearances at Level Crossings	
5.1	Minimum	51 mm
5.2	Maximum	57 mm
6.0	Minimum depth of space for wheel flange from rail level	38 mm
7.0	Ballast Cushion below the bottom of the sleeper at the rail seat – Main Line.	350 mm.
7.1	Ballast Cushion – Loop Line & Sidings	250 mm
8.0	Sleeper	PSC Mono-block, 60 Kg with 1 in 20 cant for the rail seat (The rail seat of PSC Sleeper will be able to cater to 68 Kg/m and 60 Kg/m rail sections by providing suitable liners.)
9.0	Sleeper Density – Main Line	1660
9.1	Sleeper Density – Loop Line & Sidings	1540
10	Fastening	Elastic Rail Clip
11	Formation Width– Embankment	13.5 meter

S. N	Technical Parameter	Value
11.1	Formation Width– Cutting excluding side drains	12.9 meter

Rail Seat: In order to allow use of heavier 68 Kg/m rail in future during the life span of the concrete sleeper, the width of the rail seat shall be such so as to accommodate 60 Kg/m rail and 68 kg/m rails by provision of suitable liners..

Ballast shall conform to IR specifications issued by RDSO [IRS GE;1] with latest correction slip

Check rail shall be installed on curve tracks with a radius < 220 meters.

Guard Rail shall be provided for the track on Major Bridges, Important Bridges, Rail Flyovers, RUBs and for the tracks under Road Over Bridges.

In depot buildings, various non-ballasted track forms will be required inside to permit rolling stock inspections and access to wheel lathes etc.

2.4 Earthwork Design

For this Contract, the "Guideline and Specification for Design of Formation for Heavy Axle Load, GE: 0014", issued by RDSO will be followed. The geometric parameters and design principles are described in terms of earthwork structure as follows:

Formations comprises of Granular layer (Blanket) over prepared sub-grade and embankment fill (Para 3.0 Formation Components);

Cross fall slope to be at least 1:30 or 3% with tolerance of 0.5% (Para 5.7 Geometrical requirements for the soil formation);

Parameter of blanket thickness (45cm, 60cm, 80cm or 100cm) and sub grade (75cm or 100cm) are specified as mandatory provisions to be adopted (Para 17. Specification & Recommendations: (Mandatory));

In the case of new construction, minimum height of embankment should not be less than one meter to ensure proper drainage, effective stress dispersal, and uniform riding qualities (para 5.1.3);

Uniform total thickness of formation of 2m should be provided including blanket, prepared sub grade & top layer of embankment fill etc. (Table 6, Para 2. Two Layer System (Blanket & Prepared Sub-grade on Embankment Fill);

To allow for increased width of ballast on account of super elevation, additional necessary toe wall may be provided to ensure a cess width of 900 mm (Para 5.7 Geometrical requirements for the soil formation, Top Width of Formation);

The construction drawings including longitudinal and cross-sections based on his final design shall be prepared by the Contractor. The drawings shall be reviewed by the Consultant and accepted by the Employer.

The slope stability analysis shall generally be in accordance with Annexure-III of RDSO GE: G-1.

The following two tables indicates the geometric parameters and design principles with regards to Earthwork Structure of DFC project.

Table 4: Geometric Parameters of Earthwork

S. No.	Parameter	Value
1-1	Formation Width	13.5m
1-2	Slope Gradient for Embankment	2H : 1V

S. No.	Parameter	Value
1-3	Thickness of Blanket	600mm
1-4	Formation width for Cut	12.9m
1-5	Slope Gradient for Cut	1H : 1V
1-6	Thickness of Prepared Sub-grade	1,000mm (If the existing soil conditions satisfy the conditions of prepared sub-grade for embankment height up to 1.6 meter, the same shall be treated as sub-grade.)
1-7	Width of Berm	1,500mm (Minimum)
1-8	Cross Slope at Top of Blanket	1 : 30 or 3.0% with tolerance of 0.5%
1-9	Cross Slope at Top of Prepared Sub grade	1 : 30 or 3.0% with tolerance of 0.5%
1-10	Cross Slope at Top of Embankment Fill	1 : 30 or 3.0% with tolerance of 0.5%
1-11	Cross Slope at Berm	1 : 30 or 3.0% with tolerance of 0.5%

Table 5: Design Principles of Earthwork

S. No.	Conditions	Design Principle
2-1	FL (Formation Level) is higher than GL (Ground Level) by 6 m.	Embankment structure on the natural ground consists of following layers. Blanket in 600 mm Prepared Sub-grade in 1,000mm Embankment fill in remaining thickness Berm is prepared every 6m from top of blanket layer
2-2	FL is higher than GL by 1.6 m – 6.0m	Embankment structure on the natural ground consists of following layers. Blanket in 600 mm Prepared Sub-grade in 1,000mm Embankment fill in remaining thickness
2-3	FL is higher than GL by 0.6 - 1.6m	Embankment structure with cutting work consists of following layers. Blanket in 600 mm Prepared Sub-grade in 1,000mm Natural ground requires more than Embankment fill requirement (Min. Ev2 : 30 MPa) If natural ground have more than 60 MPa in Ev2, prepared subgrad layer is not required.
2-4	FL is higher than GL 0 - 0.6m	Cut structure consists of following layers. Blanket in 600 mm

2-5	FL is equal to or less than GL	Cut structure consists of following layers. Blanket in 600 mm
2-6	HFL (High Flood Level) is higher than GL	Embankment structure on the natural ground consists of following layers. Blanket in 600 mm Prepared Sub-grade in 1,000mm Embankment fill in more than 1,000mm from H.F.L.

2.5 Drainage

For effective drainage, the following points shall be kept in view:

Top of the formation should be finished to cross slope of 1 in 30 from centre of formation to both sides in case of single/double line. However, in case of multiple lines, the cross slope should be from one end to the other towards cess/drain provided in between.

Once the top surface of the formation has been finished to proper slope and level, movement of material vehicle for transportation of ballast, sleepers etc. should be avoided as these movements will cause development of unevenness, ruts on surface which will accumulate water and weaken the formation.

At locations, where the water table is high and fill soil is fine grained, it may be desirable to provide a granular layer of about 30 cm thickness at the base, above the sub-soil across the full width of formation.

Blanket material should conform to the laid down specifications.

In the double track section, central drain between two tracks should not be provided, however between IR and DFC tracks it should be provided.

In cuttings, properly designed side drains and catch water drains should be provided.

In yard, surface drains should be generally open for ease of cleaning and inspection.

2.6 Bridges

The basis for the design of structure, sub-structure, foundation for major bridges, protection works for minor bridges, RUB's and ROBs, RFOs and footover bridges shall be based on relevant IRS, IRC and IS standards.

2.7 MMD and Structure Gauges

The Maximum Moving Dimensions (MMD) has been calculated on the condition of wagon's static and dynamic movement for the DFC. Those dimensions are shown on the MMD and Structure Gauges Drawing in Figure 1 below.

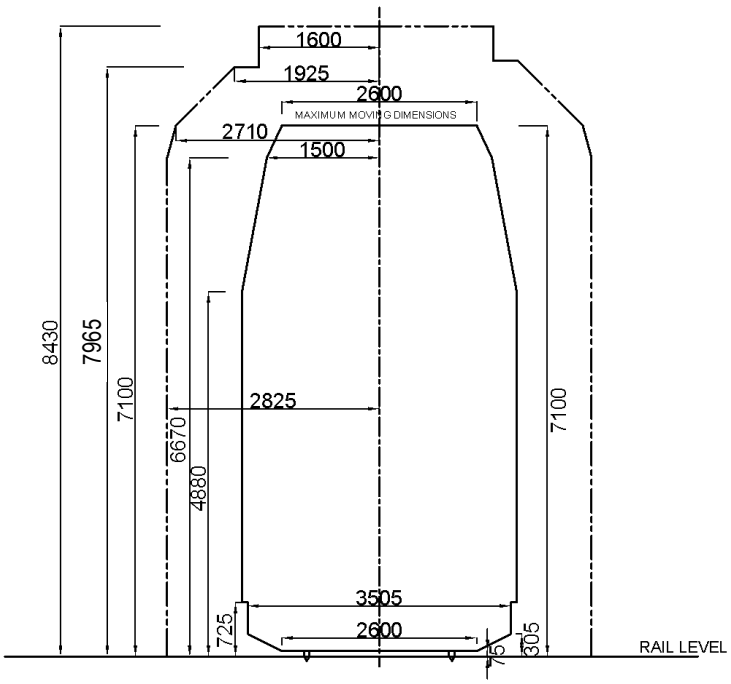


Figure 1 Maximum Moving Dimension and Structure Gauges

With regard to headroom clearance, the following exceptions are added to the requirements above. Minimum height above rail level for a distance of 1,600 mm on either side of the centre of the track shall be:

Light overhead structure such as foot over bridges 8,430 mm

Heavy overhead structure such as road over bridge or flyover 8,050 mm

Heavy overhead structure at turnout etc. 8,430 mm

Note: On Lines proposed to be electrified on 25 kV AC System, necessary provision should be made in overhead structures and overhead equipment if necessary by using longer traction overhead equipment masts to permit possible raising of the track by 275 mm in future to cater for increased ballast cushion, larger sleeper thickness and deeper rail sections.

Vertical Clearances for RUB, ROB's and RFO's

The vertical clearance for fixed structure gauge in SOD is considered as 8.430m as is explained above.

Vertical Clearance at under passes shall be 5m at normal. However, in urban areas, this should be increased to 5.5 m so that double decker buses could be accommodated as per IRC 54 - 1974 “Lateral and Vertical Clearances At Underpasses for Vehicular Traffic”.

In parallel section where Bridge is proposed for passage of vehicular/double decker, it shall have a minimum Vertical Clearance as available under the bridge of adjacent track. For bridge provided for passage of non-vehicular traffic in Detour section a min vertical clearance of 3.6 m to 4.5 m shall be provided, as per IRC 11 - 1962 “Design and Layout of Cycle Tracks” (Refer to Para 1.4.6 (1) of this report).

2.8 Loading

As per MOR letter no.2000/PL19/13 Pt4 of 3rd June 2009, and as per MOR letter DO No. 2006/Infra/6/3 Pt1 of 3rd December 2009, it was decided that while DFCC track would be fit for 25 tonne axle load, the substructure of bridges alone should be made suitable for 32.5 tonne axle load.

The loading standards applied to the Rail Track Structures and Rail Track Formations shall generally be in accordance with Bridge Rules [second reprinting 2008, incorporating correction slips up to 39] issued by Research Design and Standards Organization and Bridge Design Manual [1998] issued by Government of India, Ministry of Railways.

2.9 Deck Drainage

The rainwater run-off from bridge decks shall be collected and piped to a suitably designed storm water drainage system.

2.10 Track Work Design

1) The DFCCIL currently plans to construct the track structure to cater to 25 tonne axle load using 60 kg/m HH rails procured from Japan, mono-block concrete sleepers laid at nominal 600mm spacing (1660/km) and placed on 350mm ballast cushion. This is based on best international practice for Heavy Haul railways involving movement of 25 tonne axle load rolling stock. With the current traffic projections, rail renewal will have to be carried out after 800 GMT i.e. in about 10 to 15 years (depending upon the traffic carried by various sections of WDFC. In order to allow use of heavier 68 Kg/m rail in future during the life span of the concrete sleeper, the width of the rail seat shall be such so as to accommodate 60 Kg/m rail and 68 kg/m rails by provision of suitable liners. RDSO's standard drawing for 25 tonne axle load concrete sleeper is for the track gauge of 1673 mm (RDSO drawing no. T-7008 for 136 RE Rails).

2) Planning for the construction method and procedure for track work

Construction will be mechanized. Bottom ballast will be placed initially and accurately leveled. Concrete sleepers will be lifted by suitable machines and set to the required spacing on the ballast to the correct alignment.

60 Kg HH Japanese Rails rolled in suitable lengths (12.5m/25m) will be brought to site. Before use at site, the rails shall be flash butt welded in lengths of 250 m under controlled conditions in depot by the Contractor by following all the precautions and mandatory checks as per Indian Railways Manual for Flash Butt Welding of Rails. The 250 m long rails after laying in track will also be welded by deploying Mobile Flash Butt Welding plant except in exceptional circumstances restricted to special locations apart from turnouts where Thermit welding may be deployed with the approval of the Employer / Engineer.

De-stressing will be carried out within the appropriate neutral temperature range for each section using suitable rail tensors.

3) Material survey and procurement plan for ballast

Ballast shall conform to IR specifications issued by RDSO [IRS GE:1] with latest correction slip.

4) Station loops, yards and depot tracks

The rails in station loop tracks, yards and depot tracks shall be UIC60/90UTS section with hardness and be continuously welded laid on mono-block pre-stressed concrete sleepers at nominal 650mm spacing (1540 pcs/km.)

In Depot buildings, various non-ballasted track forms (e.g. embedded rails) will be required inside to permit rolling stock inspections and access to wheel lathes, etc.

Check rails shall be installed on curved tracks with a radius < 220m.

Turnouts from Main Line will be 1 in 12.

1 in 8 ½ turnouts shall be provided for those lines taking off from loops for sidings and from yard lines. The turnouts will have curved thick web switch rails, cast manganese crossings and laid on fan-shaped PSC bearers.

5) Performance Requirements

The main line and loop line tracks shall carry 50 to 100 GMT per annum/direction. The track structure shall be suitably tamped deploying appropriate tamping units so as to ensure the track structure requires minimal intervention between the two tamping cycles for operating 25 tonne axle load trains operating at a maximum speed of 100km/hr. The tamping cycle will be 2 years or 100 GMT of traffic; whichever is earlier.

6) Track Laying Standards

The following standards of track geometry should be achieved in floating condition measured three months after the restoring the speed to normal i.e. 100 km/hr.

Table 6: Track Laying Standards

Sl. No.	Description	Value
1	Maximum difference of any point in relation to the designed layout	a) Vertical : +/-10 mm b) Horizontal : +/-10mm
2	Gauge (with reference to 1676 mm)	a) Maximum variation over the prescribed track gauge : +3mm to 0mm b) Maximum variation in track gauge from sleeper to sleeper : 2mm c) Average track gauge (mean over 100 m length): +1.8mm to 0mm
3	Misalignment :	+/-5mm
4	Vertical Un-evenness (left & right hand rails)	+2mm to (-)1 mm
5	Maximum deviation of measured versine over its designed value on a 20 m chord (half overlapping)	+/-5mm
6	Cant/Cross Level (to be measured at every 4th sleeper)	a) Straight track and curved track: +/- 3mm b) Sleeper to sleeper variation of cant/x-level : +/- 1mm
7	Twist (maximum value on base of 3 m)	a) Straight and circular portion of curve = +/- 1mm/m b) On transition portion of curve (over designed value) = +0.5mm/m
8	Turnouts	a) Stock rail joint (longitudinal location) : +/-15 mm b) Nose to nose of Xing in crossovers : +/- 10mm c) Flangeway clearance at the end of the switch planning : +5mm to (-) 0mm d) Switch toe opening : +1mm to (-) 0mm e) Switch toe squareness : 5 mm

Sl. No.	Description	Value
		f) Deviation of measured versine over its designed value for switches, lead track and curved crossing (measured on 6 meter half overlapping chord) : +/-3mm
9	Sleeper laying	a) Spacing ; +/-10mm b) Sleeper perpendicularity to rail centre line (out of square) : 5 mm
	Fishplated rail joint squareness across the track:	10 mm
11	Rail Expansion Joint	a) Gauge : +/- 1mm b) Gap at opening : +/-2mm c) Out of squareness of switch rails : +/-2mm

7) Flash Butt Welding Tolerances

Each completed joint shall be checked for straightness, alignment and finishing by using a one meter and 10 centimeter long straight edge. The permissible tolerances should conform to "Manual For Flash-butt Welding of Rails (2004) – Ministry of Railways".

8) Testing of Flash Butt Welded (FBW) Joints

All flash butt welded joints in the plant shall be subjected to Visual inspection, Dimensional checks & Ultrasonic Testing for bond integrity. Further, sample weld joints shall be subjected to Transverse Bending Test & Detailed Metallurgical Tests in a laboratory as a Quality Assurance Measure for hardness criteria and magnetic particle inspection etc. The Test Regime of Flash Butt Welds, as given in Para 10 of Manual of FBW of rails shall be followed.

Rectification measures to improve the quality of flash butt welds to obtain the desired metallurgical properties, strength & heat-affected zone etc. at welded ends of rails shall be taken to the satisfaction of the Inspecting Agency nominated by the Employer. Complete record of all such tests shall be maintained.

9) Thermit Welding Tolerances:

The finished dimensional tolerances shall be as under and to be measured after cooling of the welded joint and should conform to "Manual for Fusion of Welding of Rails by Alumino Thermit Welding Process 2006, Ministry of Railways", as indicated in Section 1.8.

All precautionary measures as defined in IR Standard Specifications for Fusion Welding of Rails by Alumino-Thermic Process should be followed for carrying out the Thermt Welding.

Rail joints, welded by the Contractor shall be guaranteed against failure for a period of one year from the date of commissioning of the project. The failed joints shall be replaced in accordance with clause 6.4 of the aforementioned manual.

10) Ultrasonic Testing of Rails / Welds:

Ultrasonic Testing of Rails/ Welds shall be carried out as per Manual for Ultrasonic Testing of Rails and Welds 2006, as mentioned in Section 1.8.

11) De-stressing of Continuous Welded Rail (CWR)

Neutralization of the stresses (De-stressing) in the Rails during construction shall be carried out when:

(a) The CWR track is laid at a temperature outside the range of the temperature interval for CWR track laying;

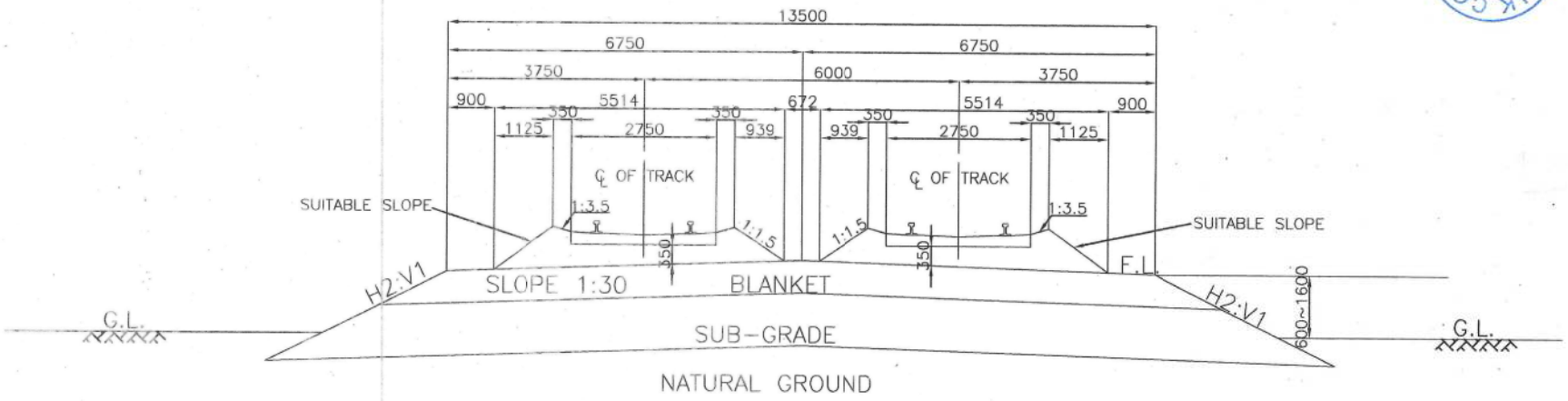
(b) It is found out that under the influence of construction activities the neutral temperature has changed and does not coincide anymore with the laying in neutral temperature;

(c) There is a necessity of construction works connected with the weakening of the ballast bed or considerable movement of the track's vertical or horizontal position and in all cases of danger of the CWR track's disruption;

(d) In any other case as required by the provisions of the LWR Manual.

ATTACHMENT-5A

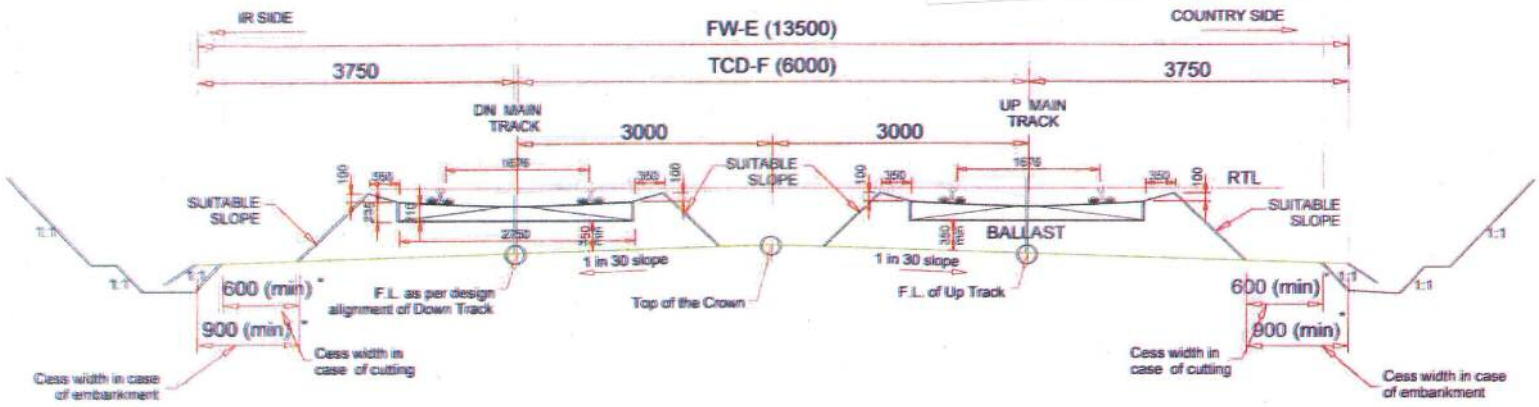
(Typical Cross Section for straight in embankment and cutting as per LWR for track centre 6M and cross slope 1 in 30)



(TYPICAL CROSS SECTION FOR STRAIGHT IN EMBANKMENT AND CUTTING)

Project Title: Dedicated Freight Corridor Project (Western Corridor Phase-2: Dadri - Rewari & Vadodara - JNPT Section)	Client: 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA	Drawing Title: STANDARD CROSS SECTION OF EMBANKMENT	Drawing Number: NKC-CTS-EWS-AL-00001 Scale: NTS Reference:	Consultant: NK Consortium 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA
			Drawn By: / Checked By: / Approved By:	

ANNEXURE- 1



SLT'S PROPOSAL AS PER FIG-4.2.1 (C) OF LWR MANUAL

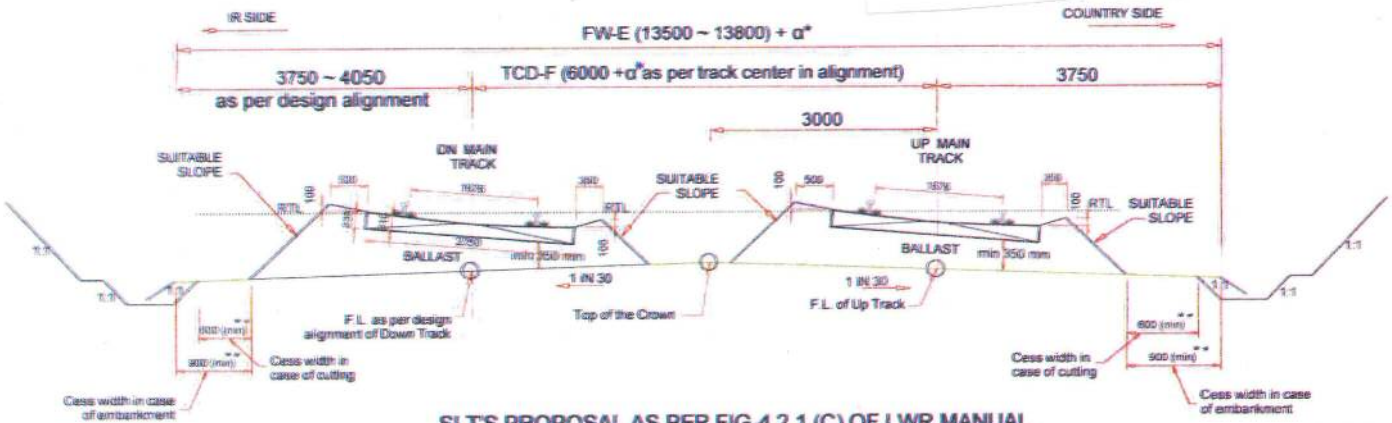
TYPICAL CROSS SECTION FOR STRAIGHT IN EMBANKMENT AND CUTTING AS PER LWR FOR TRACK CENTRE 6 M AND CROSS SLOPE 1 IN 30.

* Indicative available cess width (900 mm for embankment & 600 mm for cutting) in general for ballast profile.

ATTACHMENT-5B

(Typical Cross Section for curve in embankment and cutting as per LWR for track centre 6M and cross slope 1 in 30)

ANNEXURE- 2



SLT'S PROPOSAL AS PER FIG-4.2.1 (C) OF LWR MANUAL

TYPICAL CROSS SECTION FOR TRACK ON RIGHT HAND CURVE

* α is extra track center of Down and Up Main Track based on alignment design & shall vary in each curve.

** indicative available cess width (900 mm for embankment & 600 mm for cutting) in general for ballast profile.

ATTACHMENT-6

(Infrastructure facilities at TMD, IMD, SIMD and Stations for basing P&E)

Infrastructre for base station of P&E

Sl. No.	Name of DFC Station	Phase	Package	Jn/Xing Station	Inter-station distance	Cumulative	SIMD	IMD	TMD	Ballast Depots/siding 700M long	Hot Axle (UP) 120M length	Hot Axle (DN) 120M length	Track Machine Siding 120m length	TW Siding	Machine Maintenance Unit (M.M.U) (Area 100	Wiring Train Siding	Accident relief Train Siding	IMD Covered Area(Sq.m) Bldg.				SIMD Area (Sq.m) Bldg.			
																		Civil (SqM) for IMD	S & T (SqM) for IMD	OHE & PSI (SqM) for IMD	Total Area (SqM) Bdg.	Civil (SqM) for SIMD	S & T (SqM) for SIMD	OHE & PSI (SqM) for SIMD	Total Area (SqM) Bdg.
1	JNPT	II	P-11	Jn	0			Yes			Yes	Yes	U/D	Yes				410	460	834	1704				
2	Nilije	II	P-11	Xing	38	38		79				Yes	U/D		Yes										
3	Kharbao	II	P-11	Jn	35	73		Yes			Yes	Yes	U/D	Yes				410	460	834	1704				
4	Saphale	II	P-12	Xing	34	113						Yes	U(Future)/D												
5	Palghar	II	P-12	Xing	35	148	Yes	149			Yes		D(Future)/U									125	125	64	314
6	Gholwad	II	P-12	Xing	41	189						Yes	U(Future)/D		Yes										
7	Pardi	II	P-12	Xing	39	228		Yes			Yes		D(Future)/U	Yes				410	460	834	1704				
8	Ancheli	II	P-12	Xing	38	266						Yes	U(Future)/D		Yes										
9	New Udhana	II	P-13	Jn	45	311																			
10	Nyo (Udana)	II	P-13	IR/Xing	0	311		202																	
11	Gothangam	II	P-13	Xing	15	326	Yes					Yes	U(Future)/D									125	125	64	314
12	Sanjali	II	P-13	Xing	38	364					Yes		D(Future)/U		Yes										
13	Varadiya	II	P-13	Xing	28	392						Yes	U(Future)/D												
14	Makarpura	I	P-3	Jn	38	430		Yes	Yes		Yes	Yes	D/U	Yes	Yes	Yes		460	410	834	1704				
15	Vasad	I	P-3	Xing	35	465	Yes	161				Yes	U/D									125	125	64	314
16	Changa	I	P-3	Xing	28	493	Yes				Yes		D/U	Yes	Yes							125	125	64	314
17	Timba	I	P-3	Xing	66	559	Yes			Yes		Yes	U/D									125	125	64	314
18	Sabarmati South	I	P-3	Jn	32	591		Yes				Yes	One for D & U	Yes	Yes		Yes	460	410	834	1704				
19	Sabarmati North	I	P-3	Jn	0	591					Yes		D/U												
20	Gumasan	I	P-3	Xing	44	635	Yes					Yes	U/D									125	125	64	314
21	Mehsana	I	P-3	Jn	37	672	Yes	150			Yes	Yes	D/U		Yes							125	125	64	314
22	New Umardasi/Malo	I	P-3	Xing	42	714	Yes				Yes		U/D		Yes							125	125	64	314
23	New Palanpur	I	P-3	Jn	27	741		Yes			Yes	Yes	D/U	Yes	Yes			460	410	834	1704				
24	Chadotar	I	P-3	IR/Xing	0	741						Yes													
25	Sriamirgarh	I	P-2	Xing	30	771	Yes	99			Yes		D/U									120	120		240
26	Swarupganj	I	P-2	Xing	39	810	Yes			Yes/u		Yes	D/U		Yes		Yes/u					120	120	120	360
27	Banas	I	P-2	Xing	13	823					Yes		D/U												
28	Keshavganj	I	P-2	Xing	17	840		Yes					D/U	Yes	Yes			350	350	450	1150				
29	Birdiya	I	P-2	Xing	40	880	Yes	108			Yes	Yes	D/U									120	120		240
30	Jawali	I	P-2	Xing	34	914	Yes			Yes/u			D/U				Yes/u					120	120		240
31	Marwar	I	P-2	Jn	34	948		Yes			Yes	Yes	D/U	Yes	Yes			350	350	450	1150				
32	Chandawel	I	P-2	Xing	38	986	Yes				Yes		D/U									120	120		240
33	Haripur	I	P-2	Xing	19	1005	Yes	134		Yes/u		Yes	D/U				Yes/u					120	120	120	360
34	Bangurgram	I	P-2	Jn	41	1046	Yes				Yes	Yes	D/U		Yes							120	120		240
35	Saradhana	I	P-2	Xing	36	1082		Yes	Yes			Yes	D/U	Yes				350	350	450	1150				
36	Kishangarh	I	P-1	Xing	28	1110	Yes				Yes		D/U		Yes							120	120		240
37	Sakun	I	P-1	Xing	34	1144	Yes	159		Yes/u		Yes	D/U									120	120		240
38	Phulera	I	P-1	Jn	19	1163	Yes				Yes	Yes (200m)	D/U		Yes							120	120		240
39	Pachar Malikpur	I	P-1	Xing	48	1211	Yes						D/U									120	120		240
40	Srimadhopur	I	P-1	Xing	30	1241		Yes			Yes	Yes	D/U	Yes				350	350	450	1150				
41	Bagega	I	P-1	Xing	37	1278	Yes	140		Yes/u			D/U									120	120		240
42	Dabla	I	P-1	Xing	35	1313	Yes				Yes	Yes	D/U		Yes							120	120		240
43	Ateli	I	P-1	Jn	40	1353	Yes				Yes	Yes (200m)	D/U									120	120		240
44	Rewari	I	P-1	Jn	28	1381		Yes			Yes	Yes (200m)	D/U	Yes	Yes	Yes		350	350	450	1150				
45	Dharuheda	II	P-14	Xing	14	1395					Yes	Yes	D												
46	Mewat	II	P-14	Xing	32	1427					Yes	Yes	No		Yes										
47	Pirthala	II	P-14	Jn	34	1461		124			Yes	Yes	U/D												
48	Faridabad	II	P-14	Jn	33	1494					Yes	Yes	D		Yes										
49	Dadri	II	P-14	Jn	11	1505	Yes				Yes	Yes	U/D									125	125	64	314

List of Buildings in Junction and Crossing Stations

Package	CPM	Junction & Crossing Station (Mark.)	Junction & Crossing Station (Name)	Chainage DFC	Buildings Location and Areas: Control Room (CTC) & Office of Regional Manager (SqM)	Crew Changing Building , (SqM)	IMD covered area (SqM): Civil (SqM)	IMD covered area (SqM): S & T (SqM)	IMD covered area (SqM): OHE & PSI (SqM)	IMD Sub Depot: Civil (SqM)	IMD Sub Depot: S & T (SqM)	IMD Sub Depot: OHE & PSI (SqM)	OHE Depot WT (SqM)	Track Machine Depot (SqM)	Station Bldg. Offices, Resting Facilities including Verandah (SqM)	Service Building: S & T Dept. (SqM)	Service Building: Electrical Dept. (SqM)	Service Building: Engg. Department (SqM)	TWS (SqM)	MMU (SqM)	Sub-Depots for brake down/ emergency & day to day maintenance (SqM)	Total Area (SqM)	Misc. Work PF, path way etc. @ 5% of area required (SqM)	Total covered Area Required at each Station (SqM)	Open Area to be developed at each station - duly fenced (SqM)	SIDING: BALLAST Depots/ siding 750 M long	SIDING: Hot Axle (UP) 120 m length	SIDING: Hot Axle [Dn] 120 m / 200m length	SIDING: Track M/C 120 m length	SIDING: I M D	SIDING: Track M/C Depot	SIDING: Tower Wagon Siding (35m effective length)	SIDING: Wiring Train Siding (250m)	SIDING: Total Length of Siding at each station	Covered Car Parking for Sedan Type Vehicles	Residential Buildings (Nos. of units): Type-II	Type-III	Type-IV	Type-V	Residential Quarters for KEY MEN on IR & DFCCIL Stations. (Type-II) Nos.
2	Ajmer- Sec-9	CS6	Sriamirgarh	41.650	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	-	Yes	-	D/U	-	-	-	-	360	10 cars	8	4	0	0	3
		CS7	Swarupganj	81.150	-	-	-	-	-	120	120	120	-	-	400	120	130	150	-	100	100	1,360	68	1,428	1,428	Yes/U	-	Yes	D/U	-	-	-	-	1110	10 cars	8	4	0	0	4
		CS8	Benas	92.175	-	-	-	-	-	-	-	-	-	-	400	120	130	150	-	-	100	900	45	945	945	-	Yes	-	D/U	-	-	-	-	360	10 cars	12	8	4	0	2
	Ajmer- Sec-10	CS9	Keshavganj	12.795	-	-	350	350	450	-	-	-	-	-	400	120	130	150	165	100	100	2,315	116	2,431	2,431	-	-	-	D/U	Yes	-	Yes	-	275	10 cars	8	4	0	0	3
		CS10	Biroliya	52.750	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	-	Yes	Yes	D/U	-	-	-	-	480	10 cars	8	4	0	0	4
		CS11	Jawali	86.450	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	Yes/U	-	-	D/U	-	-	-	-	990	10 cars	8	4	0	0	3
	Ajmer- Sec-11	**JS5**	**Marwar**	20.175	-	120	350	350	450	-	-	-	-	-	**800**	120	130	150	165	100	-	2,735	137	2,872	2,872	-	Yes	Yes (200m)	D/U	Yes	-	Yes	-	595	10 cars	12	8	4	0	5
		CS12	Chandawal	56.569	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	-	Yes	-	D/U	-	-	-	-	360	10 cars	8	4	0	0	3
		CS13	Heripur	76.775	-	-	-	-	-	120	120	120	-	-	400	120	130	150	-	-	100	1,260	63	1,323	1,323	Yes/U	-	Yes	D/U	-	-	-	-	1110	10 cars	8	4	0	0	4
		JS6	**Bangurgram**	12.250	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	100	100	1,240	62	1,302	1,302	-	Yes	Yes	D/U	-	-	-	-	480	10 cars	8	4	0	0	3
	Ajmer- Sec-12	CS14	Seradhana	48.350	-	-	350	350	450	-	120	-	-	200 + Open Shed of size 14m x 50m in continuation of Track Machine Depot for inspection and maintenance of track machine	400	120	130	150	165	-	100	2,535 + Open Shed of size 14m x 50m in continuation of Track Machine Depot for inspection and maintenance of track machine	127	2,662 + Open Shed of size 14m x 50m in continuation of Track Machine Depot for inspection and maintenance of track machine	2,662 + Open Shed of size 14m x 50m in continuation of Track Machine Depot for inspection and maintenance of track machine	Accident relief train siding 750m	-	Yes	D/U	Yes	Yes	Yes	-	1145 including accident relief siding	10 cars	12	8	4	0	4
	Residential Quarters (Type-II) for KEY MEN at different IR Stations at : Madar-2 nos., Daurai-2 nos., Makrera-1 no., Mangaliyawas-1 no., Lamana-1 no., Kharwa-2 nos., Piplaj-1 no., Beawar-1 no., Amarpura-2 nos., Sendra-1 no., New Bar-2 nos., Guriya-2 nos., Bagri Saljanpur-1 no., Bagri Nagar-1 no., Sajot Road-1 no., Bhaisana-1 no., Dhareswar-2 nos., Auwa-1 no., Bantaraghunathgarh-1 no., Bhinawaliya-1 no., Somesar-1 no., Bhagwanpura-1 no., Rani-2 nos., Khimel-1 no., Falna-2 nos., Jawaibandh-2 nos., Moribera-2 nos., Kother-2 nos., Nana-1 no., Sirohi Road-1 no., Bhimana-1 no., Kiwarli-2 nos., Morthala-1 no., Abu Road-1 no., Maval-2 nos., Sandra Road-1 no., Ikbalgarh-2 nos. (Total 52 nos.)																																							62
	Total Residential Quarters (Type-II) for KEY MEN at different DFCCIL Stations and IR Stations																																							90
1	Jaipur-Sec-12	CS15	Kishangarh	76.319	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	100	100	1,240	62	1,302	1,302	-	Yes	-	D/U	-	-	-	-	360	10 cars	20	6	4	0	5
		CS16	Sekun	7.920	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	Yes/U	-	Yes	D/U	-	-	-	-	1110	10 cars	8	4	0	0	5
	Jaipur- Sec-13	**JS7**	**Phulera**	27.100	-	-	-	-	-	-	-	-	-	-	**800**	120	130	150	-	100	-	1,300	65	1,365	1,365	-	Yes	Yes (200m)	D/U	Yes	-	-	-	560	10 cars	20	6	4	0	5
		CS17	Pacher Malikpur	75.075	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	-	-	-	D/U	-	-	-	-	240	10 cars	8	4	0	0	4
		CS18	Shrimadhpur	22.860	-	-	350	350	450	-	-	-	-	-	400	120	130	150	165	100	100	2,315	116	2,431	2,431	-	Yes	Yes	D/U	Yes	-	Yes	-	515	10 cars	20	6	4	0	4
	Jaipur-Sec-14	CS19	Baghega	59.715	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	Yes/U	-	-	D/U	-	-	-	-	1110	10 cars	8	4	0	0	4
		CS20	Dabla	94.525	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	100	100	1,240	62	1,302	1,302	-	Yes	Yes	D/U	-	-	-	-	480	10 cars	12	4	2	0	5
	Jaipur- Sec-15	**JS8**	**Ateli**	27.432	-	-	-	-	-	120	120	-	-	-	400	120	130	150	-	-	100	1,140	57	1,197	1,197	-	Yes	Yes (200m)	D/U	-	-	-	-	560	10 cars	20	6	4	0	4
	Rewari-Sec-15 RD	**JS9**	**Rewari**	13.200	-	120	350	350	450	-	-		50	-	**800**	120	130	150	165	100	-	2,785	139	2,924	2,924	-	Yes	Yes (200m)	D/U	Yes	-	Yes	Yes	1035	10 cars	20	6	4	0	6
	Residential Quarters (Type-II) for KEY MEN at different IR Stations at : Pali-1 No., Kund-1 No., Kathuwas-1 no., Mirzapur Bachhod-1 no., Narnaul-3 nos., Amarpur-2 nos., Nizampur-2 nos., Jhilo-1 no., Maonda-2 nos., Nim ka Thana-2 nos., Kanwat-2 nos., Kachera-2 nos., Ringas-4 nos., Kisanmanpura-2 nos., Badhal-2 nos., Renwal-1 no., Mindha-1 no., Bheslana-2 nos., Sanodhiya-1 no., Khandel-2 nos., Hirnoda-1 no., Naraina-1 no., Dantra-1 no., Sali-2 nos., Gahalota-2 nos., Tiloniya-1 no., Mandawariya-1 no. Gegal Akhari-2 nos., Ladpura-2 nos. (Total 48 nOs.)																																							48
	Total Residential Quarters (Type-II) for KEY MEN at different DFCCIL Stations and IR Stations																																							90

General rules for Location of Buildings and Depots:-

1) Crew Changing Stations, at intervals = 500 Kms. (3 Nos. Provided.)
2) IMD- Integrated Maintenance Depots include OHE, General Power, Track and S & T Depots.
3) Sub Depots OHE, PSI and S&T at all stations except at IMDs. (Modified in Addendum)
4) CTC- Centralized Train Control will be at Ahmadabad (1 Location)
5) Points and Signals will be operated by Station Masters locally.
6) Western DFC consisting Phase I: 913 km and Phase II: 500 km approximately.
7) Sub-Depots are proposed at all crossing stations (Modified in Addendum)
8) Resting Facilities for Machine Staff, OHE, S&T, Opretions staff may be provided at all Junction and Crossing Stations.
9) Emergency reserve of engineering materials like CC cribs, service girder etc. to be stored at Ballast Depots.
10) 90 numbers of key men quarters, for each package, to be spread over on IR and DFCCIL stations

Abbreviations:

OHE	Over Head Equipment
PSI	Power Supply Installation
TWS	Tower Wagon Shed
IMD	Integrated Maintenance Depot
CTC	Centralized Train Control
ESM	Elect. Signal Maintenance
PWI	PW Inspector (Senior Section Engg.)
TI	Traffic Inspector
MMU	Machine Maintenance Unit
D / U	Down / Up

NOTE :- The number of various types of residential buildings as identified above at individual stations are tentative and may change during the design stage keeping the total number of respective type of residential buildings unchanged

Package	CPM	Junction & Crossing Station (Mark)	Junction & Crossing Station (Name)	Chainage DFC (Km)	Buildings Location and Areas										Station Bldg, Offices, Resting Facilities including Verandah (Sqm)	Service Building			TWS (Sqm)	MMU (Sqm)	Sub-Depots for brake down/ emergency & day to day maintenance (Sqm)	Total Area (Sqm)	Misc. Work PF, path way etc. [As actual or @ 5% of area required (SqM)]	Total covered Area Required at each Station (SqM)	Open Area to be developed at each station (SqM)	SIDING										Covered Parking for Sedan Type Vehicles	Residential Buildings (Nos. of units)				Residential Quarters for Key Men on DFCCIL & IR Stations and at other Locations (Type II) (Nos.)
					Control Room (CTC) & Office of Regional Manager (Sqm)	Crew Changing Building , (Sqm)	IMD covered area (SqM)			IMD Sub Depot			OHE Depot WT (Sqm)	Track Machine Depot (Sqm)		S & T Dept. (SqM)	Electrical Dept. (Sqm)	Engg. Department (Sqm)									Ballast Depots/ siding 750 M long	Hot Axle [UP] 120 m length	Hot Axle [Dn] 120 m length	Track M/C 120 m length	IMD	Track M/C Depot	Tower Wagon Siding (35m effective length)	Wiring Train Siding (250m)	Accident Relief Train Siding (750m long)	Total Length of Siding at each station		Type-II	Type-III	Type-IV	Type-V	
							Civil (Sqm)	S & T (Sqm)	OHE & PSI (Sqm)	Civil (Sqm)	S & T (Sqm)	OHE & PSI (Sqm)																												
3®	Vadodara Sec-5	**JS1**	**Makapura**	133.001	-	120	460	410	834	-	-	-	50	200	663	120	130	150	165	100	-	3,402	85	3,487	4,176	-	Yes	Yes	D/U	Yes	Yes	Yes (U or D)	Yes	-	765	10 Veh.	4	4	2	2	8
		CS1	Vasad	168.226	-	-	-	-		125	125	64	-	-	460	120	130	150	-	-	100	1,274	48	1,322	1,617	-	-	Yes	U (Future) /D	-	-	-	-	-	240	10 Veh.	4	4	2	-	4
	Ahmedabad Sec-5	CS2	Changa	196.649	-	-	-	-		125	125	64	-	-	460	120	130	150	Future Provision	100	100	1,374	48	1,422	1,617	-	Yes	-	D (Future) /U	-	-	Yes (U or D)	-	-	275	10 Veh.	4	4	2	-	5
		CS3	Timba	57.519	-	-	-	-		125	125	64	-	-	460	120	130	150	-	-	100	1,274	48	1,322	1,617	Yes (U or D)	-	Yes	U (Future) /D	-	-	-	-	-	990	10 Veh.	4	8	2	-	4
		JS2	**Sabarmati South**	80.660	2500	-	460	410	834	-	-	-	-	-	663	120	130	150	-	100	-	5,367	183	5,550	6,239	-	-	Yes	One for D & U	Yes	-	Yes (U or D)	-	Yes	1025	10 Veh.	20	6	4	2	9
	Ahmedabad Sec-7	**JS3**	**Sabarmati North**	98.636	-	-	-	-	-	-	-	-	-	-	**663**	120	130	150	-	-	-	1,063	53	1,116	1,116	-	Yes	-	D/U	-	-	-	-	-	360	10 Veh.	20	6	4	-	6
	Ahmedabad Sec-8N	CS4	Ghumasan	17.506	-		-			125	125	64	-	-	460	120	130	150	-	-	100	1,274	48	1,322	1,617	-	-	-	U (Future) /D	-	-	-	-	-	120	10 Veh.	4	8	2	-	4
		JS4	Mahesana	58.121	-	-	-			125	125	64	-	-	663	120	130	150	-	100	-	1,477	58	1,535	1,830	-	Yes	Yes	D/U	-	-	-	-	-	480	10 Veh.	20	6	4	-	8
		CS5	Malosan	100.732	-	-	-			125	125	64	-	-	460	120	130	150	-	100	100	1,374	53	1,427	1,722	-	-	-	U (Future) /D	-	-	-	-	-	120	10 Veh.	4	8	2	-	4
	Ajmer Sec-9 (North Side)	**JS5**	**Palanpur**	12.151	-	-	460	410	834	-	-	-	-	-	663	120	130	150	-	100	-	2,867	58	2,925	3,614	-	Yes	Yes	D/U	Yes	-	Yes (U or D)	-	-	515	10 Veh.	20	6	4	-	8
		Station	**Chadotar**	1.278	-	-	-	-	-	-	-	-	-	-	460	-	-	150	-	-	-	610	31	641	641	-	-	-	-	-	-	-	-	-	-	2 Veh.	4	4	2		1
																																								Residential Quarters (Type II) for KEY MEN at IR Stations and at Other Locations as detailed below					**23**
																																							Total Nos. of Residential Quarters (Type II) for KEY MEN at DFCCIL Stations, IR Stations and at Other Locations					**84**

BREVIATIONS for SIDING - D: DOWN U : UP

Note : The number of various types of Residential Buildings as identified above at individual Stations are tentative and may change during the design stage keeping the total number of respective type of residential buildings

Abbreviations:

OHE	Over Head Equipment
PSI	Power Supply Installation
TWS	Tower Wagon Shed
IMD	Integrated Maintenance Depot
CTC	Centralized Train Control
ESM	Elect. Signal Maintenance
PWI	PW Inspector (Senior Section Engg.)
TI	Traffic Inspector
MMU	Machine Maintenance Unit

Location of Key Men Quarters at IR Stations and Other Locations		Nos.
1	Jhulasan Railway Station of IR	1
2	Dangaw Railway Station of IR	1
3	Ambliyasan Railway Station of IR	2
4	Jagudan Railway Station of IR	3
5	Mehsana Railway Station of IR	2
6	Unjha Railway Station of IR	2
7	Kamli Railway Station of IR	3
8	Sidhpur Railway Station of IR	1
9	Dharewada Railway Station of IR	1
10	Chapi Railway Station of IR	1
11	Umardashi Railway Station of IR	1
12	Palanpur Railway Station of IR	2
13	Chitrasani Railway Station of IR	2
14	Jethi Railway Station of IR	1
	Total	23

List of Buildings in Junction and Crossing Stations

Package	CPM	Station (Mark)	Station (Name)	Chainage DFC (KMs)	Building Locations and Areas									Stn Bldg. Offices, Resting Facilities including Verandah (SqM)	Service Building			TWS (SqM)	MMU (SqM)	Sub-Depots for brake down/ emergency & day to day maintenance (SqM)	Total Area (SqM)	Misc. Work PF, path way etc. @ 5% of area required (SqM)	Total covered Area Required at each Station (SqM)	Open Area to be developed at each station - duly fenced (SqM)	SIDING											Covered Parking for Sedan Type Vehicles	Residential Buildings (Nos. of units)				Residential Quarters for KEY MEN on DFCCIL Stations. (Type-II) Nos.
					Control Room(CTC) & Office of Regional Manager (SqM)	Crew Changing Building (SqM)	IMD covered area (SqM)			IMD Sub Depot			OHE Depot WT (SqM)	Track Machine Depot (SqM)		S&T Dept. (SqM)	Electrical Dept. (SqM)	Engg. Department (SqM)								BALLAST Depots/ siding 700 M long	Hot Axle (UP) 120M length	Hot Axle [Dn] 120M length	Track M/C 120 M length	IMD	Track M/C Shed of size 50m x 14m	Tower Wagon Siding	Wiring Train Siding	Accident Relief Train Siding	Total Length of Siding at each station (m)						
							Civil (SqM)	S&T (SqM)	OHE & PSI (SqM)	Civil (SqM)	S&T (SqM)	OHE & PSI (SqM)																											
11	Mumbai Sec-1	JS1	JNPT	0.509						314					460	120	130	150				1,174	43	1,217	1,826		Yes	Yes	U/D						1114.5	10 Veh.	4	4	2		5
		CS1	Nilje	37.928											460	120	130	150		100		960	48	1,008	1,008			Yes	U(Future)/D						240	10 Veh.	4	4	2		5
		JS2	Kharbao	72.578		120	1704								663	120	130	150	165			3,052	67	3,119	3,808		Yes	Yes	U/D	Yes		Yes			515	10 Veh.	4	4	2	2	4
																																									Residential Quarters (Type II) for KEY MEN at IR Stations and at other locations as detailed below					17
ABBREVIATIONS for SIDING:			D: DOWN	U: UP																																				Total No. of Residential Quarters (Type II) for KEY MEN at DFCCIL Stations, IR Stations and at other locations					**31**

Note: The number of various types of Residential Buildings as identified above at individual Stations are tentative and may change during the design stage keeping the total number of Residential Buildings unchanged.

Abbreviations:

OHE	Over Head Equipment
PSI	Power Supply Installation
TWS	Tower Wagon Shed
IMD	Integrated Maintenance Depot
CTC	Centralized Train Control
ESM	Elect. Signal Maintenance
PWI	PW Inspector (Senior Section Engg.)
TI	Traffic Inspector
MMU	Machine Maintenance Unit

	Location of Key Men Quarters at IR Stations and Other Locations	Nos.
1	Jasai Railway Station of IR	2
2	Dapoli Railway Station of IR	1
3	Panvel Railway Station of IR	2
4	Kalemboli Railway Station of IR	1
5	Taloje Panchanand Railway Station of IR	2
6	Diva Railway Station of IR	0
7	Dativali Railway Station of IR	0
8	Kopar Road Railway Station of IR	1
9	Bhiwani Road Railway Station of IR	1
10	Kaman Railway Station of IR	2
11	Juchandra Railway Station of IR	1
12	Vasai Road Railway Station of IR	2
13	Virar Railway Station of IR	1
14	Vaitarana Railway Station of IR	1
	Total	**17**

List of Buildings in Junction and Crossing Stations

Package	CPM	Crossing Station (Mark)	Crossing Station (Name)	Chainage DFC (KMs)	Building Locations and Areas										Stn Bldg, Offices, Resting Facilities including Verandah (SqM)	Service Building			TWS (SqM)	MMU (SqM)	Sub-Depots for brake down/ emergency & day to day maintenance (SqM)	Total Area (SqM)	Misc. Work PF, path way etc. @ 5% of area required (SqM)	Total covered Area Required at each Station (SqM)	Open Area to be developed at each station - duly fenced (SqM)	SIDING											Covered Parking for Sedan Type Vehicles	Residential Buildings (Nos. of units)				Residential Quarters for KEY MEN on DFCCIL Stations. (Type-II) Nos.
					Control Room(CTC) & Office of Regional Manager (SqM)	Crew Changing Building (SqM)	IMD covered area (SqM)			IMD Sub Depot			OHE Depot WT (SqM)	Track Machine Depot (SqM)		S&T Dept. (SqM)	Electrical Dept. (SqM)	Engg. Department (SqM)								BALLAST Depots/ siding 700 M long	Hot Axle (UP) 120M length	Hot Axle [Dn] 120M length	Track M/C 120 M length	IMD	Track M/C Shed of size 50m x 14m	Tower Wagon Siding	Wiring Train Siding	Accident Relief Train Siding	Total Length of Siding at each station(m)							
							Civil (SqM)	S&T (SqM)	OHE & PSI (SqM)	Civil (SqM)	S&T (SqM)	OHE & PSI (SqM)																												
12	Mumbai Sec-2	CS2	Saphale	106.892											460	120	130	150				860	43	903				Yes							240	10 Veh.	4	4	2		3
	Mumbai Sec-2	CS3	Palghar	141.712						314					460	120	130	150			100	1,274	48	1,322	1,931		Yes		D(Future)/U						240	10 Veh.	4	4	2		4
	Mumbai Sec-2	CS4	Gholvad	181.719											460	120	130	150		100		960	48	1,008				Yes		U(Future)/D					240	10 Veh.	4	4	2		4
	Surat Sec-3	CS5	Pardi	27.613		120		1704							663	120	130	150	165			3,052	67	3,119	3,808		Yes		D(Future)/U	Yes		Yes			275	10 Veh.	4	4	2	2	5
	Surat Sec-3	CS6	Ancheli	65.134											460	120	130	150		100		960	48	1,008				Yes		U(Future)/D					240	10 Veh.	4	4	2		5
																																									Residential Quarters (Type II) for KEY MEN at IR Stations and at other locations as detailed below					31
ABBREVIATIONS for SIDING:			D: DOWN	U: UP																																				Total No. of Residential Quarters (Type II) for KEY MEN at DFCCIL Stations, IR Stations and at other locations					52

Note: The number of various types of Residential Buildings as identified above at individual Stations are tentative and may change during the design stage keeping the total number of Residential Buildings unchanged.

Abbreviations:	
OHE	Over Head Equipment
PSI	Power Supply Installation
TWS	Tower Wagon Shed
IMD	Integrated Maintenance Depot
CTC	Centralized Train Control
ESM	Elect. Signal Maintenance
PWI	P.W.Inspector (Senior Section Engg.)
TI	Traffic Inspector
MMU	Machine Maintenance Unit

	Location of Key Men Quarters at IR Stations and Other Locations	Nos.
1	Kelve Road Railway Station of IR	2
2	Palghar Railway Station of IR	2
3	Boisar Railway Station of IR	1
4	Vanagaon Railway Station of IR	2
6	Umbergaon Road Railway Station of IR	2
7	Sanjan Railway Station of IR	2
8	Bhilad Railway Station of IR	2
9	Karambeli Railway Station of IR	1
10	Vapi Railway Station of IR	2
11	Udvada Railway Station of IR	2
12	Atul Railway Station of IR	1
13	Valsad Railway Station of IR	2
14	Dungri Railway Station of IR	2
15	Billimora Railway Station of IR	2
16	Hansapur Railway Station of IR	1
17	Navsari Railway Station of IR	2
18	Maroli Railway Station of IR	2
19	Sachin Railway Station of IR	1
	Total	**31**

List of Buildings in
Junction and Crossing Stations

Package	CPM	Junction/ Crossing Station (Mark)	Junction/Crossing Station (Name)	Chainage DFC (KMs)	Building Locations and Areas: Control Room(CTC) & Office of Regional Manager (SqM)	Crew Changing Building (SqM)	IMD covered area (SqM): Civil (SqM)	IMD covered area (SqM): S&T (SqM)	IMD covered area (SqM): OHE & PSI (SqM)	IMD Sub Depot: Civil (SqM)	IMD Sub Depot: S&T (SqM)	IMD Sub Depot: OHE & PSI (SqM)	OHE Depot WT (SqM)	Track Machine Depot (SqM)	Stn Bldg, Offices, Resting Facilities including Verandah (SqM)	Service Building: S&T Dept. (SqM)	Service Building: Electrical Dept. (SqM)	Service Building: Engg. Department (SqM)	TWS (SqM)	MMU (SqM)	Sub-Depots for brake down/ emergency & day to day maintenance (SqM)	Total Area (SqM)	Misc. Work PF, path way etc. @ 5% of area required (SqM)	Total covered Area Required at each Station (SqM)	Open Area to be developed at each station - duly fenced (SqM)	SIDING: BALLAST Depots/ siding 700 M long	Hot Axle (UP) 120M length	Hot Axle [Dn] 120M length	Track M/C 120 M length	IMD	Track M/C Shed of size 50m x 14m	Tower Wagon Siding	Wiring Train Siding	Accident Relief Train Siding	Total Length of Siding at each station (m)	Covered Parking for Sedan Type Vehicles	Residential Buildings (Nos. of units): Type-II	Type-III	Type-IV	Type-V	Residential Quarters for KEY MEN on DFC Stations (Type-II) Nos.
13	Surat Sec-4	JS3	New Udhna	12800											460	120	130	150				860	43	903	903											10 Veh.	4	4	2		4
	Vadodara Sec-4	CS7	Gothangam	28869							314				460	120	130	150			100	1,274	48	1,322	1,931			Yes	U(Future)/D						240	10 Veh.	4	4	2		4
		CS8	Sanjali	67423											460	120	130	150		100		960	48	1,008	1,008		Yes		D(Future)/U						240	10 Veh.	4	4	2		4
	Vadodara Sec-5	CS9	Varediya	95381											460	120	130	150				860	48	908	908			Yes	U(Future)/D						240	10 Veh.	4	4	2		5
	Residential Quarters (Type II) for KEY MEN at IR Stations as detailed below																																								5
	Total No. of Residential Quarters (Type II) for KEY MEN at DFC Stations and IR Stations																																								22

ABBREVIATIONS for SIDING: D: DOWN U: UP

Note: The number of various types of Residential Buildings as identified above at individual Stationns are tentative and may change during the design stage keeping the total number of Residential Buildings unchanged.

Abbreviations:

OHE	Over Head Equipment
PSI	Power Supply Installation
TWS	Tower Wagon Shed
IMD	Integrated Maintenance Depot
CTC	Centralized Train Control
ESM	Elect. Signal Maintenance
PWI	PW Inspector (Senior Section Engg.)
TI	Traffic Inspector
MMU	Machine Maintenance Unit

	Location of Key Men Quarters at IR Stations	Nos.
1	Sachin Railway Station of IR	1
2	Bhestan Railway Station of IR	1
3	Kosamba Railway Station of IR	1
4	Panoli Railway Station of IR	1
5	Sanjali Railway Station of IR	1
	Total	5

List of Buildings in Junction and Crossing Stations

Package	CPM	Station (Mark)	Station (Name)	Chainage DFC (KMs)	Building Locations and Areas										Stn Bldg. Offices, Resting Facilities including Verandah (SqM)	Service Building			TWS (SqM)	MMU (SqM)	Sub-Depots for brake down/ emergency & day to day maintenance (SqM)	Total Area (SqM)	Misc. Work PF, path way etc. @ 5% of area required (SqM)	Total covered Area Required at each Station (SqM)	Open Area to be developed at each station - duly fenced (SqM)	SIDING											Covered Parking for Sedan Type Vehicles	Residential Buildings (Nos. of units)				Residential Quarters for KEY MEN on DFCCIL Stations. (Type-II) Nos.
					Control Room(CTC) & Office of Regional Manager (SqM)	Crew Changing Building (SqM)	IMD covered area (SqM)			IMD Sub Depot			OHE Depot WT (SqM)	Track Machine Depot (SqM)		S&T Dept. (SqM)	Electrical Dept. (SqM)	Engg. Department (SqM)								BALLAST Depots/ siding 700 M long	Hot Axle (UP) 120M length	Hot Axle [Dn] 120M length	Track M/C 120 M length	IMD	Track M/C Shed of size 50m x 14m	Tower Wagon Siding	Wiring Train Siding	Accident Relief Train Siding	Total Length of Siding at each station (m)			Type-II	Type-III	Type-IV	Type-V	
							Civil (SqM)	S&T (SqM)	OHE & PSI (SqM)	Civil (SqM)	S&T (SqM)	OHE & PSI (SqM)																														
14	Noida Sec-15RD	CS10	Dharuhera	27.686											460	120	130	150				860	43	903	903		Yes	Yes	D						360	10 Veh.	4	4	2		3
		CS11	Mewat	58.478											460	120	130	150		100		960	48	1,008	1,008		Yes	Yes	No						240	10 Veh.	4	4	2		4
	Noida Sec-16	JS4	Pirthala	92.375											663	120	130	150				1,063	53	1,116	3,509		Yes	Yes	U/D						680	10 Veh.	4	4	2		3
		CS12	Faridabad	123.862											460	120	130	150		100		960	48	1,008	1,008		Yes	Yes	D						360	10 Veh.	4	4	2		3
		JS5	Dadri	138.187						314					663	120 (for Dadri DFC Station) + 60 (for Dadri IR Station)	130	150				1,437	56	1,493	3,886		Yes	Yes	U/D						600	10 Veh.	4	4	2		4
																																							Residential Quarters (Type II) for KEY MEN at DFCCIL Stations					17

ABBREVIATIONS for SIDING: D: DOWN U: UP

Note: The number of various types of Residential Buildings as identified above at individual Stations are tentative and may change during the design stage keeping the total number of Residential Buildings unchanged.

Abbreviations:

OHE	Over Head Equipment
PSI	Power Supply Installation
TWS	Tower Wagon Shed
IMD	Integrated Maintenance Depot
CTC	Centralized Train Control
ESM	Elect. Signal Maintenance
PWI	PW Inspector (Senior Section Engg.)
TI	Traffic Inspector
MMU	Machine Maintenance Unit

ATTACHMENT-7

(Information on the OHE System Parameters)

Information on the OHE System

1.1 Western Dedicated Freight Corridor

1.1.1 The Western Corridor is planned from Jawaharlal Nehru Port at Nhava Sheva (JNPT), Mumbai to Tughlakabad/Dadri near Delhi. The Western Corridor of DFC Project covers a length of about 1,480 RKM (JNPT – Ahmadabad – Palanpur – Rewari – Asaoti - Dadri). Western Corridor is planned to be implemented in two Phases. The first phase envisages construction of about 915 RKM between Makarpura (Vadodara) and Rewari.

1.1.2 The Project entails construction of double-track electrified railway lines capable of handling 25 ton axle load, trains of 750m, single haul or 1500m with two coupled trains as long haul. Accordingly, loop lines in yards will be 1500m long capable of servicing two trains of 750m long each. In the first phase, although yard lines will be 1500 m long, crossing stations will have 750 m long loops with provision to extend them in future. The bridges and other structures will be designed to allow movement of 32.5 ton axle load, while the track structure will be initially designed for 25 ton axle load, operating at maximum train speed of up to 100 km/hr.

1.1.3 The Overhead Equipment Design will provide for movement of double stack container on flat wagons and the contact wire shall be provided at a height of about 7.54m above rail at support. The overhead electrification shall be designed with clearances as provided in the Schedule of Dimension of Dedicated Freight Corridor (DFC) – 2012 for maximum speed of 120 kmph and shall permit raising of the tracks by 275 mm to allow ultimately axle loads to be increased to 32.5 tonnes in future.

1.1.4 The Western DFC Phase-I route has 10 junction and 20 crossing stations, as under:

TABLE 1.1-1

List of Junction and Crossing Stations on Rewari- Makarpura (Vadodara) Section

Rewari Junction	Bangurgram Junction	Palanpur Junction
Ateli Junction	Haripur	Malosana
Dabla	Chandawal	Mahesana Junction
Bhagega	Marwar Junction	Ghumasan
Pacharmalikpur	Jawali	Sabarmati Junction (N)
Phulera Junction	Birolyia	Sabarmati Junction (S)
Sakun	Keshavaganj	Timba

Kishangarh	Banas	Changa
Saradhna	Swarupganj	Vasad
Srimadopur	Sriamirgarh	Makarpura Junction

Note: (1) Junction Stations are the interchange stations with Indian Railways & are indicated in bold letters.
(2) Junction stations are indicated in bold letters.

1.1.5 Trains will be hauled by 9000HP, 3 phase electric locomotives.

1.1.6 The formation of single trains shall be either 4500t container trains or 6000t bulk carrier trains. Trains may be coupled in formation of twin trains hauling 12000t bulk and 9000t containers with one engine in the middle of the train or two engines in front.

1.1.7 The Freight Corridor will utilize 25 kV AT feeding system on the main lines and 25kV conventional feeding system in yards, stations and depots.

1.1.8 The first section of the Western Dedicated Corridor from Rewari to Makarpura is to be opened for commercial services by December 2016.

1.1.9 Out of the entire length of Phase-I, the priority section is Rewari to Dabla, which should be commissioned earlier to enable trial testing of 9000 h.p. locomotives for the corridor.

1.2 Salient Features of the Western Dedicated Freight Corridor System

1.2.1 The salient features of the Western Dedicated Freight Corridor are as follows:

(I)	Gauge	1676mm
(II)	No. of tracks	2
(III)	Shortest radius of curve	700m on main lines and 200m on Depot and yard lines
(IV)	Maximum gradient	0.5%, with one stretch of 1120 mtrs of 0.55%
(V)	System of current collection.	Overhead Equipment
(VI)	On Main Line	25kV AT feeding system, regulated poly-gonal type
(VII)	Rewari Depot	25kV ac regulated polygonal type OHE system
(VIII)	Crossing and Junction Stations	25kV ac regulated polygonal type OHE system

(IX)	Design Speed Main Line Depot Access Line Depot Test Track Depot Other Tracks Crossovers	 120 km/h 50 km/h OHE inside depot will be designed and erected by the Other Contractor (RS P-7)

1.2.2 The Contractor shall provide 25kV AT Feeding System, auto- tensioned overhead equipment on the sections.

1.2.3 The nominal height of contact wire shall be about 7.54 m above rail level for the passage of double stack containers mounted on flat wagons.

1.2.4 Complete 25 kV ac flexible polygonal Overhead Equipment (OHE) including parallel reinforcing conductors along the track, foundations, steel structures, protective conductors, 25 kV feeder and cross track feeders, earth and associated insulators and hardware, jumpers and isolators (other than those located in TSS, SSP and SP).

1.2.5 +25kV and -25kV cable/Overhead cross-track feeders and flexible cable feeder connections from track-side bus to the tracks.

1.3 Design Features of Overhead Equipment

(a) Normal Encumbrance:(Axial Distance between Contact wire and the Catenary wire in a vertical plane) :1.4m
(b) Standard spans in multiples of 4.5 m from a minimum of 27 m
(c) Stagger of Contact Wire:
- On straight :200 mm
- On curved track : 300 mm

(d) The maximum distance between anti-creep to the anchor structure is 750m on Indian Railways. The Contractor may propose longer lengths upto 1000 m in view of the need to provide taller masts to support contact wire at height of 7.54 m based on his design calculations for acceptance by the Engineer. This should be submitted with detailed calculations for movement of cantilevers from their normal position to extreme temperature conditions.
(e) Structures: These may be of rolled Steel sections or fabricated. The Contractor may propose employing Tubular poles of proven design.

1.4 OHE Conductors

1.4.1 Indicative Sizes of Conductors

The indicative sizes of conductors for the main lines are furnished in the Table No. 9.5-1 below: The contractor has to design system in such a way that the conductors are sized to meet the power requirement for traffic to be hauled in the year 2031-32.

TABLE: No 1.4-1
OHE Conductors for Main Lines for each track

Conductor	Minimum Size(mm^2)	Material	Remarks
Catenary	125	Copper Magnisium	Material having temperature range up to 100^0C shall be used
Contact wire	150	Silver bearing copper	
25 kV Feeder	To be determined	AAAC	Material having temperature range up to 80^0C shall be used
Protective Earth wire	To be determined	ACSR	
Buried Earth Galavanied steel wires	To be determined	GI	If required to be provided as a result of simulation study

1.4.2 Flexible Droppers

Each bronze dropper shall consist of suitable size (minimum 10mm^2) bronze strands and two dropper clamps, one of which is connected to the contact wire, and the other to the catenary wire. Flexible dropper shall conform to DIN 482. The maximum resistance at the joint between the bronze dropper wire and the clamp, and at the contact point between the clamp and the catenary and contact wire, shall be less than the resistance of the conductor of the same length. The maximum temperature rise at the joint and at the contact surface shall not be higher than that of the conductor. The tensile breaking load of the complete joint shall not be less than 90% of the failure tension of the dropper wire.

1.4.3 Cantilever Assemblies

The cantilever system (MCS) on DFCC shall be modular.

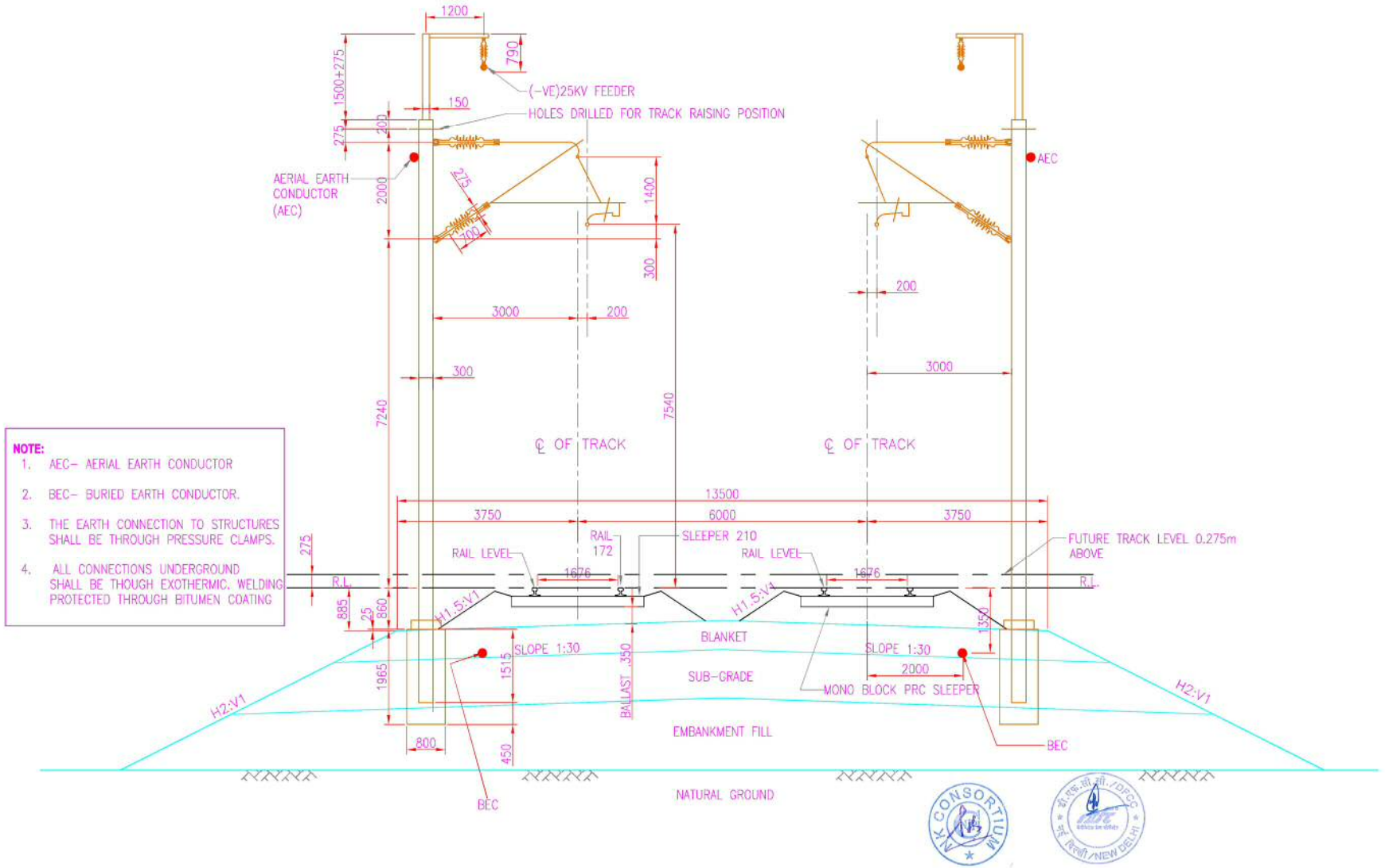
1.4.4 Location and Setting distance of Structures

Setting distance of structures (distance from centre line of track to face of mast) shall normally be 3.0 m plus curve allowance as required. Setting distance of portal upright, multiple OHE structure, anchor structures shall normally be 3.5 m. Where such distances are not possible, maximum possible clearance, but not less than that required by the Schedule of Dimensions for Western Dedicated Corridor for fixed structure shall be adopted. This is subject to review by the Engineer. The setback of location of traction mast shall be such that visibility of signals is not obstructed and shall be as indicated in the ACTM.

ATTACHMENT-8

(Typical OHE Mast on Embankment at 3.00-meter implantation)

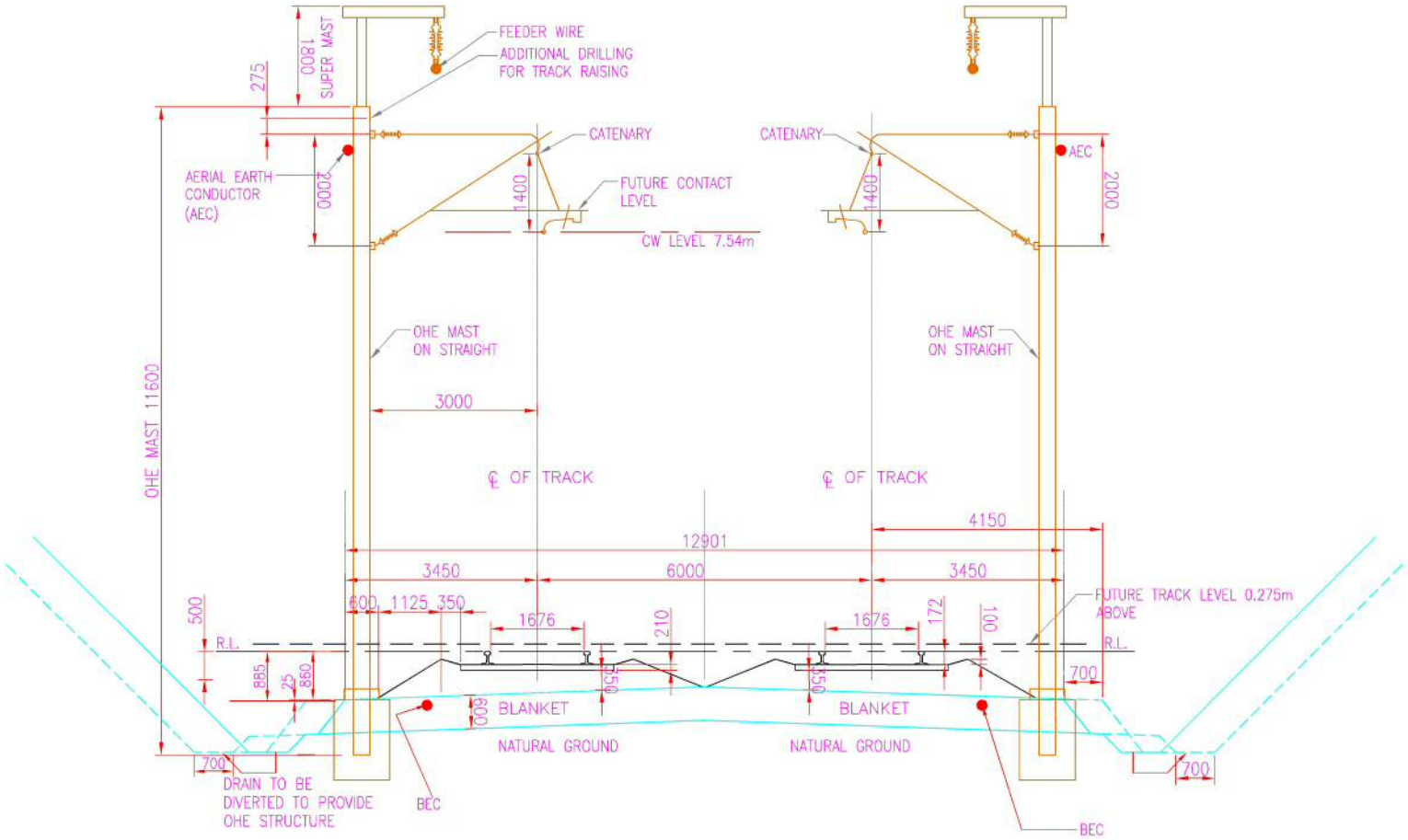
(Conceptual Drawing)



NOTE:

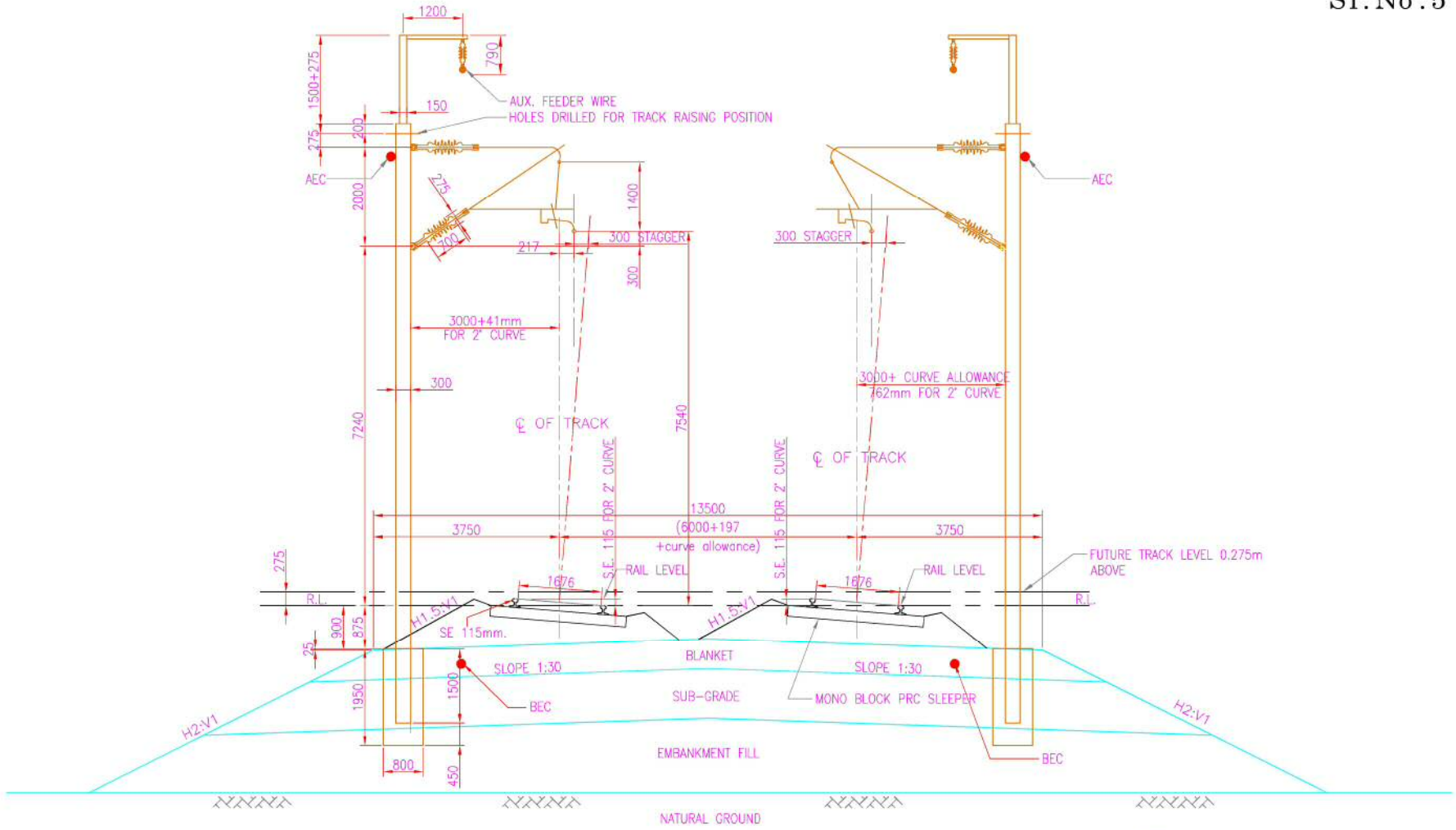
1. AEC– AERIAL EARTH CONDUCTOR
2. BEC– BURIED EARTH CONDUCTOR.
3. THE EARTH CONNECTION TO STRUCTURES SHALL BE THROUGH PRESSURE CLAMPS.
4. ALL CONNECTIONS UNDERGROUND SHALL BE THOUGH EXOTHERMIC WELDING PROTECTED THROUGH BITUMEN COATING

Project Title: Dedicated Freight Corridor Project (Western Corridor Phase-1: Rewari - Vadodara Section)	Client: Dedicated Freight Corridor Corporation of India (A GOVERNMENT OF INDIA UNDERTAKING) 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA	Drawing Title: TYPICAL OHE MAST ON EMBANKMENT AT 3.00m IMPLANTATION	Drawing Number: EMP4/OHE/101/ A(R) Scale: NTS Reference: --------- Drawn By: / / Checked By: / / Approved By: / /	Consultant: NJPI NK Consortium 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA



Project Title: Dedicated Freight Corridor Project (Western Corridor Phase-1: Rewari - Vadodara Section)	Client: Dedicated Freight Corridor Corporation of India (A GOVERNMENT OF INDIA UNDERTAKING) 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA	Drawing Title: TYPICAL OHE STRUCTURES IN CUTTING ON TANGENT TRACK ALSO SHOWING DIVERSION OF DRAIN.	Drawing Number: EMP4/OHE/101/ B(R) Scale: NTS Reference: --------- Drawn By: / / Checked By: / / Approved By: / /	Consultant: NJPI NK Consortium 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA

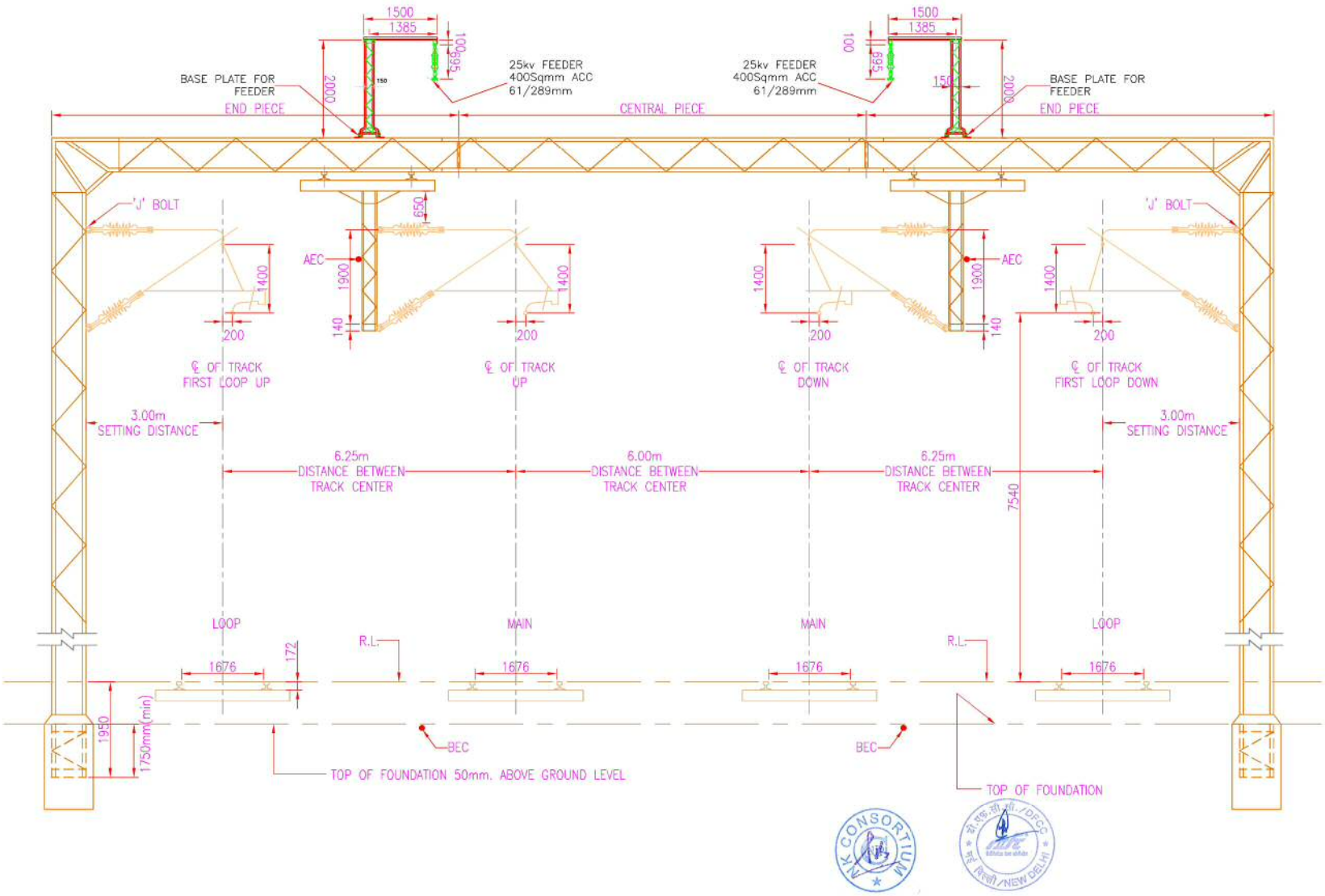
Sl. No. 5



NOTE:
REFER S.O.D. FOR DFC WESTERN CORRIDOR FOR EXTRA CURVE ALLOWANCE.

Project Title : Dedicated Freight Corridor Project (Western Corridor Phase-1: Rewari - Vadodara Section)	Client : Dedicated Freight Corridor Corporation of India (A GOVERNMENT OF INDIA UNDERTAKING) 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA	Drawing Title : TYPICAL OHE STRUCTURES ON A 2° CURVE	Drawing Number : EMP4/OHE/101/C(R) Scale : NTS Reference : --------- Drawn By : / / Checked By : / / Approved By : / /	Consultant : NK Consortium 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA

Sl. No. 6



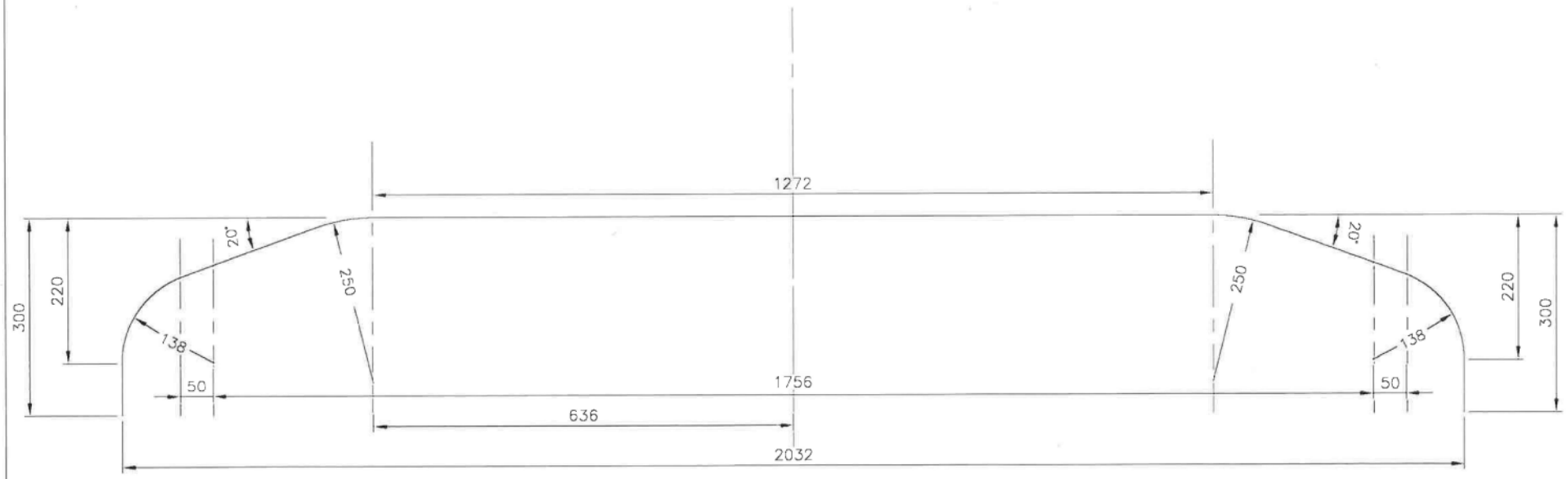
Project Title : Dedicated Freight Corridor Project (Western Corridor Phase-1: Rewari - Vadodara Section)	Client : Dedicated Freight Corridor Corporation of India (A GOVERNMENT OF INDIA UNDERTAKING) 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA	Drawing Title : TYPICAL ARRANGEMENT OF OHE ON PORTAL AT FOUR TRACK SECTION	Drawing Number : EMP4/OHE/102 (R) Scale : NTS Reference : --------- Drawn By : / / Checked By : / / Approved By : / /	Consultant : NJPI NK Consortium 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA

ATTACHMENT-9

(Pantograph profile with 2032 mm wide bow of WDFC)

Attachment-3

PROPOSED PANTOGRAPH PROFILE WITH 2032 mm WIDE BOW FOR WDFC



OUTLINE OF PANTOGRAPH 2032 WIDE

ATTACHMENT-10

(Technical Specification & Cross Sction of Contact Wire over IR and DFCCIL network)

composition of the drawing stocks or intermediate rod stocks shall be given in Table 2.

TABLE. 2- Material Composition of the drawing stocks or intermediate rod stocks

Material Designation			Composition in % Elements							
Material Group	Symbol	Number		Cu	Mg	Sn	Cd	P	Other elements Total	Other elements Excluding Sn
Copper-tin Alloy	Cu Sn 0.2	CW 129C	Min	Rest	-	0.15	-	-	-	
			Max		-	0.55	-	-	0.1	

5 PHYSICAL PROPERTIES

The physical properties of the contact wire shall be given in TABLE.3.

TABLE. 3- Physical Properties

SN	Item	Unit	Value /Quality	Relevant part of EN50149:2012
1	Maximum Resistivity	10^{-8} Ωm	2.155	Clause no. 4.6.1 Table 2
2	Density (at 20°C)	Kg/m^3	8,920	Annex. C.4
3	Co-efficient of linear expansion	/K	1.7×10^{-5}	Annex. C.5
4	Constant Mass Temp Co-efficient of Resistance	/K	3.2×10^{-3}	Clause no. 5.4

6 SIZES, SHAPES, DIMENSIONS, WEIGHTS AND OTHER PROPERTIES OF CONTACT WIRE

6.1 CLASSIFICATION

The contact wire shall be classified following class as indicated in TABLE.4

TABLE. 4- Classification

Nominal Cross Section mm^2	Symbol
150	BC-SN

6.2 IDENTIFICATION

Contact wires shall have one off set identification groove (as per Figure 5 of EN50149:2012) shown in Figure. 1.

NOKO FOR TECHNICAL DESIGN
Date :
Signature :

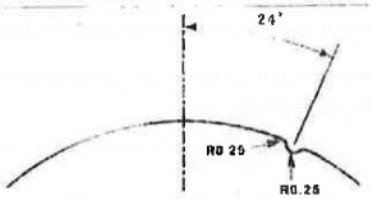


Figure. 1. Identification groove

6.3 CLAMPING GROOVE

The dimension of the clamping groove shall be in accordance with type B as given in Figure 2.

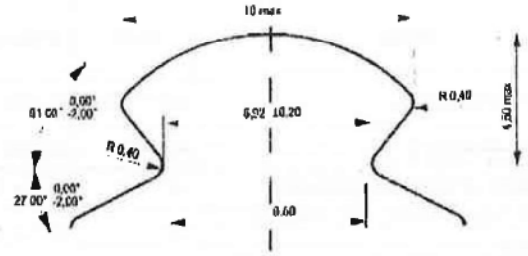


Figure. 2. Type B clamping groove.

6.4 SIZE

Dimensions and shape shall be shown in Figure. 3.

Dimension and shape is referred from Figure A.9 in Annex A of EN50149:2012.

NONO FOR TECHNICAL DESIGN
Date :
Signature :

6.6 JOINTS

There is no joint in drawing stock or intermediate drawing stock.

6.7 APPEARANCE AND CONDITION

The wires shall not present any imperfections (roughness, sliver, seam, inclusion or cracks) liable to affect the mechanical and/or electrical properties specified in this specification or to cause difficulties during installation/operation.

The surface shall be clean and free of oxide inclusions or sulphide generated during the manufacturing process or foreign substances such as pickling residue.

The color of the metallic bright surface immediately after manufacturing may change due to atmospheric influence. This is acceptable.

7 TEST

7.1 MATERIAL COMPOSITION

SUMITOMO ELECTRIC INDUSTRIES,LTD. shall submit a certificate to confirm the material composition is in accordance with Table.2 of this specification.

7.2 APPEARANCE AND CONDITION

The contact wire together with each sample which is subjected to other tests identified in this standard shall be examined with the naked eye (corrected to normal vision). The appearance shall comply with the requirements of Clause 6.7. of this specification.

7.3 PROFILES AND DIMENSIONS

Dimensional examination shall be performed either using a suitable micrometer or sliding caliper, or using a profile reflector with a minimum amplification of 10, or other appropriate methods.

7.4 ELECTRIC PROPERTIES

The resistivity or resistance per unit length measurements shall be made in conformity with IEC 60468:1974. The results shall be in accordance with Table. 5.

Note 1: The coefficient of temperature for the measurement of resistance at temperatures shall be in accordance with Table. 3.

Note 2: In a temperature range from -50°C up to 100°C the coefficient of temperature for the resistance is constant. For this application of measurement of electrical properties, definition of temperature range is not necessary.

NONO FOR TECHNICAL DESIGN
Date :
Signature :

NK CONSORTIUM

डी.एफ.सी.सी./DFCC
नई दिल्ली/NEW DELHI

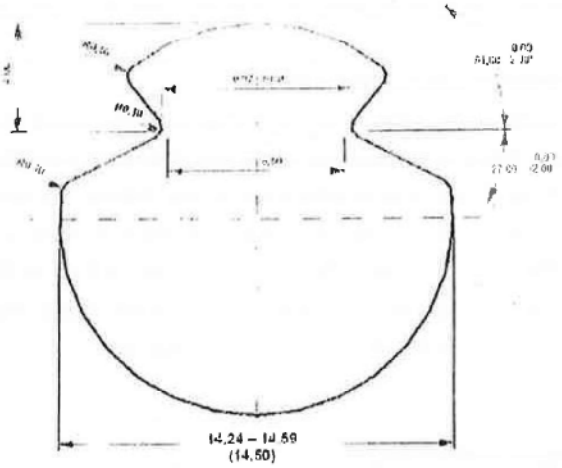


Figure. 3. Configuration of contact wire

NOTE Dimensions given without tolerances or ranges are for guidance only.
Dimensions in brackets are nominal only.

6.5 MECHANICAL AND ELECTRICAL PROPERTIES

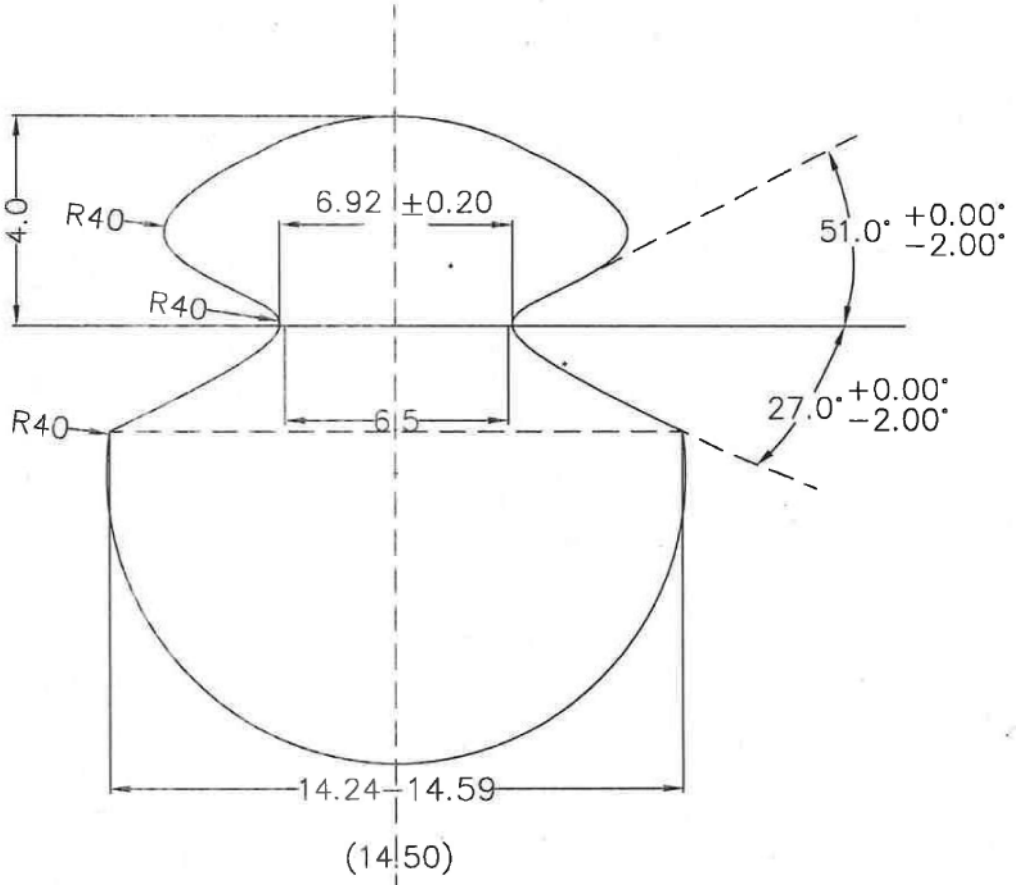
Mechanical and Electrical Properties shall be as detailed in Table 5.

TABLE. 5- Mechanical & Electrical Properties

SN	Item	Unit	Value / Quality	Relevant part of EN50149:2012
1	Nominal Cross Section	mm^2	150	Clause no. 4.5.2
2	Nominal Mass	Min.kg/km Max.kg/km	1,298 1,378	Annex C Table C.1
3	Max. Resistance(at 20°C)	Ω/km	0.144	–
4	Min. Tensile Strength	N/mm^2	420	Clause no. 4.7.1 Table 4
5	Elongation on 200mm	Min. % Max. %	2 8	Clause no. 4.7.1 Table 4
6	Min. Breaking Load*	KN	61.1	Clause no. 4.7.1 Table 5

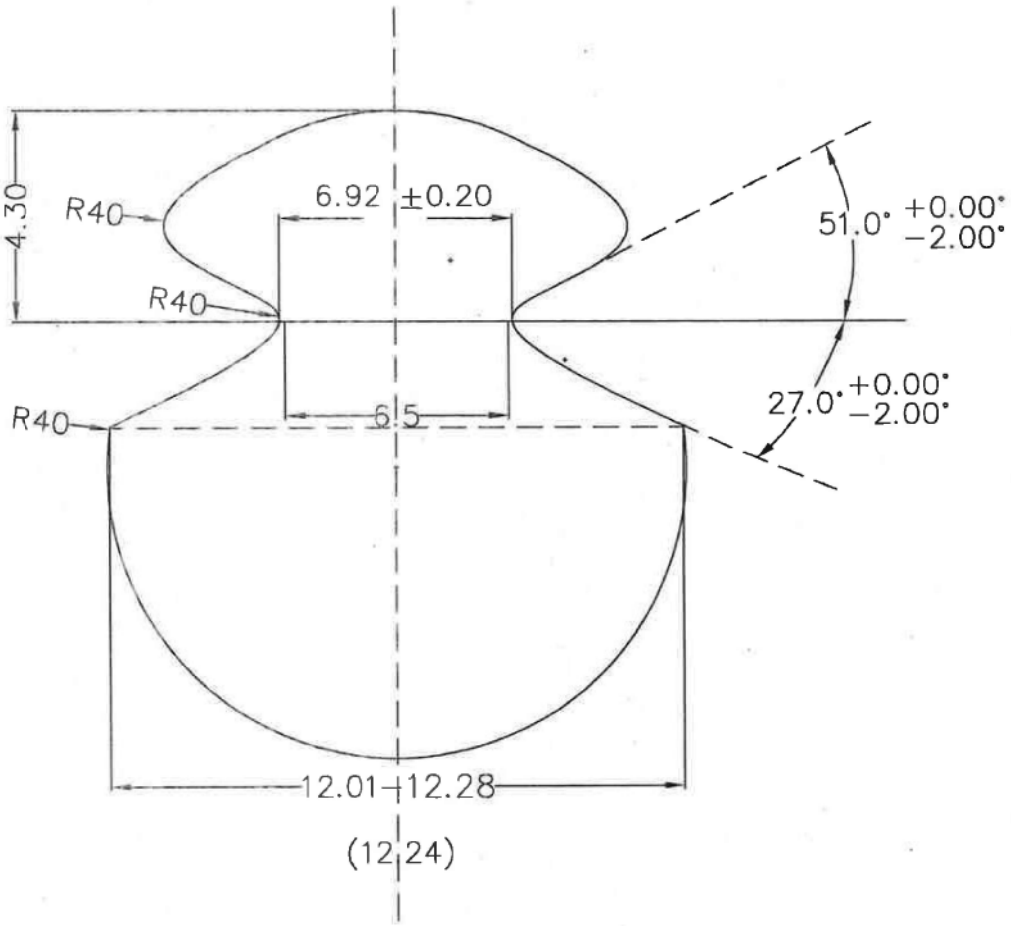
* Min. Breaking Load is calculated on minimum cross sectional area.

NONO FOR TECHNICAL DESIGN
Date :
Signature :



CONFIGURATION OF CONTACT WIRE –(150mm²)

Project Title: Dedicated Freight Corridor Project (Western Corridor Phase-2: Dadri - Rewari & Vadodara - JNPT Section)	Client: 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA	Drawing Title: CONFIGURATION OF CONTACT WIRE –(150MM²)	Drawing Number: / Scale: NTS / Reference: / Drawn By: / Checked By: / Approved By:	Consultant: NK Consortium, 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA



CONFIGURATION OF CONTACT WIRE –(107mm²)

Project Title: Dedicated Freight Corridor Project (Western Corridor Phase-2: Dadri - Rewari & Vadodara - JNPT Section)	Client: 5th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA	Drawing Title: CONFIGURATION OF CONTACT WIRE –(107MM²)	Drawing Number: Scale: NTS Reference: Drawn By: / Checked By: / Approved By:	Consultant: NK Consortium, 4th Floor, Pragati Maidan Metro Station Building, New Delhi-110001, INDIA

ATTACHMENT-11

(Dimension of Drum for Catenary Conductor and Contact Wire)

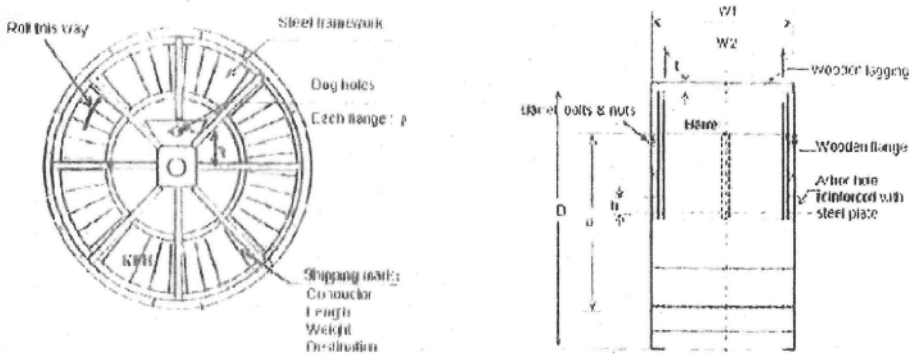


FIG-2 DRUM FOR CATENARY CONDUCTOR

TABLE-10. DIMENSION OF DRUM

Length (m)	Reel type	Approximate dimension (mm)								Net weight (kg)	Gross weight (kg)	remark
		D (Flange)	d (Barrel)	W1	W2	h	t	φ	R			
1400	125	1200_{-20}^{+20}	710_{-10}^{+10}	720_{-20}^{+20}	620_{-10}^{+0}	$85_{-0}^{+5.0}$	$25_{-3.0}^{+3.0}$	$50_{-5.0}^{+5.0}$	220_{-30}^{+30}			
2500	125	1400_{-20}^{+20}	710_{-10}^{+10}	740_{-20}^{+20}	620_{-10}^{+0}	$85_{-0}^{+5.0}$	$25_{-3.0}^{+3.0}$	$50_{-5.0}^{+5.0}$	220_{-30}^{+30}			

NONO FOR TECHNICAL DESIGN
Date
Signature

Each drum shall carry only one continuous length of contact wire. The contact wire shall be carefully coiled in layers with the contact side facing the center of the robust drum. Each coil shall be contiguous and well packed, particularly near the flanges of the wire drum, such that it will not be possible for the coil lay to be disturbed during transit. End of contact wire shall be fixed as shown in Figure. 9.

Drum dimension shall be as shown in Figure.10. and Table.10.

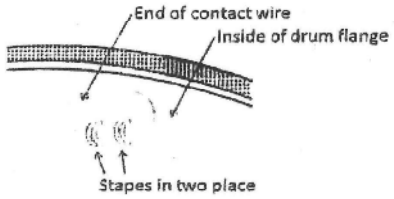


Figure. 9. Fixing for end of contact wire

The packing of conductor will be sea worthy and conductor drum will be suitable to withstand the tensioning force during construction and compatible with the wiring equipment

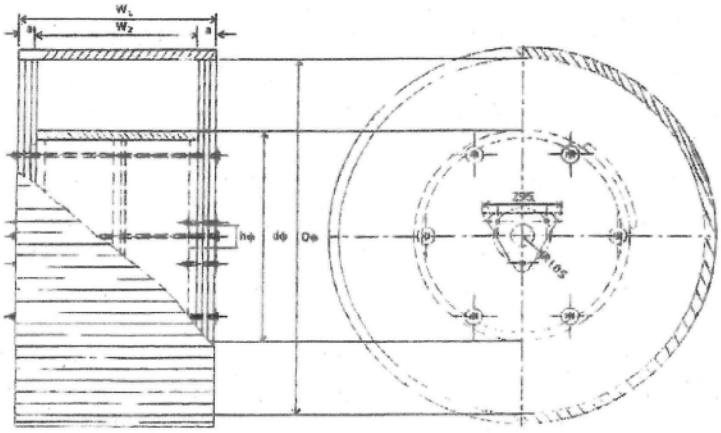


Figure.10. Configuration of drum

NOMO FOR TECHNICAL DESIGN
Date :
Signature :

Table.10- Details of Drum

Drum No.	D Dia mm	d.Dia. mm	W_1 mm	W_2 mm	a mm	h Dia. mm	Tare Weight Kg	Length of contact wire m
T-15	1,150	800	613	505	54	85	150	730
T-17	1,200	800	732	600	66	85	165	1,150
T-19	1,300	800	732	600	66	85	200	1,720
T-20	1,350	800	732	600	66	85	220	2,020

NOTE Length tolerance is +10m,-0m.

9.1.2 WIRE DRUM MARKINGS

Every wire drum shall bear a permanently marked number, assigned either by the customer or the manufacturer, clearly visible on each flange, together with an arrow and the words "take off" indicating the rolling direction of drum.

A label, resistant to deterioration and indelibly marked, shall be attached to one flange

The following items shall be legibly marked or labeled on a suitable place of the drum.

(1) Manufacturer's name
(2) Classification
(3) Length
(4) Masses (both gross and net)
(5) End point of wire
(6) Rolling direction of drum
(7) Drum number
(8) Year, month of manufacture
(9) Employer name
(10) Project name
(11) Customer order number

NOMO FOR TECHNICAL DESIGN
Date :
Signature :

9.1.3 STORING CONDITION

ATTACHMENT-12

(System Overview of the Signalling System)

1.1 System Overview

1.1.1 The Signalling system shall consist of following sub-systems or equipment as minimum requirement. In accordance with the requirement, the Contractor shall propose appropriate system configuration with sub-system or equipment for review by the Engineer.

1.1.2 Main Line and Depot access Line:

1) All main and running lines information shall be conveyed to OCC;
2) NOT USED
3) Electronic Interlocking system (Refer list of stations at Annexure3)
4) Automatic signalling in Block Sections with nominal signal spacing of 2 Kms.
5) Interlocking of Level Crossing Gates (Refer list in Data Book Vol. IV of Bid Documents)
6) Train Detection system;
7) Data Transmission System;
8) Train Monitoring and Diagnostic System (for phase 1 stations including Block sections as per Annexure3);
9) Power Supply System (PSS);
10) Point machines and
11) Other necessary equipment.

1.1.3 OCC:

1.1.3.1 The trains on main and running lines and Depot access line shall be all supervised in OCC. All routes setting shall be carried out at local stations. All necessary data shall be collected in OCC. Refer Annexure 1 and Annexure 2 for FRS and Technical specs of TMS respectively.

1.1.3.2 TMS terminals shall be provided at designated places of IR to enable IR to give weekly forecast of trains coming in from IR to DFC to enable DFC to prepare time table. This will be reviewed daily and any changes required shall be carried out manually by OCC. These terminals are included in the Misc. User terminals listed in next Clause.

1.1.3.3 19 No. of Miscellaneous user terminals shall be provided with its location and quantity tentatively fixed as under:

IR's Junction stations: 9

IR's Divl. Control Offices: 5

IR's Zonal. Control Offices: 3

DFCCIL's Corporate Office: 2

For IR's terminals connectivity, the Contractor shall provide OFC upto Junction stations details of which shall be finalized during Interface with IR.

1.1.3.4 Following minimum systems shall be provided in OCC:

1) Data Transmission System
2) Operation console
3) Rear Projection System for traffic supervision
4) Colour laser printers
5) Interface equipment
6) Uninterruptible Power Supply System (PSS)
7) Master Clock (Clock signal will be provided by the telecommunication system as specified in Part 2 of PS)
8) Other necessary equipment

1.1.4 Depot:

a) Signalling inside the Depot shall be provided by P-7 contractor. However, ST P-5A contractor shall provide TPWS on Test Track as well as on entry and exit signals in the Depot. In addition, P-5 contractor shall provide Signalling Monitor console in TPWS maintenance room in the Depot linking it to console of Signal Fault Controller in OCC.

b) For sending weekly schedule of Loco attachment/ detachment from ELMD to OCC for its integration with the time table, one TMS terminal will be provided in ELMD at the place indicated by P-7 contractor.

c) Typical Signalling Plan of Depot may be referred at Attachment 18 of Addendum 3. It may be noted that Trap and Point taking off from main line and Crossover between UP and DN lines of DFCCIL at Dadri end of Depot shall be controlled from DFCCIL's Rewari Interlocking.

1.1.5 Crew Lobbies & Signal Maintenance Base:

1.1.5.1 Maintenance Base will be in designated IMDs. Similarly there will be designated Crew Lobbies for booking of drivers.

1.1.5.2 Following minimum system shall be provided in Crew Lobbies & Signal Maintenance Bases.

1) TMS terminal;
2) Other Necessary Equipment.

ATTACHMENT-13

(Scope and Purpose of Telecommunication System)

INTRODUCTION

1.1 Scope and Purpose

1.1.1 This Specification covers the Design, manufacturing, delivery, installation, testing, Commissioning and support for the Telecommunications System to be supplied under this Contract.

1.1.2 The Telecommunications System comprises of six subsystems including Fiber Optic Cable Communication System (OFC), GSM-R Radio System, Electronic Private Automatic Branch Exchange Telephone System, Dispatch Telephone System, Master Clock System and Video Surveillance System. This Particular Specification includes:

- Chapter 2 Scope of Works,
- Chapter 3 Performance Requirements,
- Chapter 4 Design Requirements,
- Chapter 5 to 11 of system requirements
- Chapter 12 Interface,
- Chapter 13 Verification, Testing and Commissioning,
- Chapter 14 Packaging, Shipping, Storage and Delivery,
- Chapter 15 Installation,
- Chapter 16 Operation and Maintenance Support,
- Chapter 17 Spares, Special Tools and Test Equipment,
- Chapter 18 Training,
- Chapter 19 Documentation, and
- Chapter 20 Programme Requirements.

1.2 Relevant Documents

1.2.1 This Particular Specification (PS) shall be read in conjunction with the General Conditions of Contract, Particular Conditions of Contract, the General Specification (GS), and any other document forming part of the Contract.

1.2.2 In the event of a conflict between the GS and the PS, the requirements of the PS shall prevail.

1.2.3 In the event of a conflict between the PS and any other standards or specifications quoted in the PS, the requirements of the PS shall prevail.

1.2.4 Notwithstanding the contents of Sections above, the Contractor shall always immediately seek advice from the Engineer in the event of conflicts between specifications.

1.3 Reference Drawings

1.3.1 Reference drawings consist of typical stations as well as others as shown in Volume V of Reference Drawings. All drawings are indicative and for reference

1.4 Overview of Telecommunication System

(1) For efficient railway management and operation, it is essential to have a wellorganized telecommunication network covering strategic locations like OCC, stations, Electric Locomotive Maintenance Depot (ELMD) and maintenance depots, and it is equally essential to have reliable links between the strategic locations and moving trains or working staff along the railway track.

(2) The telecommunication system shall provide all necessary communication channels for carrying voice, data, and video signals for railway management and operation. Telecommunication channels shall be used for the telephone and radio systems and more than that for the control and supervision of the train from the OCC, and data channels for traction power control and supervision from the OCC.

(3) The OFC backbone transmission network, which shall provide the necessary communication channels in the WDFC, shall be of adequate high quality, and shall have high reliability, availability and expandability.

(4) A private telephone exchange network (PABX) shall be constructed to provide basic telephone communication within the WDFC, it shall be used for management, personnel management, facility maintenance and train operation.

(5) The telecommunication system shall also consist of a Dispatcher Telephone System / direct line telephone communication network exclusively for the train operation and maintenance functions and shall constitute a non-blocking and vital communication link.

(6) The GSM-R radio system shall enable communication between the fixed strategic locations and the moving trains as well as the moving working personnel along the railway track. The radio system shall also be used for ELMD operation.

(7) A master clock system shall be provided to distribute time signal to all the clocks at stations, depots, and OCC.

(8) Video Surveillance System shall be installed at OCC.

1.4.1 Optical Fiber Cable Communication System

1.4.1.1 The Optical Fiber Cable Communication system (OFC) shall provide a common transmission backbone for the telecommunication & signalling Subsystems and other contracts of this project. The OFC shall have sufficient transmission bandwidth to cater for current operational needs of the WDFC Phase I as well as for future system expansion.

1.4.1.2 The OFC shall be equipped with a network management system to provide status monitoring, configuration, analysis and control of the various network elements.

1.4.1.3 The OFC consists of main optical fiber cable network, secondary optical fibre cable network, SDH transmission system and Data Network System. Equipment for ELMD shall be provided by RS P-7. It shall however be integrated in the SDH network of WDFC.

1.4.2 GSM-R Radio System

1.4.2.1 The Radio system shall comprise the following main functional elements:
(1) Train radio to OCC and vice versa
(2) Hand-portable to OCC and vice versa
(3) Hand-portable to DCC and vice versa
(4) Hand-portable to Hand-portable
(5) SCR to OCC and Hand-portables/ train mobiles and vice versa
(6) Railway Emergency Calls

1.4.3 Telephone System

1.4.3.1 The Telephone system shall provide a digital EPABX fixed telephone network in OCC, stations and ELMD. Requirement of ELMD is excluded from the scope of ST P-5 as it shall be provided by RS P-7 contractor. ELMD system shall however interface with the WDFC system provided by ST P-5 as detailed in later chapters

1.4.3.2 The Telephone system shall include a Dispatch Telephone system to provide direct line telephone lines for train operation, traction power supply control and maintenance telephone lines for track, rolling stock, signalling and telecommunication. The system shall ensure instant, un-interruptible communication between key locations of the WDFC.

1.4.3.3 The EPABX network and DTS may be equipped with a common (or separate as applicable) network management system to provide user data management, alarm monitoring, performance monitoring and system monitoring.

1.4.4 Dispatch Telephone System Consoles

1.4.4.1 Dispatch telephone console shall be provided for each controller in OCC, ELMD, and stations. The DTS console in ELMD is excluded from the scope of ST P-5 as it shall be provided by RS P-7 contractor. ELMD system shall however interface with the WDFC system provided by ST P-5 as detailed in later chapters

1.4.4.2 Dispatch telephones shall be installed at strategic points, such as level crossings and traction substations, etc.

1.4.5 Master Clock System

1.4.5.1 Master clock system shall consist of two levels of hierarchy. First level is central level with synchronous signal from external. The second level is clock signal distributed to OCC, stations and ELMD, then fan out to clock display units. Requirements of ELMD are excluded from the scope of ST P-5 as it shall be provided by RS P-7 contractor. ELMD system shall however interface with the WDFC system provided by ST P-5 as detailed in later chapters.

1.4.6 Video Surveillance System

1.4.6.1 IP cameras shall be installed in OCC for security surveillance of the complete OCC complex.

1.4.6.2 VDU shall be provided for security controller in OCC as detailed in PS.

1.4.7 Provisions in BCC

1.4.7.1 All works at BCC will be done by the other contractor(s), however any interface for backup systems working between OCC and BCC shall be the responsibility of STP-5 contractor.

ATTACHMENT-14

(Climatic Condition)

Attachment 8

Climatic Conditions

Climatic Conditions play an important role in the functioning of equipment. The climatic conditions prevailing over Indian is harsh in all respects and it is important for the bidder to study each aspect carefully in providing features in the design to ensure reliable product.

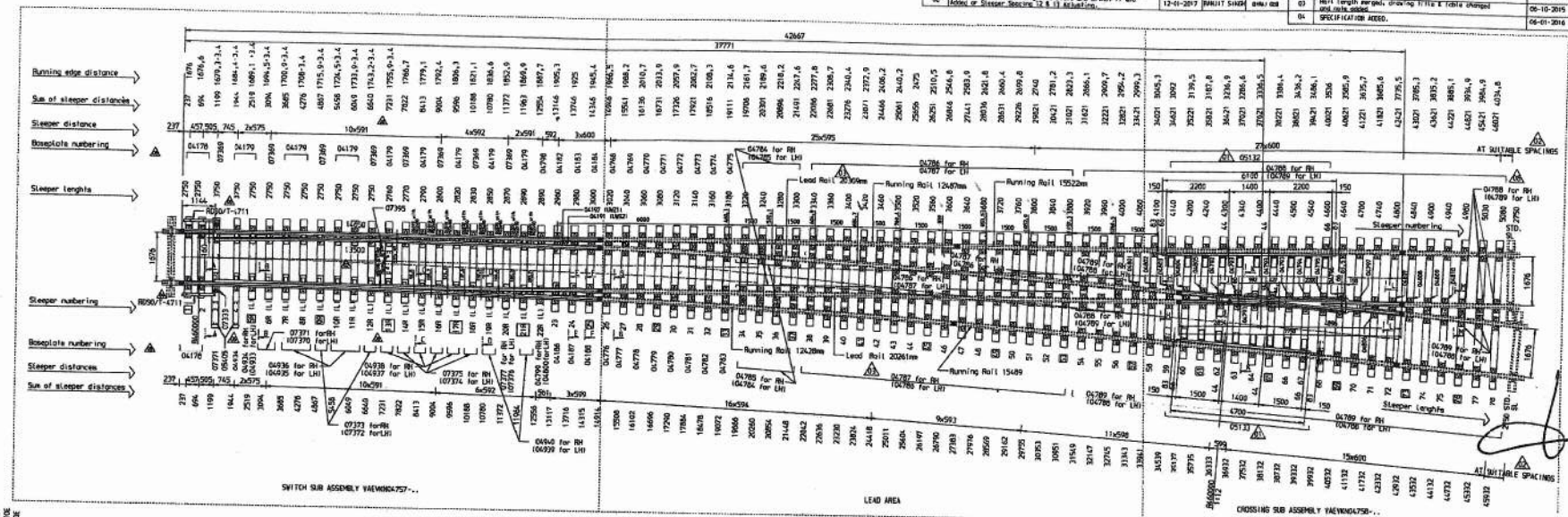
Temperature:	Ambient: -5°C to 50^0C Metallic surface temperature under Sun : 75°C Max and 55^0C in shade.
Humidity:	100 saturation during rainy season
Altitude:	1000 m above mean sea level
Rainfall:	Ranging from 1750 mm to 6250 mm during rainy season Number of rainy days in a year 120 days
Coastal Area:	Humid and salt laden atmosphere with maximum pH value of 8.5, Sulphate of 7 mg per litre, max. concentration of chlorine 6 mg per litre and maximum conductivity of 130 micro Siemens/cm.
Vibration:	The vibration and shock levels recorded on various sub-systems in existing IR are generally more than the limits given in IEC 61373 particularly at axle box, and traction motor High level of SO g vibration and shocks. Accelerations over 500 m/s^2 have been recorded at axle box levels for long period during run. Vibrations during wheel slips are of even high magnitude.
Wind Speed: Kg/m^2	High wind speed in certain areas with wind pressure reaching 150
Dust:	Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/m3
Solar Radiations:	$1kW/m^2$
Theft and Pilferage	Assembly and Sub-assembly having grey market value are vulnerable to theft and pilferage. Anti-theft measures for such vulnerable assembly shall be considered. Track side mounting shall also have similar protection against trespassing.

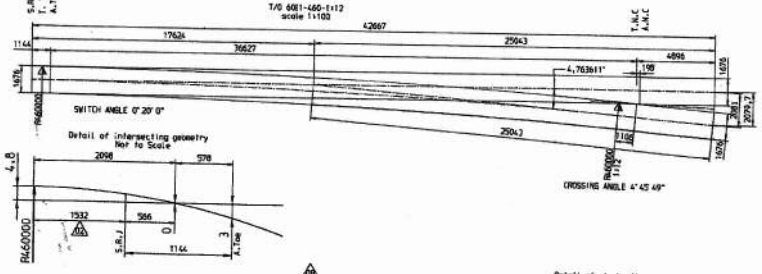
ATTACHMENT-15

(Layout for 1 in 12 and 1 in $8\frac{1}{2}$ Canted Turnout)

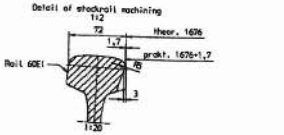
05	PLATE SOREY RDSO/T-3912	28-05-2016	Ranjit Singh	Biraj Deb	REV NO	REVISION NOTE		DATE	CHANGED BY	CHECKED BY
06	MS PLATE, MS FLAT TIE BAR & 6mm THK. GRSP ADDED	09-06-2016	RANJIT SINGH	RANJIT SINGH	01	changing Jhuck rail chair		09-12-2014	POSATEZ	KRENN
07	TITLE MODIFIED & SPECIFICATION ADDED	31-07-2016	RANJIT SINGH	BIRAJ DEB	02	Note added		13-07-2015	Ranjit Singh	Biraj Deb
08	Added or Sleeper Spacing 12 & 13 Actuation.	12-01-2017	RANJIT SINGH	BIRAJ DEB	03	Note length merged, drawing title & table changed and note added.		06-10-2015	Hiranshu	Ranjit Singh
					04	SPECIFICATION ADDED.		06-01-2016	Ranjit Singh	Biraj Deb

(1)





Detail of stockrail machining



19) Detail of Pirollers assembly given in Dwg. no. VAEVKN04757-..

18) Check Rail gap can be adjusted during maintenance upto 10mm with the help of shims to dwg. no. VAEVKN04638-..

● welding joint

17. Sleeper spacing is between sleeper no. 3 & 4 has been kept as 745mm instead of 600mm to suit the assembly of IRS point machine with 220mm Stock.

16. Head Hardend (Gr.1080M1) rails shall be used for manufacture of this turnout.

15. Sleeper No. 3 & 4 can be positioned acc. the side where the motor has to be installed.

14) The L.H turnout is the mirror image from R.H turnout except Slide chair & sleeper No. S To 22.

13) For L.H turnout sleeper No. SR to No. 22 to be replaced by no. SL to 22L and slide chair plates have to be replaced acc. to DWG. No. VAEVKN04757-00. Sleepers No. 1 to 4 and No. 22 To No. 1E remain incl. their plates.

12) Switch Sub Assembly dwg. no. VAEVKN04757-..

11) Crossing Sub Assembly dwg. no. VAEVKN04758-..

10) Weldable CMS crossing dwg.no. VAEVKN04619-..

9) Sections for turnout dwg.no. VAEVKN04750-..

8) Stressfree position of the switchblade at half opening of the switch 100 +/-25

7) On sleepers marked with [...], the gauge has to be measured.
For sleepers no. 3 to 13 see "detail of stockrail machining" 1676+1,7!!

6) Sleeper Nos. 1 to 22 are perpendicular to the main Line.

5) Sleeper Nos. 23 to 62 are laid in fan shape and 63 to 76 at half angle.

4) Standard fastening of rails with E-clip MK-V.

3) Rail gap 4mm

2) Grooved rubber sole plate 6mm thick will be used under baseplates

1) 10mm railpads will be used between baseplates and rails.

NOTE

NONCC FOR TECHNICAL DESIGN
Date: 2.1.03.2017
Signature:
Com. M. Agarwal
NKC/CORR

This design sutiable for 50Kmph speed specialy for WDFCC project

SLEEPER NO.	SLEEPER DRAWING NO	COMBINED B.PLATE	STD B.PLATE	STD B.PLATE	10mm THK. GROOVED RUBBER SOLE PLATE	6mm THK. BASE PAD
57	VAEVKN04999	- - -	VAEVKN04788-1 No.	VAEVKN04789-1 No.	VAEVKN04818-4 Nos.	VAEVKN04806-2 No. & VAEVKN04813-1 No.
56	VAEVKN04998	- - -	VAEVKN04788-2 Nos.	VAEVKN04789-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04813-1 Nos.
55	VAEVKN04997	- - -	VAEVKN04788-2 Nos.	VAEVKN04789-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04801-1 Nos.
54	VAEVKN04996	- - -	VAEVKN04788-2 Nos.	VAEVKN04788-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04801-1 Nos.
53	VAEVKN04995	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
52	VAEVKN04994	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
51	VAEVKN04993	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
50	VAEVKN04992	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
49	VAEVKN04991	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
48	VAEVKN04990	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
47	VAEVKN04989	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
46	VAEVKN04988	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
45	VAEVKN04987	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
44	VAEVKN04986	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
43	VAEVKN04985	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
42	VAEVKN04984	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
41	VAEVKN04983	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
40	VAEVKN04982	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
39	VAEVKN04981	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
38	VAEVKN04980	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
37	VAEVKN04979	- - -	VAEVKN04788-2 Nos.	VAEVKN04787-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04800-1 Nos.
36	VAEVKN04978	- - -	VAEVKN04784-2 Nos.	VAEVKN04785-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04699-1 Nos.
35	VAEVKN04977	- - -	VAEVKN04784-2 Nos.	VAEVKN04785-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04699-1 Nos.
34	VAEVKN04976	- - -	VAEVKN04784-2 Nos.	VAEVKN04785-2 Nos.	VAEVKN04818-4 Nos.	VAEVKN04699-1 Nos.
33	VAEVKN04975	VAEVKN04775-1 No. VAEVKN04783-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04812-2 Nos.
32	VAEVKN04974	VAEVKN04774-1 No. VAEVKN04782-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04811-2 Nos.
31	VAEVKN04973	VAEVKN04773-1 No. VAEVKN04781-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04810-2 Nos.
30	VAEVKN04972	VAEVKN04772-1 No. VAEVKN04780-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04809-2 Nos.
29	VAEVKN04971	VAEVKN04771-1 No. VAEVKN04779-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04808-2 Nos.
28	VAEVKN04970	VAEVKN04770-1 No. VAEVKN04778-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04807-2 Nos.
27	VAEVKN04969	VAEVKN04769-1 No. VAEVKN04777-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04806-2 Nos.
26	VAEVKN04968	VAEVKN04768-1 No. VAEVKN04776-1 No.	- -	- -	VAEVKN04818-4 Nos.	VAEVKN04805-2 Nos.

BEARING PLATE

TABLE OF SLEEPERS AND THEIR FITTINGS

IRS-T-12-2009

THIS DRAWING HAS BEEN PROOF CHECKED IN ACCORDANCE WITH THE REQUIREMENTS OF DFCCIL AND FOUND SUITABLE FOR INSTALLATION IN WDFC FOR 25T AXLE LOADS

Date.....

PROOF CHECKER

SYSTRA

Chief Track Engineer

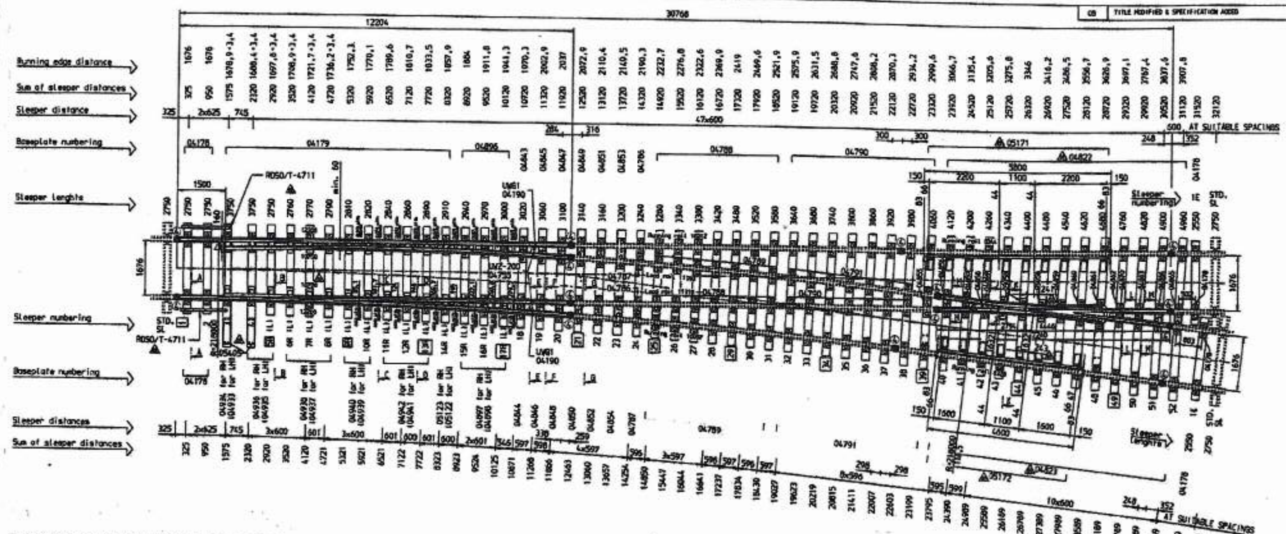
SATYAKI BHATTACHARYYA
Senior Track & Alignment Engineer

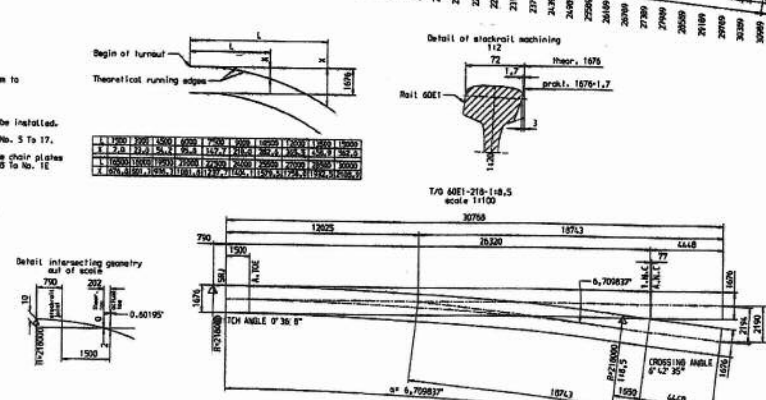
	RDSO/T-3223	GFN-GS INSULATING LINERS (PINK)	129
	RDSO/T-3222	GFN-GS INSULATING LINERS (YELLOW)	128
	RDSO/T-3913	24 / PLATE SCREW	224
	RDSO/T-3912	24 / PLATE SCREW	220
	T 10773	SINGLE COIL SPRING WASHER	444
	RDSO/T-5919	ERC MK-V	298
	VAEVKN04805 TO VAEVKN04812	6mm THK. GROOVED RUBBER SOLE PLATE	2 Each
	VAEVKN04913	6mm THK. GROOVED RUBBER SOLE PLATE	1
	VAEVKN04901	6mm THK. GROOVED RUBBER SOLE PLATE	14
	VAEVKN04900	6mm THK. GROOVED RUBBER SOLE PLATE	64
	VAEVKN04899	6mm THK. GROOVED RUBBER SOLE PLATE	18
	VAEVKN04918	10mm THK. GROOVED RUBBER SOLE PLATE	108
	VAEVKN04811	10mm THK. GROOVED RUBBER SOLE PLATE	20
	VAEVKN04778 & VAEVKN04783	COMBINED BEARING PLATES	1 EACH
	VAEVKN04769 & VAEVKN04775	COMBINED BEARING PLATES	1 EACH
	VAEVKN04801	COMBINED BEARING PLATES	1
	VAEVKN04789	STANDARD BEARING PLATE	7
	VAEVKN04788	STANDARD BEARING PLATE	7
	VAEVKN04787	STANDARD BEARING PLATE	32
	VAEVKN04785	STANDARD BEARING PLATE	32
	VAEVKN04785	STANDARD BEARING PLATE	8
	VAEVKN04784	STANDARD BEARING PLATE	8
	-	LEAD RAIL CURVED 120/300mm)	1
	-	LEAD RAIL STRAIGHT 120/261mm)	1
	-	CURVED RUNNING RAIL 115489mm)	1
	-	STRAIGHT RUNNING RAIL 115522mm)	1
	-	CURVED RUNNING RAIL 112428mm)	1
	-	STRAIGHT RUNNING RAIL 112487mm)	1
	DRAWING No.	DESCRIPTION	NOS.

ITEM REF.	QUANTITY	MATERIAL DESCRIPTION -			WT. - kg
		NAME	DATE	SIGN	
	DESIGNED BY	RANJIT SINGH	13.10.2014		
	CHECKED BY	KRENN	14.10.2014		
	APPROVED BY	KLEMEN	16.10.2014		

voestalpine VAE VKN INDIA PVT. LTD.
BAHALGARH, SONEPAT, HARYANA
INDIA

LAYOUT FOR 1 IN 12 CANTED TURNOUT (LEFT/RIGHT HAND) FOR 25T AXLE LOAD WITH 90Kg RAIL AND WELDABLE CMS CROSSING





31-07-2014	Ranjit Singh		REV NO	REVISION NOTE	DATE	CHANGED BY	CHECKED BY
			01	changing check rail chair	05-12-2014	POSATETZ	KRENN
			02	Note added	13-07-2015	Ranjit Singh	Biraj Deb
			03	Drawing title changed and note added	03-10-2015	Himanshu	Ranjit Singh
			04	Dimension Changed and table altered	12-10-2015	Himanshu	Ranjit Singh
			05	Specification Added	07-01-2015	Kishore	Ranjit Singh
			06	Plate screw RDSO/T-3913	28-05-2016	Ranjit Singh	Biraj Deb
			07	HS Plate, HS tie bar & 6mm THK. GRSP added	09-06-2016	Ranjit Singh	Ranjit Singh

SLEEPER NO.	SLEEPER DRAWING NO.	BEARING PLATE: Standard Plate	BEARING PLATE: Combined Plate	10mm THK. GROOVED RUBBER SOLE PLATTE	6mm THK. BASE PAD
37	VAEVKN05359	VAEVKN04790-2 Nos. & VAEVKN04791-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN05286-4 Nos.
36	VAEVKN05358	VAEVKN04790-2 Nos. & VAEVKN04791-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN05286-4 Nos.
35	VAEVKN05357	VAEVKN04790-2 Nos. & VAEVKN04791-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN05286-4 Nos.
34	VAEVKN05356	VAEVKN04790-2 Nos. & VAEVKN04791-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN05286-4 Nos.
33	VAEVKN05355	VAEVKN04790-2 Nos. & VAEVKN04791-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN05286-4 Nos.
32	VAEVKN05354	VAEVKN04790-2 Nos. & VAEVKN04791-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN05286-4 Nos.
31	VAEVKN05353	VAEVKN04788-2 Nos. & VAEVKN04789-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004901-4 Nos.
30	VAEVKN05352	VAEVKN04788-2 Nos. & VAEVKN04789-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004901-4 Nos.
29	VAEVKN05351	VAEVKN04788-2 Nos. & VAEVKN04789-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004901-4 Nos.
28	VAEVKN05350	VAEVKN04788-2 Nos. & VAEVKN04789-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004901-4 Nos.
27	VAEVKN05349	VAEVKN04788-2 Nos. & VAEVKN04789-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004901-4 Nos.
26	VAEVKN05348	VAEVKN04788-2 Nos. & VAEVKN04789-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004901-4 Nos.
25	VAEVKN05347	VAEVKN04788-2 Nos. & VAEVKN04789-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004901-4 Nos.
24	VAEVKN05346	VAEVKN04786-2 Nos. & VAEVKN04787-2 Nos.		VAEVKN04918-4 Nos.	VAEVKN004900-4 Nos.
23	VAEVKN05345		VAEVKN04853-1 No. & VAEVKN04854-1 No.	VAEVKN04918-4 Nos.	VAEVKN05285-2 Nos.
22	VAEVKN05344		VAEVKN04851-1 No. & VAEVKN04852-1 No.	VAEVKN04918-4 Nos.	VAEVKN05284-2 Nos.
21	VAEVKN05343	▲	VAEVKN04849-1 No. & VAEVKN04850-1 No.	VAEVKN04811-4 Nos.	VAEVKN05283-2 Nos.

DRAWING No.	DESCRIPTION	NOS.
RDSO/T-8222	GFN-66 INSULATING LINERS (YELLOW)	68
RDSO/T-8223	GFN-66 INSULATING LINERS (PINK)	68
RDSO/T-3913	Ø 24 PLATE SCREW	124
RDSO/T-3912	Ø 24 PLATE SCREW	124
T-10773	SINGLE COIL SPRING WASHER	248
RDSO/T-5919	ERC MKV	136
VAEVKN05286	6MM THK. GRSP	24
VAEVKN04901	6MM THK. GRSP	28
VAEVKN04900	6MM THK. GRSP	4
VAEVKN05283 to VAEVKN05285	6MM THK. GRSP	2 EACH
VAEVKN04811	10MM THK. GRSP	4
VAEVKN04918	10MM THK. GRSP	64
VAEVKN04791	STANDARD BEARING PLATE	12
VAEVKN04790	STANDARD BEARING PLATE	12
VAEVKN04789	STANDARD BEARING PLATE	14
VAEVKN04788	STANDARD BEARING PLATE	14
VAEVKN04787	STANDARD BEARING PLATE	2
VAEVKN04786	STANDARD BEARING PLATE	2
VAEVKN04849 to VAEVKN04854	COMBINED BEARING PLATE	1 EACH
-	LEAD RAIL 11318	1
-	LEAD RAIL 11390	1
-	RUNNING RAIL 10097	1
-	RUNNING RAIL 10212	1

18) Check Rail gap can be adjusted during maintenance upto 10mm with the help of shims to drg. no. VAEVKN06438-.. ▲

● welding joint

17) Sleeper spacing is between sleeper no. 3 & 4 has been kept as 745mm instead of 600mm to suit the assembly of IRS point machine with 220mm Stock.

16) Head Hardend (Gr.1080HH) rails shall be used for manufacture of this turnout.

15) Sleeper No. 3 & 4 can be positioned acc. the side where the switch machine has to be installed.

14) The L.H turnout is the mirror image from R.H turnout except Slide chair & sleeper No. 5 To 17.

13) For L.H turnout sleeper No. 5R to No. 17R to be replaced by no. 5L to 17L and slide chair plates have to be replaced acc. to DWG. No. VAEVKN05118-... Sleepers No. 1 to 4 and No. 18 To No. 1E remain incl. their plates.

12) Switch Sub Assembly dwg. no. VAEVKN05118-..

11) Crossing Sub Assembly dwg. no. VAEVKN05119-..

10) Weldable CMS crossing dwg. no. VAEVKN05120-..

9) Sections for turnout dwg. no. VAEVKN04750-..

8) Stressfree position of the switchblade at half opening of the switch (80 +/-25)

7) On sleepers marked with [..], the gauge has to be measured. For sleepers no. 3 to 8 see "detail of stockrail machining" (1676+1,7)

6) Sleeper Nos. 1 to 17 are perpendicular to the main line.

5) Sleeper Nos. 18 to 41 are laid in fan shape and 42 to 52 at half angle.

4) Standard fastening of rails with E-clip MK-V.

3) Rail gap 4mm

2) Grooved rubber sole plate 6mm thick will be used under baseplates

1) 10mm railpads will be used between baseplates and rails.

NOTE

NONOC FOR TECHNICAL DESIGN
Date: 19.9.16
Signature: V.K. GOYAL

IMPORTANT NOTE:-
MINOR CORRECTIONS IF ANY, MAY HAVE TO BE INCORPORATED IN THE DRAWING AT THE TIME OF SUBMISSION OF FINAL LAYOUT DRAWING.

IRS-T-12-2009
IRS-T-29-2000
EN.13232
SPECIFICATION

ITEM REF.	QUANTITY	MATERIAL DESCRIPTION -		WT. - Kg
	NAME	DATE	SIGN	voestalpine VAE VKN INDIA PVT. LTD. BAHALGARH, SONEPAT, HARYANA INDIA
DESIGNED BY	DEMMER	19.11.2014		
CHECKED BY	GRENN	19.11.2014		
APPROVED BY	KLOHEN	19.11.2014		LAYOUT FOR 1 IN 8.5 CANTED TURNOUT (0.2T/SLEEPER) THICK WEB TONGUE RAIL WITH 60Kg RAIL AND WELDABLE CMS CROSSING ON PSC SLEEPERS.
	SHEET	SIZE 594x1189	SCALE 1:50	DRAWING NO.- VAEVKN05117-08
FILE:- 05117.prt				

THIS DRAWING HAS BEEN PROOF CHECKED IN ACCORDANCE WITH THE REQUIREMENTS OF DFCCIL AND FOUND SUITABLE FOR INSTALLATION IN WDFC FOR 25T AXLE LOADS
Date............
PROOF CHECKER
SYSTRA

SOJITZ-L&T CONSORTIUM 12/4 Delhi-Mathura Road Faridabad-121003
JOSEPH PASCAL
CHIEF TRACK ENGINEER- SLT
17-08-16

SATYAKI BHATTACHARYYA
Senior Track & Alignment Engineer
SYSTRA