



RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
(K-RIDE)

BENGALURU SUB-URBAN RAIL PROJECT
(BSRP)

SCHEDULE OF DIMENSIONS

for

Broad Gauge (1676 mm)

and

3200 mm wide Rolling Stock

with

25 KV AC OHE Traction

Examined & found in order

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(July – 2021)



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RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
(K-RIDE)

BANGALORE SUB-URBAN RAIL PROJECT (BSRP)

PREAMBLE

Vide Railway Board letter number 2019/JV Cell/KRIDE/BSTP/EBR/07 dated 21/10/2020, Railway Board has communicated, approval of Cabinet Committee of Economic Affairs for the "Bengaluru Suburban Rail Project", based on DPR prepared by RITES.

This project is being executed parallel to existing Indian Railways running lines, as per the draft Suburban Policy 2018 of Indian Railways. Due to space constraints and working in a city environment, the proposed Suburban Railways will be traversing at a height exceeding 15 meters at certain locations and have to be designed steeper gradient up to 3%.

The Schedule of Dimensions has been prepared for the Bengaluru Sub-Urban Rail projects having a Broad Gauge (1676 mm) with a 25 kV OHE Traction system, rolling stock of similar to RS 13 of DMRC (3200 mm), and end evacuation.

This SOD has been prepared based on the following guidelines:

1. The SOD has been developed assuming certain coach dimensions and design characteristics as well as track and coach maintenance tolerance. Whenever a new stock is introduced the track and coach tolerance for maintenance tolerance should be laid down. The suitability of the Rolling Stock for operation with these maintenance tolerances should be established and sanction shall be obtained from the competent authority before the operation of the Rolling Stock.
2. kinematic envelope has been developed for 3200 mm wide and 4048 (max) mm high rolling stock. The Kinematic Envelope has been developed taking into account all track defects and rolling stock defects.
3. The clearances are based on assumption that windows are sealed and doors are closed during movement.
4. Track and Rolling stock shall be maintained to the tolerances considered for calculation of Kinematic Envelope.
5. The Structure Gauge indicated in SOD shall not be violated under any circumstances except for platform coping, designated operational structures such as platform screen door/gate structures including structural support, hand railing in back of the house, platform edge, etc.

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6. "The vehicle Kinematic Envelope for the platform area shall be applied only within confines of stations up to 70 Km/h vehicle speed and 70 Km/h wind speed for elevated/At-Grade sections and '42 Km/h windspeed' for the underground sections and platforms. At all other locations, the Kinematic Envelope corresponding to 90Km/h vehicle speed and maximum wind speed at that geographical area shall be used for determining the Structure Gauge for elevated and at grade section (outside the station area). 42 Km/h side wind represents 100 Pa pressure consider as buffeting effect.
7. The speed of trains at platforms on elevated or at grade stations shall be restricted to 40 KMPH when wind speed is more than 70 KMPH but less than 90KMPH. Metro operation shall be stopped when wind speed reaches 100 km/h or more. Continuous recording of wind speed shall be done at critical locations defined by metro administration
8. Design speed is 90 km/h and operational speed shall be 80 km/h (except at stations). The operating speed at stations shall be 50 km/h. The operating speed in depots shall be 25 km/h. Minimum speed potential on diverging lines at turnouts having,
 - a. Weldable CMS crossing (1 in 16) and tick web switch with 785 m radius of lead curve rail shall be 50 km/h.
 - b. Weldable CMS crossing (1 in 12) and thick web switch with 410 m radius of lead curve rail shall be 45 km/h.
 - c. Weldable CMS crossing (1 in 8.5) and tick web switch with 218 m radius of lead curve rail shall be 30 km/h
9. The Kinematic envelope of rolling stock shall not be infringed under any circumstances and structure gauge for all locations other than stations shall not be infringed under any circumstances.
10. No work/workmen/Equipment is allowed between Vehicle and Structure gauge during the operation of trains.
11. Electrical Clearances shall be measured from the Kinematic Envelope of rolling stock.
12. The train operation will be stopped in the affected section by Central Control if any one of the Trains in the UP or DN direction derails. The operation will remain suspended till the clearance was given by the Accident Site Manager, from the site by exchange of private numbers with Central Control.
13. All the dimensions given are in millimetres, or otherwise stated explicitly.

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Schedule of Dimensions

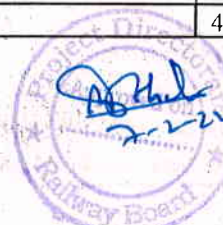
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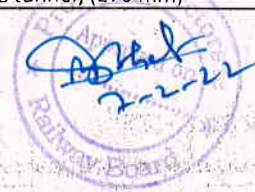
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STANDARD DIMENSIONS
1676mm GAUGE (BG)
CHAPTER 1—GENERAL

Item no	Items	Values
1.1	1. Min Spacing of Tracks	
		At grade and Elevated 3900
		Underground 3900
	2. Spacing of track Between BSRP track and existing IR track	
		Recommended 7800 #
		Minimum 5300 #
	<p>Note:</p> <p>a) Refer to Appendix-1 for further details</p> <p>b) Refer Figure no KRIDE/BSRP/KRS-01/RSBG-2</p> <p>c) No structure or OHE/ signal post should present in between. In case of OHE masts/signal posts are required to be provided in between tracks under unavoidable circumstances the clearance maintained in 1.1 above shall be increased by equal to the width of such provisions/structure/foundations, as the case may be</p> <p>d) In the case of existing structures, a special clearance study shall be made as indicated in Appendix-5 before electric traction is introduced.</p>	
1.2	Curves	
1.2.1	Minimum radius of curves (horizontal) in meters	
		On the main running line 200
		On depot and other than main running line 175
		At passenger platform 1000
1.2.2	Transition length:	
	<p>Transition length shall be determined using a cant gradient, rate of change of cant, rate of change of cant deficiency. It shall be a maximum of L1, L2 or L3</p> <p>$L1 = C_a \cdot V / (dC_a/dC_t)$</p> <p>$L2 = C_d \cdot V / (dC_d/dC_t)$</p> <p>$L3 = C_a \cdot V / (dC_a/dC_u)$</p> <p>$C_a$ Cant</p> <p>C_d Cant deficiency</p> <p>V Speed of vehicle.</p> <p>dC_a/dC_t Rate of change of cant mm/sec</p> <p>dC_d/dC_t Rate of change of cant deficiency mm/sec</p> <p>dC_a/dC_u Cant gradient mm/m</p> <p>Transition length in any case should not be less than 15 m.</p>	

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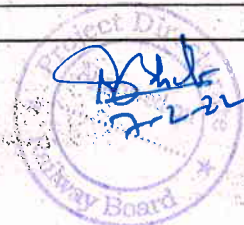
will be decided separately

1.2.3	Minimum length of any alignment (circular curves and straights) between two transition curves. In practice, length is determined by, $L=V/5$ (L in m and V in KMPH), as maximum speed is 90 kmph this formula is irrelevant.	20 m
1.2.4	1. Minimum radius of curves (Vertical) in meters	1500
	2. Minimum length vertical curves.	20 m
	3. In practice length is determined by, $L=V/4$ (L in m and V in KMPH),	
1.3	Gradients	
1.3.1	The max Gradient (compensated) shall be	3%
	Note: a. There shall be no change of gradient in transition portion of curves. b. The gradient will be compensated at the rate of 0.04% per degree of curve.	
1.3.2	Maximum permissible gradient on turnouts	
	1. On ballasted track	0.25 %
	2. On ballastless track	3.00 %
	Note: a. There shall be no change of gradient (i.e., Vertical curve) on and within 15.0m (desirable)/ 3.0 m (minimum) of any turnout on Ballastless track. In case of ballasted track, there shall be no change of grade on and within 30 meters of any turnout. b. There shall be no horizontal curve within 15.0m (desirable)/3.0 m (minimum) of any turnout on Ballastless track and 30 meters of any Turnout on Ballasted Track. c. Turnout shall normally be installed on straight track. In exceptional situations, turnout may take off from curve provided that the radius of lead curve (main line as well as diverging line) is not less than 190m. The negotiability of rolling stocks on such turnout must be certified by rolling stock supplier and confirmed through oscillation trial and a suitable speed restriction should be imposed on main and/or diverging track based on track geometry and other considerations, if required. In case of turnout installed on curved track, the minimum distance from commencement of vertical curve or another horizontal curve shall be 15m for Ballast-less track. Turnout shall not be laid on transition curve. d. The limit of turnout for above purposes shall be taken from Stock Rail Joint (SRJ) to end (i.e., heel) of crossing for Ballast-less track. For Ballasted track, it shall be from SRJ to last common sleeper behind end of crossing. e. The maximum permissible gradient on turnout and the location of turnout with respect to vertical/ horizontal curves in vicinity shall be ensured by metro that the Rolling stock is fit to negotiate these gradients. f. The above stipulations shall also be applicable for turnout to be laid outside station limit, if any.	
1.4	Cant	
	Max Cant on curves	120

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BSRP

SCHEDULE OF DIMENSIONS

		Max Cant deficiency	85
		Max Cant Excess	75
		Max Cant Gradient (mm/ mm)	1in 440
		Max rate of change of Cant (mm/ Sec)	40
		Max rate of change of Cant deficiency (mm/ Sec)	40
		Max Lateral Acceleration (m/ S ²)	0.55
1.5	Buildings and Structures		
	1. Structure Gauge has been arrived at by allowing a minimum clearance of 150 mm to kinematic envelope and minimum electrical clearance of 300 mm from 25 kV live parts.		
	Minimum horizontal distance from center of track to any structure (except a passenger platform and OHE mast) for heights above rail level on level tangent track shall be as under: (Also refer to Figure No. <i>KRIDE/BSRP/KRS-01/RSBG-2, 3</i>)		
	Height from Rail level	Elevated and at-grade track	At grade station
	0 to 350	1475 increasing to 1825	1475 increasing to 1815
	350 to 1030	1485 increasing to 1850	1815 increasing to 1835
	1030 to 1130	1850 increasing to 1885	1835 increasing to 1870
	1130 to 3000	1885 increasing to 1950	1870 increasing to 1935
	3000 to 4220	1950 decreasing to 1495	1935 decreasing to 1480
	4220 to 5900	1495	1480
		Under Ground track	Underground station
	0 to 350	1475 increasing to 1815	1475 increasing to 1800
	350 to 1030	1815 increasing to 1835	1800 increasing to 1815
	1030 to 1130	1835 increasing to 1870	1815 increasing to 1860
	1130 to 3000	1870 increasing to 1935	1860 increasing to 1930
	3000 to 4220	1935 decreasing to 1480	1930 decreasing to 1475
	4220 to 5900	1480	1475
	Note:		
	a) <i>Extra allowance shall be provided for curves as laid down at Appendix</i>		
	b) <i>For structures on elevated sections, extra lateral allowance of 50 mm shall be provided</i>		
	c) <i>Under item 1.5, any material stacked by the side of line is to be considered a structure in the sense in which the word is used here. These items also apply to projections of rock etc., from the side of cutting</i>		
	d) <i>Light structures such as ladders, thin posts, etc. erected alongside the track at a distance of less than 2150 mm from centre of adjacent track should be blanked off to a height of 300mm between 1850 mm and 2150 mm above rail level.</i>		
1.6	Minimum horizontal distance of any OHE mast or telegraph post measured from the centre of and at right angles to the nearest track (taking 200 mm as foundation width from structure gauge)		2150
1.7	Height of Road Over Bridges and Foot Over Bridges		

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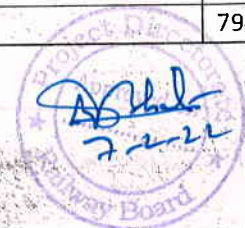
SCHEDULE OF DIMENSIONS

	1. Minimum height above rail level for a distance of 1500 mm on either side of the center of track for overhead structures with OCS	4838
	2. With OHE the minimum height above rail level for a distance of 1600mm on either side of the center of track shall be as under:	
	a. Light overhead structure such as Foot Over Bridges	5900
	b. Heavy overhead structure such as Road Over Bridges and Flyovers	5600
	Note:	
	a. <i>In case of restricted height of existing structures, a special study shall be made, as indicated in Appendix 5 before 25 kV AC traction is introduced. Accordingly, only in such cases, the minimum height above rail level shall not be lower than 5070mm in case of Heavy Overhead Structure (such as Road Over & Flyovers) and 5270mm in case of Light Overhead Structures (such as Foot Over Bridges) for a minimum contact wire height of 4800mm from above rail level. Refer Appendix 5 point 4 and 5</i>	
	b. <i>The height mentioned against item 1.7 shall be measured from the higher or super-elevated rail.</i>	
	c. <i>In areas where 25 KV A.C traction is used or likely to be used, if any turnout or crossover is located under a heavy overhead structure or within 40m from its nearest face irrespective of the position of level crossing gate, the minimum height of such overhead structure shall be 6250mm*. Also, in case the turnout is beyond 40m but the level crossing gate is within 520m from the nearest face of the bridge, the height of such overhead structure shall be 6250mm*.</i>	
1.8	Clearance for power line crossings including telephone line crossings of Railway tracks.	
	Minimum Clearance from Rail Level for New Power Line Crossing or Crossing Planned for Alteration	
1.8.1	1. Up to and including 11 KV	Underground
	2. Above 11 KV and up to 33 KV	14660
	3. Above 33 KV and up to 66 KV	14960
	4. Above 66 KV and up to 132 KV	15560
	5. Above 132 KV and up to 220 KV	16460
	6. Above 220 KV and up to 400 KV	18260
	7. Above 400 KV and up to 500 KV	19160
	8. Above 500 KV and up to 800 KV	21860
	Minimum Clearance Between Highest Traction Conductor and lowest transmission Line Crossing Conductor	
1.8.2	1. Up to and including 11 KV	Underground
	2. Above 11 KV and up to 33 KV	2440
	3. Above 33 KV and up to 66 KV	2440
	4. Above 66 KV and up to 132 KV	3050
	5. Above 132 KV and up to 220 KV	4580
	6. Above 220 KV and up to 400 KV	5490
	7. Above 400 KV and up to 500 KV	7940

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	8. Above 500 KV and up to 800 KV	7940
1.8.3	Minimum Clearance between any conductor not adequately insulated and any railway structure under most adverse condition	
	1. Up to including 650 volts	2500
	2. Above 650 volts up to and including 33 KV	3700
	3. Above 33 KV up to and including 66 KV	4000
	4. Above 66 KV up to and including 132 KV	4600
	5. Above 132 KV up to and including 165 KV	4900
	6. Above 165 KV up to and including 220 KV	5500
	7. Above 220 KV up to and including 400 KV	7300
	8. Above 400 KV up to and including 500 KV	8200
	9. Above 500 KV up to and including 800 KV	10900
	Note: a. All height /clearances are in mm and under maximum sag conditions. b. If the crossing is provided with a guarding, a minimum clearance of 2000mm shall be maintained between bottom of the guard wire and highest traction conductor. c. Power line crossing in yards & stations area shall be avoided	
1.8.4	Minimum height above rail level for telegraph, telephone and other such low-tension wires crossing a railway:	6100
1.9	Minimum Horizontal Distance of Structures of height H carrying electrical conductor and crossing a railway line.	
	The minimum horizontal distance measured at right-angle to, and from the centre of nearest track to any part of the structure above ground level.	H+ 6
	Note: a) Rigid well-founded post/structure: Any post/structure which is so constructed or guyed as to remain in vertical position, or failing this to continue to provide the minimum horizontal clearance of 2.135m from the centre of nearest track, with one or all of the conductors broken or with its conductors attached, when subjected to maximum wind pressure, shall be considered to be a "rigid well-founded post/structure." b) The existing rigid well-founded post/structures, presently at a distance equal to or more than (ii) as given above, but less than (H+ 2.135) m, shall be inspected by the railway's nominated electrical official once in a year jointly with the owner of the post/structure and certify the safety of the structure, keeping appropriate records of inspections. c) If the existing post/structure carrying electrical conductors crossing a railway line, is not rigid and well-founded then the minimum horizontal distance, measured at right angles from the center of the nearest track, shall be equal to the height of the post/structure above ground level plus 2.135m.	
1.10	Kinematic envelope	
	The Kinematic Envelope is shown in Figure No. KRIDE/BSRP/KRS-01/R SBG 1, 1A, 1B, 1C and refer Appendix 6	

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	Note: a. kinematic envelope is calculated only for tangent track. b. Kinematic envelope is calculated to extreme end of the coach with above condition to count nosing effect also.	
1.11	Extra clearances on curves	
	Following are the extra allowances considered for curves. Abbreviations used in this para 1.11 1. C- the distance between centers of bogie in meters. 2. C ₁ -Is the vehicle length in meter 3. R- radius of curvature 4. C _a -Cant applied in mm 5. h – height from rail level in mm 6. g – the distance between centers of rails in mm 7. V1-with vehicle center in sag or vehicle on summit 8. V2-with vehicle center on summit or vehicle end in sag	
1.11.1	Inside of curve	
	A. <u>Curvature effect</u> i. Mid throw at the center of the vehicle = V (mm) = $125xC^2/R$ ii. Allowance due to gauge widening on curves Note: a. For value i and ii refer Appendix-2 b. Lateral shift of 35 mm due to nosing included in Kinematic Envelope for tangent track (and as a result, in Structure Gauge also) shall be subtracted from the total extra allowance worked out as at para 1.11.1(A)-i & ii above for inside of curve in case the value of mid throw (V) is equal to or greater than 35 mm. In case the value of mid throw (V) is less than 35 mm, the curvature effect shall be due to widening of the gauge only (The mid throw minus 35 mm shall be taken as zero). Refer to Appendix-2	
	B. <u>Allowance for Super elevation</u> The lean 'L' due to Cant at any point at height 'h' above rail level is given by: $L = C_a \times h/g$ Note: For values of Structure Gauge (E ₁) for inside of curve with cant effect only, refer to Appendix-3	
	C. <u>Allowance for vertical curve (vertical throw)</u> Throw V1 and V2 (mm) for vertical curve shall be calculated as under: $V_1 = 125C^2/R$	

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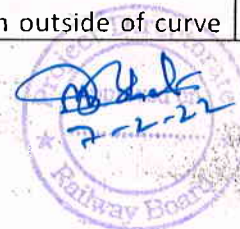
	$V_2=(125 C_1^2/R)-V_1$ V1 -with vehicle center in sag or vehicle on summit V2 -with vehicle center on summit or vehicle end in sag Note: <i>Values of vertical throw due to vertical curves of different radii are given in figure No. KRIDE/BSRP/KRS-01/RSBG-8 (Values of mid throw and end throw are approximately same)</i>	
1.11.2	Outside of curve	
	(A) Curvature effect i) End throw at the end of vehicle = $V_o \text{ (in mm)} = [125 \times C_1^2 / R] - [125 \times C^2 / R]$ ii) Allowance due to gauge widening on curves iii) Additional nosing due to gauge widening on curves. Note: <i>The values of items (i) to (iii) are shown in Appendix-2</i>	
	(B) Allowance for Super elevation The lean 'L' due to Cant at any point at height 'h' above rail level is given by: $L = -Ca \times h/g$ Note: I. <i>For values of Structure Gauge (E₁) for inside of curve with cant effect only, refer to -Appendix-3</i> II. <i>-ve sign indicates relief due to Cant or reduction in additional clearance required</i> III. <i>. Full relief for lean due to cant (Ca) is to be taken into account only for calculation of track spacing without any structure between tracks. In case there is a structure adjacent to track, relief for lean is to be taken into account only if the cant provided is greater than 50 mm and shall be limited to a value = (Ca - 50) x h/g.</i>	
	(C) Allowance for vertical curve (vertical throw) Same as 1.11.1C	
1.12	Minimum track spacing on curves	
	The worst case will be when the end of a bogie carriage on the inner track is opposite the centre of a similar carriage on the outer track.	
1.12.1	Without any structure between tracks	
	The minimum track spacing for curves without any structure between tracks shall be the sum of the following: a. (E + F), b. T1 (Extra lateral allowance due to curvature on inside of curve Appendix-2 c. T2 (Extra lateral allowance due to curvature on outside of curve	

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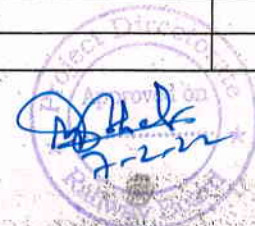
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	<p>(Appendix 2) and</p> <p>d. 300 mm for elevated and at grade, 300 mm for underground (clearance between adjacent Kinematic Envelopes).</p> <p>Where,</p> <p>E-is the distance from vertical axis of centre line of track to canted Kinematic Envelope on inside of curve at a height 'h' (from rail level) for a given cant and</p> <p>F-is the distance from vertical axis of centre line of track to canted Kinematic Envelope on outside of curve at a height 'h' (from rail level) for a given cant.</p> <p>Note:</p> <p>a) The value of 'F' calculated from the formula at Figure KRIDE/BSRP/KRS-01/RSBG-4 includes full relief due to Cant.</p> <p>b) The sum of 'E' and 'F' (which are with cant effect only), shall be the maximum of values calculated for same height from rail level.</p>	
1.12.2	With a structure between adjacent tracks	
	<p>The minimum track spacing for curves with a structure between tracks shall be the sum of:</p> <p>i) (E1 +T1) Minimum clearance to the structure from centre line of track on inside of curve (for outer track).</p> <p>ii) (F1 +T2) Minimum clearance to the structure from centre line of track on outside of curve (for inner track)</p> <p>iii) Width of structure between adjacent tracks (measured across the tracks).</p> <p>Where,</p> <p>E1 is the horizontal distance from vertical axis of centre line of track to canted Structure Gauge on inside of curve for a given cant,</p> <p>F1 is the horizontal distance from vertical axis of centre line of track to canted Structure Gauge on outside of curve for a given Cant,</p> <p>T1 is extra lateral allowance due to curvature on inside of curve, (Appendix 2) and</p> <p>T2 is extra lateral allowance due to curvature on outside of curve (Appendix 2)</p> <p>Note:</p> <p>The values of E1 and F1 for a given cant Ca, shall each be the maximum of values at different heights of structure from rail level. In case the cant provided (Ca) is greater than 50 mm on inner track, the value of F1 shall be for the cant of (Ca-50) mm. In case the cant provided is 50 mm or less on inner track, the value of F1 shall be for ZERO cant.</p>	
	Minimum track spacing, so worked out with a structure between the adjacent tracks shall not be less than that calculated as per para 1.12.1 for tracks without any structure between adjacent tracks.	
1.13	Walk ways	
	Walk ways will not be provided in any section because.	

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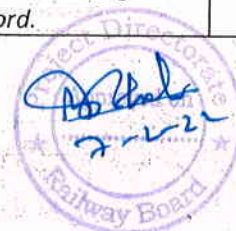
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	<ol style="list-style-type: none"> 1. End evacuation of passenger in case of emergency is designed in rolling stock. 2. Schedule maintenance of permanent way will be performed outside service hours only 3. At-grade sections will be robustly fenced. 	
1.14	Derailment guard	
	<ol style="list-style-type: none"> 1. <i>In view of chances of collision of derailed train with the train coming from other direction, adequate measures shall be taken to restrict lateral movement of derailed vehicles on elevated structures. Proper communication facilities should also be available at the stations.</i> 2. <i>Derailment guard shall be provided inside of running rail on elevated as well as in tunnel having multiple tracks and at-grade section at locations specified by the Metro railway. For single track tunnel, location for providing derailment guard is given in note. In tunnels, the derailment guard should preferably be provided inside the track, so that it permits less swat of coach towards tunnel wall in case of derailment.</i> 3. <i>In case of single-track tunnel. the derailment guards shall be provided:</i> <ol style="list-style-type: none"> a. <i>Entry of tunnel: 200 m from tunnel portal outside the tunnel to 50 m inside the tunnel.</i> b. <i>Exit of tunnel. 50 in front inside of tunnel portal to 200 m outside the tunnel.</i> c. <i>In curved track having radius 500 m or less including transition portion but excluding locations where check rail is provided.</i> d. <i>Covering locations of all important installations e.g., location of any sub-station or hazardous structures inside the tunnel, etc. damage to which in the assessment of metro rail administration can result into serious loss of life or/and infrastructure as a result of derailment in tunnel.</i> e. <i>The above is subject to the condition that metro railway shall carry out the risk assessment analysis for derailment in tunnels and ensure that the maintenance practices in the maintenance manual are as per the risk assessment mitigation plan.</i> 4. <i>The lateral clearance between the running rail and the derailment guard shall be 210 ± 30 mm.</i> 5. <i>In case of Double Resilient Base Plate Assembly Fastening System as approved by MoR, the lateral clearance between running rail and the derailment guard shall be 250 ± 20 mm.</i> 6. <i>It shall not be lower than 25 mm below the top of the running rail and should be clear of the rail fastenings to permit installation, replacement and maintenance</i> 7. <i>Derailment guard shall be designed such that in case of derailment:</i> <ol style="list-style-type: none"> a. <i>The wheels of a derailed vehicle under crash load, moving at maximum speed are retained on the viaduct or tunnel.</i> b. <i>Damage to track and supporting structures is minimum.</i> c. <i>The detailed design calculations of derailment guards along with detailed structural drawings shall be furnished for record.</i> 	

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**CHAPTER 2
STATION YARDS**

Item no	Items	Values
2.1	Spacing of tracks: - (Refer to Figure No KRIDE/BSRP/KRS-01/RSBG-2 2A, 2B, 3, 3A, 3B)	
	Minimum distance centre to centre of straight tracks	4100
	Note: a. In case of new OHE masts / signal posts are required to be provided in between tracks under unavoidable circumstances, the clearance maintained in 1 above shall be increased by equal to the width of such provisions /structures/ foundations, as the case may be. b. In case of rectangular tunnel minimum distance between the center of track is the sum of structure gauge + width of columns + service requirement on either side of structure between the track.	
2.2	Maximum steepest gradient in station yards, unless special safety devices are adopted and/or special rules enforced to prevent accidents in accordance with approved special instructions.	
	1. Recommended	Level
	2. Maximum (Steepest)	1/1200
	3. Exceptional	1/400
	Note: a. Recommended dimension is generally the good practice, a departure from which requires sanction. b. There shall be no change of gradient in platform track. c. Any steeper gradient than 1 in 1200 and up to exceptional gradient of 1 in 400 shall be proposed by civil engineering head and approved by Managing Director in consultation with the head of Safety nominated by Metro Rail Authority.	
	Note: a. For above purpose, Station Yard means I. On single line to a distance of 50 meters beyond Stock Rail Joint of outermost points at either end of the station II. On double line where 2 aspects signaling is provided, from home signal to a distance of 50 meters beyond Stock Rail Joint of outermost points at the trailing end, or where there are no loops, to last stop signal of each line III. On double line where multiple aspect signaling is provided to a distance of 50 meters beyond Stock Rail Joint of outermost points at either end of the station or where there are no loops, from Block Section Limit Board	

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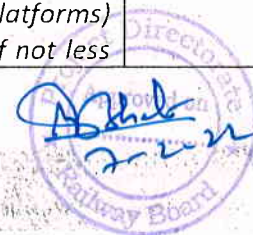
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	<i>to last stop signal of each line</i>		
	<i>b. There must be no change of grades within 30 m. of any points or crossings</i>		
2.3	Platforms		
2.3.1	Minimum horizontal distance from centre of the track to the face of passenger platform coping		
		Elevated/at-grade	underground
	For Ballasted track	1675	1665
	For Ballastless track	1670	1660
2.3.2	Maximum horizontal distance from centre of the track to the face of passenger platform coping		
		Elevated/at-grade	underground
	For Ballasted track	1680	1670
	For Ballastless track	1675	1665
	Note:		
	I. Platform faces shall be flared away smoothly from the centre line of the track at either end for a distance of 1500 mm so as to give a dimension of 1785 mm ± 5 mm (1780 mm minimum and 1790 mm maximum) from centre line of track. II. For additional clearance for platforms on curves, refer to para 2.7. III. The distances mentioned above (2.3.1) are with respect to static width of the coach at platform level (3050). IV. The distance shall be adjusted with the variation in width of Rolling Stock.		
2.3.3	Horizontal distance from centre of track to face of passenger Platform wall		
		Maximum	1905
		Minimum	1675
	Note:		
	a. The coping of passenger platform must be so constructed that, when necessary, to allow for introduction of wider stock, it can be easily and expeditiously set back up to 1905mm. from centre of track.		
2.3.4	A. Maximum height above rail level for passenger platform		
	1. Ballasted track		1085
	2. Ballastless Track		1095
	B. Minimum height above rail level for passenger platform		
	1. Ballasted track		1075
	2. Ballastless Track		1085
	Note:		
	a. The height of platform serving super elevated track should be in relation to the plane passing through the top of both the rails b. Platforms may be flush with rail level c. The ends of all platforms (except end loading platforms) must be ramped to a slope of 1 in 6 for a width of not less		

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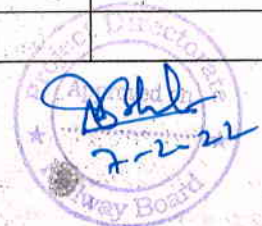
	<p>than 1 m from the face of the platform wall, the rest can either be ramped to the same slope or fenced.</p> <p>d. Signal wires or supports for signal wires may be allowed underneath the platform coping</p> <p>e. The length of a passenger platform should be not less than the length of the longest passenger train</p> <p>f. No passenger platform in case of new line would be constructed on a curve having radius less than 1000 m</p> <p>g. In case of construction of a new platform on the existing line addition/alteration to existing platforms or in gauge conversion/doubling works, where either the new platform(s) are to be constructed or the old being dismantled and reconstructed, efforts should be made to ease out the existing curves having radii less than 1000 m. However, for these works, having platform located/to be located on curves with radii less than 1000 m, no condonation of CRS/Board would be necessary</p> <p>h. Coping should be constructed such a way that, it should be modified to maintain recommended height of platforms due to future track lifting/alterations during track maintenance.</p>	
2.3.5	Buildings and structures:	
	1. Minimum horizontal distance of any isolated structure on a passenger platform from edge of coping	2500
	2. Minimum horizontal distance of any continuous structure on a passenger platform from edge of coping	3000
	<p>Note:</p> <p>a. Structure on the platform is treated as isolated if its length along the platform length is 2000 mm or less. Any structure having length exceeding 2000 mm is treated as continuous structure.</p> <p>b. No fixed structure should infringe the structure gauge except for the designated railway operational structure. Designated railway operational structure includes platform edges and platform gates, such designated operational structure shall under no circumstances infringe the applicable kinematic envelope.</p> <p>c. Clocks, Mirrors, CCTV, LED TV, PIDS (Passenger Information Display Systems) shall not be considered as structure and shall be located at a distance of 1000 mm from platform edge/coping with minimum height of 2500 mm from top of platform.</p> <p>d. Anything like above, hung from roof of station shall be adequately secured and a safety loop is to be provided for taking care of incidences of failure of hung arrangement.</p>	
2.4	Height of Over Head Structures:	

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	Minimum height above rail level for a width of 1600 mm on either side of central line of track, of a foot over bridge or a signal gantry in a passenger station	5900
	<p>Note:</p> <p>a) However, for existing overhead structure, dimensions given in clause 1.7.b: shall be applicable.</p> <p>b) Tunnel, through girder bridge and semi – through girder bridge in station yards shall be treated as heavy overhead structures, such as ROB for electrification works and the same dimensions as mentioned clause 1.7.b shall be applicable.</p> <p>c) The height of Foot Over Bridges mentioned above may reduce to 5750 mm subject to following conditions</p> <ol style="list-style-type: none"> I. The minimum height of the contact wire shall be 4800 mm. II. A special study shall be conducted as indicated in Appendix-5 to ascertain the feasibility of the contact wire height as 4800mm. III. There shall be no crossover below FOB or within 40 m from the face of FOB. IV. There shall be no level crossing within 520 m from face of FOB. V. The maximum height of rolling stock shall be restricted to 4420 mm. VI. The height shall be measured from the higher or super-elevated rail 	
2.5	Points and crossing	
2.5.1	Maximum clearance of check rail opposite nose of crossing	48
	<p>Note:</p> <p>In case of turnouts laid with 1673 mm gauge, the clearance shall be 45 mm instead of 48 mm</p>	
2.5.2	Minimum clearance of check rail opposite nose of crossing	44
	<p>Note:</p> <p>In case of turnouts laid with 1673 mm gauge, the clearance shall be 41mm instead of 44 mm</p>	
2.5.3	Maximum clearance of wing rail at nose of crossing	48
	<p>Note:</p> <p>In case of turnouts laid with 1673 mm gauge, the clearance shall be 45 mm instead of 48 mm</p>	
2.5.4	Minimum clearance of wing rail opposite nose of crossing	44
	<p>Note:</p> <p>In case of turnouts laid with 1673 mm gauge, the clearance shall be 41mm instead of 44 mm</p>	
2.5.5	Minimum clearance between switch rail and stock rail at the heel of switch rail.	52

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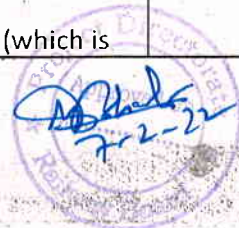


2.5.6	Minimum clearance between toe of open thick web switch and stock rail	160		
2.5.7	Minimum radius of curvature for slip points, turnouts of crossover roads (Metre)	218		
	<p>Note:</p> <p><i>In special cases mentioned below this may be reduced to not less than the minimum of:</i></p> <p>a) 213 m radius in case of 1 in 8.5 BG turnouts with 6.4 m over riding switch, and</p> <p>b) 175 m radius in case of 1 in 8.5 scissors crossing to allow for sufficient straight over the diamond crossing between crossovers</p>			
2.5.7	Minimum angles of crossing (ordinary)	1/16		
	<p>Note:</p> <p><i>Crossings as flat as 1 in 20 will usually be sanctioned if recommended by the Commissioner of Railway Safety.</i></p>			
2.5.8	Diamond crossings not to be flatter than	1/8.5		
	<p>Note:</p> <p><i>Diamond Crossings as flat as 1 in 10 will usually be sanctioned if recommended by the Commissioner of Railway Safety.</i></p> <p><i>The above restrictions shall not apply to moveable diamond crossings</i></p>			
2.5.9	Minimum length of tongue rail (as per RDSO drawing /T6280)			
		Turnouts	RDSO drawing	length
		1 in 8.5	T 6280	7620
		1 in 12	T 6155	12480
		1 in 16	T 7076	12935
2.6	SUPERELEVATION AND SPEED ON CURVES WITH TURNOUTS OF CONTRARY AND SIMILAR FLEXURE.			
2.6.1	Main line			
	Subject to the permissible run through speed based on the standard of interlocking, the equilibrium super elevation, calculated for the speed of the fastest train may be reduced by a maximum amount of 85 mm without reducing speed on the main line.			
2.6.2	Turnouts:			
	<p>i. <u>Curves of contrary flexure</u></p> <p>The equilibrium super elevation (S) in millimeters should be</p> $S = (g \times V^2 / 127 \times R)$ <p>Where,</p> <p>g is gauge + width of rail head in mm (1750 for BG),</p> <p>R radius of turnout in meters and</p> <p>V is speed on turnout in Kmph.</p> <p>The permissible negative superelevation on the turnout (which is</p>			

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	also the actual super elevation of the main line) may then be made. (85- s) mm	
	Curves of Similar flexure The question of reduction or otherwise of superelevation on the main line must necessarily be determined by the administration concerned. In the case of a reverse curve close behind the crossing of a turnout, the superelevation may be run out at the maximum of 1 mm in 440 mm.	
2.7	Additional clearance for platforms on curves	
	On inside of curve= Mid Throw + Lean + Gauge Widening	
	On outside of curve= End Throw + Gauge Widening Additional clearances on account of Lean = $C_a \times 1085/1750$ Additional clearances on account of Gauge widening = 3 mm	
	NOTE: <ol style="list-style-type: none"> 1. Additional clearances on account of Mid throw and End throw for platforms on curves of different radii are shown at Appendix- 4 2. Extra clearances on account of Lean and gauge widening need not be provided if super elevation and gauge widening is not provided. 3. Platform shall not be provided on curves having radius less than 1000 m. 4. There should be no super elevation and gauge widening in platform sections. 5. Platforms located in curves shall be fitted with gap filler wherever necessary to maintain the maximum stepping distance (between carbody and Platform) at platform as 75 mm in horizontal direction and 50 mm in vertical direction. The gap filler shall be of elastic nature and flexible to allow train contact without any adverse effect on passenger safety and stability of trains. 	
	Abbreviations used in Appendix 4 C is the distance between centres of Bogies in metres C1 is the length of the coach / vehicle in metres R is the radius of curve in metres V is Mid throw (on inside of curve) in mm V3 is Throw (on inside of curve) at any point between two Bogie centres in mm V0 is End throw (on outside of curve) in mm V4 is Throw (on outside of curve) at any point between C.L. of two Bogies and coach end in mm N is value of nosing included in the clearance between body of coach and vertical face of platform coping in mm = 17.5 mm. N1 is value of nosing at any point at a distance of X meters from C.L. of two Bogies in mm with X equal to or less than C/2 N2 is value of nosing at any point at a distance of X meters from	

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C.L. of Bogies in mm with X equal to or less than C1/2		
2.8	Interlocking and signal gear "Maximum height above rail level or any part of interlocking or signal gear on either side of center of track subject to the restrictions embodied in note below shall be as under"	
	1. Between center line of track and 1675 mm on either side of track	25
	2. Beyond 1675 mm on either side of track	200
	<p>Note:</p> <ol style="list-style-type: none"> For a distance of 229mm outside and 140mm inside the gauge faces of the rail, no gear or track fittings must project above rail level except. such parts as are required to be actuated by the wheels or wing rails and point rails of special crossings leading to snag dead ends or elevated check rails of crossing or check rails/check flats of diamond crossings. Signal wires or supports for signal wires may be allowed at not less than 1675 mm or 1830 mm in the case of tunnels or through or semi-through girder bridges on either side of the centre of the track provided that they are not more than 203mm above rail level. Metal covers with ramps on both sides must be provided overall interlocking gear projecting above rail level between the rails of a track to prevent hanging couplings from damaging the gear. A tyre or an attachment of wheel may project below the minimum height of 75 mm from a distance of 51 mm inside to 216 mm outside of the gauge face of the wheel 	

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**CHAPTER 3
ROLLING STOCK**

Item no	Items	Values
3.1	Passenger electric multiple units	
3.1.1	1. Length of the coach body (maximum including end fairings)	21740
	2. Maximum length over buffers	22600
3.1.2	Maximum width of the coach	3200
3.1.3	Height of coach (Maximum)	
	1. Height of coach except pantograph.	4000
	2. Pantograph in locked down position.	4048
	3. Pantograph in raised position under OHE	4800
	4. Pantograph in raised position under OCS	4318
3.1.4	1. Distance between bogie centres.	14850 ±250
	2. Maximum distance apart between any two adjacent axles	12810
	3. Length of rigid wheel base for single bogie	2290 to 2500
3.1.5	Kinematic Envelope for level tangent track Figure No. <i>KRIDE/BSRP/KRS-01/RSBG-1,1A,1B,1C.</i>	
3.1.6	Minimum clearance above rail level, when fully loaded vehicle for a width of 1450mm on either side of center of track, with the exception of wheels and attachments thereto (vide note below) for bogie mounted equipment's in worst condition (The worst condition means wheels with maximum wear and primary springs with maximum deflection) in dynamic condition	75
	Note: <i>A tyre or an attachment to a wheel may project below the minimum height of 75 mm from a distance of 51mm inside to 216mm outside of the gauge face of the wheel.</i>	
3.1.7	“Minimum clearance above rail level,when fully loaded vehicle for a width of 1450mm on either side of centre of track, for body mounted equipment's in worst condition (The worst conditionmeans wheels with maximum wear and primary springs with maximum deflection) in dynamic condition.	102
3.1.8	Cattle guard	Not compulsory
3.1.9	Incline of tread/wheel profile. RDSO SK. No.91146 Alt-latest	1/20
3.1.10	Wheel	
	a. Maximum wheel gauge back-to-back distance	1602
	b. Minimum wheel gauge back-to-back distance	1599
	c. Maximum diameter on the tread measured at 63.5 mm from the wheel gauge face	860

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	d. Minimum diameter on the tread measured at 63.5 mm from the wheel gauge face.	780
	e. Minimum width of wheel	127
3.1.11	1. Minimum projection for flange of new wheel measured from tread at 63.5 mm from the wheel gauge face	28.5
3.1.12	2. Maximum projection for flange of worn wheel measured from tread at 63.5 mm from the wheel gauge face	35
	i. Maximum thickness of flange of wheel measured from wheel gauge face at 13 mm from outer edge of flange	29.4
	ii. Minimum thickness of flange of wheel measured from wheel gauge face at 13 mm from outer edge of flange.	16
3.1.13	Floor Height	
	a. Maximum height above rail level for floor of any unloaded vehicle	1130
	b. Minimum height above rail level for floor of fully loaded normal vehicle	1100
3.1.14	a. Maximum height of centre coupler above rail level for unloaded vehicle	815
	b. Minimum height of centre coupler above rail Level for fully loaded vehicle	740
3.2	Locomotives and engineering service vehicles	
	Other items of rolling stock, viz shunting locomotives, OHE maintenance and inspection cars, emergency re-railing van, track machines, etc., used on BSRP, will conform with the Kinematic Envelope of the Passenger Electric Multiple Units as shown at Figure <i>KRIDE/BSRP/KRS-01/RSBG-1,1A,1B</i>	

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CHAPTER 4
ELECTRIC TRACTION

25 KV A.C. 50 Cycles

Item no	Items	Values
4.0	Electrical clearances are compiled as per the table.	
4.1	<p>Minimum Vertical and Lateral distance between 25 KV line parts and earthed parts of fixed structure or moving loads / rolling stocks shall be as large as possible and these Electrical Clearances must be complied as per Table 2: Electrical Clearances under Para 5.1.3 – Clearances between live parts of contact lines and earth’ of BS EN 50119:2009.</p> <p>However, These Electrical clearances are minimum and may be increased depending on various parameters e.g., Absolute humidity, the Ambient Temperature range, Air Pressure, Pollution, Relative Air Density, Shape and material for both energized and earth Structures. Metro may consider each case individually as suggested in BS EN 50119:2009.</p> <p>The Minimum vertical and lateral electrical clearances to be maintained under worst condition of temperature, wind etc. between any live part of the overhead equipment of pantograph and parts of any fixed structures (earthed or otherwise) or moving loads shall be as under:</p>	
	Long duration	250
	Short duration	200
	<p>Note:</p> <ul style="list-style-type: none"> i. Wherever electric traction is in use, special precautions shall be taken to maintain the following clearance ii. A minimum vertical distance of 270 mm shall normally be provided between rolling stock and contact wire to allow for a 20 mm temporary raising of the tracks during maintenance. Wherever the allowance required for track maintenance exceeds 20 mm the vertical distance between rolling stock and contact wire shall correspondingly be increased. iii. Long Duration means when the conductor is at rest and Short Duration means when the conductor is not at rest. iv. Where adoption of above clearances is either not feasible or involves abnormally high cost, permanent bench mark shall be provided to indicate the level of the track to be maintained 	270
4.2	Minimum air clearance between any live bare conductor (overhead equipment, pantograph or contact line for feeder for 25 kV) and other bodies (rolling stock, over bridges, signal gantries etc.)	
	Long duration	290
	Short duration	200
4.3	Height of contact wire: Minimum height from rail level to the under-side of live Conductor wire:	
	i. under bridges and in tunnels	4800

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	ii. In the open	5000
	iii. At level crossings	5500
	iv. In running and carriage sheds wherever staff are expected to work on the roof of rolling stock	5200
	v. Metal conductor of rigid overhead contact system	4318
	<p>Note:</p> <p>a. For the movement of over-dimensional consignments if any the height specified under 4.3 (i) above, shall be increased by the difference between the height of the consignment contemplated and 4.41m. In case such an over-dimensional consignment is moved at speeds not exceeding 15 km/h and is also specially escorted by authorized KRIDE staff, the derived height of contact wire may be reduced by 50 mm</p> <p>b. On curves, all vertical distances specified in item 4.3 above, shall be measured above level of the inner rail, increased by half the super-elevation</p> <p>c. In cases where it is proposed to allow only locomotives or rolling stocks not higher than 4.42 m, the minimum height of contact wire specified under item 4.3(i) above may be reduced to 4.69 meter.</p> <p>d. In cases where it is proposed to allow only locomotives or rolling stocks not higher than 4.27 m, the minimum height of contact wire specified under Item 4.3(i) above may be reduced to 4.54 meter. Aboard showing this restriction and specifying —locomotive s or stocks not permitted to ply on such sections —, shall be exhibited at the entrance to the same.</p> <p>e. Suitable prescribed gradient on the height of the contact wire shall be provided for connecting these wires installed at different heights.</p> <p>Note 2 For rigid OCS</p> <p>a. Location of level crossing from the exit point of the tunnel will take in to consideration the OHE height of 4318 mm at the tunnel exit and permissible contact wire gradient</p> <p>b. For the circular tunnel on curve refer 1.11.2</p> <p>c. It shall be ensured that environment level inside the tunnel is controlled suitably so that no extra air clearance over and above the minimum separation prescribed 4.1 and 4.2 on account of pollution, fog etc. is required.</p>	
4.4	Maximum variation of the live conductor wire on either side of the centre line of track under static conditions	
	on straight track	200
	on curves	300
	Note: These limits would not apply to special locations like insulated overlaps and out of run wires	
4.5	Maximum width of pantograph collector	2030
	The Kinematic Envelope with the size of Pantograph adopted, shall be within the Kinematic Envelope shown at Figure	

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	i. KRIDE / BSRP / KSR - 01 / RSBG - 01 ii. KRIDE / BSRP / KSR - 01 / RSBG - 01A iii. KRIDE / BSRP / KSR - 01 / RSBG - 01B iv. KRIDE / BSRP / KSR - 01 / RSBG - 01C	
	A tolerance of plus 10mm on maximum width specified is permissible to accommodate variation in manufacture and mounting with respect to the centre line of vehicle	
	Refer Appendix -5	

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CHAPTER 5
PLATFORM SCREEN DOORS

Item no	Items	Values
5.1	Minimum Platform Screen Door Width	2000
5.2	Minimum Platform Screen Door Height from Platform Level	
	Partial Height	1500
	Full Height	2100
5.3	Minimum Platform Threshold offset from track center-line straight track (Underground)	1800
5.4	Minimum Platform Threshold offset from track center-line straight track (At Grade/ Elevated)	1800
5.5	Minimum Platform Screen Door Panel offset from track center-line straight track	
	Underground	1850
	At Grade /Elevated	1850
	<p>Note:</p> <ul style="list-style-type: none"> a. Assumed plus/minus 300 mm stopping accuracy. b. Curve track through station to be considered separately. c. Platform Screen Doors are considered as designated railway operational structures. Therefore, PDS may infringe the Structure Gauge, but does not infringe the station Kinematic Envelope and having minimum clearance of 10 mm from Kinematic Envelope to Platform Screen Door. d. The deflector (if provided) attached to the bottom of the sliding door shall be designed in order to not to protrude beyond the door threshold. 	

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SCHEDULE OF DIMENSIONS

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Appendix -1

Refer clause 1.1
DESIGN SPEED AND TRACK CENTERS ON CURVES

SI no	Radius of curve (meters)	Actual cant corresponding to speed										Design Speed	Minimum distance between two adjacent tracks	
		10	20	30	40	50	60	70	80	90	Elevated or At-grade		Under Ground	
1	3000	0	2	4	7	11	17	23	29	37	37	90	3900	3900
2	2800	0	2	4	8	12	18	24	31	40	40	90	3900	3900
3	2600	1	2	5	8	13	19	26	34	43	43	90	3900	3900
4	2400	1	2	5	9	14	21	28	37	47	47	90	3900	3900
5	2200	1	3	6	10	16	23	31	40	51	51	90	3900	3900
6	2000	1	3	6	11	17	25	34	44	56	56	90	3900	3900
7	1800	1	3	7	12	19	28	38	49	62	62	90	3900	3900
8	1600	1	3	8	14	22	31	42	55	70	70	90	3900	3900
9	1400	1	4	9	16	25	35	48	63	80	80	90	4000	4000
10	1200	1	5	10	18	29	41	56	73	93	93	90	4000	4000
11	1000	1	6	12	22	34	50	68	88	112	112	90	4000	4000
12	800	2	7	16	28	43	62	84	110	140	120	80	4050	4050
13	600	2	9	21	37	57	83	113	147	186	120	70	4050	4050
14	400	3	14	31	55	86	124	169	220	279	120	55	4100	4100
15	200	7	28	62	110	172	248	338	441	558	120	45	4200	4200
16	175	8	31	71	126	197	283	386	504	638	120	40	4250	4250

Note:

- The track spacing shown in the table above is without any structure between two tracks and for equal cant for both outer and inner tracks.
- Figures for any intermediate radius of curvature may be obtained by interpolating between two adjacent radii. For higher radii, values may be extrapolated.
- The track spacing above is not applicable to stations and may be calculated depending on specific situation.
- Actual cant may be decided depending upon attainable speed at that location.

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BSRP SCHEDULE OF DIMENSIONS

Appendix-2

EXTRA HORIZONTAL CLEARANCE ON CURVES DUE TO CURVATURE EFFECT
INSIDE OF CURVE (refer clause 1.11.1)

Radius In Metres	Mid throw for C=15.1m	Nosing included in KE/ structure gauge for tangent track	Extra gauge tolerance on curves (G)	Extra horizontal shift on curve (T1)	Remarks All dimensions are in mm if it was not stated
175	163	35	9	137	
200	143	35	9	117	
250	114	35	9	88	
300	95	35	9	69	
350	81	35	9	55	
400	71	35	9	45	
450	63	35	9	37	
500	57	35	3	25	
600	48	35	3	16	
700	41	35	3	9	
800	36	35	3	4	
900	32	35	3	3	
1000	29	35	3	3	
1200	24	35	3	3	
1500	19	35	3	3	
1600	18	35	3	3	
2000	14	35	3	3	
2400	12	35	3	3	
2800	10	35	3	3	
3000	10	35	3	3	



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EXTRA HORIZONTAL CLEARANCE ON CURVES DUE TO CURVATURE EFFECT
INSIDE OF CURVE (refer clause 1.11.2)

Radius in Metres	End throw	Gauge widening (G)	Extra nosing (EN)	Extra horizontal shift (T2)	Remarks All dimensions are in mm if it was not stated
175	185	9	2	196	Gauge widening on curves= 9 mm for curves sharper than 500 m radius and 3 mm for curves of radius of 500 m and flatter. End throw=125 C ¹ /R- 125C ² /R C1=21.74 length of vehicle C- distance between bogie center C=14850±250 Worst case C=14850-250=14.600 m R- Radius of curve in m
200	162	9	2	173	
250	130	9	2	141	
300	108	9	2	119	
350	93	9	2	104	
400	81	9	2	92	
450	72	9	2	83	
500	65	9	2	76	
600	54	3	1	58	
700	46	3	1	50	
800	41	3	1	45	
900	36	3	1	40	
1000	32	3	1	36	
1200	27	3	1	31	
1500	22	3	1	26	
1600	20	3	1	24	
2000	16	3	1	20	
2400	14	3	1	18	
2800	12	3	1	16	
3000	11	3	1	15	



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SCHEDULE OF DIMENSIONS

Appendix-3

BSRP

CANT EFFECT ON STRUCTURE GAUGE- AT GRADE AND ELEVATED SECTION

CANT	h=350			h=1130			h=1885			h=3000			h=4220			h=5900			h=1495			
	SIN α	COS α	TAN α	E	F	H1	H2	H1	H2	F	E	H1	H2	F	E	H1	H2	F	E	H1	H2	
120	3.931	0.069	0.998	1845	1797	534	284	1803	1317	1058	2151	1740	3187	2919	1781	1202	4373	4168	1896	1087	6049	5844
115	3.767	0.066	0.998	1844	1798	527	287	1807	1309	1061	2143	1749	3179	2923	1769	1214	4367	4170	1879	1104	6043	5847
110	3.603	0.063	0.998	1843	1799	519	290	1810	1301	1064	2135	1758	3172	2927	1757	1227	4361	4173	1863	1121	6037	5849
105	3.439	0.060	0.998	1843	1801	511	292	1814	1294	1067	2126	1767	3164	2930	1745	1239	4355	4175	1846	1138	6032	5852
100	3.275	0.057	0.998	1842	1802	504	295	1817	1286	1070	2118	1775	3157	2934	1734	1251	4349	4178	1830	1155	6026	5855
95	3.111	0.054	0.999	1841	1803	496	298	1821	1278	1074	2110	1784	3149	2937	1722	1264	4342	4180	1813	1173	6020	5858
90	2.948	0.051	0.999	1841	1805	488	301	1824	1270	1077	2102	1793	3141	2941	1710	1276	4336	4183	1796	1190	6014	5860
85	2.784	0.049	0.999	1840	1806	481	303	1828	1263	1080	2093	1802	3134	2944	1698	1288	4330	4185	1780	1207	6008	5863
80	2.620	0.046	0.999	1839	1807	473	306	1831	1255	1083	2085	1811	3126	2948	1686	1301	4324	4187	1763	1224	6002	5865
75	2.456	0.043	0.999	1838	1808	465	309	1835	1247	1086	2077	1820	3118	2951	1674	1313	4318	4190	1746	1241	5996	5868
70	2.292	0.040	0.999	1838	1810	458	312	1838	1239	1089	2068	1828	3111	2955	1663	1325	4311	4192	1730	1258	5990	5870
65	2.128	0.037	0.999	1837	1811	450	314	1842	1232	1092	2060	1837	3103	2958	1651	1337	4305	4194	1713	1275	5984	5873
60	1.965	0.034	0.999	1836	1812	442	317	1845	1224	1095	2052	1846	3095	2961	1639	1349	4299	4196	1696	1292	5978	5875
55	1.801	0.031	1.000	1835	1813	435	320	1849	1216	1098	2043	1855	3087	2965	1627	1362	4292	4198	1680	1309	5972	5878
50	1.637	0.029	1.000	1834	1814	427	323	1852	1208	1101	2035	1864	3079	2968	1615	1374	4286	4201	1663	1326	5965	5880
45	1.473	0.026	1.000	1833	1815	419	325	1855	1201	1104	2026	1872	3072	2971	1603	1386	4280	4203	1646	1343	5959	5882
40	1.310	0.023	1.000	1833	1817	412	328	1859	1193	1107	2018	1881	3064	2975	1591	1398	4273	4205	1629	1360	5953	5884
35	1.146	0.020	1.000	1832	1818	404	331	1907	1185	1110	2010	1890	3056	2978	1579	1410	4267	4207	1613	1377	5946	5886
30	0.982	0.017	1.000	1831	1819	396	334	1904	1177	1113	2001	1898	3048	2981	1567	1422	4260	4209	1596	1394	5940	5889
25	0.818	0.014	1.000	1830	1820	389	336	1901	1169	1115	1993	1907	3040	2984	1555	1435	4253	4211	1579	1411	5933	5891
20	0.655	0.011	1.000	1829	1821	381	339	1898	1161	1118	1984	1916	3032	2988	1543	1447	4247	4213	1562	1427	5927	5893
15	0.491	0.009	1.000	1828	1822	373	342	1895	1154	1121	1976	1924	3024	2991	1531	1459	4240	4215	1546	1444	5920	5894
10	0.327	0.006	1.000	1827	1823	365	345	1891	1146	1124	1967	1933	3016	2994	1519	1471	4233	4216	1529	1461	5913	5896
5	0.164	0.003	1.000	1826	1824	358	347	1888	1138	1127	1959	1941	3008	2997	1507	1483	4227	4218	1512	1478	5907	5898
0	0	0	1	1825	1825	350	350	1885	1130	1130	1950	1950	3000	3000	1495	1495	4220	4220	1495	1495	5900	5900

REFER TO FIGURE NO. KRIDE/BSRP/KRS-01/RBGS-3

$E1 = [ab + (h \times \tan \alpha)] \times \cos \alpha$ $F1 = [ab - (h \times \tan \alpha)] \times \cos \alpha$

$H1 = (Ca/2) + (h / \cos \alpha) + (ab - h \times \tan \alpha) \times \sin \alpha$ $H2 = (Ca/2) + (h / \cos \alpha) - (ab - h \times \tan \alpha) \times \sin \alpha$

ab=Ab=Distance from center line of vehicle to Structure Gauge for Tangent track at height 'h' from rail level

ac=Distance from center line of canted track to Structure Gauge for Tangent track at height 'h' from rail level. bc=h x tan α = Lateral increment

due to cant (measured along the line parallel to line joining top of rails.)

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SCHEDULE OF DIMENSIONS

BSRP

CANT EFFECT ON STRUCTURE GAUGE- ATGRADE AND ELEVATED PLATFORM

CANT	TABLE 3B			h=350			h=1130			ab=1870			h=3000			ab=1935			h=4220			ab=1480			h=5900			ab=1480				
	α	SIN α	COS α	TAN α	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2
120	3.931	0.069	0.998	0.069	1835	1787	534	285	1943	1788	1316	1059	2136	1725	3186	2920	1766	1187	4372	4169	1881	1072	6048	5825	1881	1072	6048	5825	1881	1072	6048	5825
115	3.767	0.066	0.998	0.066	1834	1788	526	287	1940	1792	1308	1062	2128	1734	3178	2924	1754	1200	4366	4171	1864	1089	6042	5818	1864	1089	6042	5818	1864	1089	6042	5818
110	3.603	0.063	0.998	0.063	1833	1789	518	290	1937	1795	1300	1065	2120	1743	3171	2927	1742	1212	4360	4174	1848	1106	6036	5810	1848	1106	6036	5810	1848	1106	6036	5810
105	3.439	0.060	0.998	0.060	1833	1791	511	293	1934	1799	1293	1068	2111	1752	3163	2931	1731	1224	4354	4176	1831	1123	6031	5803	1831	1123	6031	5803	1831	1123	6031	5803
100	3.275	0.057	0.998	0.057	1832	1792	503	296	1932	1802	1285	1071	2103	1760	3156	2935	1719	1236	4348	4179	1815	1140	6025	5806	1815	1140	6025	5806	1815	1140	6025	5806
95	3.111	0.054	0.999	0.054	1831	1793	495	298	1929	1806	1277	1074	2095	1769	3148	2938	1707	1249	4342	4181	1798	1158	6019	5808	1798	1158	6019	5808	1798	1158	6019	5808
90	2.948	0.051	0.999	0.051	1831	1795	488	301	1926	1809	1270	1077	2087	1778	3141	2942	1695	1261	4336	4183	1781	1175	6013	5801	1781	1175	6013	5801	1781	1175	6013	5801
85	2.784	0.049	0.999	0.049	1830	1796	480	304	1923	1813	1262	1080	2078	1787	3133	2945	1683	1273	4329	4186	1765	1192	6007	5804	1765	1192	6007	5804	1765	1192	6007	5804
80	2.620	0.046	0.999	0.046	1829	1797	473	307	1920	1816	1254	1083	2070	1796	3125	2948	1671	1286	4323	4188	1748	1209	6001	5806	1748	1209	6001	5806	1748	1209	6001	5806
75	2.456	0.043	0.999	0.043	1828	1798	465	309	1917	1820	1247	1086	2062	1805	3118	2952	1659	1298	4317	4190	1731	1226	5996	5808	1731	1226	5996	5808	1731	1226	5996	5808
70	2.292	0.040	0.999	0.040	1828	1800	457	312	1914	1823	1239	1089	2053	1813	3110	2955	1648	1310	4311	4192	1715	1243	5989	5810	1715	1243	5989	5810	1715	1243	5989	5810
65	2.128	0.037	0.999	0.037	1827	1801	450	315	1911	1827	1231	1092	2045	1822	3102	2959	1636	1322	4305	4195	1698	1260	5983	5812	1698	1260	5983	5812	1698	1260	5983	5812
60	1.965	0.034	0.999	0.034	1826	1802	442	318	1908	1830	1223	1095	2037	1831	3095	2962	1624	1334	4298	4197	1681	1277	5977	5814	1681	1277	5977	5814	1681	1277	5977	5814
55	1.801	0.031	1.000	0.031	1825	1803	434	320	1905	1834	1216	1098	2028	1840	3087	2965	1612	1347	4292	4199	1665	1294	5971	5816	1665	1294	5971	5816	1665	1294	5971	5816
50	1.637	0.029	1.000	0.029	1824	1804	427	323	1902	1837	1208	1101	2020	1849	3079	2968	1600	1359	4286	4201	1648	1311	5965	5818	1648	1311	5965	5818	1648	1311	5965	5818
45	1.473	0.026	1.000	0.026	1823	1805	419	326	1898	1840	1200	1104	2011	1857	3071	2972	1588	1371	4279	4203	1631	1328	5959	5820	1631	1328	5959	5820	1631	1328	5959	5820
40	1.310	0.023	1.000	0.023	1823	1807	411	328	1895	1844	1192	1107	2003	1866	3063	2975	1576	1383	4273	4205	1614	1345	5952	5822	1614	1345	5952	5822	1614	1345	5952	5822
35	1.146	0.020	1.000	0.020	1822	1808	404	331	1892	1847	1185	1110	1995	1875	3056	2978	1564	1395	4266	4207	1598	1362	5946	5824	1598	1362	5946	5824	1598	1362	5946	5824
30	0.982	0.017	1.000	0.017	1821	1809	396	334	1889	1850	1177	1113	1986	1883	3048	2981	1552	1407	4260	4209	1581	1379	5940	5826	1581	1379	5940	5826	1581	1379	5940	5826
25	0.818	0.014	1.000	0.014	1820	1810	388	337	1886	1854	1169	1116	1978	1892	3040	2985	1540	1420	4253	4211	1564	1396	5933	5828	1564	1396	5933	5828	1564	1396	5933	5828
20	0.655	0.011	1.000	0.011	1819	1811	381	339	1883	1857	1161	1119	1969	1901	3032	2988	1528	1432	4247	4213	1547	1412	5927	5830	1547	1412	5927	5830	1547	1412	5927	5830
15	0.491	0.009	1.000	0.009	1818	1812	373	342	1880	1860	1153	1121	1961	1909	3024	2991	1516	1444	4240	4215	1531	1429	5920	5832	1531	1429	5920	5832	1531	1429	5920	5832
10	0.327	0.006	1.000	0.006	1817	1813	365	345	1876	1864	1146	1124	1952	1918	3016	2994	1504	1456	4233	4216	1514	1446	5913	5834	1514	1446	5913	5834	1514	1446	5913	5834
5	0.164	0.003	1.000	0.003	1816	1814	358	347	1873	1867	1138	1127	1944	1926	3008	2997	1492	1468	4227	4218	1497	1463	5907	5836	1497	1463	5907	5836	1497	1463	5907	5836
0	0	0	0	0	1815	1815	350	350	1870	1870	1130	1130	1935	1935	3000	3000	1480	1480	4220	4220	1480	1480	5900	5838	1480	1480	5900	5838	1480	1480	5900	5838

Maximum cant – 120 mm, maximum cant excess 75 mm/deficiency 85 mm

Examined & found in order

Mohammad
Faiz Ansari

Digitally signed by
Mohammad Faiz Ansari
Date: 2021.08.25 17:51:49
+05'30'



KRIDE/BSRP	
JGM/RS	Director P & P
MUNUSUWALI	Digitally signed by
GOMARI	NEERAJ
GOWDA	NEERAJ AGRAWAL
RAMESHA	AGRAWAL
	Date: 2021.08.22
	Time: 22:57:46 +05'30'



SCHEDULE OF DIMENSIONS

CANT EFFECT ON STRUCTURE GAUGE- ATRADE-AND-ELEVATED PLATFORM for Under ground section

CANT	α	h=350			h=1130			h=1870			h=3000			ab=1935			h=4220			ab=1480			h=5900			ab=1480						
		SIN α	COS α	TAN α	E	F	H1	H2	H3	E	F	H1	H2	H3	E	F	H1	H2	H3	E	F	H1	H2	H3	E	F	H1	H2	H3			
120	3.931	0.069	0.998	0.069	1835	1787	534	285	1943	1788	1316	1059	2136	1725	3186	2920	1766	1187	4372	4169	1881	1072	6048	5881	1881	1072	6048	5881	1881	1072	6048	5881
115	3.767	0.066	0.998	0.066	1834	1788	526	287	1940	1792	1308	1062	2128	1734	3178	2924	1754	1200	4366	4171	1864	1089	6042	5883	1864	1089	6042	5883	1864	1089	6042	5883
110	3.603	0.063	0.998	0.063	1833	1789	518	290	1937	1795	1300	1065	2120	1743	3171	2927	1742	1212	4360	4174	1848	1106	6036	5890	1848	1106	6036	5890	1848	1106	6036	5890
105	3.439	0.060	0.998	0.060	1833	1791	511	293	1934	1799	1293	1068	2111	1752	3163	2931	1731	1224	4354	4176	1831	1123	6031	5853	1831	1123	6031	5853	1831	1123	6031	5853
100	3.275	0.057	0.998	0.057	1832	1792	503	296	1932	1802	1285	1071	2103	1760	3156	2935	1719	1236	4348	4179	1815	1140	6025	5856	1815	1140	6025	5856	1815	1140	6025	5856
95	3.111	0.054	0.999	0.054	1831	1793	495	298	1929	1806	1277	1074	2095	1769	3148	2938	1707	1249	4342	4181	1798	1158	6019	5858	1798	1158	6019	5858	1798	1158	6019	5858
90	2.948	0.051	0.999	0.051	1831	1795	488	301	1926	1809	1270	1077	2087	1778	3141	2942	1695	1261	4336	4183	1781	1175	6013	5861	1781	1175	6013	5861	1781	1175	6013	5861
85	2.784	0.049	0.999	0.049	1830	1796	480	304	1923	1813	1262	1080	2078	1787	3133	2945	1683	1273	4329	4186	1765	1192	6007	5864	1765	1192	6007	5864	1765	1192	6007	5864
80	2.620	0.046	0.999	0.046	1829	1797	473	307	1920	1816	1254	1083	2070	1796	3125	2948	1671	1286	4323	4188	1748	1209	6001	5866	1748	1209	6001	5866	1748	1209	6001	5866
75	2.456	0.043	0.999	0.043	1828	1798	465	309	1917	1820	1247	1086	2062	1805	3118	2952	1659	1298	4317	4190	1731	1226	5996	5869	1731	1226	5996	5869	1731	1226	5996	5869
70	2.292	0.040	0.999	0.040	1828	1800	457	312	1914	1823	1239	1089	2053	1813	3110	2955	1648	1310	4311	4192	1715	1243	5989	5871	1715	1243	5989	5871	1715	1243	5989	5871
65	2.128	0.037	0.999	0.037	1827	1801	450	315	1911	1827	1231	1092	2045	1822	3102	2959	1636	1322	4305	4195	1698	1260	5983	5873	1698	1260	5983	5873	1698	1260	5983	5873
60	1.965	0.034	0.999	0.034	1826	1802	442	318	1908	1830	1223	1095	2037	1831	3095	2962	1624	1334	4298	4197	1681	1277	5977	5876	1681	1277	5977	5876	1681	1277	5977	5876
55	1.801	0.031	1.000	0.031	1825	1803	434	320	1905	1834	1216	1098	2028	1840	3087	2965	1612	1347	4292	4199	1665	1294	5971	5878	1665	1294	5971	5878	1665	1294	5971	5878
50	1.637	0.029	1.000	0.029	1824	1804	427	323	1902	1837	1208	1101	2020	1849	3079	2968	1600	1359	4286	4201	1648	1311	5965	5880	1648	1311	5965	5880	1648	1311	5965	5880
45	1.473	0.026	1.000	0.026	1823	1805	419	326	1898	1840	1200	1104	2011	1857	3071	2972	1588	1371	4279	4203	1631	1328	5959	5882	1631	1328	5959	5882	1631	1328	5959	5882
40	1.310	0.023	1.000	0.023	1823	1807	411	328	1895	1844	1192	1107	2003	1866	3063	2975	1576	1383	4273	4205	1614	1345	5952	5885	1614	1345	5952	5885	1614	1345	5952	5885
35	1.146	0.020	1.000	0.020	1822	1808	404	331	1892	1847	1185	1110	1995	1875	3056	2978	1564	1395	4266	4207	1598	1362	5946	5887	1598	1362	5946	5887	1598	1362	5946	5887
30	0.982	0.017	1.000	0.017	1821	1809	396	334	1889	1850	1177	1113	1986	1883	3048	2981	1552	1407	4260	4209	1581	1379	5940	5889	1581	1379	5940	5889	1581	1379	5940	5889
25	0.818	0.014	1.000	0.014	1820	1810	388	337	1886	1854	1169	1116	1978	1892	3040	2985	1540	1420	4253	4211	1564	1396	5933	5891	1564	1396	5933	5891	1564	1396	5933	5891
20	0.655	0.011	1.000	0.011	1819	1811	381	339	1883	1857	1161	1119	1969	1901	3032	2988	1528	1432	4247	4213	1547	1412	5927	5893	1547	1412	5927	5893	1547	1412	5927	5893
15	0.491	0.009	1.000	0.009	1818	1812	373	342	1880	1860	1153	1121	1961	1909	3024	2991	1516	1444	4240	4215	1531	1429	5920	5895	1531	1429	5920	5895	1531	1429	5920	5895
10	0.327	0.006	1.000	0.006	1817	1813	365	345	1876	1864	1145	1124	1952	1918	3016	2994	1504	1456	4233	4216	1514	1446	5913	5896	1514	1446	5913	5896	1514	1446	5913	5896
5	0.164	0.003	1.000	0.003	1816	1814	358	347	1873	1867	1138	1127	1944	1926	3008	2997	1492	1468	4227	4218	1497	1463	5907	5898	1497	1463	5907	5898	1497	1463	5907	5898
0	0	0	1	0	1815	1815	350	350	1870	1870	1130	1130	1935	1935	3000	3000	1480	1480	4220	4220	1480	1480	5900	5900	1480	1480	5900	5900	1480	1480	5900	5900



Maximum cant – 120 mm, maximum cant excess 75 mm/deficiency 85 mm
Examined & found in order
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25
 17:52:35 +05'30'

KRIDE/BSRP	
JGM/RS	Director P & P
HUNUSUVALLI KOMARI GOWDA RAMESHA	Digitally signed by NEERAJ AGRAWAL Date: 2021.06.22 22:31:05 +05'30'



SCHEDULE OF DIMENSIONS

CANT EFFECT ON STRUCTURE GAUGE - MONO-AND-ELEVATED-PLATFORM for Underground platforms

CANT	TABLE 3D			h=350			ab=1800			h=1130			ab=1860			h=3000			ab=1930			h=4220			ab=1475			h=5900			ab=1475		
	α	SIN α	COS α	TAN α	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	
120	3.931	0.069	0.998	0.069	1820	1772	533	286	1933	1778	1315	1060	2131	1720	3185	2921	1761	1182	4371	4169	1876	1067	6047	5855	1876	1067	6047	5855	1876	1067	6047	5855	
115	3.767	0.066	0.998	0.066	1819	1773	525	288	1930	1782	1307	1063	2123	1729	3178	2924	1749	1195	4365	4171	1859	1084	6042	5840	1859	1084	6042	5840	1859	1084	6042	5840	
110	3.603	0.063	0.998	0.063	1818	1774	517	291	1927	1785	1300	1066	2115	1738	3170	2928	1737	1207	4359	4174	1843	1101	6036	5851	1843	1101	6036	5851	1843	1101	6036	5851	
105	3.439	0.060	0.998	0.060	1818	1776	510	294	1924	1789	1292	1069	2107	1747	3163	2931	1726	1219	4353	4176	1826	1118	6030	5853	1826	1118	6030	5853	1826	1118	6030	5853	
100	3.275	0.057	0.998	0.057	1817	1777	502	297	1922	1792	1284	1072	2098	1755	3155	2935	1714	1231	4347	4179	1810	1135	6025	5856	1810	1135	6025	5856	1810	1135	6025	5856	
95	3.111	0.054	0.999	0.054	1816	1778	495	299	1919	1796	1277	1075	2090	1764	3148	2938	1702	1244	4341	4181	1793	1153	6019	5859	1793	1153	6019	5859	1793	1153	6019	5859	
90	2.948	0.051	0.999	0.051	1816	1780	487	302	1916	1799	1269	1078	2082	1773	3140	2942	1690	1256	4335	4184	1776	1170	6013	5861	1776	1170	6013	5861	1776	1170	6013	5861	
85	2.784	0.049	0.999	0.049	1815	1781	480	305	1913	1803	1261	1081	2073	1782	3133	2945	1678	1268	4329	4186	1760	1187	6007	5864	1760	1187	6007	5864	1760	1187	6007	5864	
80	2.620	0.046	0.999	0.046	1814	1782	472	307	1910	1806	1254	1084	2065	1791	3125	2949	1666	1281	4323	4188	1743	1204	6001	5866	1743	1204	6001	5866	1743	1204	6001	5866	
75	2.456	0.043	0.999	0.043	1813	1783	464	310	1907	1810	1246	1087	2057	1800	3117	2952	1654	1293	4317	4190	1725	1221	5995	5869	1725	1221	5995	5869	1725	1221	5995	5869	
70	2.292	0.040	0.999	0.040	1813	1785	457	313	1904	1813	1238	1090	2048	1808	3110	2955	1643	1305	4311	4193	1710	1238	5989	5871	1710	1238	5989	5871	1710	1238	5989	5871	
65	2.128	0.037	0.999	0.037	1812	1786	449	315	1901	1817	1231	1093	2040	1817	3102	2959	1631	1317	4304	4195	1693	1255	5983	5874	1693	1255	5983	5874	1693	1255	5983	5874	
60	1.965	0.034	0.999	0.034	1811	1787	442	318	1898	1820	1223	1096	2032	1826	3094	2962	1619	1329	4298	4197	1676	1272	5977	5876	1676	1272	5977	5876	1676	1272	5977	5876	
55	1.801	0.031	1.000	0.031	1810	1788	434	321	1895	1824	1215	1098	2023	1835	3087	2965	1607	1342	4292	4199	1660	1289	5971	5878	1660	1289	5971	5878	1660	1289	5971	5878	
50	1.637	0.029	1.000	0.029	1809	1789	426	323	1892	1827	1208	1101	2015	1844	3079	2969	1595	1354	4285	4201	1643	1306	5965	5880	1643	1306	5965	5880	1643	1306	5965	5880	
45	1.473	0.026	1.000	0.026	1808	1790	419	326	1888	1830	1200	1104	2006	1852	3071	2972	1583	1366	4279	4203	1626	1323	5958	5883	1626	1323	5958	5883	1626	1323	5958	5883	
40	1.310	0.023	1.000	0.023	1808	1792	411	329	1885	1834	1192	1107	1998	1861	3063	2975	1571	1378	4273	4205	1609	1340	5952	5885	1609	1340	5952	5885	1609	1340	5952	5885	
35	1.146	0.020	1.000	0.020	1807	1793	403	331	1882	1837	1184	1110	1990	1870	3055	2978	1559	1390	4266	4207	1593	1357	5946	5887	1593	1357	5946	5887	1593	1357	5946	5887	
30	0.982	0.017	1.000	0.017	1806	1794	396	334	1879	1840	1177	1113	1981	1878	3048	2981	1547	1402	4260	4209	1576	1374	5939	5889	1576	1374	5939	5889	1576	1374	5939	5889	
25	0.818	0.014	1.000	0.014	1805	1795	388	337	1876	1844	1169	1116	1973	1887	3040	2985	1535	1415	4253	4211	1559	1391	5933	5891	1559	1391	5933	5891	1559	1391	5933	5891	
20	0.655	0.011	1.000	0.011	1804	1796	381	339	1873	1847	1161	1119	1964	1896	3032	2988	1523	1427	4247	4213	1542	1407	5926	5893	1542	1407	5926	5893	1542	1407	5926	5893	
15	0.491	0.009	1.000	0.009	1803	1797	373	342	1870	1850	1153	1122	1956	1904	3024	2991	1511	1439	4240	4215	1526	1424	5920	5895	1526	1424	5920	5895	1526	1424	5920	5895	
10	0.327	0.006	1.000	0.006	1802	1798	365	345	1866	1854	1146	1124	1947	1913	3016	2994	1499	1451	4233	4217	1509	1441	5913	5896	1509	1441	5913	5896	1509	1441	5913	5896	
5	0.164	0.003	1.000	0.003	1801	1799	358	347	1863	1857	1138	1127	1939	1921	3008	2997	1487	1463	4227	4218	1492	1458	5907	5898	1492	1458	5907	5898	1492	1458	5907	5898	
0	0	0	1	0	1800	1800	350	350	1860	1860	1130	1130	1930	1930	3000	3000	1475	1475	4220	4220	1475	1475	5900	5900	1475	1475	5900	5900	1475	1475	5900	5900	

Maximum cant – 120 mm, maximum cant excess 75 mm/deficiency 85 mm

Examined & found in order

Mohammad Faiz Ansari
Digitally signed by Mohammad Faiz Ansari
Date: 2021.08.25 17:53:23 +05'30'

JGM/RS	Director P & P
HUNUSUVALI	Digitally signed by NEERAJ AGRAWAL
KOMARI	NEERAJ AGRAWAL
GOWDA	Date: 2021.08.22
RAMESHA	22:58:44 +05'30'



SCHEDULE OF DIMENSIONS

BSRP

CANT EFFECT ON STRUCTURE GAUGE AT GRADE AND ELEVATED PLATFORM KINEMATIC ENVELOPE FOR AT-GRADE & ELEVATED SET

CANT	TABLE 3D												ab=1195	h=4800	ab=1195	h=4220	ab=1780	h=3000	ab=1715	h=1130	ab=1610	h=350	h=350			h=1130			ab=1715			ab=1780			h=4220			h=4800			ab=1195						
	COS		TAN		E		F		H1		H2												E		F		H1		H2		E		F		H1		H2		E			F		H1		H2	
	α	α	α	α	E	F	H1	H2	E	F	H1	H2											E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F		H1	H2	E	F	H1	H2
120	3.931	0.069	0.998	0.069	0.069	1630	1582	520	299	1788	1633	1305	1070	1981	1570	3175	2931	1482	903	4352	4188	1521	863	4931	4762	4931	4762	4931	4762	4931	4762	4931	4762	4931	4762	4931	4762										
115	3.767	0.066	0.998	0.066	0.066	1630	1584	513	301	1786	1637	1298	1072	1973	1579	3168	2934	1470	915	4347	4190	1508	877	4926	4765	4926	4765	4926	4765	4926	4765	4926	4765	4926	4765	4926	4765										
110	3.603	0.063	0.998	0.063	0.063	1629	1585	505	303	1783	1641	1291	1075	1965	1588	3161	2937	1458	927	4342	4192	1494	891	4921	4770	4921	4770	4921	4770	4921	4770	4921	4770	4921	4770	4921	4770										
105	3.439	0.060	0.998	0.060	0.060	1628	1586	498	305	1780	1644	1283	1078	1957	1597	3154	2940	1446	940	4337	4193	1481	905	4916	4772	4916	4772	4916	4772	4916	4772	4916	4772	4916	4772	4916	4772										
100	3.275	0.057	0.998	0.057	0.057	1627	1587	491	307	1777	1648	1276	1080	1948	1606	3147	2943	1434	952	4331	4195	1467	919	4910	4774	4910	4774	4910	4774	4910	4774	4910	4774	4910	4774	4910	4774										
95	3.111	0.054	0.999	0.054	0.054	1627	1589	484	310	1774	1651	1269	1083	1940	1615	3140	2946	1422	964	4326	4196	1454	933	4905	4776	4905	4776	4905	4776	4905	4776	4905	4776	4905	4776	4905	4776										
90	2.948	0.051	0.999	0.051	0.051	1626	1590	477	312	1771	1655	1262	1085	1932	1623	3133	2950	1410	976	4321	4198	1440	947	4900	4777	4900	4777	4900	4777	4900	4777	4900	4777	4900	4777	4900	4777										
85	2.784	0.049	0.999	0.049	0.049	1625	1591	470	314	1768	1658	1254	1088	1924	1632	3125	2953	1399	989	4316	4199	1427	960	4895	4779	4895	4779	4895	4779	4895	4779	4895	4779	4895	4779	4895	4779										
80	2.620	0.046	0.999	0.046	0.046	1624	1592	463	316	1765	1662	1247	1090	1915	1641	3118	2956	1387	1001	4310	4201	1413	974	4890	4780	4890	4780	4890	4780	4890	4780	4890	4780	4890	4780	4890	4780										
75	2.456	0.043	0.999	0.043	0.043	1624	1594	456	318	1762	1665	1240	1093	1907	1650	3111	2958	1375	1013	4305	4202	1400	988	4884	4782	4884	4782	4884	4782	4884	4782	4884	4782	4884	4782	4884	4782										
70	2.292	0.040	0.999	0.040	0.040	1623	1595	449	320	1759	1668	1233	1096	1899	1659	3104	2961	1363	1025	4299	4204	1386	1002	4879	4783	4879	4783	4879	4783	4879	4783	4879	4783	4879	4783	4879	4783										
65	2.128	0.037	0.999	0.037	0.037	1622	1596	442	322	1756	1672	1225	1098	1890	1667	3097	2964	1351	1037	4294	4205	1372	1016	4874	4785	4874	4785	4874	4785	4874	4785	4874	4785	4874	4785	4874	4785										
60	1.965	0.034	0.999	0.034	0.034	1621	1597	435	325	1753	1675	1218	1101	1882	1676	3089	2967	1339	1050	4288	4207	1359	1030	4868	4786	4868	4786	4868	4786	4868	4786	4868	4786	4868	4786	4868	4786										
55	1.801	0.031	1.000	0.031	0.031	1620	1598	428	327	1750	1679	1211	1103	1873	1685	3082	2970	1327	1062	4283	4208	1345	1044	4863	4788	4863	4788	4863	4788	4863	4788	4863	4788	4863	4788	4863	4788										
50	1.637	0.029	1.000	0.029	0.029	1619	1599	421	329	1747	1682	1204	1106	1865	1694	3075	2973	1315	1074	4277	4209	1332	1057	4857	4789	4857	4789	4857	4789	4857	4789	4857	4789	4857	4789	4857	4789										
45	1.473	0.026	1.000	0.026	0.026	1618	1600	414	331	1743	1685	1196	1108	1857	1702	3067	2976	1303	1086	4272	4210	1318	1071	4852	4790	4852	4790	4852	4790	4852	4790	4852	4790	4852	4790	4852	4790										
40	1.310	0.023	1.000	0.023	0.023	1618	1602	407	333	1740	1689	1189	1111	1848	1711	3060	2979	1291	1098	4266	4212	1304	1085	4845	4791	4845	4791	4845	4791	4845	4791	4845	4791	4845	4791	4845	4791										
35	1.146	0.020	1.000	0.020	0.020	1617	1603	400	335	1737	1692	1182	1113	1840	1720	3052	2981	1279	1110	4261	4213	1291	1099	4840	4793	4840	4793	4840	4793	4840	4793	4840	4793	4840	4793	4840	4793										
30	0.982	0.017	1.000	0.017	0.017	1616	1604	393	337	1734	1695	1174	1115	1831	1728	3045	2984	1267	1122	4255	4214	1277	1113	4835	4794	4835	4794	4835	4794	4835	4794	4835	4794	4835	4794	4835	4794										
25	0.818	0.014	1.000	0.014	0.014	1615	1605	385	339	1731	1699	1167	1118	1823	1737	3038	2987	1255	1135	4249	4215	1263	1126	4829	4795	4829	4795	4829	4795	4829	4795	4829	4795	4829	4795	4829	4795										
20	0.655	0.011	1.000	0.011	0.011	1614	1606	378	342	1728	1702	1160	1120	1814	1745	3030	2989	1243	1147	4243	4216	1250	1140	4823	4796	4823	4796	4823	4796	4823	4796	4823	4796	4823	4796	4823	4796										
15	0.491	0.009	1.000	0.009	0.009	1613	1607	371	344	1725	1705	1152	1123	1806	1754	3023	2992	1231	1159	4238	4217	1236	1154	4818	4797	4818	4797	4818	4797	4818	4797	4818	4797	4818	4797	4818	4797										
10	0.327	0.006	1.000	0.006	0.006	1612	1608	364	346	1721	1709	1145	1125	1797	1763	3015	2995	1219	1171	4232	4218	1222	1168	4812	4798	4812	4798	4812	4798	4812	4798	4812	4798	4812	4798	4812	4798										
5	0.164	0.003	1.000	0.003	0.003	1611	1609	357	348	1718	1712	1137	1128	1789	1771	3008	2997	1207	1183	4226	4219	1209	1181	4806	4799	4806	4799	4806	4799	4806	4799	4806	4799	4806	4799	4806	4799										
0	0	0	1	0	0	1610	1610	350	350	1715	1715	1130	1130	1780	1780	3000	3000	1195	1195	4220	4220	1195	1195	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800	4800										

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SCHEDULE OF DIMENSIONS

CANT EFFECT ON STRUCTURE GAUGE-AT GRADE-AND-ELEVATED PLATFORM Kinematic envelope for underground section

CANT	TABLE 3D			h=350			ab=1595			h=1130			ab=1705			h=3000			ab=1765			h=4220			ab=1180			h=4318			ab=1180					
	α	SIN α	COS α	TAN α	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2	E	F	H1	H2
120	3.931	0.069	0.998	0.069	1615	1567	519	300	1778	1624	1304	1070	1967	1555	3174	2932	1467	888	4351	4189	1473	881	4449	4287	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
115	3.767	0.066	0.998	0.066	1615	1569	512	302	1776	1627	1297	1073	1958	1564	3167	2935	1455	900	4346	4191	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
110	3.603	0.063	0.998	0.063	1614	1570	505	304	1773	1631	1290	1076	1950	1573	3160	2938	1443	912	4341	4192	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
105	3.439	0.060	0.998	0.060	1613	1571	498	306	1770	1634	1283	1078	1942	1582	3153	2941	1431	925	4336	4194	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
100	3.275	0.057	0.998	0.057	1612	1572	491	308	1767	1638	1276	1081	1934	1591	3146	2944	1419	937	4331	4196	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
95	3.111	0.054	0.999	0.054	1612	1574	484	310	1764	1641	1268	1083	1925	1600	3139	2947	1407	949	4325	4197	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
90	2.948	0.051	0.999	0.051	1611	1575	477	313	1761	1645	1261	1086	1917	1608	3132	2950	1395	961	4320	4199	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
85	2.784	0.049	0.999	0.049	1610	1576	470	315	1758	1648	1254	1088	1909	1617	3125	2953	1384	974	4315	4200	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
80	2.620	0.046	0.999	0.046	1609	1577	463	317	1755	1652	1247	1091	1900	1626	3118	2956	1372	986	4310	4202	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
75	2.456	0.043	0.999	0.043	1609	1579	456	319	1752	1655	1240	1093	1892	1635	3110	2959	1360	998	4304	4203	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
70	2.292	0.040	0.999	0.040	1608	1580	449	321	1749	1658	1232	1096	1884	1644	3103	2962	1348	1010	4299	4204	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
65	2.128	0.037	0.999	0.037	1607	1581	441	323	1746	1662	1225	1098	1875	1652	3096	2965	1336	1022	4293	4206	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
60	1.965	0.034	0.999	0.034	1606	1582	434	325	1743	1665	1218	1101	1867	1661	3089	2968	1324	1035	4288	4207	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
55	1.801	0.031	1.000	0.031	1605	1583	427	327	1740	1669	1211	1103	1858	1670	3081	2971	1312	1047	4282	4208	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
50	1.637	0.029	1.000	0.029	1604	1584	420	329	1737	1672	1203	1106	1850	1679	3074	2973	1300	1059	4277	4210	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
45	1.473	0.026	1.000	0.026	1603	1585	413	331	1733	1675	1196	1108	1842	1687	3067	2976	1288	1071	4271	4211	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
40	1.310	0.023	1.000	0.023	1603	1587	406	333	1730	1679	1189	1111	1833	1696	3060	2979	1276	1083	4266	4212	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
35	1.146	0.020	1.000	0.020	1602	1588	399	336	1727	1682	1181	1113	1825	1705	3052	2982	1264	1095	4260	4213	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
30	0.982	0.017	1.000	0.017	1601	1589	392	338	1724	1685	1174	1116	1816	1713	3045	2984	1252	1107	4255	4214	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
25	0.818	0.014	1.000	0.014	1600	1590	385	340	1721	1689	1167	1118	1808	1722	3037	2987	1240	1120	4249	4215	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
20	0.655	0.011	1.000	0.011	1599	1591	378	342	1718	1692	1159	1120	1799	1731	3030	2990	1228	1132	4243	4216	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
15	0.491	0.009	1.000	0.009	1598	1592	371	344	1715	1695	1152	1123	1791	1739	3023	2992	1216	1144	4237	4217	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
10	0.327	0.006	1.000	0.006	1597	1593	364	346	1711	1699	1145	1125	1782	1748	3015	2995	1204	1156	4232	4218	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
5	0.164	0.003	1.000	0.003	1596	1594	357	348	1708	1702	1137	1128	1774	1756	3008	2997	1192	1168	4226	4219	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282
0	0	0	1	0	1595	1595	350	350	1705	1705	1130	1130	1765	1765	3000	3000	1180	1180	4220	4220	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282	1461	894	4444	4282

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GOWDA	AGRAWAL
RAMESHA	Date: 2021.08.22
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BSRP SCHEDULE OF DIMENSIONS

Maximum cant – 120 mm, maximum cant excess 75 mm/deficiency 85 mm

Appendix -4												
Additional clearance for Platforms on curve on account of mid throw and end throw												
This table does not include the effect of lean and gauge widening.												
EXTRA CLEARANCE												
RADIUS	INSIDE OF CURVE						OUTSIDE OF CURVE					
	AT MID POINT BETWEEN CENTRES OF TWO BOGIES			AT EDGE OF OPEN DOOR NEAREST TO C.L. OF BOGIES			AT END OF COA			AT EDGE OF OPEN DOOR, FARTHEST FROM C.L. OF BOGIES		
	MID THROW =2850/R	NOSING	ADDITIONAL CLEARANCE	V3	N1	ADDITIONAL CLEARANCE (ROUNDED)	END THROW = 3325/R	THROW =19340/R	NOSING =17.5x	DIFFERENCE BETWEEN N AND N	ADDITIONAL CLEARANCE	ADDITIONAL CLEARANCE (ROUNDED) OFF TO NEAREST 5 (mm)
V	N	V-N	V3	N1	V3 - (N-N1)	V0	V4	N2	N-N2	V4-(N-N2)	V4-(N-N2)	
metres	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1	2	3	4	5	6	7a	8	9	10	11	12a	12
3000	9.5	17.5	0	9.3	1.4	-6.8	11	6.4	15.3	2.2	4.2	5
2800	10.2	17.5	0	10.0	1.4	-6.1	12	6.9	15.3	2.2	4.7	5
2400	11.9	17.5	0	11.7	1.4	-4.4	14	8.1	15.3	2.2	5.9	5
2000	14.3	17.5	0	14.0	1.4	-2.1	17	9.7	15.3	2.2	7.5	10
1800	15.8	17.5	0	15.6	1.4	-0.5	19	10.7	15.3	2.2	8.5	10
1600	17.8	17.5	0	17.6	1.4	1.5	21	12.1	15.3	2.2	9.9	10
1500	19.0	17.5	0	18.8	1.4	2.7	22	12.9	15.3	2.2	10.7	10
1200	23.8	17.5	5	23.4	1.4	7.3	28	16.1	15.3	2.2	13.9	15
1000	28.5	17.5	10	28.1	1.4	12	34	19.3	15.3	2.2	17.1	15

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NOTES:

1. **Extra clearance for curve**

1.1. **Inside of curve:** Higher value of (i) i.e., column 4 and (ii) i.e., column 7 shall be adopted

1.1.1. Additional clearance at centre line of Bogies = Mid Throw - Nosing = $V-N$, where $V = (125C^2/R) = 28500/R$ with $C=15.10$ m for the worst case.

Note: Nosing at centre line of the Bogies is zero and therefore the nosing value included in the platform clearance on straight track is deducted from Mid throw.

1.1.2. Additional clearance at any other location between two Bogies at a distance of X from C.L. of Bogies = $Throw (V3) - (N-N1)$,

where

$$V3 = [125 \times \{C^2 (2x)^2\} / R] = 28400/R$$

And

$$N1 = N \times (X) / (C1/2) = 17.5 \times 0.873 / 10.87 = 1.4 \text{ mm}$$

(Minimum distance 'X' for the nearest edge of an open door from centre line of Bogies is 0.873 metre)

Note: Nosing at a distance of (X) from C.L. of two Bogies is less than N (included in the platform clearance on straight track) and therefore the difference deducted from Throw at that point.

1.2 **Outside of curve:**

1.2.1 Additional clearance at coach end = End throw

$$(V_0) = 125 \times (C^2 - C1^2) / R = 33500/R \text{ for coach end with } C1=14.6 \text{ metres and } C = 2 \times 10.87 \text{ metres}$$

1.2.2 Additional clearance at any other location at a distance of 'X' metres from C.L. of Bogies = $Throw (V4) - (N-N2)$, where, $X < C1 / 2$,

$$V4 = 125 \times (19.18 \times 19.18 - 14.6 \times 14.6) / R = 19340/R \text{ for farthest edge of end door in open position with } C1 = 2 \times 9.590 = 19.18 \text{ metres and } C = 14.60 \text{ metres for the worst case, } N2 = \text{Nosing at the farthest edge of an open door}$$

$$= N \times (X) / (C1)$$

$$= 17.5 \times 9.59 / 10.87 \text{ mm} = 15.3 \text{ mm} \quad (\text{Maximum distance (X) for the farthest edge of open door from centre line of two Bogies} = 9.590 \text{ M})$$

1. As nosing (N2) at (X) from C.L. of two Bogies is less than the nosing (N) at end of the coach (included in platform clearance on straight track),

2. The difference between clearance required at coach end and at the farthest door edge is less than 25 mm. As half width of coach at ends is a be provided is additional clearance required at the farthest door edge (column 12).

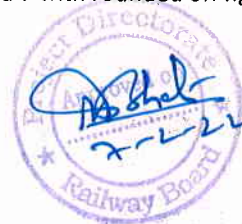
2. Values of additional clearances (columns 4, 7 and 12) are rounded off to the nearest 5 mm.

3. Negative values of additional clearance are taken as Zero in the columns 4 and 7 with rounded off figures.

Examined & found in order

Mohammad
Faiz Ansari

Digitally signed by
Mohammad Faiz Ansari
Date: 2021.08.25 17:57:00
+05'30'



KRIDE/BSRP	
JGM/RS	Director P. & P
HUNUSUVALLI KOMARI Digitally signed by HUNUSUVALLI KOMARI Date: 2021.08.25 17:57:00 +05'30'	NEERAJ Digitally signed by NEERAJ AGRAWAL Date: 2021.08.25 17:57:00 +05'30'

Appendix 5

Clearances required for 25 KV single phase A.C. Electric Traction

1. It is desirable to provide the maximum possible clearance in the case of lines equipped for 25 KV A.C. 50cycle single phase electric traction.

Minimum Clearance between live bare conductors / pantographs and structure:	: 200 mm
a. Short term clearances_ Vertical and lateral distance between live conductors and earth (normally existing only for a brief period)	
b. Long term clearances _ Vertical and lateral distance between live conductors and earth (which may remain for a considerable period)	: 250 mm

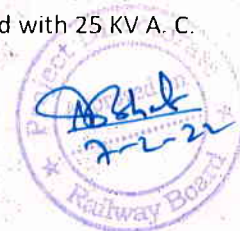
2. In order to ascertain whether the requisite clearance would be available under an existing structure, the permissible height of the contact wire shall be determined. For this purpose, the following particulars should be known:
1. Particulars of the structure including profile.
 2. Allowance for slewing of tracks
 3. Allowance for low joints in tracks
 4. Radius of curvature of track under the structure
 5. Superelevation of track under the structure
 6. Maximum permissible speed under the structure
 7. Maximum dimensions of over-dimensional consignments which are permissible and safety erasures which would be taken for movement of over-dimensional consignments.
 8. Location of the structure in relation to level crossings, water column and turnouts in the vicinity.
 9. The type of overhead equipment.
 10. Vertical Oscillation of contact wire.
 11. Kinematic envelope of rolling stock and over dimensional consignments (in case another vehicle like maintenance vehicle is to be permitted on line).
3. After determining the permissible height of the contact wire based on the above particulars, the clearance required between the lowest portion of the bridge or structure and the top most position of the overhead wire shall be determined in each case after study of the following: —
1. System of tensioning of the overhead equipment
 2. Atmospheric conditions.
 3. Maximum permissible number of electric locomotives per train (double or triple headed)
 4. Location of the structure in relation to points and crossings, overlap, spans, etc.
 5. Length of the structure along the tracks.
 6. Type of structure, girder, masonry etc.
 7. The span of overhead equipment under the bridge,
 8. Presence of a traction feeder,
 9. Likelihood of diesel locomotives halting under the structure.
 10. Pantograph push-up.
 11. Static electrical Clearance.
 12. Vertical Oscillation of OHE.
4. The minimum height of contact wire
1. for a stock height of 4.42m, to be able to run on all sections electrified with 25 KV A. C. traction system with live traction overhead equipment.

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Faiz Ansari**

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Date: 2021.08.25 17:57:52 +05'30'

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i	Height of the locomotive	4420
ii	Minimum clearance to contact wire	250
iii	Allowance for track maintenance	20
iv	Minimum height of contact wire (Total)	4690

Note:

- For OHE span length of 49.5 m or below, the oscillations of contact wire get reduced to 0.05 m and the minimum height of the contact wire in para 4(a)(iv) can be reduced to 4.69 m.
- After determining the minimum height of contact wire on the assumption that it would permit passage of standard locomotives and stocks, the maximum height of over dimensional consignments (ODC) with the live overhead equipment at speed over 15km/h (when vertical oscillation of overhead equipment is pronounced) is derived as under:

Minimum height of contact wire	4690
Less	
i. Minimum electrical clearance	200
ii. Track allowance	20
iii. Allowance for vertical oscillation of contact wire under influence of moving pantographs	50
Total Permissible maximum height of over dimensional consignment	270

- If an over dimensional consignment is moved at slow speed not exceeding 15 kmph there will be no downward displacement (due to oscillation) of contact wire. However, to cater for the likelihood of an over dimensional consignment halting under a structure, a clearance of 0.25m under rest condition is to be provided, vide item 1 of Chapter V-A. In this case the derived height of contact wire may be reduced by 50mm.
- As per UIC 606-1 the Minimum/Maximum of contact wire bearing in mind the probability of simultaneous occurrence of random factors.
 F_v = sag of contact wire: preliminary sag and sag between droppers.
 F_g = levelling tolerance of the track.
 F_{mu} = downwards deviation of the tolerance for fitting of the contact wire.
 F_{du} = downwards dynamic oscillations of the contact wire.
 F_{tu} = Sag of the contact wire at the highest temperature, measured in relation to its position for the average temperature (Taken '0' as this is a regulated OHE)
 F_e = Effects of Ice on the height of contact plane (Taken '0' as no snow in Bangalore)
 B_1 = Clearance between plane electrodes for normal atmosphere pressure (including variations in air humidity).
 B_2 = Allowance for pressure variations
 B_3 = Allowance for pollution (Running for Thermal units, proximity to the sea, industrial pollution)
 B_4 = Allowance for unequal distribution of Electrical field
 B_5 = Allowance for over voltages appearing the catenary network.
 B_6 = Other safety allowances (birds, operating irregularities)
 HL = Height of limiting Gauge. (Height of coach)

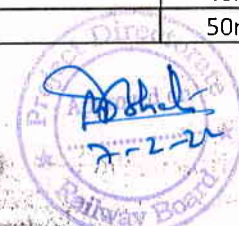
ELECTRICAL DISTANCES FOR THE 25KV VOLTAGES from live wire to nearest metal conductor	
B1	30mm
B2	40mm
B3	50mm

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NEERAJ AGRAWAL	Digitally signed by NEERAJ AGRRAWAL Date: 2021.08.22

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Faiz Ansari

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Date: 2021.08.25 17:58:46
+05'30'





B4	30mm
B5	10mm
B6	70mm
normal distances dynamically without pollution	170mm
normal distances dynamically with pollution	220mm
minimum distances dynamically without pollution	70mm
minimum distances dynamically with pollution	120mm
normal distances static without pollution	270mm
normal distances static with pollution	320mm
minimum distances static without pollution	200mm
minimum distances static with pollution	250mm

HL= 4048mm	B4= 30mm	Fv= 100mm (maximum value).
B1= 30mm	B5= 100mm	Fmu = 10mm
B2=40mm	B6= 70mm	Fdu = 10mm
B3 = 50mm	Fg= 20mm	

Formula as per the UIC 606-1 for minimum contact wire height:

$$1). H_f \text{ min} = HL + B1 + B2 + B3 + Fg + (F_e \text{ or } F_{tu}) + F_v + \sqrt{B4^2 + B5^2 + B6^2 + F_{mu}^2 + F_{du}^2}$$

Where,

$$H_{fmin} = 4048 + 30 + 40 + 50 + 0 + 20 + 100 + \sqrt{30^2 + 100^2 + 70^2 + 10^2 + 10^2}$$

$$H_{fmin} = 4414.49 \text{ mm}$$

Formula as per the UIC 606-1 for Maximum contact wire height:

Where,

H_{fn} = Nominal height of the contact wire, here H_{fmin} is taken as nominal.

F_s = static uplift of the contact wire by the pantograph.

F_q = additional quasi-static uplift of the contact wire at maximum speed.

F_{do} = upward dynamic oscillations of the contact wire.

F_{mo} = upwards deviation of the tolerance for fitting or the contact wire.

$$H_f \text{ max} = H_{fn} + f_s + f_q + f_{to} + \sqrt{f_{do}^2 + f_{mo}^2}$$

Therefore

$$H_f \text{ max} = 4414.49 + 100 + 0 + \sqrt{10^2 + 10^2}$$

$$H_f \text{ max} = 4528.64 \text{ mm}$$

$$\text{Value of } H_f \text{ max} = 4528.64 \text{ mm}$$

$$\text{Value of } H_f \text{ min} = 4414.49 \text{ mm} = 4425$$

F _{to} = 0mm
F _{do} = 10mm
F _{mo} = 10mm
F _s + F _q = 100mm

Minimum Height of heavy structure = min height of wire + clearance between bridge and live wire + contact wire thickness + rise on edge = 4425 + 270 + 16 + 14 = 4742 = 4750 + (300 mm encumbrance)

$$= 5050$$

Minimum height of light structure = minimum height of heavy structure + 200

$$= 5050 + 200 = 5250$$

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Date: 2021.08.25 17:59:42 +05'30'

42



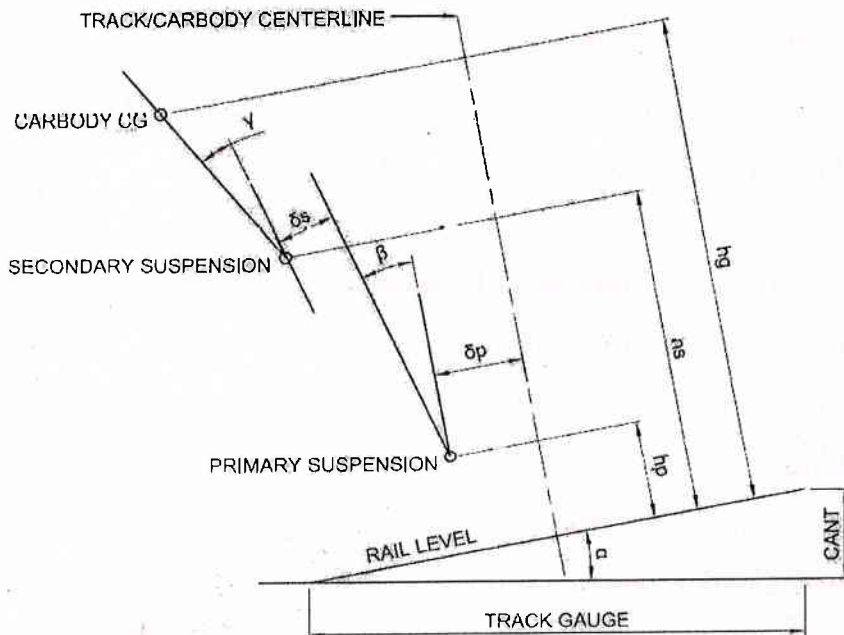
KRIDE/BSRP	
JGM/RS	Director P & P
HUNUSUVALLI KOMARI GOWDA	Digitally signed by HUNUSUVALLI KOMARI GOWDA Date: 2021.08.22
Digitally signed by NEERAJ AGRAWAL	Digitally signed by NEERAJ AGRAWAL Date: 2021.08.22

KINEMATIC ENVELOPE METHODOLOGY

Kinematic envelope is calculated as below.

Below calculation is done for motor coach and trailer coach separately, with both secondary suspension in inflated and deflated condition. Maximum of above 4 set of value is considered as displacement added to maximum moving dimension to get kinematic envelope of the coach as below. The calculation is done for location A as mentioned in fig-2 below to count nosing effect also.

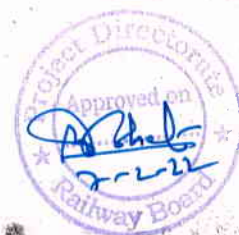
1. Wind effect is converted in equivalent cant.
 Wind force= $\frac{1}{2} (A \rho V^2)$
 V wind velocity in m/s
 P density of air 1.2 kg/m³
 An area of resistance 3*22=66 m
Cant due to track= wind force * track gauge / car body mass * acceleration due to gravity
2. Cant excess and cant deficiency will be added (in case of outside station portion)
3. Speed will be converted in equivalent cant.
 Cant due to speed= $K_{speed} * (\text{speed of vehicle})$
 K_{speed} will be taken as .396 for broad gauge condition
4. Cant= sum of 1,2,3 above.



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18:00:39 +05'30'



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NEERAJ AGRAWAL	Digitally signed by NEERAJ AGRAWAL Date: 2021.08.25 18:00:39 +05'30'

5. Deflection and tilt is calculated as below
system of equations has been developed to analyze the vehicle sway as follows:
Design code (501 British railways)
Tan α = cant/ track gauge
Cant = as calculated sl no 4 above.
Track gauge = 1750 for broad gauge.

Secondary Lateral Equation

$$\alpha = \delta s * ksec Lat / M * g \dots\dots\dots (A)$$

Secondary Roll Equation

$$Ksec roll * \gamma = M * g * \{ \{ (hg-hs) * (\alpha + \beta + \gamma) \} + G \} + Q \dots\dots\dots (B)$$

Primary Roll Equation

$$K prim roll * \beta = M * g * \{ \{ (hg-hp) * (\alpha + \beta + \gamma) \} + \delta s + G \} \dots\dots\dots (C)$$

Primary lateral deflection

$$p = M * g * (\alpha + \beta + \gamma) / Kprim lat \dots\dots\dots (D)$$

The above equations are solved simultaneously to get body roll (γ), bogie roll (β) and secondary suspension lateral deflection (s). Primary lateral deflection (p) is calculated from equation—D

After values of α , β , γ determined, equation J & K are used to calculate the sway of the body at any height H above rail level.

$$Sway = \{ (hc-hs) * \gamma \} + \{ (hc-hp) * \beta \} \dots\dots\dots (J) \quad \text{for CG point}$$

$$Sway = \{ (hc-hs) * \gamma \} + \{ (hc-hp) * \beta \} - Wc * \{ 1 - \cos (\beta + \gamma) \} \dots\dots\dots (K)$$

for a point with semi-width Wc

Pure Lateral Displacement = Pri Lat Disp + Sec Lat disp + + Flange Lat Play

Yaw displacement (rolling stock) = pure lat displacement (n/A)

n = bogie centre to end of coach distance.

A = Bogie centre to centre distance.

Yaw displacement (track) = track alignment tolerance * (2n/A + n/A)

Nosing = yaw displacement (rolling stock + track)

Cross level dip = cross level error * h/ track gauge.

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Date: 2021.08.25
18:01:40 +05'30'



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HUNUSUWALL KOMARI GOWDA RAMESHA	Digitally signed by NEERAJ AGRAWAL Date: 2021.08.22



h = required height.

Displacement= pure lateral displacement+ sway + nosing + Cross level disp.

This is to added with below to get total deflection of coach under dynamic condition.

1. Gauge tolerance (for ballast and ballast less track)
2. Alignment tolerance.
3. Wheel wear tolerance.
4. Bogie and body clearances.

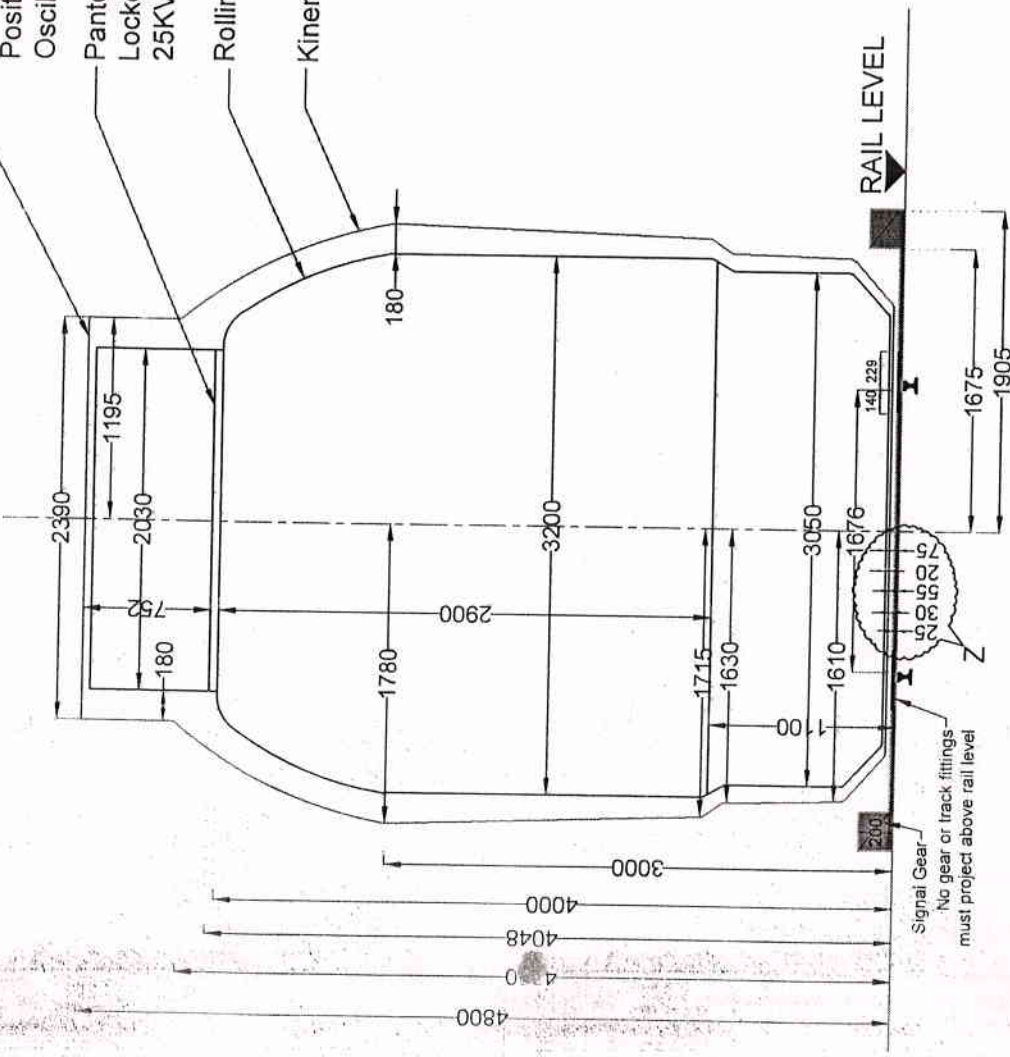
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Mohammad Faiz Ansari
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 Date: 2021.08.25 18:02:38 +05'30'

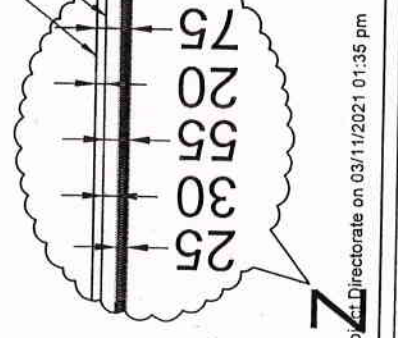


KRIDE/BSRP	
JGM/RS	Director P & P
HUNUSUVALLI KOMARI GOWDA RAMESHA	Digitally signed by NEERAJ AGRAWAL Date: 2021.08.22 18:02:38 +05'30'

Position (Including 50mm Oscillation Clearance)
 Pantograph Height in Locked-Down Position for 25KV System
 Rolling Stock Outline
 Kinematic Envelope



Rolling Stock Outline
 Kinematic Envelope
 Signal Gear



1. ALL DIMENSIONS ARE IN MM.
2. KINEMATIC ENVELOPE (of 3200mm maximum coach width) IS CALCULATED FOR WIND SPEED OF 70 kmph, COACH SPEED OF 90 kmph, TRACK DEFECT / CLEARANCE (gauge tolerance + alignment tolerance + cross level error + track alignment error + vertical un-evenness) OF 32mm (for ballasted track) 22mm (for ballast-less track), COACH CLEARANCES (wheel wear + flange wear + bolster to bogie body clearance+ bogie body to axle box clearance, etc.,) OF 43mm, (For bolsterless bogie 32 mm) CENTER BETWEEN BOGIE OF 15000mm AND TOTAL END-TO-END COACH LENGTH OF 21740mm.
3. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVE (including vertical curve) AND CANT SHALL BE EXTRA.
4. KINEMATIC ENVELOPE IS VALID FOR VEHICLE WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.

THIS SECTION IS FOR BALLASTED TRACK. IN CASE OF BALLASTLESS TRACK, DECREASE KINEMATIC ENVELOPE BY 10MM

Examined & found in order
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25 18:03:43
 +05'30'



25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	KINEMATIC ENVELOPE FOR AT-GRADE AND ELEVATED SECTIONS ON LEVEL OR CONSTANT GRADE TANGENT TRACK
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 01
SCALE :	NTS SHEET No : 01

K RIDE	HUNUSIVALLIKOMARI GONDIA RAMESHA
JGM/RSG	Digitally signed by HEBDAJ AGRAWAL
DIRECTOR PLANNING (P&P)	Digitally signed by HEBDAJ AGRAWAL

Note :
 1. MINIMUM ELECTRICAL CLARENCE - 270mm
 2. REGIONAL WIND SPEED OF BENGALURU - 10 TO 15 kmph
 3. MAXIMUM WIND SPEED OF BENGALURU - 50 kmph
 4. OPERATION IS AS PER IS-875 (latest)

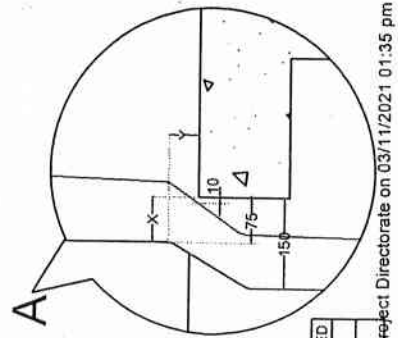
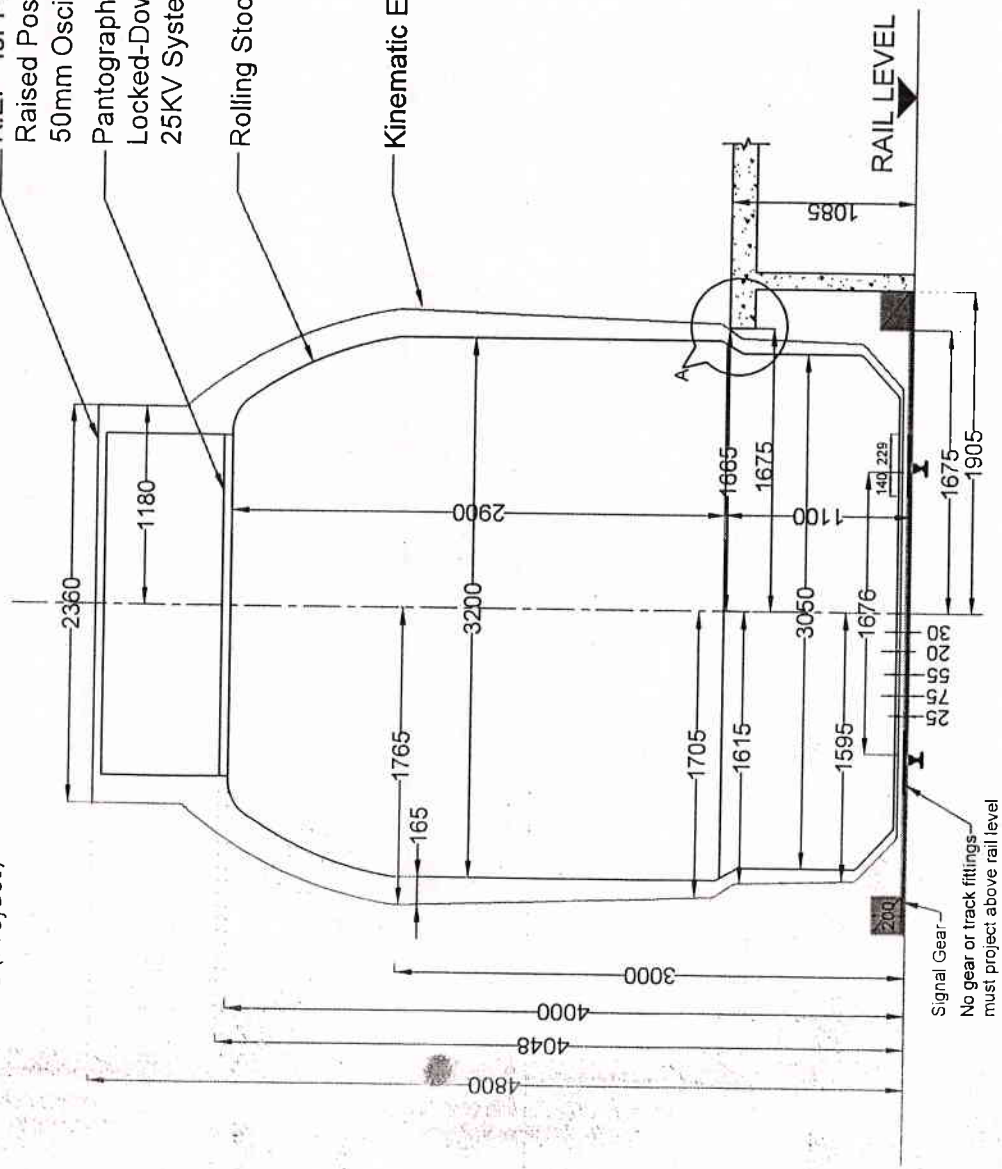
- ALL DIMENSIONS ARE IN mm.
- KINEMATIC ENVELOPE (of 3200mm maximum coach width) IS CALCULATED FOR WIND SPEED OF 70 kmph, COACH SPEED OF 70 kmph, TRACK DEFECT / CLEARANCE (gauge tolerance + alignment tolerance + cross level error + track alignment error + vertical un-evenness) OF 32mm (for ballasted track) 22mm (for ballast-less track), COACH CLEARANCES (wheel wear + flange wear + bolster to bogie body clearance + bogie body to axle box clearance, etc.) OF 43mm, (For bolasterless bogie 32 mm) CENTER BETWEEN BOGIE OF 15000mm AND TOTAL END-TO-END COACH LENGTH OF 21740mm.
- HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVE (including vertical curve) AND CANT SHALL BE EXTRA.
- KINEMATIC ENVELOPE IS VALID FOR VEHICLE WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.

THIS SECTION IS FOR BALLASTED TRACK. IN CASE OF BALLASTLESS TRACK, DECREASE KINEMATIC ENVELOPE BY 10MM HEIGHT OF PASSENGER PLATFORM:

- MAX. FOR BALLASTED TRACK - 1085
- MAX. FOR BALLASTLESS TRACK - 1095
- MIN. FOR BALLASTED TRACK - 1075
- MIN. FOR BALLASTLESS TRACK - 1085

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 Mohammad Faiz Ansari
 Date: 2021.08.25 18:04:45
 +05'30'

- Raised Position(Including 50mm Oscillation Clearance)
- Pantograph Height in Locked-Down Position for 25KV System
- Rolling Stock Outline
- Kinematic Envelope



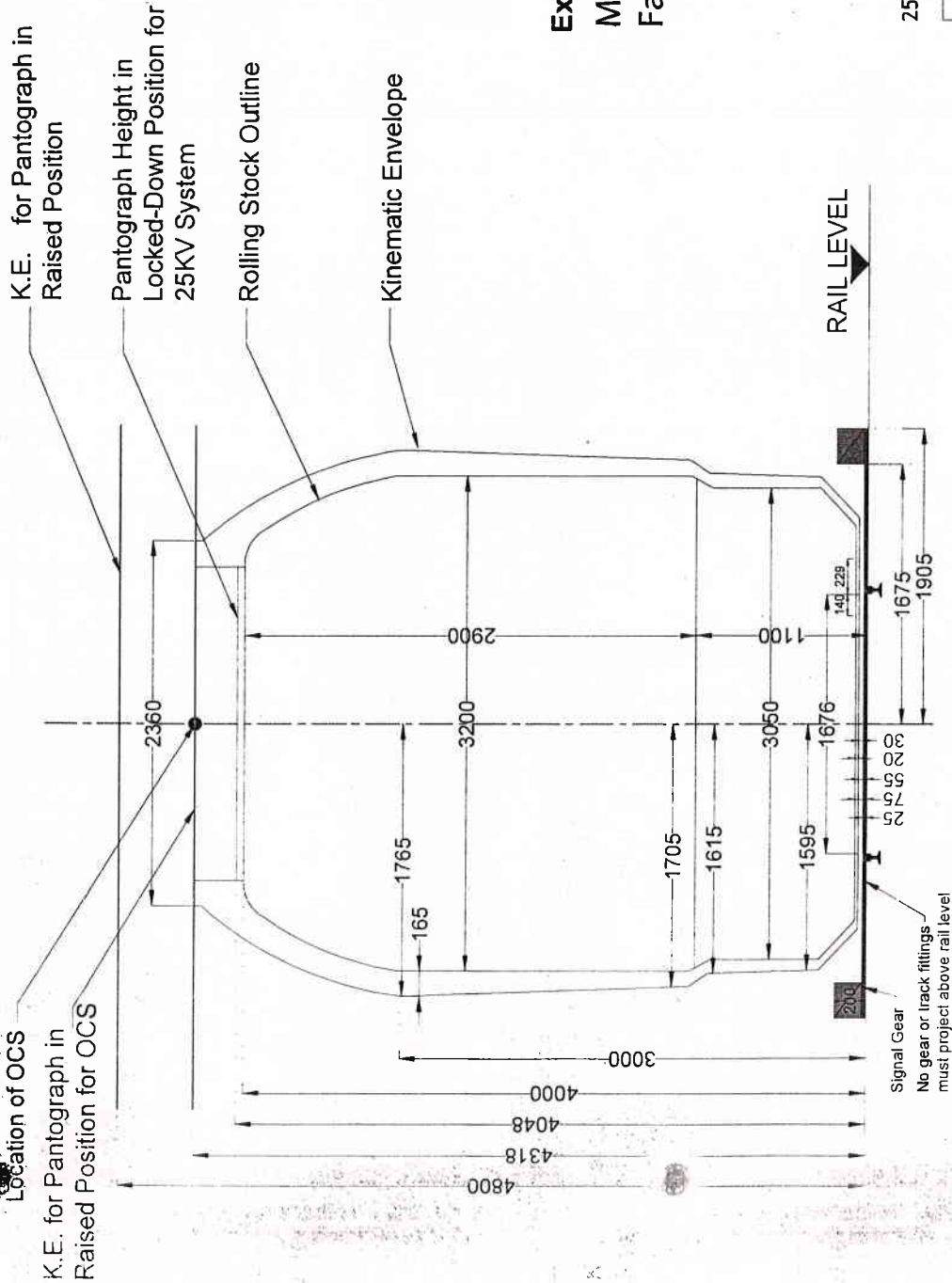
- Note
- MINIMUM ELECTRICAL CLEARANCE - 270mm
 - REGIONAL WIND SPEED OF BENGALURU - 10 TO 15 kmph
 - MAXIMUM WIND SPEED OF BENGALURU - 50 kmph
 - OPERATION IS AS PER IS - 875 (latest)
 - DESIGN SPEED OF ROLLING STOCK - 90 kmph

CONDITION	UNLOADED	LOADED
X	75	75
Y	50	20

25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK :	BSRP- BENGALURU SUBURBAN RAIL PROJECT KINEMATIC ENVELOPE FOR AT-GRADE AND ELEVATED SECTIONS ON LEVEL OR CONSTANT GRADE TANGENT TRACK AT PLATFORM
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 01A
SCALE :	NTS SHEET No : 02

K RIDE	HUNUSIVALLI KOMARI, Digitally signed by HUNUSIVALLI GOWDA RAMESHA, Date: 2021.08.25 15:15:46 +05'30'
JGM/287	Digitally signed by NEERAJ AGRAWAL, Date: 2021.08.22 15:15:46 +05'30'
DIRECTOR PLANNING (P&P)	



NOTE:-

1. ALL DIMENSIONS ARE IN mm.
2. KINEMATIC ENVELOPE (for 3200mm maximum coach width) IS CALCULATED FOR WIND SPEED OF 42 kmph, COACH SPEED OF 90 kmph, TRACK DEFECT / CLEARANCE (gauge tolerance + alignment tolerance + cross level error + track alignment error + vertical un-evenness) OF 32mm (for ballasted track) 22mm (for ballast-less track), COACH CLEARANCES (wheel wear + flange wear + bolster to bogie body clearance+ bogie body to axle box clearance, etc.) OF 43mm, (For bolsterless bogie 32 mm) CENTER BETWEEN BOGIE OF 15000mm AND TOTAL END-TO-END COACH LENGTH OF 21740mm.
3. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVE (including vertical curve) AND CANT SHALL BE EXTRA.
4. KINEMATIC ENVELOPE IS VALID FOR VEHICLE WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.

THIS SECTION IS FOR BALLASTED TRACK. IN CASE OF BALLASTLESS TRACK, DECREASE KINEMATIC ENVELOPE BY 10MM

Examined & found in order

Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25
 18:05:49 +05'30'



25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP - BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	KINEMATIC ENVELOPE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS) ON LEVEL OR CONSTANT GRADE TANGENT TRACK
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 01B
SCALE :	NTS SHEET No. : 03

K RIDE	
JGM/RS 48 DIRECTOR PLANNING (P&P)	HUNISUVALLI KOMARI GOWDA RAMESHA Digitally signed by HUNISUVALLI KOMARI GOWDA RAMESHA Date: 2021.08.25 13:18:11 +05'30'
	Digitally signed by NEERAJ AGRAWAL Date: 2021.08.23 16:16:47 +05'30'

- Note:
1. MINIMUM ELECTRICAL CLARENCE - 270mm
 2. REGIONAL WIND SPEED OF BENGALURU - 10 TO 15 kmph
 3. MAXIMUM WIND SPEED OF BENGALURU - 50 kmph
 4. OPERATION IS AS PER IS - 875 (latest)
 5. DESIGN SPEED OF ROLLING STOCK - 90 kmph

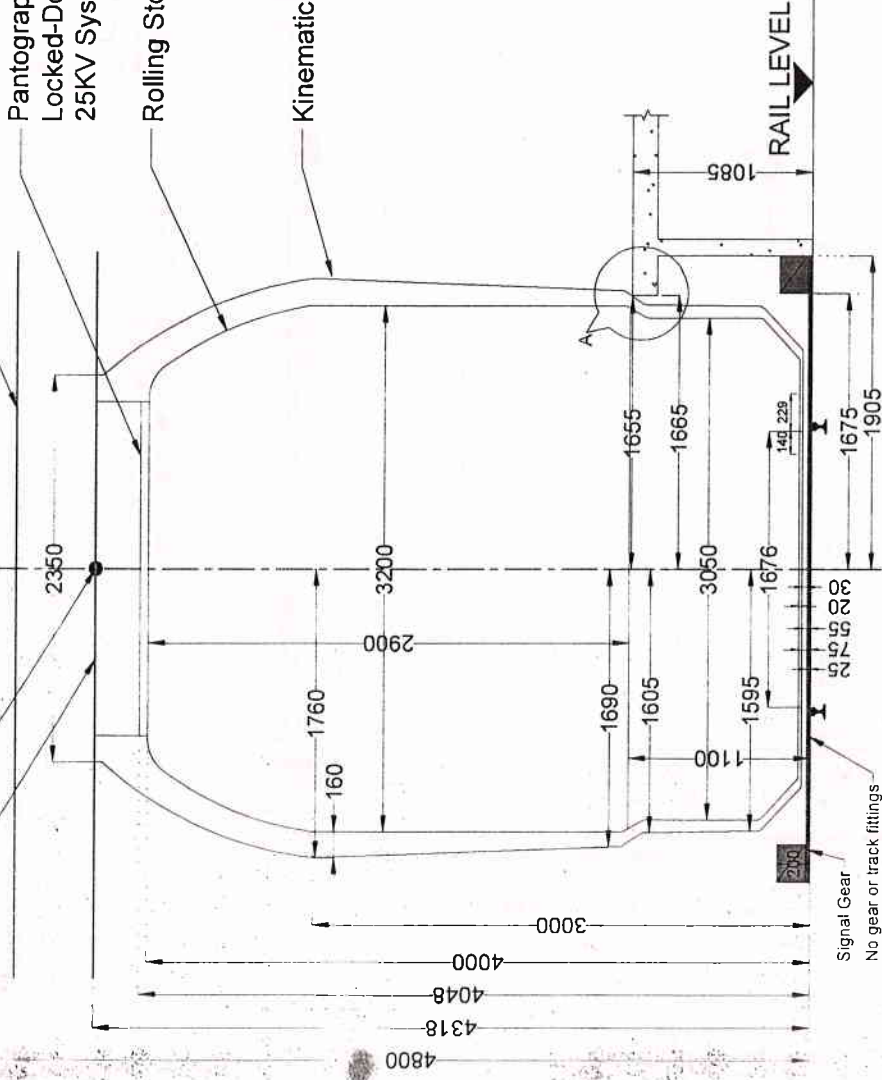
990216/2021/Location of Object

K.E. for Pantograph in Raised Position

Pantograph Height in Locked-Down Position for 25KV System

Rolling Stock Outline

Kinematic Envelope



- NOTE:-
- ALL DIMENSIONS ARE IN mm.
 - KINEMATIC ENVELOPE (of 3200mm maximum coach width) IS CALCULATED FOR WIND SPEED OF 42 kmph, COACH SPEED OF 70 kmph, TRACK DEFECT / CLEARANCE (gauge tolerance + alignment tolerance + cross level error + track alignment error + vertical un-evenness) OF 32mm (for ballasted track) 22mm (for ballast-less track), COACH CLEARANCES (wheel wear + flange wear + bolster to bogie body clearance + bogie body to axle box clearance, etc.) OF 43mm. (For bolterless bogie 32 mm) CENTER BETWEEN BOGIE OF 15000mm AND TOTAL END-TO-END COACH LENGTH OF 21740mm.
 - HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVE (including vertical curve) AND CANT SHALL BE EXTRA.
 - KINEMATIC ENVELOPE IS VALID FOR VEHICLE WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.

THIS SECTION IS FOR BALLASTED TRACK. IN CASE OF BALLASTLESS TRACK, DECREASE KINEMATIC ENVELOPE BY 10MM HEIGHT OF PASSENGER PLATFORM:

- MAX. FOR BALLASTED TRACK - 1085
- MAX. FOR BALLASTLESS TRACK - 1095
- MIN. FOR BALLASTED TRACK - 1075
- MIN. FOR BALLASTLESS TRACK - 1085

Examined & found in order

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Mohammad Faiz Ansari
 Date: 2021.08.25
 18:06:57 +05'30'



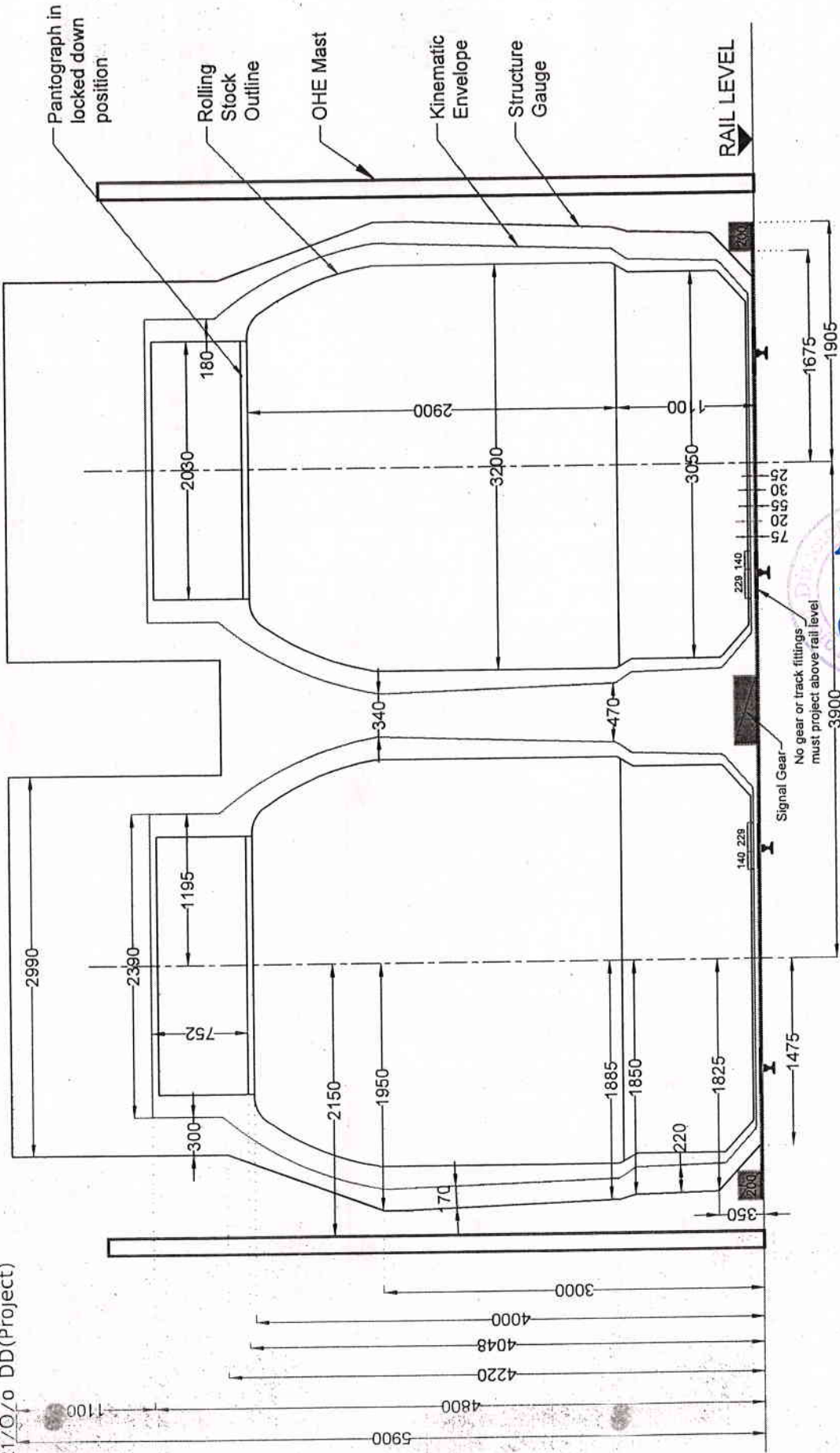
25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK :	KINEMATIC ENVELOPE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS) ON LEVEL OR CONSTANT GRADE TANGENT TRACK AT PLATFORM
DRG. No :	KRIDE / BSRR / KSR - 01 / RSBG - 01C
SCALE :	NTS
SHEET No. :	04

JGMIRS	HUNUSVALI KOMARI	Digitally signed by HUNUSVALI KOMARI
49	GOWDA RAMESHA	Digitally signed by GOWDA RAMESHA
DIRECTOR PLANNING (P&P)	NEERAJ	Digitally signed by NEERAJ
	AGRAWAL	Digitally signed by AGRAWAL
		Date: 2021.08.22 16:19:43

- Note :
- MINIMUM ELECTRICAL CLARENCE - 270mm
 - REGIONAL WIND SPEED OF BENGALURU - 10 TO 15 kmph
 - MAXIMUM WIND SPEED OF BENGALURU - 50 kmph
 - OPERATION IS AS PER IS - 875 (latest)
 - DESIGN SPEED OF ROLLING STOCK - 90 kmph

CONDITION	UNLOADED	LOADED
X	65	65
	50	20



Examined & found in order

Mohammad
Faiz Ansari

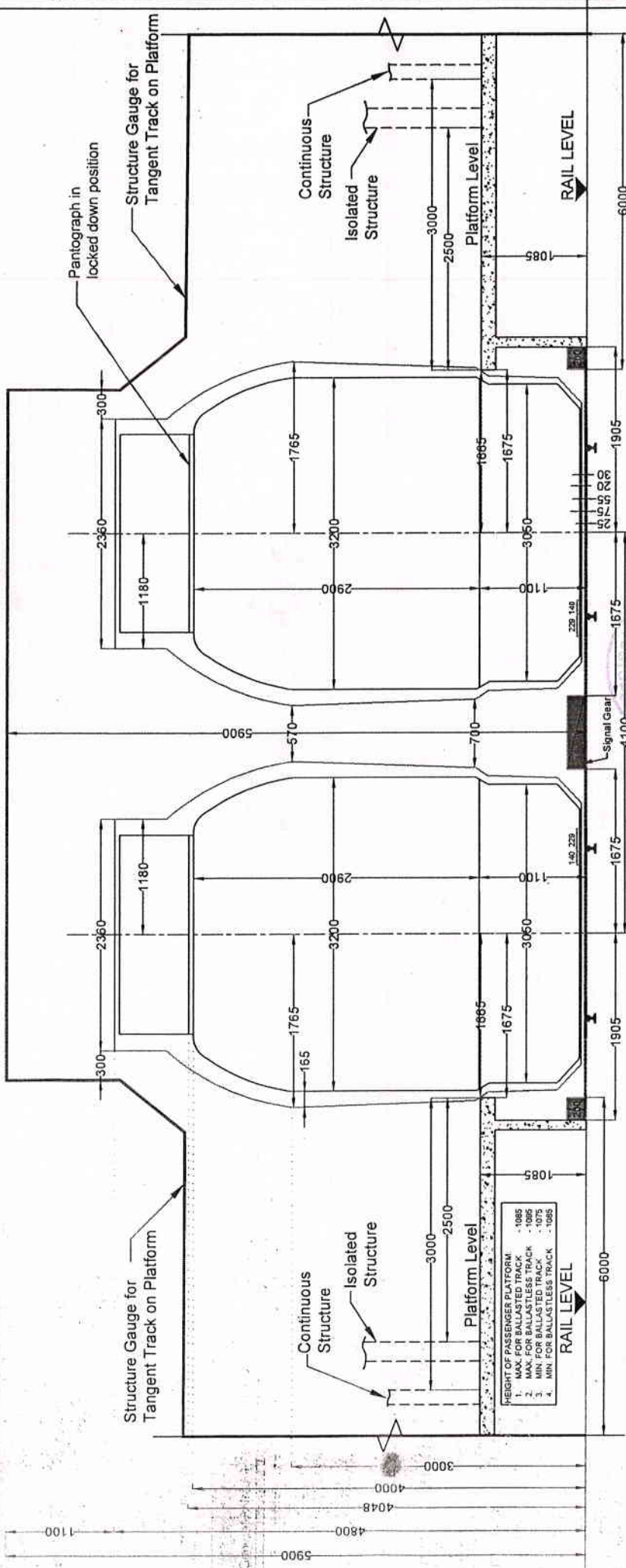
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Mohammad Faiz Ansari
Date: 2021.08.25 18:08:00
+05'30'

25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	STRUCTURE GAUGE FOR AT-GRADE AND ELEVATED SECTIONS ON LEVEL OR CONSTANT GRADE TANGENT TRACK
DRG. No. :	KRIDE /BSRP / KSR - 01 / RSBG - 02
SCALE :	NTS SHEET No. : 05

K RIDE	
JGM/RS	HUNUSUVALI KOMARI GOWDA RAMESHA
50	Digitally signed by HUNUSUVALI KOMARI GOWDA RAMESHA Date: 2021.08.22 15:18:51 +05'30'
DIRECTOR PLANNING (P&P)	NEERAJ AGRAWAL Digitally signed by NEERAJ AGRAWAL Date: 2021.08.23 16:20:28 +05'30'

- NOTE:**
- ALL DIMENSIONS ARE IN mm.
 - TRACK CENTRES / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
 - ALLOWANCE FOR HORIZONTAL AND VERTICAL CURVES AND CANT SHALL BE EXTRA.
 - FOR KINEMATIC ENVELOPE , REFER TO FIGURE NO. RSBG - 1.



Examined & found in order
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25 18:09:06
 +05'30'

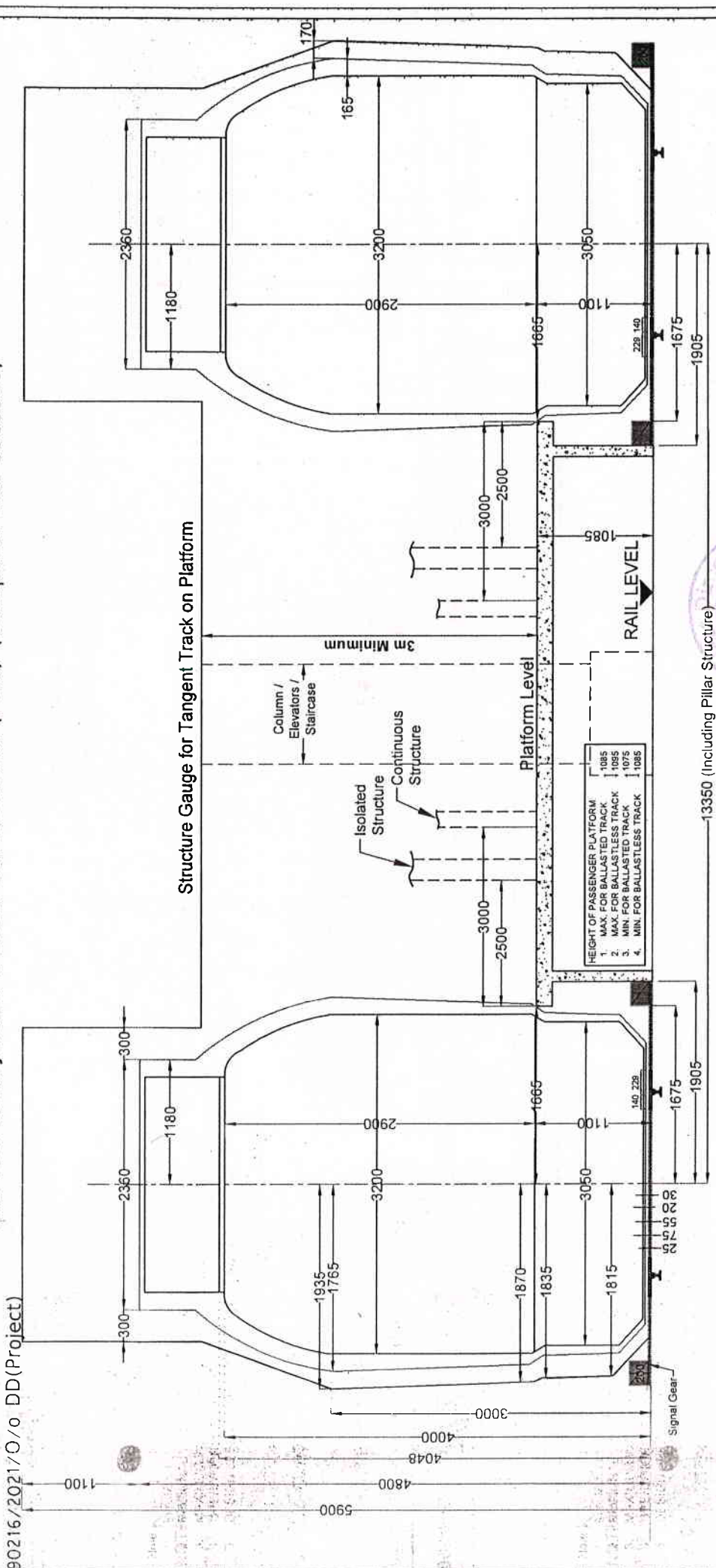
- NOTE:**
1. ALL DIMENSIONS ARE IN MM.
 2. ALLOWANCE FOR CURVE / CANT SHALL BE EXTRA. HOWEVER THE TRACK SPACING OF 4100 mm WILL NOT INCREASE FOR CURVE OF RADIUS 1000 m AND FLATTER.
 3. VERTICAL THROW DUE TO VERTICAL CURVE SHALL BE EXTRA.
 4. TRACK CENTERS / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
 5. FOR MAINTENANCE OF ANY OF THE OHE LINES, BOTH THE LINES SHALL BE SHUT DOWN.
 6. THE OHE IS PROPOSED TO BE SUPPORTED FROM CEILING BY DROP ARM.
 7. Refer K.E. RSSG 1A

25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK:	STRUCTURE GAUGE FOR AT-GRADE AND ELEVATED SECTIONS ON LEVEL OR CONSTANT GRADE TANGENT TRACK FOR SINGLE-END PLATFORM
DRG. No :	KRIDE /BSRP / KSR - 01 / RSBG - 02A
SCALE :	NTS
SHEET No :	06

K RIDE	
JGM/RS	HUNUSVALLI KOMARI GOWDA RAMESHA
51	Digitally signed by HUNUSVALLI KOMARI GOWDA RAMESHA Date: 2021.08.25 15:19:06 +05'30'
DIRECTOR PLANNING (P&P)	NEERAJ AGRAWAL
	Digitally signed by NEERAJ AGRAWAL Date: 2021.08.22 16:22:09 +05'30'

THIS SECTION IS FOR BALLASTED TRACK IN CASE OF BALLASTLESS TRACK DECREASE KINEMATIC ENVELOPE BY 10MM AND PLATFORM COPING EDGE DISTANCE FROM CENTRE OF THE TRACK TO BE REDUCED TO 450



Examined & found in order
 Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25 18:10:19
 +05'30'



- NOTE:**
1. TYPICAL FOR 6000 mm WIDE, ISLAND PLATFORMS.
 2. ALL DIMENSIONS ARE IN mm.
 3. ALLOWANCE FOR CURVE / CANT SHALL BE EXTRA. HOWEVER THE TRACK SPACING OF 4100 mm WILL NOT INCREASE FOR CURVE OF RADIUS 1000 m AND FLATTER.
 4. VERTICAL THROW DUE TO VERTICAL CURVE SHALL BE EXTRA.
 5. TRACK CENTRES / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
 6. FOR MAINTENANCE OF ANY OF THE OHES, BOTH THE LINES SHALL BE SHUT DOWN.
 7. THE OHES IS PROPOSED TO BE SUPPORTED FROM CEILING BY DROP ARM.
 8. PLATFORM WIDTH IS NOT TO SCALE
- Refer K.E. RSBG 1A

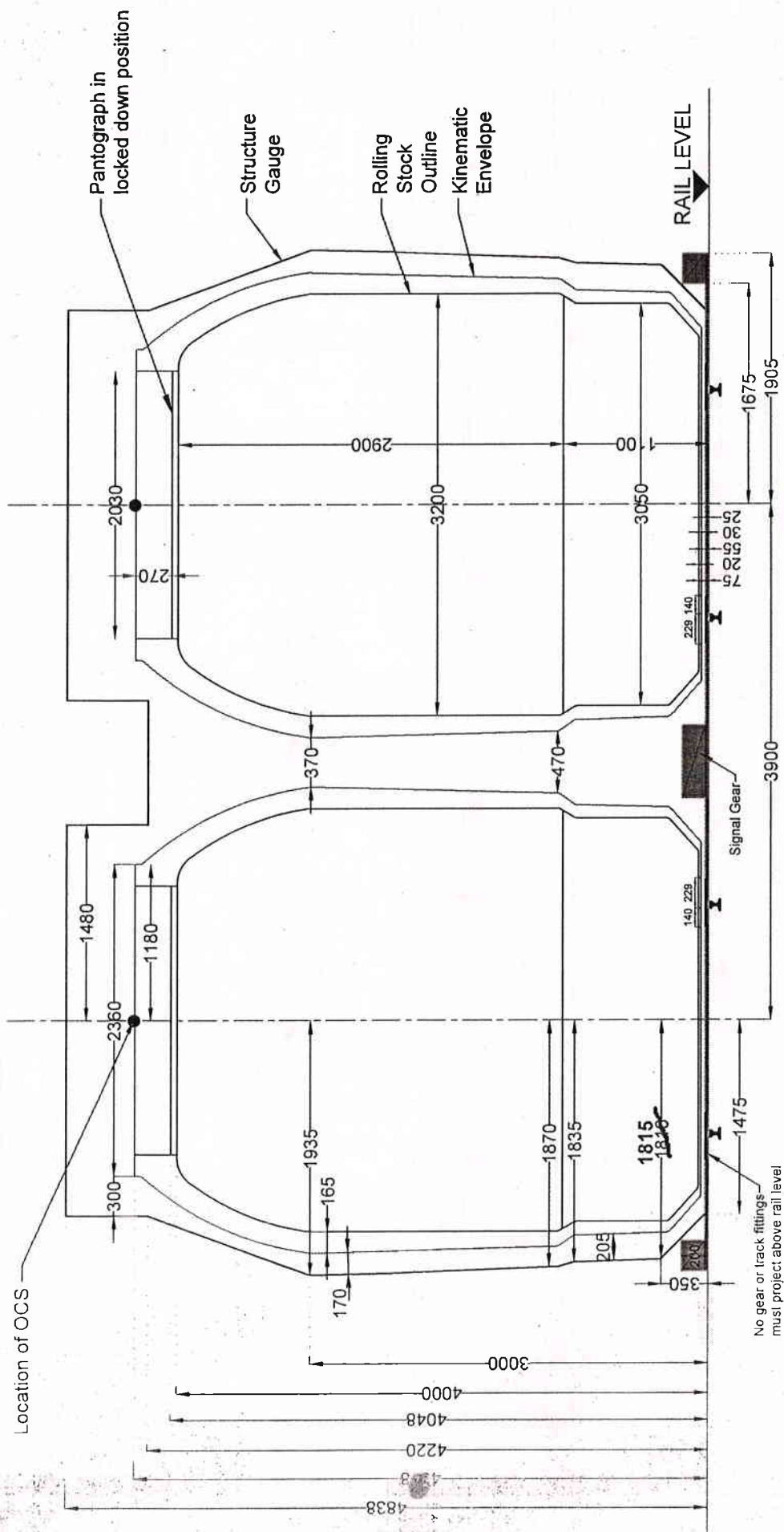
25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP-BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK:	STRUCTURE GAUGE FOR AT-GRADE AND ELEVATED SECTIONS ON LEVEL OR CONSTANT GRADE TANGENT TRACK FOR ISLAND PLATFORM
DRG. No:	KRIDE / BSRP / KSR - 01 / RSBG - 02B
SCALE:	NTS

K RIDE	
JGM/RS	HUNISUVALLI KOMARE GOWDA RAMESHA
DIRECTOR PLANNING (P&P)	NEERAJ AGRAWAL

52

THIS SECTION IS FOR BALLASTED TRACK IN CASE OF BALLASTLESS TRACK DECREASE KINETIC ENVELOPE BY 10MM AND PLATFORM COPING EDGE SEPARATED FROM CURVE BY MAXIMUM OF 100MM. SO/JV, Project Director on 03/11/2021 01:35 pm



NOTE:

- ALL DIMENSIONS ARE IN mm.
- TRACK CENTRES / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
- ALLOWANCE FOR HORIZONTAL AND VERTICAL CURVES AND CANT SHALL BE EXTRA.

Examined & found in order

Mohammad Faiz Ansari

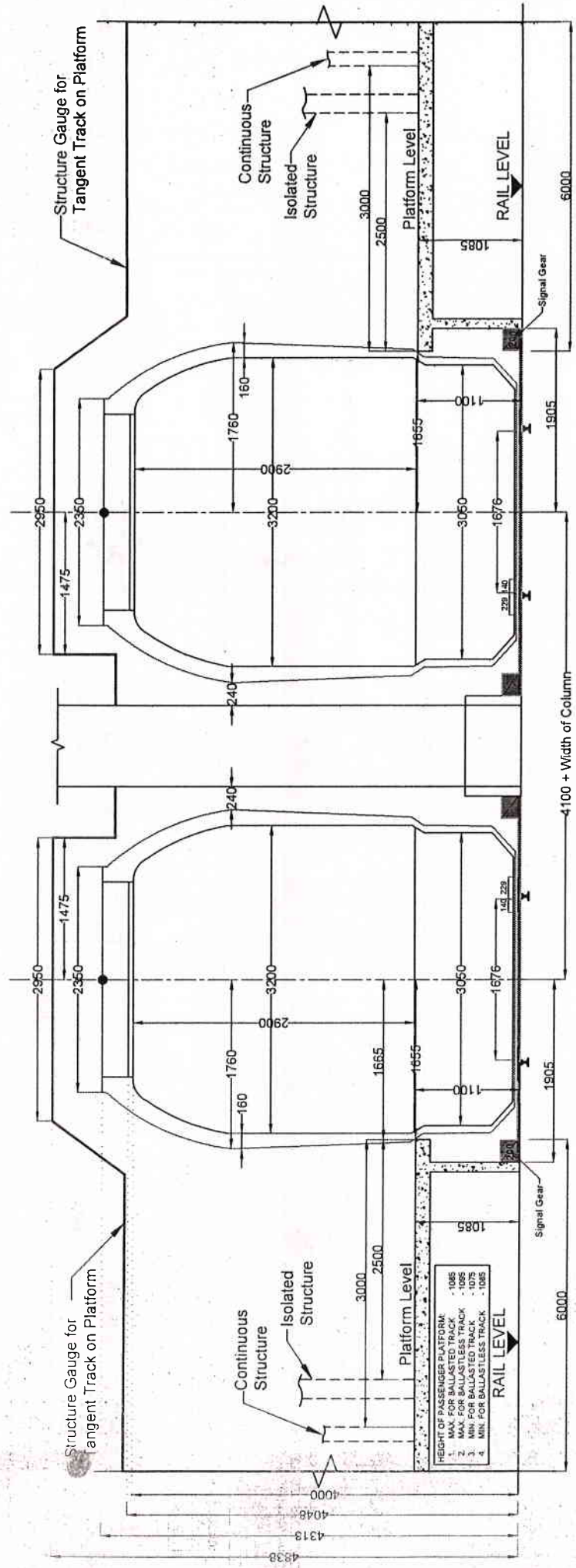


25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK :	BSRP - BANGALURU SUBURBAN RAIL PROJECT
DRG. No :	STRUCTURE GAUGE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS) ON LEVEL OR CONSTANT GRADE TANGENT TRACK
SCALE :	NTS
SHEET No :	08

JCM/RS	K RIDE
DIRECTOR PLANNING (P&P)	HUNUSWALU KOMARI
NEERAJ	GOWDA RAMESHA
ACRAWAL	ACRAWAL

53



Examined & found in order
 Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25 18:12:33
 +05'30'

25 KV A.C. TRACTION

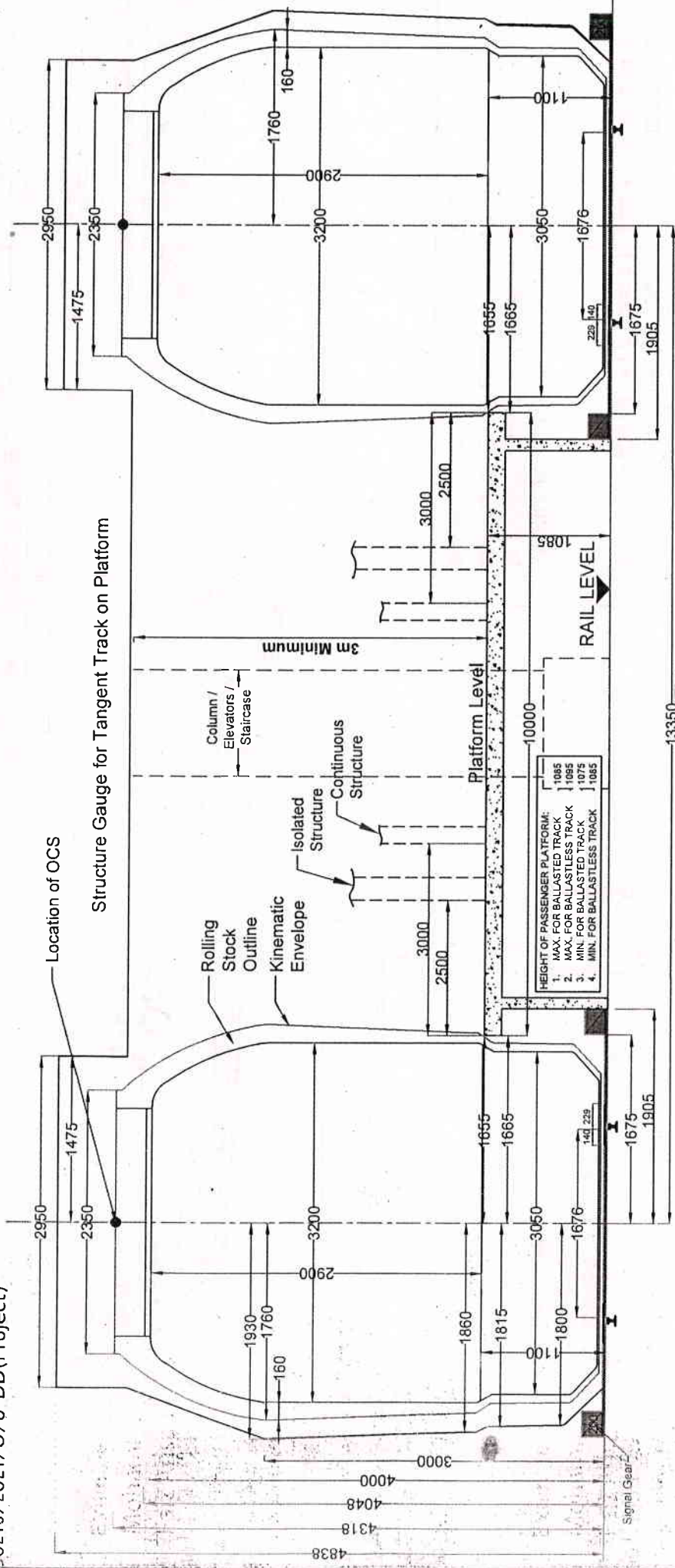
K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK :	STRUCTURE GAUGE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS) ON LEVEL OR CONSTANT GRADE TANGENT TRACK FOR SINGLE-END PLATFORM
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 03A
SCALE :	NTS
SHEET No :	09

JGM/RS	K RIDE
DIRECTOR PLANNING (P&P)	HINDUJIVALLI KOMARI
	POWDA RAMESHA
	NEERAJ AGRAWAL

NOTE

1. ALL DIMENSIONS ARE IN mm.
2. TRACK CENTRES / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
3. ALLOWANCE FOR HORIZONTAL AND VERTICAL CURVES AND CANT SHALL BE EXTRA.
4. FOR KINEMATIC ENVELOPE. REFER TO FIGURE NO. RSBG - 01C

THIS SECTION IS FOR BALLASTED TRACK. IN CASE OF BALLASTLESS TRACK, DECREASE KINEMATIC ENVELOPE BY 10MM AND PLATFORM COPING EDGE GENERATE FOR CONFORM TO ENVELOPE. REFER TO FIGURE NO. RSBG - 01C



Examined & found in order
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25 18:13:42
 +05'30'



NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. TRACK CENTRES / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
3. ALLOWANCE FOR HORIZONTAL AND VERTICAL CURVES AND CANT SHALL BE EXTRA.
4. PLATFORM WIDTH IS NOT TO SCALE.
5. FOR KINEMATIC ENVELOPE, REFER TO FIGURE NO. RSBG - 01C

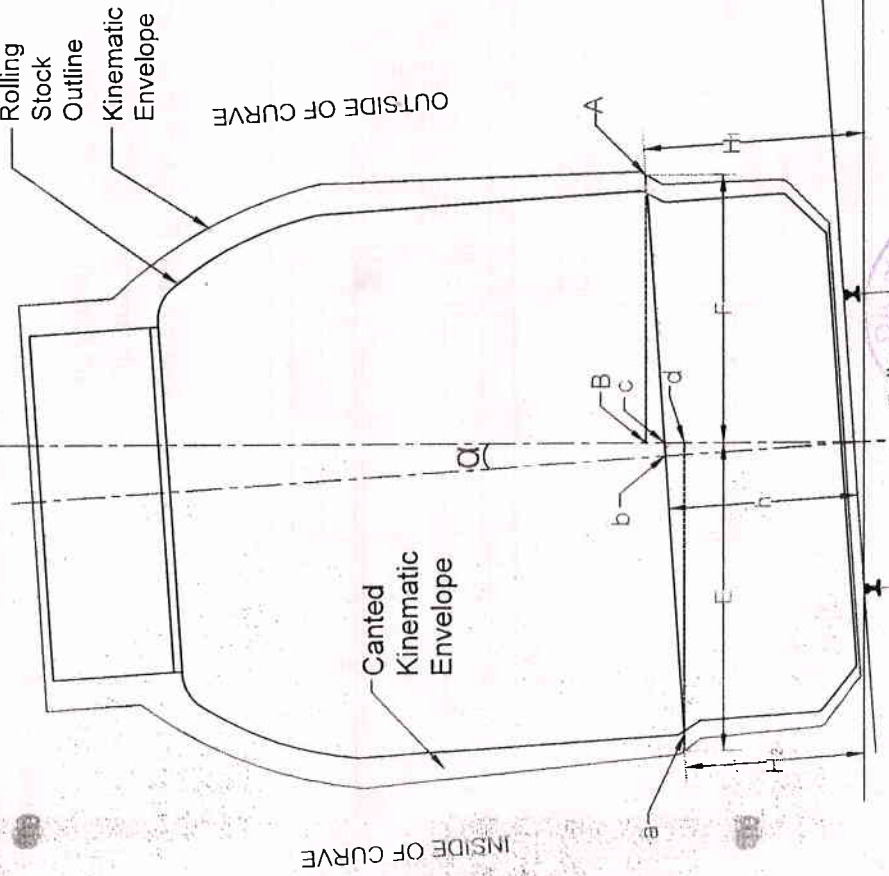
THIS SECTION FOR BALLASTED TRACK IN CASE OF BALLASTLESS TRACK
 REQUIRE KINEMATIC ENVELOPE BY 10MM AND PLATFORM COPING EDGE
 GENERATED FROM ENVELOPE BY RE-DRAWING BOPAL-BHARU B SCHEMATIC SECTION

25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK:	STRUCTURE GAUGE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS) ON LEVEL OR CONSTANT GRADE TANGENT TRACK FOR ISLAND PLATFORM
DRG. No:	KRIDE / BSRP / KSR - 01 / RSBG - 03B
SCALE:	NTS SHEET No: 10

JMIRS	K RIDE
HUNUSVALLI KOMARE GOWDA RAMESHA	HUNUSVALLI KOMARE GOWDA RAMESHA
DIRECTOR PLANNING (P&P)	DIRECTOR PLANNING (P&P)

1. ALL DIMENSIONS ARE IN mm
2. THIS DOES NOT INCLUDE CURVATURE EFFECT AND ALLOWANCE FOR VERTICAL CURVE



$ab = Ab =$ Distance from centerline of track to Structure Gauge for level tangent track at any height 'h'
 $\sin \alpha =$ cant / g
 $g =$ 1750 mm for Broad Gauge
 $Ca =$ Cant applied
 $E = [ab + (h \times \tan \alpha)] \times \cos \alpha$
 $F = [Ab - (h \times \tan \alpha)] \times \cos \alpha$
 $H_1 = (Ca / 2) + (h / \cos \alpha) + (Ab - h \times \tan \alpha) \times \sin \alpha$
 $H_2 = (Ca / 2) + (h / \cos \alpha) - (ab + h \times \tan \alpha) \times \sin \alpha$

MAXIMUM CANT - 120
MAXIMUM CANT DEFICIENCY - 85
MAXIMUM CANT EXCESS - 75
MAXIMUM 'α' - 3.931°

25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP - BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK : EFFECT OF CANT ON KINEMATIC ENVELOPE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS)	
DRG. No :	KRIDE / BSRP / KSR - 01 / RSSG - 04
SCALE :	NTS SHEET No. : 11

JGM/RS	HUNISUVALLI KOMARI GOWDA RAMESHA
DIRECTOR PLANNING (P&P)	NEERAJ AGRAWAL

Examined & found in order

Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25
 18:14:54 +05:30



1. ALL DIMENSIONS ARE IN mm
2. THIS DOES NOT INCLUDE CURVATURE EFFECT AND ALLOWANCE FOR VERTICAL CURVE

$ab = Ab =$ Distance from centerline of track to Structure Gauge for level tangent track at any height 'h'

$\sin \alpha = \text{cant} / g$

$g = 1750$ mm for Broad Gauge

$Ca =$ Cant applied

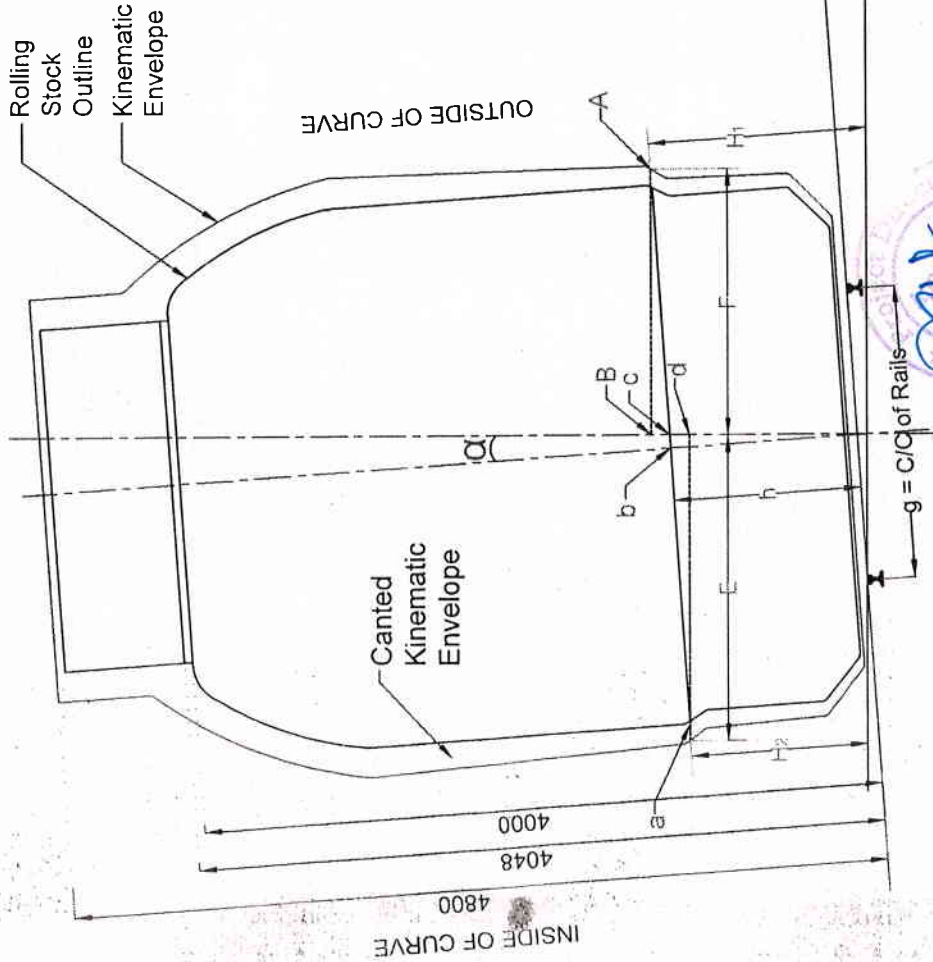
$E = [ab + (h \times \tan \alpha)] \times \cos \alpha$

$F = [Ab - (h \times \tan \alpha)] \times \cos \alpha$

$H_1 = (Ca / 2) + (h / \cos \alpha) + (Ab - h \times \tan \alpha) \times \sin \alpha$

$H_2 = (Ca / 2) + (h / \cos \alpha) - (ab + h \times \tan \alpha) \times \sin \alpha$

MAXIMUM CANT - 120
 MAXIMUM CANT DEFICIENCY - 85
 MAXIMUM CANT EXCESS - 75
 MAXIMUM 'α' - 3.931°



Examined & found in order
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25 18:16:08
 +05'30'

25 KV A.C. TRACTION

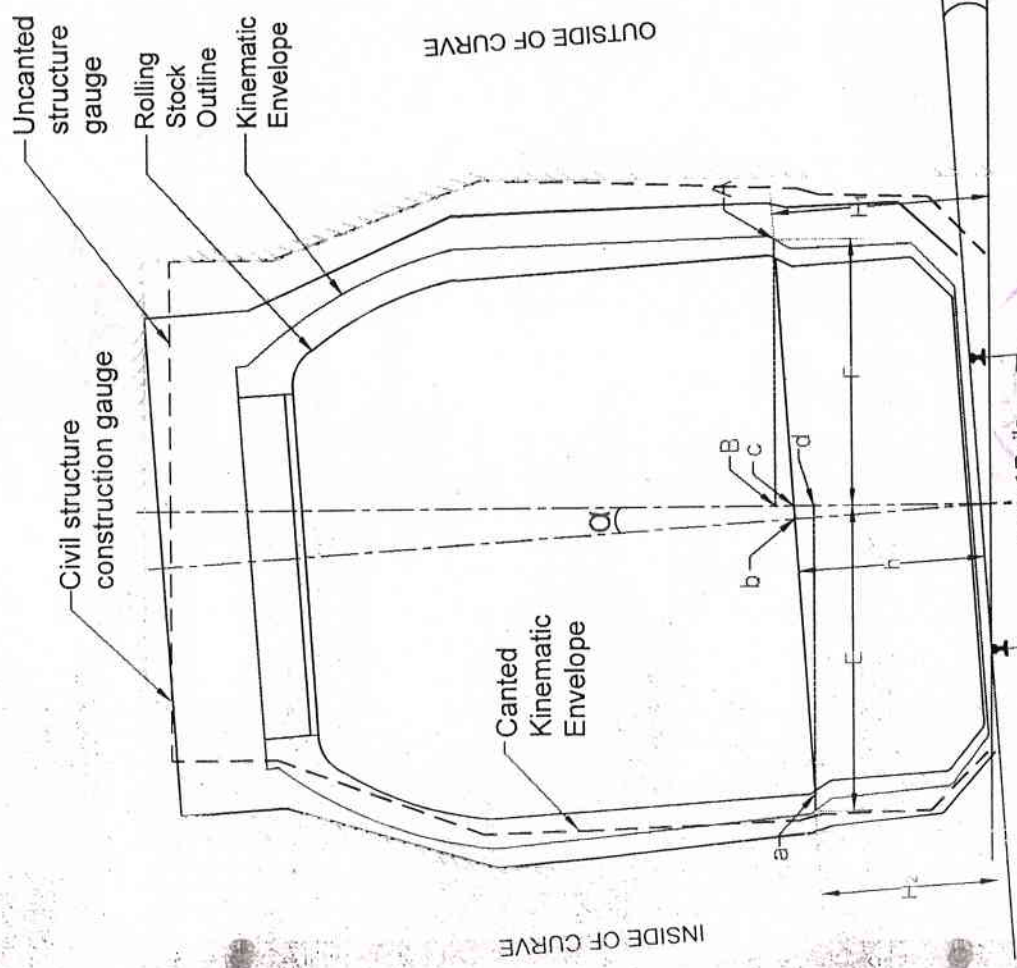
K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	EFFECT OF CANT ON KINEMATIC ENVELOPE AT ATGRADE & ELEVATED SECTION
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 04A
SCALE :	NTS SHEET No. : 12

K RIDE	
JGM/RS	HUNISVALLI KOMARI GOWDA RAMESHA
DIRECTOR PLANNING (P&P)	NEERAJ/AGRAWAL
	Digitally signed by HUNISVALLI KOMARI Date: 2021.08.25 13:34:45Z Digitally signed by NEERAJ/AGRAWAL Date: 2021.08.25 14:53:11+05'30'

- ALL DIMENSIONS ARE IN mm
- THIS DOES NOT INCLUDE CURVATURE EFFECT AND ALLOWANCE FOR VERTICAL CURVE

$ab = Ab =$ Distance from centerline of track to Structure Gauge for level tangent track at any height 'h'
 $\sin \alpha = \text{cant} / g$
 $g = 1750 \text{ mm}$ for Broad Gauge
 $Ca =$ Cant applied
 $E = [ab + (h \times \tan \alpha)] \times \cos \alpha$
 $F = [Ab - (h \times \tan \alpha)] \times \cos \alpha$
 $H_1 = (Ca / 2) + (h / \cos \alpha) + (Ab - h \times \tan \alpha) \times \sin \alpha$
 $H_2 = (Ca / 2) + (h / \cos \alpha) - (ab + h \times \tan \alpha) \times \sin \alpha$

MAXIMUM CANT - 120
 MAXIMUM CANT DEFICIENCY - 85
 MAXIMUM CANT EXCESS - 75
 MAXIMUM ' α ' - 3.931°



25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP - BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	EFFECT OF CANT ON STRUCTURE GAUGE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS)
DRG. No. :	KRIDE / BSRP / KSR - 01 / RSBG - 05
SCALE :	NTS SHEET No. : 13

JGM/RS	HUNZIVALLI KOMARI	Digitally signed by HUNZIVALLI KOMARI
DIRECTOR PLANNING (P&P)	GOMDA RAMESHA	Digitally signed by GOMDA RAMESHA
	NEERAJ	Digitally signed by NEERAJ
	AGRAWAL	Digitally signed by AGRAWAL

Examined & found in order

Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25
 20:12:34 +05'30'



1. ALL DIMENSIONS ARE IN mm
2. THIS DOES NOT INCLUDE CURVATURE EFFECT AND ALLOWANCE FOR VERTICAL CURVE

$ab = Ab$ = Distance from centerline of track to Structure Gauge for level tangent track at any height 'h'

$\sin \alpha$ = cant / g

g = 1750 mm for Broad Gauge

Ca = Cant applied

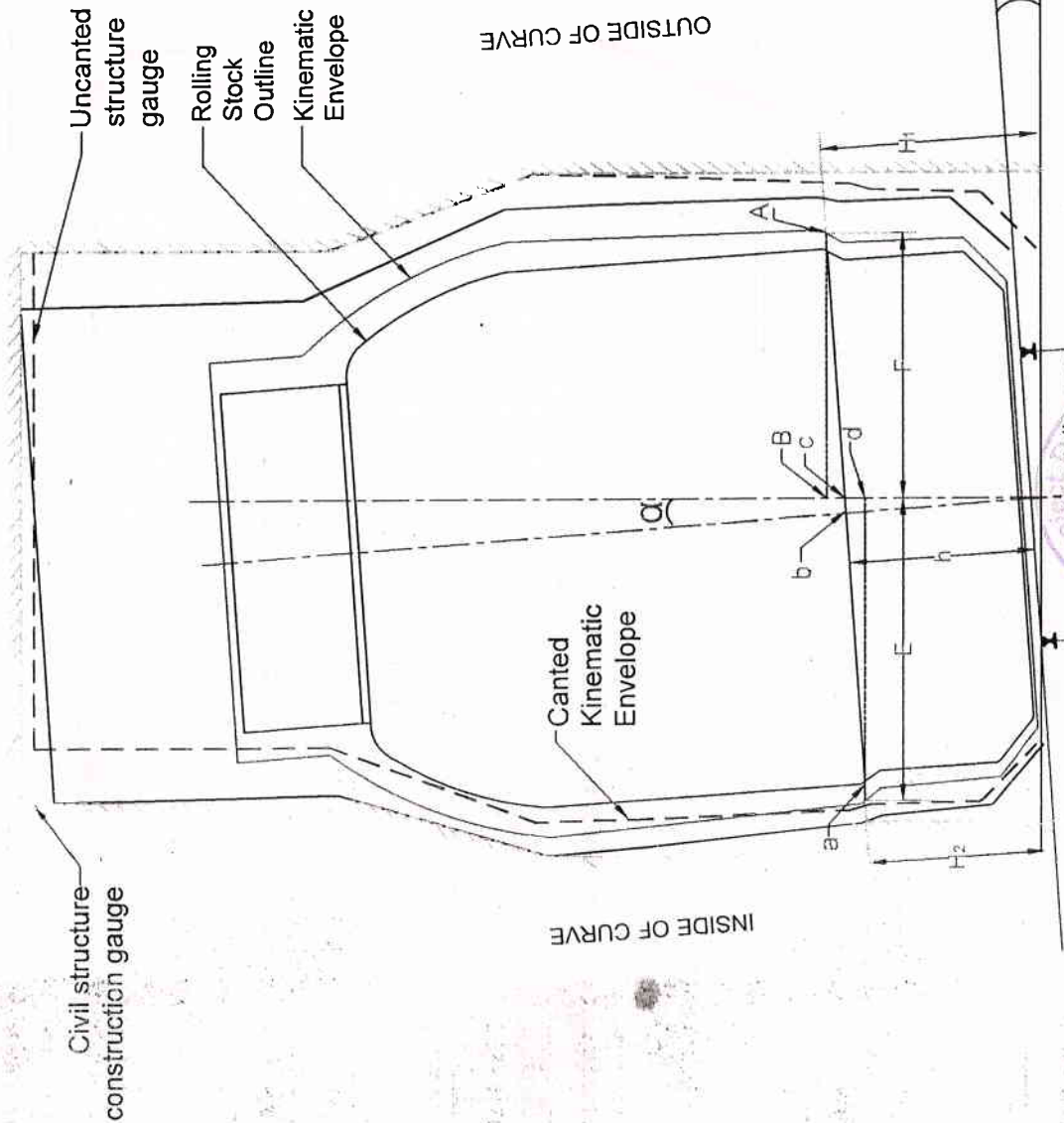
$E1$ = $[ab + (h \times \tan \alpha)] \times \cos \alpha$

$F1$ = $[Ab - (h \times \tan \alpha)] \times \cos \alpha$

H_1 = $(Ca / 2) + (h / \cos \alpha) + (Ab - h \times \tan \alpha) \times \sin \alpha$

H_2 = $(Ca / 2) + (h / \cos \alpha) - (ab + h \times \tan \alpha) \times \sin \alpha$

MAXIMUM CANT - 120
 MAXIMUM CANT DEFICIENCY - 85
 MAXIMUM CANT EXCESS - 75
 MAXIMUM 'α' - 3.931°



25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK : EFFECT OF CANT ON STRUCTURE GAUGE AT ATGRADE SECTION	
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 05A
SCALE :	NTS SHEET No : 14

JGMRS	HUNISWALIKONARI GOWDA RAMESHA
DIRECTOR PLANNING (P&P)	NEERAJ AGRAWAL

Examined & found in order
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25
 20:15:24 +05'30'

590216/2021/O/o DD(Project)

STRUCTURE GAUGE ON TANGENT TRACK WITH NO VERTICAL CURVE

V₁
V₂

STRUCTURE GAUGE VEHICLE CENTER IN SAG OR VEHICLE END IN SUMMIT

STRUCTURE GAUGE VEHICLE CENTER ON SUMMIT OR VEHICLE END IN SAG

Rolling Stock Outline

Kinematic Envelope



Examined & found in order

Mohamma
d Faiz
Ansari
Digitally signed by
Mohammad Faiz
Ansari
Date: 2021.08.25
20:18:51 +05'30'

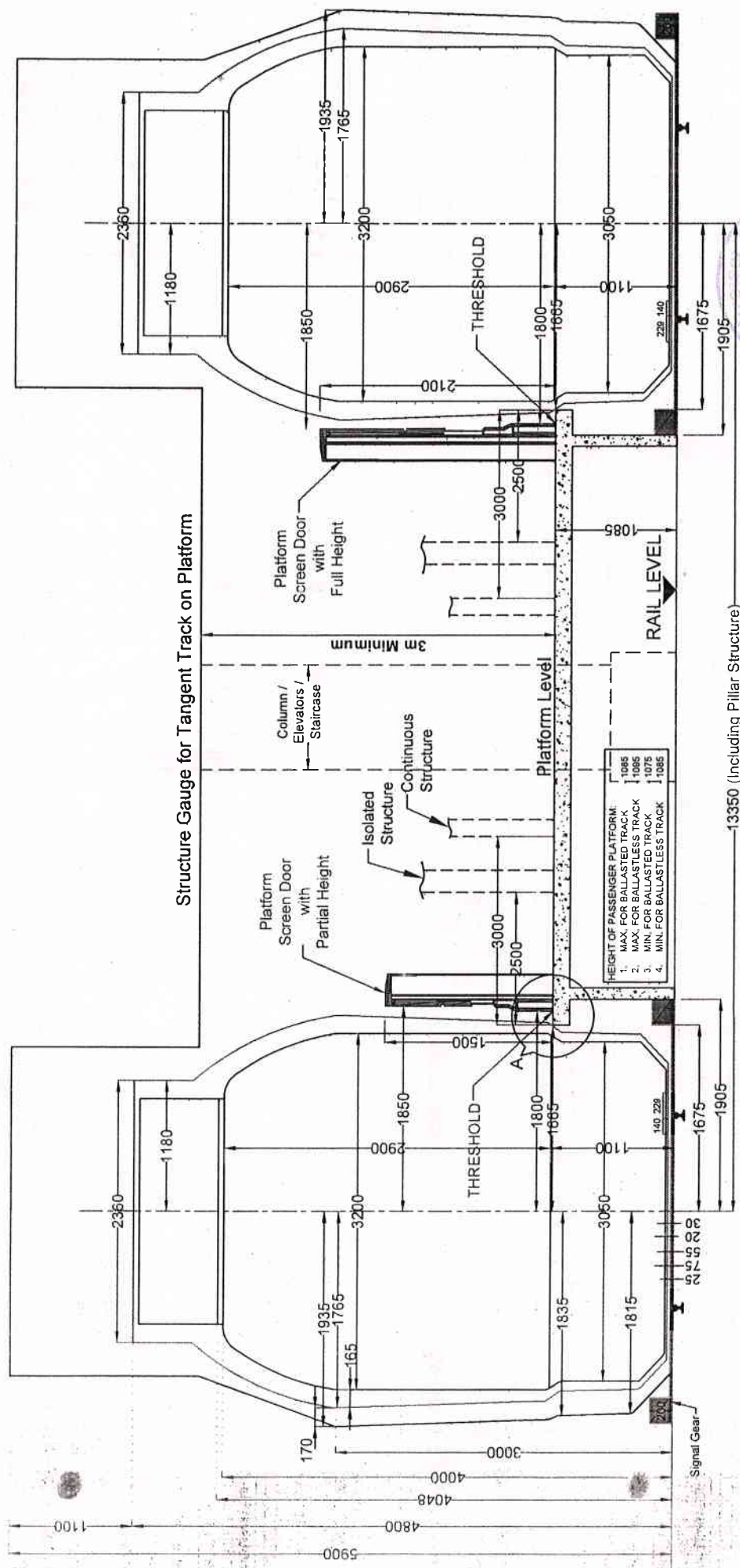
RAIL LEVEL

Note : All figures are in mm

RADIUS OF VERTICAL CURVE(M)	V ₁ / V ₂ mm
1500	24
1600	22
1700	21
1800	20
1900	19
2000	18
2100	17
2200	16
2300	16
2400	15
2500	15
2600	14
2700	14
2800	13
2900	13
3000	12

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
EFFECT OF VERTICAL CURVE ON STRUCTURE GAUGE	
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 06
SCALE :	NTS SHEET No : 15

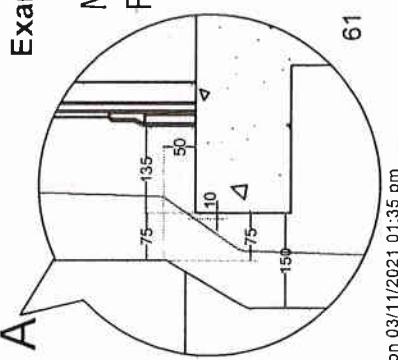
AGM/RS	HUNUSUVALI KOMARI GOVINDA BAMESHA 60
DIRECTOR PLANNING	NEERAJ AGRAWAL
Digitally signed by HUNUSUVALI KOMARI GOVINDA BAMESHA Date: 2021.08.22 16:02:01 +05'30'	Digitally signed by NEERAJ AGRAWAL Date: 2021.08.22 16:59:23 +05'30'



25 KV-A.C. TRACTION
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25
 20:21:29 +05'30'

Examined & found in order

Mohammad Faiz Ansari
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25
 20:21:29 +05'30'



- NOTE
- TYPICAL FOR 3000 mm WIDE ISLAND PLATFORMS
 - ALL DIMENSIONS ARE IN mm
 - ALLOWANCE FOR CURVE / CANT SHALL BE EXTRA. HOWEVER THE TRACK SPACING OF 4100 mm WILL NOT INCREASE FOR CURVE OF RADIUS 1000 m AND FLATTER
 - VERTICAL THROW DUE TO VERTICAL CURVE SHALL BE EXTRA.
 - TRACK CENTRES / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION
 - FOR MAINTENANCE OF ANY OF THE OHE LINES, BOTH THE LINES SHALL BE SHUT DOWN
 - THE OHE IS PROPOSED TO BE SUPPORTED FROM CEILING BY DROP ARM.
 - PLATFORM WIDTH IS NOT TO SCALE.
 - FOR KINEMATIC ENVELOPE, REFER TO FIGURE NO. RSBG - 01A
- THIS SECTION IS FOR BALLASTED TRACK. IN CASE OF BALLASTLESS TRACK, DECREASE KINEMATIC ENVELOPE TO 150 mm AND PLATFORM CORNER DISTANCE FROM RAIL TO 100 mm. ALL DIMENSIONS ARE TO BE AS SHOWN.

13350 (Including Pillar Structure)

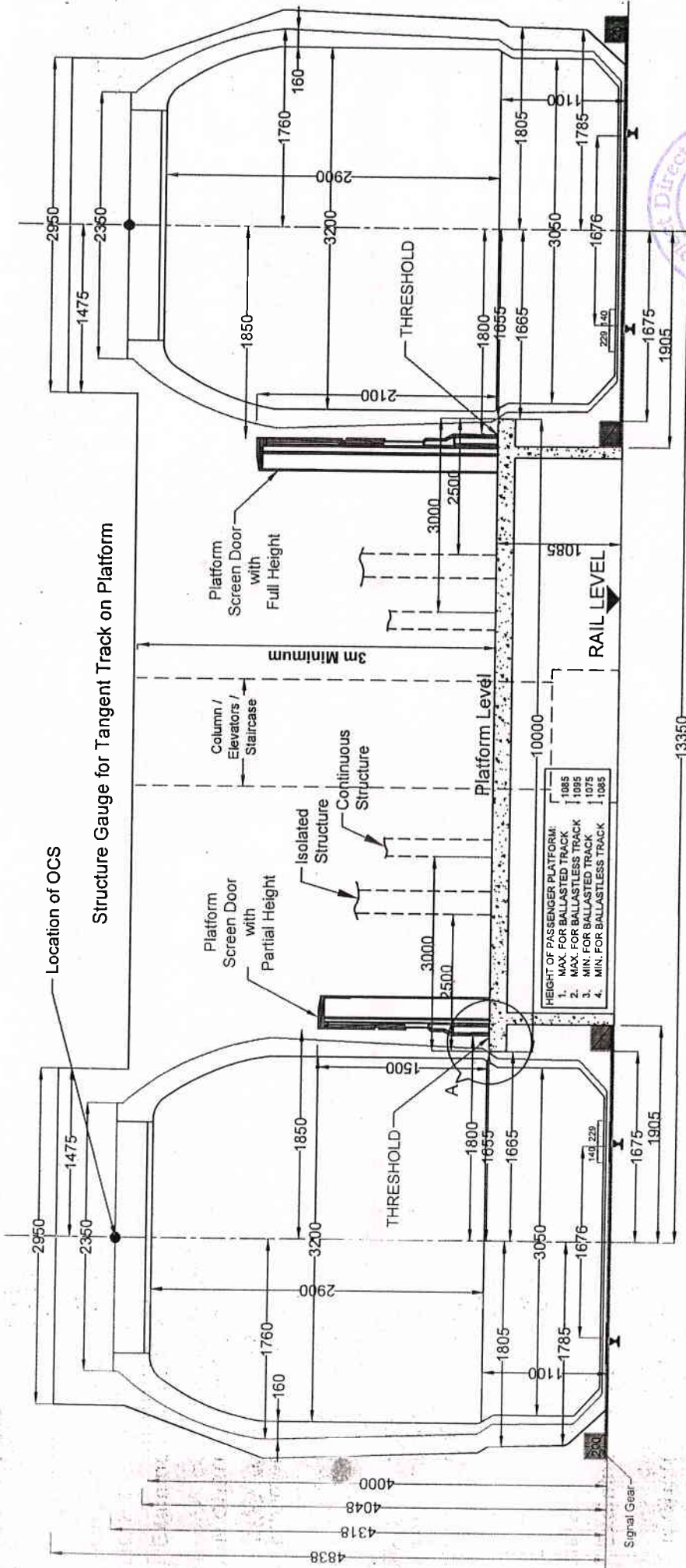
1085
 1085
 1075
 1085

HEIGHT OF PASSENGER PLATFORM:
 1. MAX. FOR BALLASTED TRACK 1085
 2. MAX. FOR BALLASTLESS TRACK 1075
 3. MIN. FOR BALLASTED TRACK 1085
 4. MIN. FOR BALLASTLESS TRACK 1085

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK:	STRUCTURE GAUGE FOR AT-GRADE AND ELEVATED SECTIONS ON LEVEL OR CONSTANT GRADE TANGENT TRACK FOR ISLAND PLATFORM
DRG. No :	KRIDE /BSRP / KSR - 01 /RS9G - 07
SCALE :	NTS
SHEET No :	16

JGM/RS	HUNISUVALLI KOMARI GOWDA RAMESHA
DIRECTOR PLANNING (P&P)	NEERAJ AGRAWAL
K RIDE	HUNISUVALLI KOMARI GOWDA RAMESHA
Checked by	HUNISUVALLI KOMARI GOWDA RAMESHA Date: 2021.08.25 15:57:04 +05'30'
Digitally signed by	NEERAJ AGRAWAL Date: 2021.08.25 17:04:32 +05'30'

61
 03/11/2021 01:35 pm

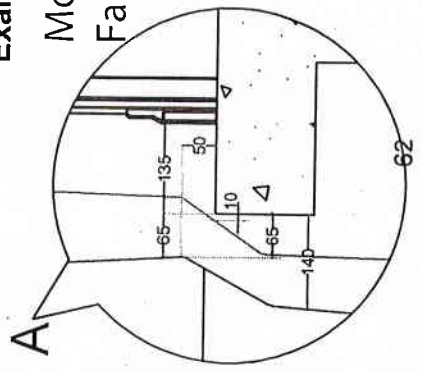


Examined & found in order
 Mohammad Faiz Ansari
 Digitally signed by Mohammad Faiz Ansari
 Date: 2021.08.25 20:24:17 +05'30'

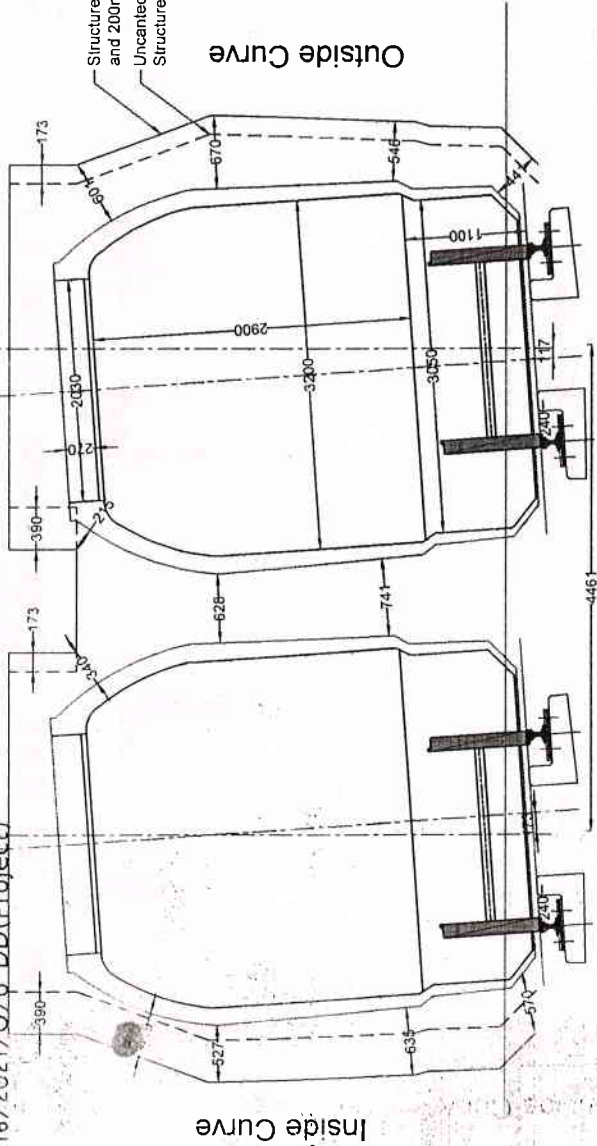


25 KV A.C. TRACTION

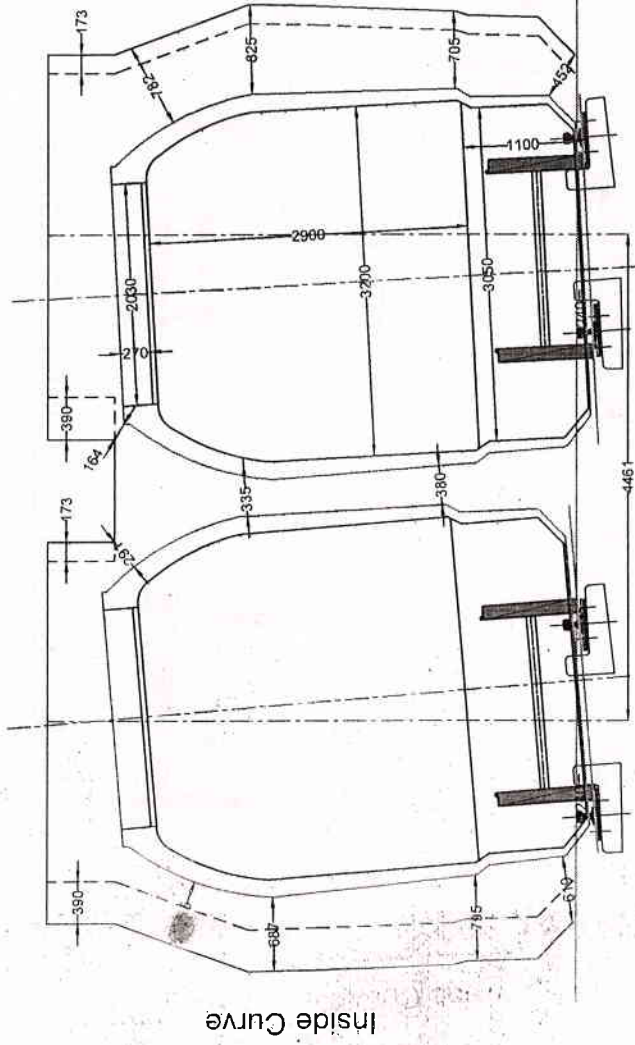
K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK:	STRUCTURE GAUGE FOR CUT AND COVER SECTION OF UNDERGROUND (TUNNELS) ON LEVEL OR CONSTANT GRADE TANGENT TRACK FOR ISLAND PLATFORM
DRG. No.:	KRIDE / BSRP / KSR - 01 / RSBG - 08
SCALE:	NTS
SHEET No.:	17



- NOTE**
- ALL DIMENSIONS ARE IN MM.
 - TRACK CENTRES / STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
 - ALLOWANCE FOR HORIZONTAL AND VERTICAL CURVES AND CANT SHALL BE EXTRA.
 - FOR KINEMATIC ENVELOPE, REFER TO FIGURE NO. RSBG - 01C
- THIS SECTION IS FOR BALLASTED TRACK. IN CASE OF BALLASTLESS TRACK, DECREASE KINEMATIC ENVELOPE BY 10MM AND PLATFORM COPING EDGE ENVELOPE BY 10MM.
- Prepared by: **MR. D. V. GOPALAKRISHNA** / **SR. ENGINEER (S&T)** / **Directorate** / **03/11/2021 01:35 pm**



COACH POSITION IN NORMAL CONDITION



COACH POSITION IN DERAILED CONDITION (INWARD)

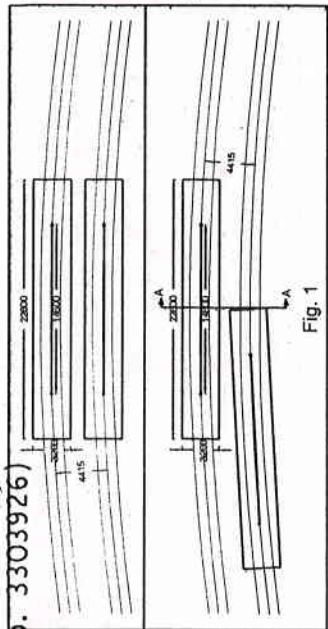


Fig. 1

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. TRACK CENTRES IS EQUAL TO SUM OF E+F+T1+T2. FOR 200M RADIUS AND CANT OF 120MM, TRACK CENTER IS 4461 (2210+1661+173+117+300)
3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
4. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
5. DERAILMENT GAURD IS PLACED AT 210 ± 30 (WORST CONDITION IS 210+30 = 240MM)
6. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig. 1)

Examined & found in order

Mohammad Faiz Ansari
 Digitally signed by Mohammad Faiz Ansari
 Date: 2021.08.25 20:28:25 +05'30'



25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK:	BSRP- BENGALURU SUBURBAN RAIL PROJECT
DRG. No :	KRIDE /BSRP /KSR - 01 / RSBG - 09
SCALE :	NTS SHEET No : 1B

JGM/RS	K RIDE
DIRECTOR PLANNING (P&P)	POURUSHALI KOVARI GOWDA RAMESHA
	NEERAJ AGRAWAL

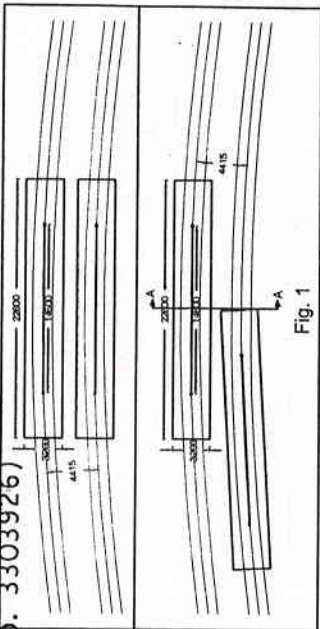


Fig. 1

NOTE:
 1. ALL DIMENSIONS ARE IN mm.
 2. TRACK CENTRES IS EQUAL TO SUM OF E+F+T1+T2.
 FOR 200M RADIUS AND CANT OF 120MM, TRACK CENTER IS 4461 (2210+1661+173+117+300)
 3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
 4. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
 5. DERAILMENT GAURD IS PLACED AT 250 ± 20 (WORST CONDITION IS 250+20 = 270MM)
 6. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig.1)

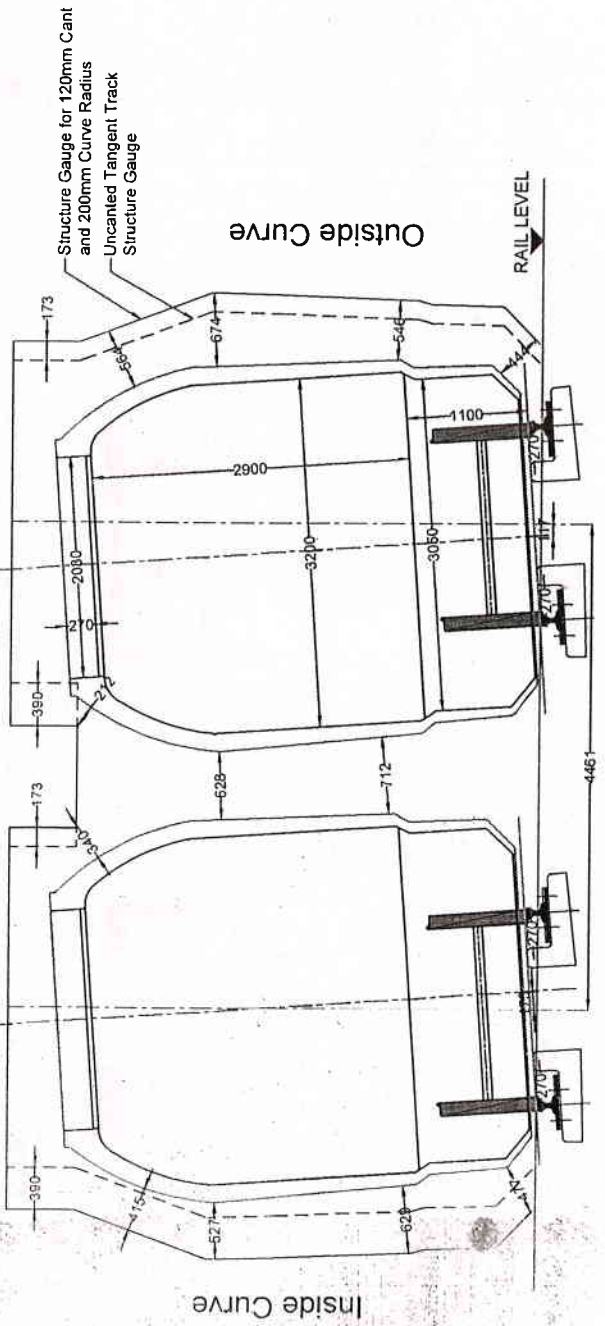
Examined & found in order
 Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25 20:31:32 +05'30'



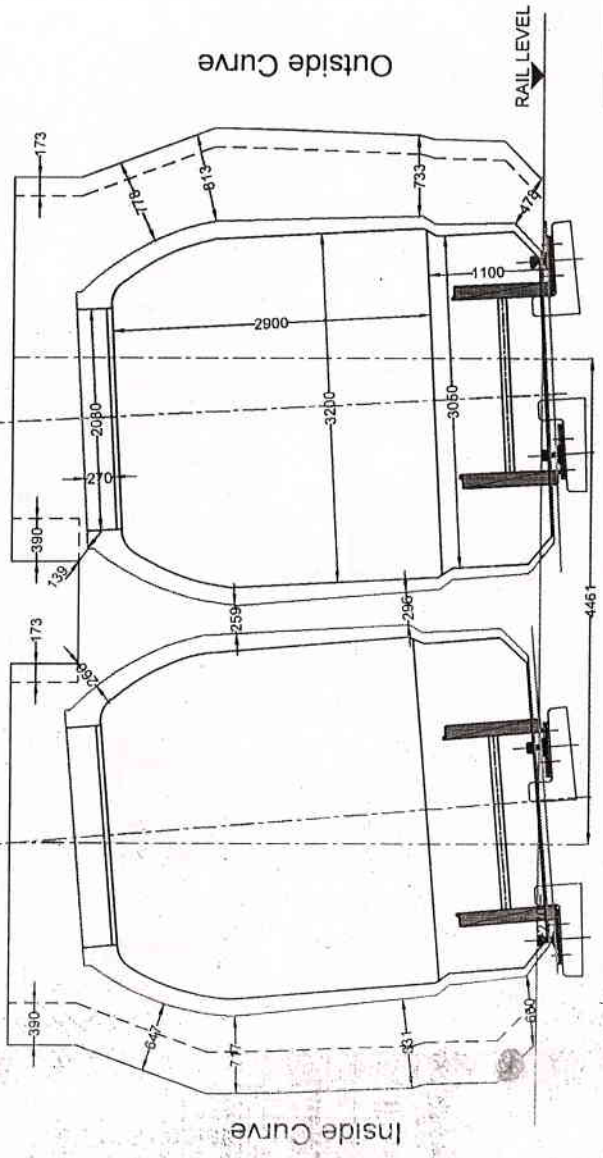
25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK:	CHECK FOR DERAILMENT CONDITION FOR CUT AND COVER SECTION WITH SHARPEST CURVE AND MAXIMUM CANT (INWARD) (DOUBLE TUNNEL) (270 mm)
DRG. No.:	KRIDE / BSRP / KSR - 01 / RSBG - 9A
SCALE:	NTS SHEET No.: 19

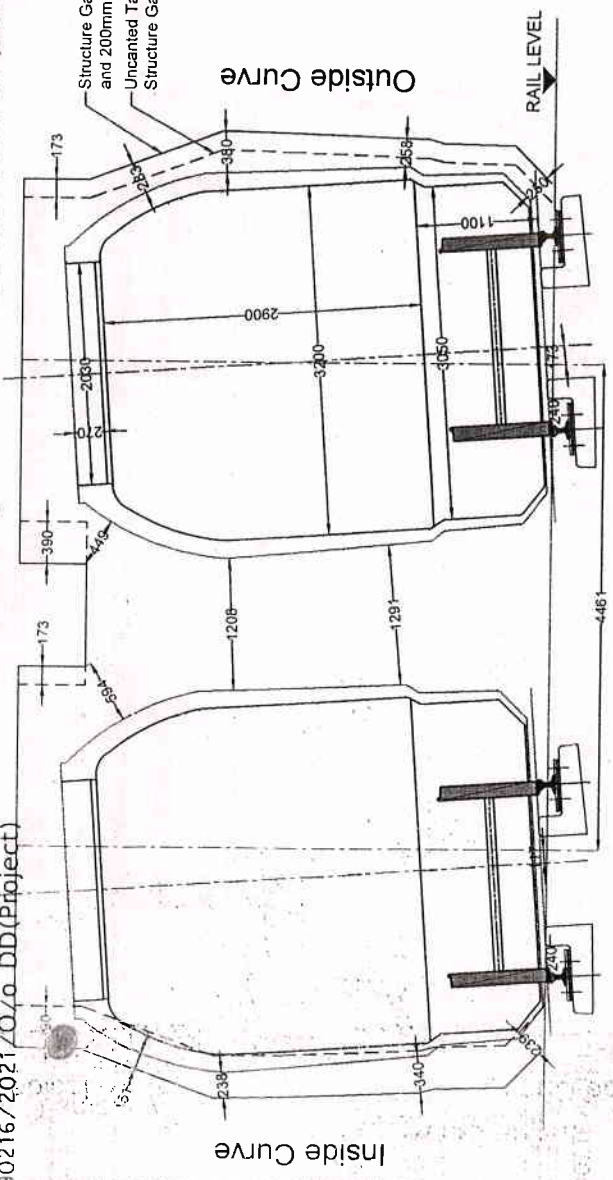
JGMFRS	K RIDE
DIRECTOR PLANNING (P&F)	MUNISWALI KOMARI SOWDA RAMESHA Date: 2021.08.23 15:58:45 Digitally signed by NERAJ AGRAWAL DN: cn=Neraj Agrawal, o=BSRP, ou=KARNATAKA



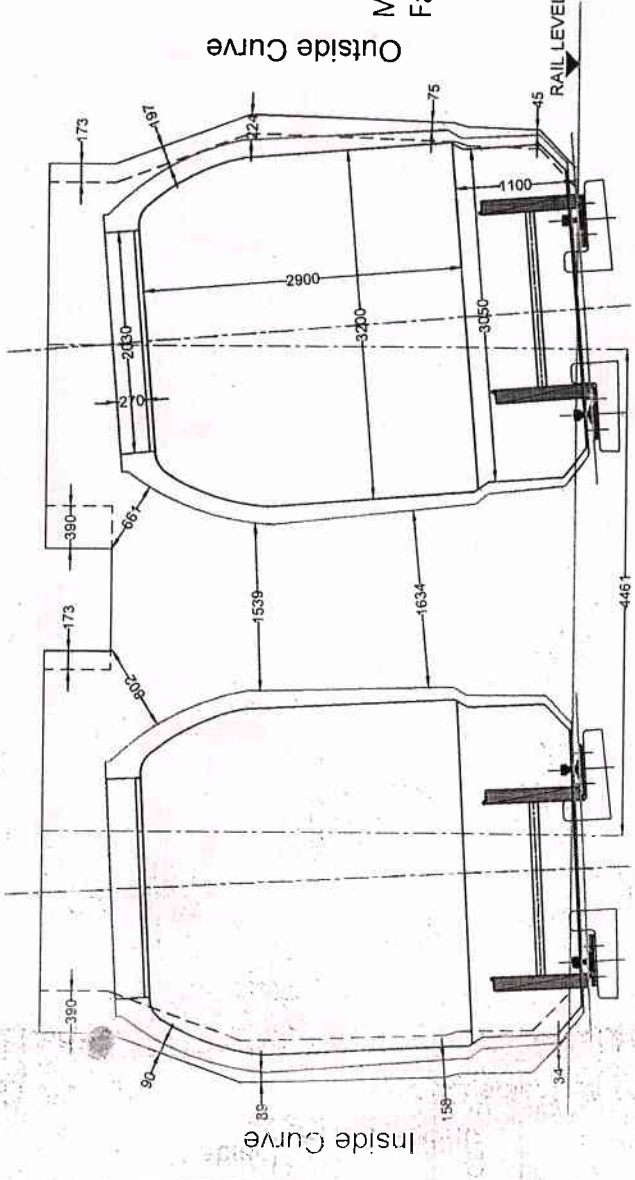
COACH POSITION IN NORMAL CONDITION



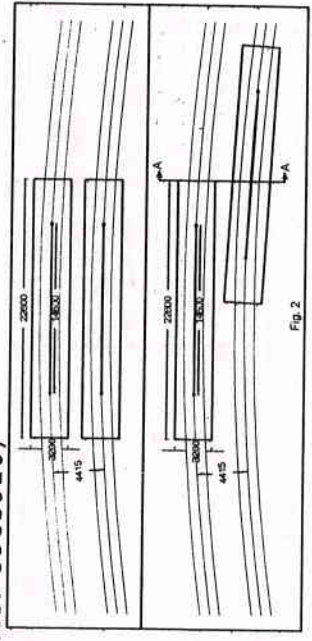
COACH POSITION IN DERAILED CONDITION (INWARD)



COACH POSITION IN NORMAL CONDITION



COACH POSITION IN DERAILED CONDITION (OUTWARD)
SECTION A-A



NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. TRACK CENTRES IS EQUAL TO SUM OF E+FF+T1+T2. FOR 200M RADIUS AND CANT OF 120MM, TRACK CENTER IS 4461 (2210+1661+173+117+300)
3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
4. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
5. DERAILMENT GAURD IS PLACED AT 210 ± 30 (WORST CONDITION IS 210+30 = 240MM)
6. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig.2)

Examined & found in order

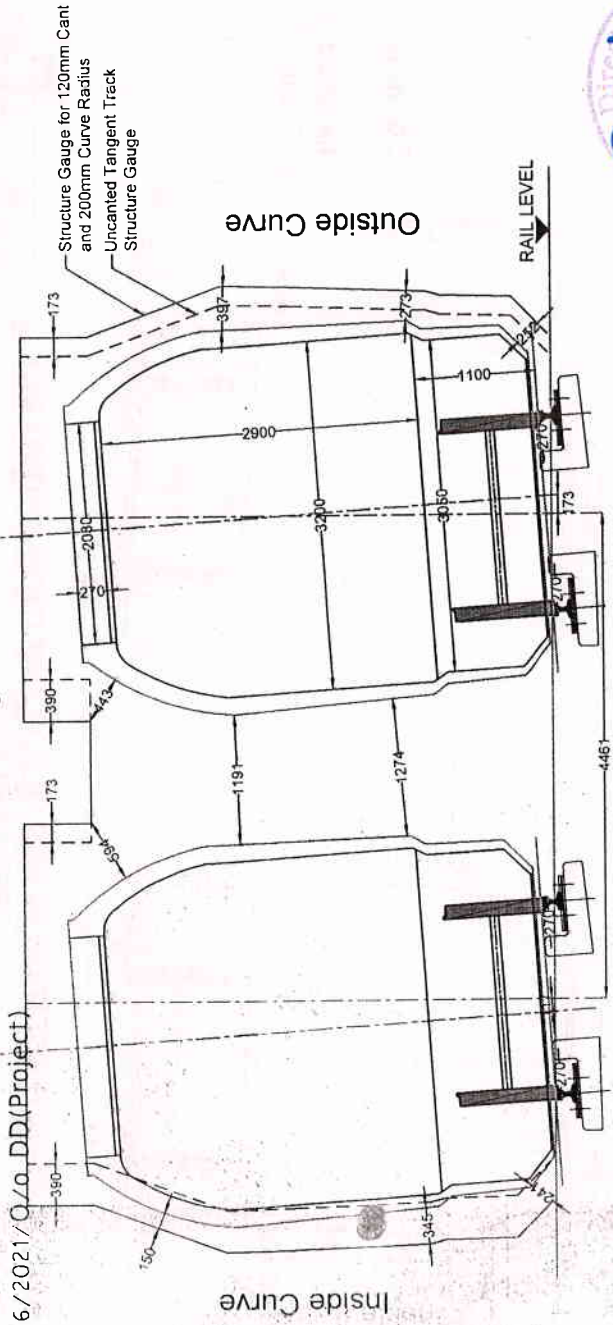
Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25 20:34:25 +0530



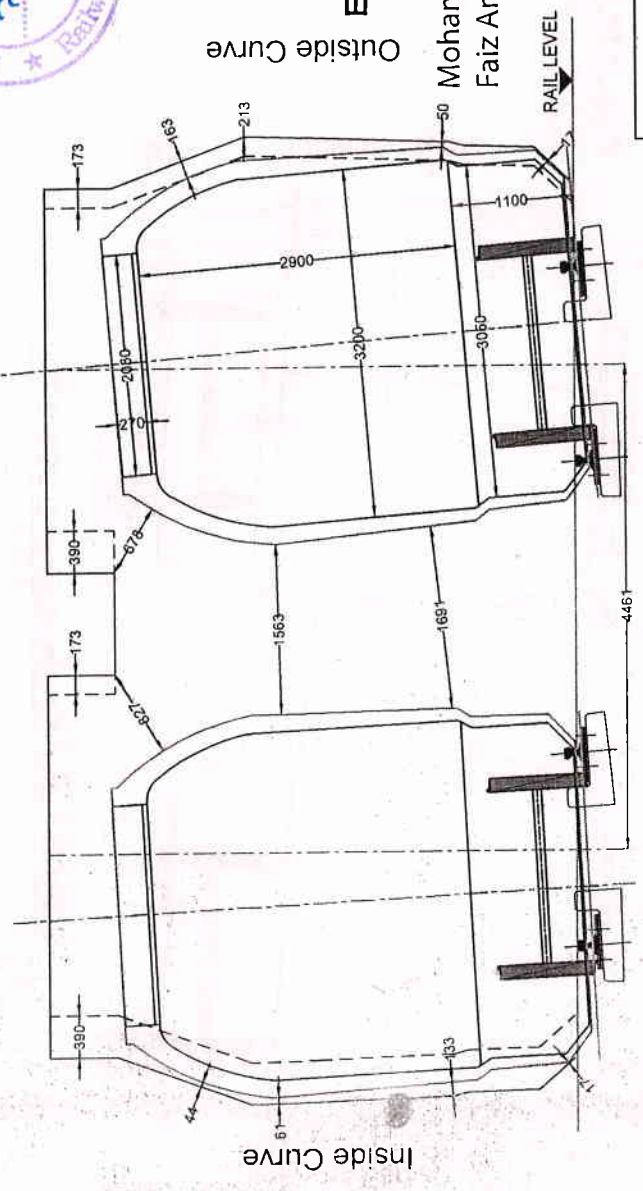
25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK:	CHECK FOR DERAILMENT CONDITION FOR CUT AND COVER SECTION WITH SHARPEST CURVE AND MAXIMUM CANT (OUTWARD) (DOUBLE TUNNEL) (240 mm)
DRG. No :	KRIDE /BSRP /KSR - 01 / RSBG - 10
SCALE :	NTS SHEET No : 20

JGM/SRS	K RIDE
DIRECTOR PLANNING (P&P)	HUNJALWALI KOMARI Digitally signed by HUNJALWALI GOWDA RAMESHA Date: 2021.08.25 15:46:29
	NEERAJ AGRAWAL Digitally signed by NEERAJ AGRAWAL Date: 2021.08.25 17:58:52

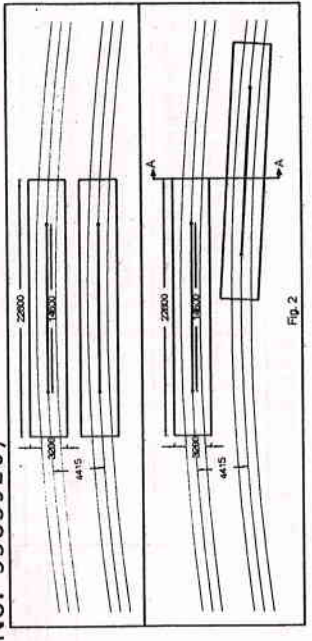


COACH POSITION IN NORMAL CONDITION



COACH POSITION IN DERAILED CONDITION (OUTWARD) 66

SECTION A - A



NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. TRACK CENTRES IS EQUAL TO SUM OF E+F+T1+T2. FOR 200M RADIUS AND CANT OF 120MM, TRACK CENTER IS 4461 (2210+1661+173+117+300)
3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
4. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
5. DERAILMENT GAURD IS PLACED AT 250 ± 20 (WORST CONDITION IS 250+20 = 270MM)
6. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig. 2)

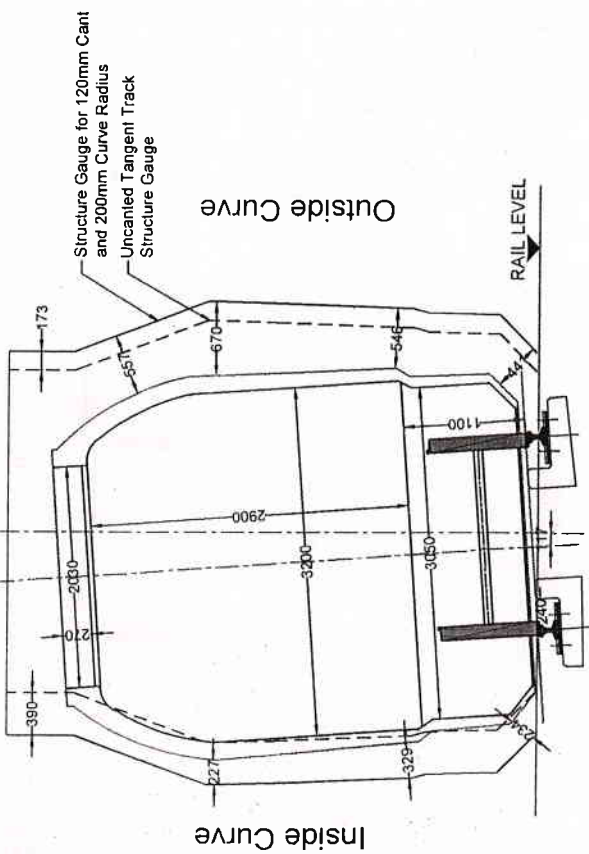
Examined & found in order

Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25 20:37:16 +05'30'

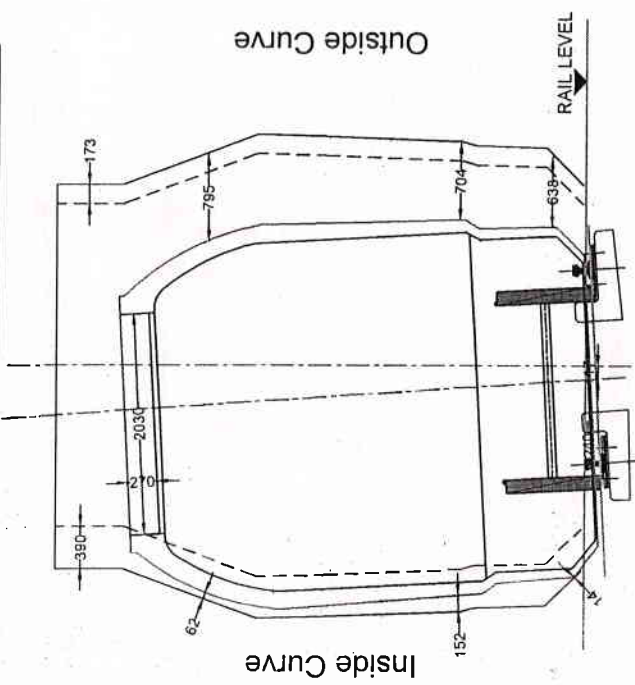
25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
NAME OF WORK :	BSPR- BENGALURU SUBURBAN RAIL PROJECT
DRG. No. :	CHECK FOR DERAILMENT CONDITION FOR CUT AND COVER SECTION WITH SHARPEST CURVE AND MAXIMUM CANT (OUTWARD) (DOUBLE TUNNEL) (270 mm)
SCALE :	KRIDE / BSRP / KSR - 01 / RSBG - 10A
SHEET No. :	NTS
21	AMS

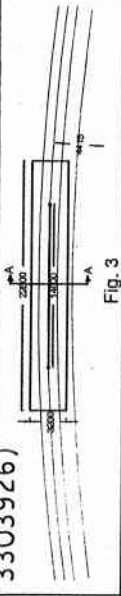
JGMRS	K RIDE
DIRECTOR PLANNING (P&P)	MOHAN KUMAR
NEERAJ	MOHAMMAD FAIZ ANSARI
AGRAWAL	DATE: 2021.08.25 20:37:16 +05'30'



COACH POSITION IN NORMAL CONDITION



COACH POSITION IN DERAILED CONDITION (INWARD)



NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
4. DERAILMENT GAURD IS PLACED AT 210 ± 30 (WORST CONDITION IS 210+30 = 240MM)

5. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig. 3)



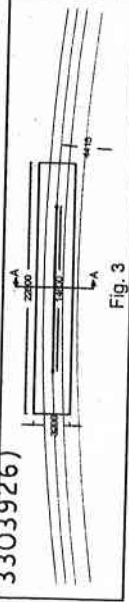
Examined & found in order

Mohammad Faiz Ansari
 Digitally signed by Mohammad Faiz Ansari
 Date: 2021.08.25 20:40:09 +05'30'

25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK:	CHECK FOR DERAILMENT CONDITION FOR CUT AND COVER SECTION WITH SHARPEST CURVE AND MAXIMUM CANT (OUTWARD) (SINGLE TUNNEL) (240 mm)
DRG. No.:	KRIDE /BSRP / KSR - 01 / RSBG - 11
SCALE:	NTS SHEET No. : 22

JGMRS	K RIDE
DIRECTOR PLANNING (P&P)	HUNDISVALI KOMARI (Digitally signed by HUNDISVALI KOMARI GONDA RAMESHA ANAND)
NEERAJ AGRAWAL	Date: 2021/08/25 17:23:22



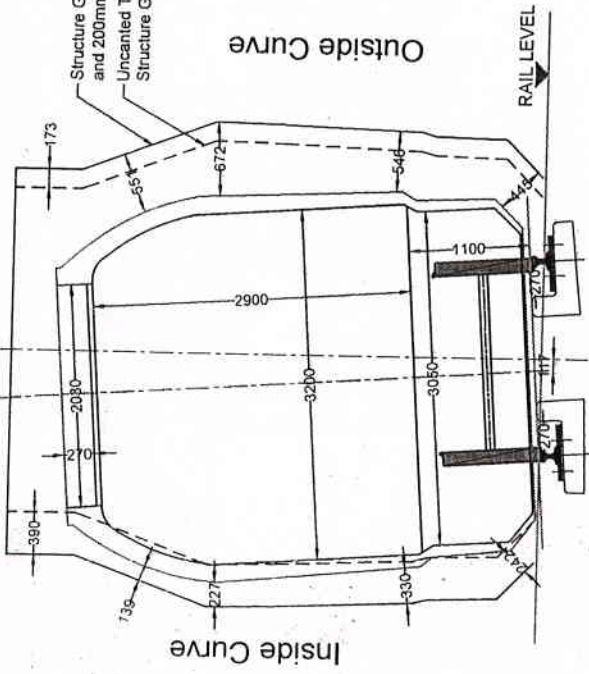
NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
4. DERAILMENT GAURD IS PLACED AT 250 ± 20 (WORST CONDITION IS $250+20 = 270$ MM)
5. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig. 3)

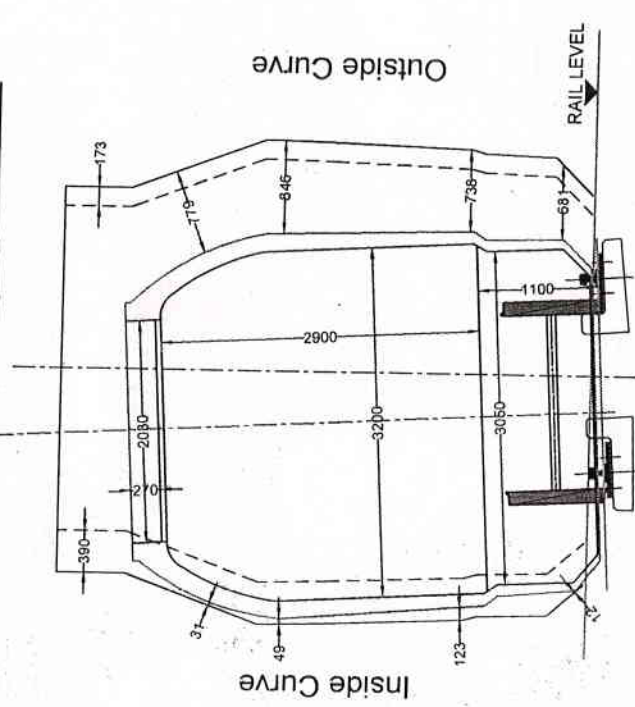


Examined & found in order

Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25
 20:43:18 +05'30'



COACH POSITION IN NORMAL CONDITION



COACH POSITION IN DERAILED CONDITION (INWARD)

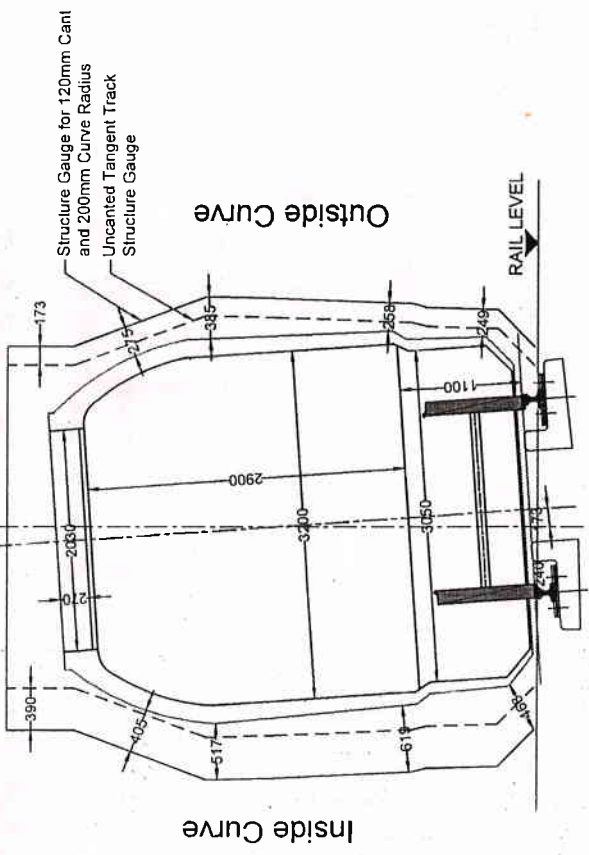
68

SECTION A-A

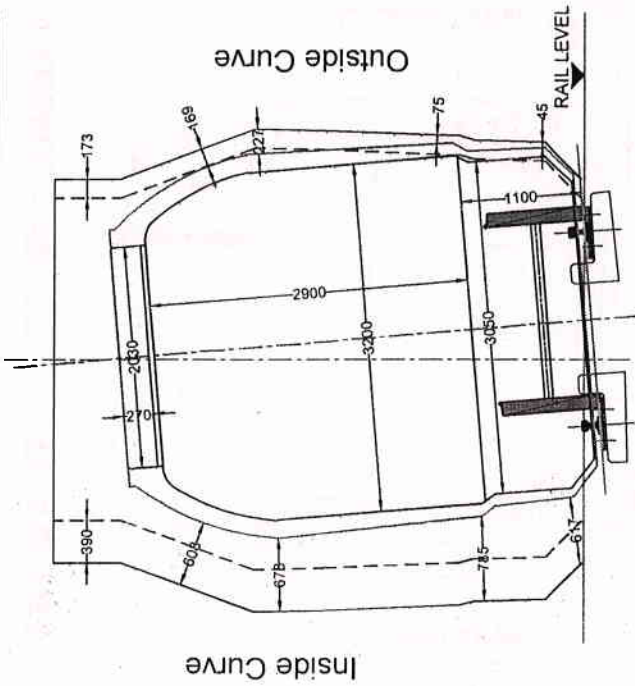
25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	CHECK FOR DERAILMENT CONDITION FOR CUT AND COVER SECTION WITH SHARPER CURVE AND MAXIMUM CANT (OUTWARD) (SINGLE TUNNEL) (270 mm)
DRG. No. :	KRIDE/BSRP/KSR-01/RSBG-11A
SCALE :	NTS
	SHEET No. : 23

JGMRS	K RIDE
DIRECTOR PLANNING (P&P)	HANUSWALI KOMARI
	FOUJDA RAMESHA
	NEERAJ
	AGRAWAL



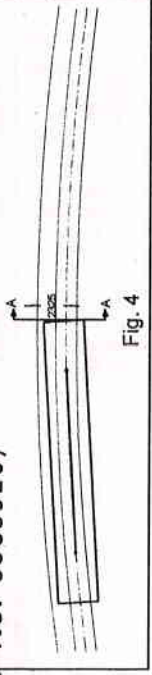
COACH POSITION IN NORMAL CONDITION



COACH POSITION IN DERAILED CONDITION (OUTWARD) 69

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
4. DERAILMENT GAUGE IS PLACED AT 210 ± 30 (WORST CONDITION IS 210+30 = 240MM)
5. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig. 4)



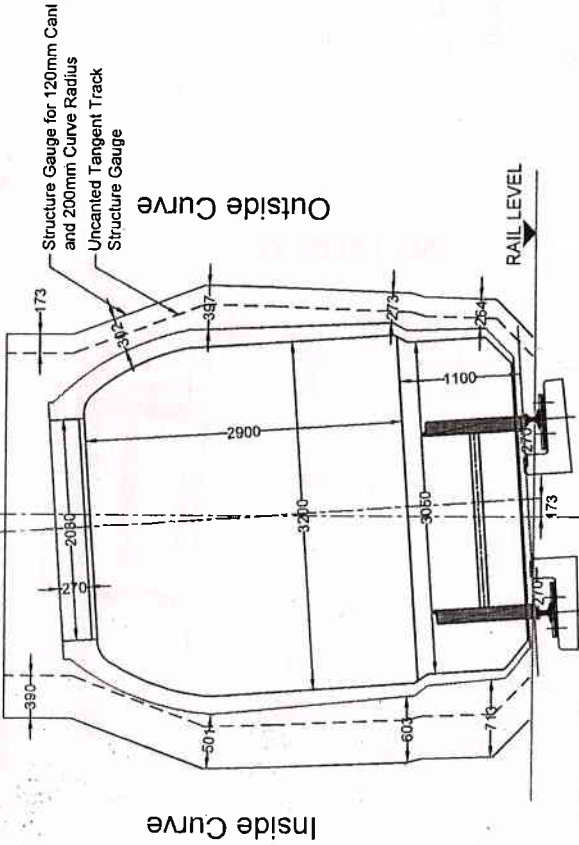
Examined & found in order
 Digitally signed by
Mohammad Faiz Ansari
 Date: 2021.08.25
 20:46:19 +05'30'



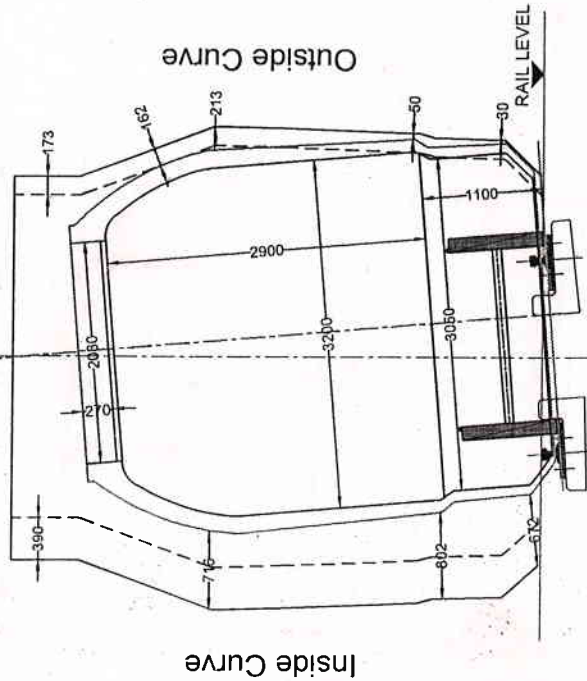
25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	ESRP - BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	CHECK FOR DERAILMENT CONDITION FOR CUT AND COVER SECTION WITH SHARPEST CURVE AND MAXIMUM CANT (OUTWARD) (SINGLE TUNNEL) (240 mm)
DRG. No :	KRIDE / BSRP / KSR - 01 / RSBG - 12
SCALE :	NTS SHEET No : 24

JGMRS	K RIDE
DIRECTOR PLANNING (P&F)	MUNISWALI KOMARI, Digitally signed by MUNISWALI GOWDA BAMESHA Date: 2021.08.25 16:03:48 +05'30'
	NEERAJ AGRAWAL Digitally signed by NEERAJ AGRAWAL Date: 2021.08.25 17:46:02 +05'30'



COACH POSITION IN NORMAL CONDITION



COACH POSITION IN DERAILED CONDITION (OUTWARD) 70

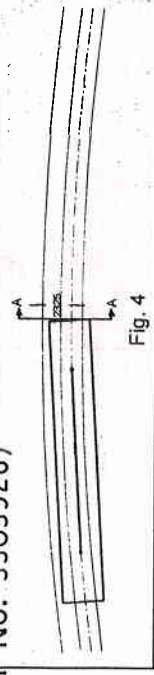


Fig. 4

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (273MM FOR 120MM CANT + 117MM FOR MID THROW) 390MM TOWARDS INSIDE OF THE CURVE.
3. STRUCTURE GAUGE HAS BEEN MOVED AWAY FROM CENTRE LINE BY (173MM FOR END THROW, SINCE CANT EFFECT WAS NEGATIVE, IT WAS IGNORED) 173MM TOWARDS OUTSIDE OF THE CURVE.
4. DERAILMENT GAUGE IS PLACED AT 250 ± 20 (WORST CONDITION IS $250+20 = 270$ MM)
5. WORST CONDITION OF DERAILMENT IS MENTIONED IN ABOVE FIGURE (Fig. 4)

Examined & found in order
 Digitally signed by
 Mohammad Faiz Ansari
 Date: 2021.08.25
 20:52:07 +05'30'



25 KV A.C. TRACTION

K RIDE	RAIL INFRASTRUCTURE DEVELOPMENT COMPANY (KARNATAKA) LIMITED
	BSRP- BENGALURU SUBURBAN RAIL PROJECT
NAME OF WORK :	CHECK FOR DERAILMENT CONDITION FOR CUT AND COVER SECTION WITH SHARPEST CURVE AND MAXIMUM CANT (OUTWARD) (SINGLE TUNNEL) (270 mm)
DRG. No. :	KRIDE / BSRP / KSR - 01 / RSBG - 12A
SCALE :	NTS
	SHEET No. : 25

JGMRS	K RIDE
DIRECTOR PLANNING (PAP)	HUNISAVALLI KOMARI GOWDA RAMESHA NEERAJ AGRAWAL