GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

2016/Proj./SoD/MEGA/30/18 New Delhi, date 03.10.2018

Managing Director,
Metro Link Express for Gandhinagar and Ahmedabad
(MEGA) Company Limited, 5th Floor,
Nirman Bhawan, Opp. Sachivalaya Gate No.4,
Sector-10-A, Gandhi Nagar,
Gujarat -382010

Sub: Approval of Schedule of Dimensions (SoD) for Ahmedabad Metro Rail project, Phase-I for Standard Gauge (1435mm).

Ref: MEGA Company Limited's letter No. MEGA/OPS/RDSO/SoD/2018/2 dated 14.09.2018

The Schedule of Dimensions (SoD) for Standard Gauge (1435mm), Surface, Elevated and Underground sections - September' 2018 for Ahmedabad Metro Rail project, Phase-I, as submitted by Metro Link Express for Gandhinagar and Ahmedabad (MEGA) Company Limited has been examined in consultation with RDSO and approval of Railway Board is hereby conveyed.

Accordingly, approved copy of SoD is enclosed.

Encl: As above

03-10-2018

(Ruth Changsan)
Director/MTP
Railway Board
☎011-47845480

Copy to: (i) **Executive Director/UTHS**, RDSO, Manak Nagar, Lucknow w.r.t their letter No. UTHS/81/MEGA/Civil dated 20.09.2018

(ii) **OSD/UT & Ex-Officio Joint Secretary,** Ministry of Housing & Urban Affairs (MoHUA), Nirman Bhavan, New Delhi-110001

SCHEDULE OF DIMENSIONS
FOR
STANDARD GAUGE (1435 mm)

SURFACE, ELEVATED AND UNDERGROUND

MEGA

SEPTEMBER 2018

Metro-Link Express for Gandhinagar & Ahmedabad (MEGA) Company Ltd.
(A SPV of Govt. of India and Govt. of Gujarat)
Block No. 01, 1st Floor, Karmayogi Bhavan,
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Metro Link Express For Gandhinagar And Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

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Manak Nagar, Lucknow-226011

Project Directorate
Approved on
03/10/18

SCHEDULE OF DIMENSIONS FOR STANDARD GAUGE (1435 mm)

SURFACE, ELEVATED AND UNDERGROUND – September 2018

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APPENDIX

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17	MEGA/GEN/SOD/PSD –2	PLATFORM GATE AT ELEVATED/AT-GRADE (PLATFORM) ON LEVEL/CONSTANT GRADE (TANGENT TRACK)	55

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03/10/18

PREAMBLE

Metro Link Express for Gandhinagar and Ahmedabad (MEGA) has adopted Standard Gauge (SG) with Third Rail bottom current collection using 750V DC Traction system.

The Schedule of Dimensions (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 tolerances. Whenever, a new stock is introduced the track and coach tolerances for maintenance tolerances should be laid down. The suitability of the Rolling stock for operation with these maintenance tolerances should be established and sanction obtained from the competent authority before the operation of the Rolling Stock.
2. The Kinematic Envelope has been developed for 2900 mm wide and 3980 mm high rolling stock.
3. The clearances are based on the assumption that windows are sealed and doors are closed during movement/operation.
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 house, platform edge etc.
6. The vehicle Kinematic Envelope at wind speed of 70 kmph shall be applied for the platform area on At-Grade, Elevated stations and Nil wind speed for Underground stations within the confines of stations. At all other locations, the Kinematic Envelope corresponding to 100 kmph wind speed shall be used for determining the Structure Gauge for Elevated and At-Grade sections (outside the station area) and Nil wind speed for underground sections (outside the station area).
7. The maximum design speed through station platforms on At-Grade, Elevated and Underground shall be limited to 70 kmph & at all other locations the maximum design speed shall be limited to 90 kmph.
8. The Kinematic envelope for stations and all other locations shall not be infringed under any circumstances.
9. No work/workmen/equipment are allowed between Vehicle and Structure gauge during operation of trains.
10. The train consists, not exceeding 6 coaches, will be operated on the system.

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SCHEDULE OF DIMENSIONS

STANDARD GAUGE (1435 mm)

INTRODUCTION

1. The dimensions given in this SOD are to be observed in all works on 1435 mm Gauge (STANDARD GAUGE), unless prior sanction has been obtained from the Railway Board through the Commissioner of Metro Railway Safety to execute works which infringe this Schedule of Dimensions (SOD).
2. Any condonation in SOD parameters will require approval of Railway Board through the Chief Commissioner of Railway Safety (CCRS).
3. The dimensions given in this SOD are applicable to Elevated, At–Grade and Underground section of MEGA which is with 750 Volts D.C. Traction system with Third rail bottom current collection and track rail return current. The Rolling Stock shall be 2900 mm wide and 3980 mm high with sealed windows and sliding doors which shall remain closed when the train is in motion.
4. The Underground Section is with Circular Tunnel or Rectangular Box or Open Cut (at Ramps) of any suitable shape while Elevated Section is with over ground structure of elevated Viaduct, with sidewalks to be used as access for inspectors or maintainers during non – operation periods and a safe evacuation route for passengers in emergency evacuation. Both Underground and Elevated system shall have suitably designed Ballastless Track (DFF). Depot track may be Ballasted / Ballastless.
5. The Schedule of Dimensions (SOD) has been divided into five chapters as under:

Chapter-1	General
Chapter-2	Stations
Chapter-3	Rolling Stock
Chapter-4	Electric Traction
Chapter-5	Platform Screen Doors/Gates

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Chapter – I: GENERAL

1.1 SPACING OF TRACKS

Minimum distance, center to center of tracks without any structure between tracks for Tangent (Straight) track for:

a) Underground Sections	3650 mm
b) Elevated Sections	3750 mm
c) Surface (At-Grade) Sections (Ballasted section)	3800 mm
d) Surface (At-Grade) Sections (Ballastless Section)	3750 mm

Note: For minimum track centers on curves, refer to Appendix-1 at page 27

1.2 CURVES

1.2.1. Minimum radius of curvature (Horizontal):

i. On main running lines, other than stations:

a) Underground Sections

Minimum Radius 200 m

b) Elevated and At-Grade Sections

Minimum Radius (Without Check Rail) 190 m

Minimum Radius (With Check Rail) 120 m

Note: Check Rail is to be provided on curves less than 190 m radius including their transition curves.

ii. Depot, yard and other non-passenger Lines

Minimum Radius 100 m

Note: Provision of check rail is not mandatory in Depot, yard and other non-passenger lines. However, if check rails are not provided, speed shall be restricted to 25 kmph or the safe speed, whichever is lower.

iii. At Station Passenger platforms

Minimum Radius 1000 m

1.2.2. Check Rail / Restraining Rail:

a) Check rails/ Restraining Rails should be provided on curves on main line where radius is 190m or less on Standard gauge. The clearance of check rail/ restraining rails shall be suitably decided after requisite studies. The detailed design calculations/ studies in this regard shall be furnished for record.

b) Check rails/ Restraining Rails shall not be mandatory for curves in depots, yards and non-passenger lines where speed is not more than 25 kmph. However, decision in this regard may be taken by Metro themselves based on layout and maintenance requirement.

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1.2.3. Cant & Cant Deficiency

Maximum permissible cant (C_a)	125 mm
Maximum desirable cant (Ca)	110 mm
Maximum permissible cant deficiency (Cd)	100 mm

1.2.4. Radius of Vertical Curve

a) Minimum radius — 1500 m

1.3 GRADIENTS

1.3.1. Maximum Permissible Gradient on Mid-Section

a) Maximum Gradient (compensated) shall be 4%.

Note:

(i) There shall be no change of gradient in transition portion of horizontal curves.

(ii) The gradient will be compensated for curvature at the rate of 0.04% per degree of curve.

1.3.2. Maximum permissible gradient on turnouts

a) On Ballasted Track 0.25 %

b) On Ballastless Track 3.0 %

Note:

(i) There shall be no change of gradient (i.e. vertical curve) on and within 15 meters (desirable)/3 meters (minimum) of any turnout on Ballastless track. In case of Ballasted track, there shall be no change of gradient on and within 30 meters of any turnout.

(ii) There shall be no horizontal curve within 15 meters(desirable)/3 meters (Minimum) of any turnout on Ballastless Track and 30 meters of any Turnout on Ballasted Track.

(iii) 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 line based-on track geometry and other considerations, if required. In case of turnout installed on curved track, the minimum distance for commencement of vertical curve or another horizontal curve shall be 15 meters for Ballastless track. Turnout shall not be laid on transition curve.

(iv) The limit of turnout for above purposes shall be taken from Stock Rail Joint (SRJ) to end (i.e. heel) of crossing for Ballastless track. For Ballasted track, it shall be from SRJ to last common sleeper behind end of crossing.

(v) The maximum permissible gradient on turnout and the location of turnout with respect to vertical/horizontal curves in vicinity shall be confirmed from rolling stock supplier for the negotiability of rolling stock.

(vi) The above stipulations shall also be applicable for turnout to be laid outside the station limits, if any.

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1.4 BUILDINGS AND STRUCTURES (OUTSIDE STATION AREA)

Minimum horizontal distance from center of track to any structure (Except Conductor Rail and platform Coping) for heights above Rail Level on tangent track on level/constant grade shall be as under:

(A) Underground Sections

1. **Circular Tunnel**

Height from Rail Level	Horizontal Distance from C.L. of track
i. From Rail Level to 88 mm	1730 mm
ii. At 88 mm	1730 mm increasing to 1768 mm
iii. 88 mm to 3197 mm	1768 mm
iv. 3197 mm to 3659 mm	1768 mm decreasing to 1428 mm
v. 3659 mm to 4153 mm	1428 mm decreasing to 628 mm
vi. At 4153 mm	628 mm decreasing to 0 mm

Refer Drawing no. MEGA/GEN/SOD/UND/01 at page 47

2. **Rectangular Box Tunnel**

Height from Rail Level	Horizontal Distance from C.L. of track
i. From Rail Level to 75 mm	1680 mm
ii. At 75 mm	1680 mm increasing to 1715mm
iii. 75 mm to 317 mm	1715 mm
iv. At 317 mm	1715 mm decreasing to 1593 mm
v. 317 mm to 883 mm	1593 mm increasing to 1676 mm
vi. 883 mm to 1771 mm	1676 mm increasing to 1678 mm
vii. 1771 mm to 3121 mm	1678 mm increasing to 1604 mm
viii. 3121 mm to 3659 mm	1604 mm decreasing to 1428 mm
ix. 3659 mm to 4153 mm	1428 mm decreasing to 628 mm
x. 4153 mm	628 mm decreasing to 0 mm

Refer Drawing no. MEGA/GEN/SOD/UND/03 at page 48

(B) Elevated and Surface (At-Grade) Sections (Ballastless Track)

Height from Rail Level	Horizontal Distance from C.L. of track
i. From Rail Level to 367 mm	1765 mm
ii. At 367 mm	1765 mm decreasing to 1653 mm
iii. 367 mm to 875 mm	1653 mm increasing to 1736 mm
iv. 875 mm to 1760 mm	1736 mm increasing to 1758 mm
v. 1760 mm to 3122 mm	1758 mm decreasing to 1702 mm
vi. 3122 mm to 3463 mm	1702 mm decreasing to 1624 mm
vii. 3463 mm to 3820 mm	1624 mm decreasing to 1308 mm
viii. 3820 mm to 4203 mm	1308 mm decreasing to 640 mm

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ix. At 4203 mm	640 mm decreasing to 0 mm

Refer Drawing no. MEGA/GEN/SOD/ELE-02 at page 46

(C) Surface (At-Grade) Sections (Ballasted Track)

Height from Rail Level	Horizontal Distance from C.L. of track
i. From Rail Level to 87 mm	1805 mm
ii. At 87 mm	1805 mm increasing to 1895 mm
iii. 87 mm to 3202 mm	1895 mm
iv. 3202 mm to 3672 mm	1895 mm decreasing to 1587 mm
v. 3672 mm to 4203 mm	1587 mm decreasing to 639 mm
vi. At 4203 mm	639 mm decreasing to 0 mm

Refer to drawing no. MEGA/GEN/SOD/ATG/02 at page 49

Notes for (A), (B) and (C):

(i) Extra clearance shall be provided for curves as laid down at para 1.7.

(ii) The term 'structure' covers any item including light ones like ladders, isolated posts, cables etc. erected alongside the track.

(iii) For At-Grade and Elevated Sections, a clearance of minimum 150 mm has been made over the Kinematic Envelope on the lateral dimensions to arrive at the Structure Gauge. For Underground Sections this clearance is 100 mm.

1.5 KINEMATIC ENVELOPE

a) For Kinematic Envelope for level/constant grade (tangent track) outside platform area, refer to:
Drawing no. MEGA/GEN/SOD/ELE/01, at page 42
Drawing no. MEGA/GEN/SOD/UND/02, at page 43
Drawing no. MEGA/GEN/SOD/ATG/01, at page 44

b) For Kinematic Envelope for level/constant grade (tangent track) in platform area, refer to: Drawing no. MEGA/GEN/SOD/ELE & UND-70 Kmph at page 45

1.6 STRUCTURE GAUGE (Except for Passenger platforms)

1.6.1. Underground sections

The Structure Gauge (Fixed Structure Line) outside platform area has been arrived at by allowing minimum clearance of 100 mm to Kinematic Envelope.

a) For Structure Gauge for Underground Sections (Circular Tunnel) with Ballastless Track for level/constant grade (tangent track) Refer drawing no. **MEGA/GEN/SOD/UND/01** at page 47.

b) For Structure Gauge for Underground Sections (Rectangular Box Tunnel) with Ballastless Track for level/constant grade (tangent track) Refer drawing no. **MEGA/GEN/SOD/UND/03** at page 48.

Note: Extra clearances shall be provided for curves as laid down at Para 1.7

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1.6.2. Elevated Sections and Surface (At-Grade) sections with Ballastless Track

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing minimum clearance of 150 mm to Kinematic Envelope. This includes 50 mm additional clearance for Elevated Sections.

a) For Structure Gauge on Elevated Sections and At-Grade sections outside station with Ballastless Track for level/constant grade (tangent track) refer to drawing no. **MEGA/GEN/SOD/ELE/02 at page 46** (outside station) with Ballastless Track for level/constant grade (tangent track).

Note: Extra clearances shall be provided for curves as laid down at Para 1.7

1.6.3. Surface (At-Grade) Sections with Ballasted Track

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing minimum clearance of 150 mm to Kinematic Envelope.

a) For Structure Gauge on Surface sections (outside stations) with Ballasted Track for level/constant grade (tangent track) Refer to drawing no. **MEGA/GEN/SOD/ATG/02 at page 49**.

Note: Extra clearance shall be provided for curves as laid down at Para 1.7

1.7 EXTRA CLEARANCES ON CURVES

Following are the extra clearances considered for curves.

1.7.1. INSIDE OF CURVE

(A) Curvature effect

a) Mid throw at the center of the vehicle = V (in mm) = 125 C^2/R

b) Lateral shift due to gauge widening on curves, is 9 mm for curves sharper than 500m radius and 5 mm for curves of radius 500m upto 1000 m.

c) Lateral shift for nosing is 37 mm for ballasted track and 34 mm for Ballastless track.

For values of curvature effect,

i) For At-Grade (Surface) Sections — Ballasted Track refer Appendix — 2A at page 28 and Appendix — 2B at page 29

ii) For Tunnel, Elevated and At-Grade (Surface) Sections — Ballastless Track refer Appendix —2C at page 30 and Appendix — 2D at page 31

Notes:

i) <u>Underground, Elevated and At-Grade Ballastless sections</u>

Lateral shift of 34 mm due to nosing is included in Kinematic Envelope for Underground, Elevated and At-Grade Sections with Ballastless Track for tangent track (and as a result, also included in Structure Gauge) which shall be subtracted from the total extra clearance worked out as at Para 1.7.1(A) above if the value of mid throw (V) is equal to or greater than 34 mm. However, if the value of mid throw (V) is less than 34 mm, the curvature effect shall be due to widening of the gauge only (Mid throw minus 34 mm shall be taken as zero).

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ii) At-Grade (Surface) Ballasted Sections

Lateral shift of 37 mm due to nosing is included in Kinematic Envelope for At-Grade (Surface) Sections with Ballasted Track for tangent track (and as a result, also included in Structure Gauge) which shall be subtracted from the total extra clearance worked out as at Para 1.7.1(A) above if the value of mid throw (V) is equal to or greater than 37 mm. However, if the value of mid throw (V) is less than 37 mm, the curvature effect shall be due to widening of the gauge only (Mid throw minus 37 mm shall be taken as zero).

(B) Clearance for Cant

a) Underground (Box structures), Elevated and At-Grade (Surface) sections

The lean 'L' due to Cant at any point at height 'h' above Rail Level is given by:

$L = C_a \times h/g$ (all in mm), where g= 1435+c mm, c being the rail head width, and C_a being the cant.

Values of Cant effect on Structure Gauge for inside of a curve with only the cant effect, as shown in drawing no. MEGA/GEN/SOD/GEN/01 at page 39, is as under:

(i) For At-Grade (Surface) Sections — Ballasted Track refer Appendix – 3A at page 32

(ii) For Elevated and At-Grade (Surface) Sections—Ballastless Track refer Appendix–3B at page 33

(iii) For Box Structures of Underground Sections—Ballastless Track refer Appendix – 3C at page 34

b) Circular Tunnels

In the case of Circular Tunnel, the cant is provided by raising the outer rail and suitably shifting the center of the Circular Tunnel towards inside of curve and upwards. This has same effect as assuming rotation of the Circular Tunnel about mid-point of top of inner rail resulting in shift of Tunnel center laterally towards inside of curve and also vertically upwards.

For values of horizontal and vertical shifts of center of Circular Tunnel for different values of cant, refer to Appendix – 4 at page 37 and Drawing no. MEGA/GEN/SOD/UND/04 at page 50.

(C) Clearance for Vertical curve (Vertical Throw)

a) Vertical Throw V1 and V2 (in mm) for vertical curve shall be calculated as under:

V1 (with vehicle center in sag or vehicle end on summit) = $125 \times C^2/R$

V2 (with vehicle center in summit or vehicle end in sag) = $[125 \times C_1^2/R] - [125 \times C^2/R]$

b) Values of Vertical Throw V1 and V2 due to vertical curves of different radii are shown in Drawing no. MEGA/GEN/SOD/GEN/02 at page 40.

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1.7.2. OUTSIDE OF CURVE

(A) Curvature effect

a) End throw at the end of vehicle = V_o (in mm) $=[125 \times C1^2/R] - [125 \times C^2/R]$

b) Clearance due to gauge widening on curves, is 9 mm for curves sharper than 500m radius and 5 mm for curves of radius 500m upto 1000m.

c) Additional nosing due to gauge widening on curves, for curves sharper than 1000 m radius

For values of curvature effect, refer to:

i) For At-Grade (Surface) Sections — Ballasted Track refer Appendix – 2A at page 28 and Appendix — 2B at page 29.

ii) For Underground, Elevated and At-Grade (Surface) Sections — Ballastless Track refer Appendix – 2C at page 30 and Appendix — 2D at page 31.

(B) <u>Clearance for Cant</u>

a) Underground (Box Structure), Elevated and At-Grade (Surface) Sections

The lean 'L' due to Cant at any point at height 'h' above Rail Level is given by:

L = (—) C_a x h/g (all in mm), where g= 1435+c, c being the rail head width

(-ve sign indicates relief due to cant or reduction in clearance required)

Values of cant effect on Structure Gauge on inside and outside of curve with only the cant effect as shown in drawing no. MEGA/GEN/SOD/GEN-01 at Page 39:

(i) For Ballasted Track sections refer Appendix — 3A at page 32

(ii) For Elevated and At-Grade(surface) sections (Ballastless Track) refer Appendix — 3B at page 33

(iii) For Box structures of Underground sections (Ballastless Track) refer Appendix—3C at page 34

b) Circular Tunnels

In the case of Circular Tunnel, the cant is provided by raising the outer rail and suitably shifting the center of the Circular Tunnel towards inside of curve and upwards. This has same effect as assuming rotation of the Circular Tunnel about mid-point of top of inner rail resulting in shift of Tunnel center laterally towards inside of curve and also vertically upwards.

For values of horizontal and vertical shifts of center of Circular Tunnel for different Values of cant, refer to Appendix – 4 at page 37 and Drawing no. MEGA/GEN/SOD/UND/04 at page 50.

(C) <u>Clearance for Vertical curve (Vertical Throw)</u>

The provision at Para 1.7.1. (C) above shall be applicable in this case also.

Vertical Throw V1 and V2 (in mm) for vertical curve shall be calculated as under:

V1 (with vehicle center in sag or vehicle end on summit) = 125 x C^2/R

V2 (with vehicle center in summit or vehicle end in sag) = $[125xC_1^2/R]-[125xC^2/R]$

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Values of vertical throw V1 and V2 due to vertical curves of different radii are shown in drawing no. MEGA/GEN/SOD/GEN/02 at page 40.

Abbreviations used in para 1.7 above:

C is the distance between centers of bogies in meters

C_1 is the coach length in meters

R is the radius of curve in meters

C_a is the cant provided in mm

h is the height from Rail Level in mm, and

g is the distance between centers of rails in mm

1.8 MINIMUM TRACK SPACING ON CURVES

Underground, Elevated and At-Grade (Surface) Sections

The worst case will be when the end of a bogie carriage on the inner track is opposite the center of a similar carriage on the outer track.

1.8.1. Without any structure between tracks

The minimum track spacing on curves without any structure between tracks shall be the sum of the following:

a) (E + F),

Where,

E is the horizontal distance from vertical axis of center line of canted track to canted Kinematic Envelope on inside of curve at a height 'h' (from Rail Level) for a given cant,

F is the horizontal distance from vertical axis of center line of canted track to canted Kinematic Envelope on outside of curve at a height 'h' (from Rail Level) for a given cant,

Refer Drawing no. MEGA/GEN/SOD/GEN/03) at page 41.

b) T1 (Extra lateral clearance due to curvature on inside of curve

c) T2 (Extra lateral clearance due to curvature on outside of curve

Minimum clearance between adjacent Kinematic Envelopes is stipulated as under:

i) 200 mm for Underground Sections

ii) 300 mm for Elevated Sections

iii) 300 mm for Surface (At-Grade) Sections

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Notes:

The value of 'F', calculated from the formula at drawing no. MEGA/GEN/SOD/GEN/03 at Page no. 41 includes full relief due to Cant.

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ii) The sum of 'E' and 'F' for same height (which are with cant effect only), shall be the maximum of values calculated for various heights from Rail Level.

For values of E, F, T1 and T2, refer to the Appendices as shown below:

	SECTIONS	FOR E & F	For T1 & T2
1	Elevated, Underground & At-Grade (Ballastless)	Appendix 3E at page 36	Appendix 2C at page 30 Appendix 2D at page 31
2	Surface (At-Grade) Ballasted Section	Appendix 3D at page 35	Appendix 2A at page 28 Appendix 2B at page 29

1.8.2. With a structure between adjacent tracks

The minimum track spacing on curves with a structure between tracks shall be the sum of the following:

a) (E1 +T1) Minimum clearance to the structure from center line of track on inside of curve (for outer track)

b) (F1 +T2) Minimum clearance to the structure from center line of track on outside of curve (for inner track)

c) Width of structure between adjacent tracks (measured across the tracks)

Where,

E1 is the horizontal distance from vertical axis of center line of canted track to canted Structure Gauge on inside of curve for a given cant,

F1 is the horizontal distance from vertical axis of center line of canted track to canted Structure Gauge on outside of curve for a given cant,

T1 is extra lateral clearance due to curvature on inside of curve and

T2 is extra lateral clearance due to curvature on outside of curve

Notes:

i) The values of **E1** and **F1** for a given cant C_a, shall each be the maximum of values at different heights of structure from Rail Level. In case the cant provided is greater than 50 mm on inner track, the value of **F1** shall be for the cant of (C_a-50) mm. In case the cant provided is 50 mm or less on inner track, the value of F1 shall be for ZERO cant.

ii) Minimum track spacing, so worked out with a structure between the adjacent tracks shall not be less than that calculated as per Para 1.8.1 for tracks without any structure between adjacent tracks.

For values of **E1**, **F1**, **T1** and **T2**, refer to the Appendices as shown in Table below:

	SECTIONS	FOR E1 & F1	FOR T1 & T2
1	Underground Rectangular Box Tunnels (Ballastless)	Appendix 3C at page 34	Appendix 2C at page 30 Appendix 2D at page 31

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	SECTIONS	FOR E1 & F1	FOR T1 & T2
2	Elevated & At-Grade (Ballastless)	Appendix 3B at page 33	Appendix 2C at page 30 Appendix 2D at page 31
3	Surface (At-Grade) Ballasted Section	Appendix 3A at page 32	Appendix 2A at page 28 Appendix 2B at page 29

1.9 WALKWAYS

Minimum Width of Walkway	610 mm
Minimum Height of Walkway	1000 mm
Maximum Height of Walkway	1200 mm

Note: Extra clearance to walkway shall be provided for curves, as laid down at Para 1.7

i) Minimum clearance to walk way at the nearest edge from the Kinematic Envelope shall be 50 mm for Underground sections and 100mm for Elevated and Surface (At-Grade) sections.

ii) Walkway should be used by Metro inspection and maintenance staff only during non-operation hours.

iii) Maximum and minimum heights of walkway on curves are above inner rail.

iv) No structure, other than signaling and minor signaling, telecom equipment posts, shall be permitted within the minimum width of walkway.

v) At locations having combined effect of curves and grades and approaches to such location, based on technical considerations duly approved by Metro, the minimum height of walkway can be reduced up to 900 mm with stipulation that such location will be suitably notified and other evacuation measures as published by MOUD, shall be ensured and width of walkway shall not be less than 940 mm (800 mm on inside of curve) for sharp curves of radius 200 m or less at such locations.

vi) If tunnel provided with walk way on the same side of the platform is connecting two stations, one station having island platform and another station having a side platform, track crossing at Rail Level is to be provided to allow access from either of the stations to the walk way and vice versa. The track crossing shall not infringe the structure gauge and shall be put to use only after train operation is stopped and traction power is switched off.

1.10 DERAILMENT GUARDS

1.10.1. The derailment guard should be provided inside/outside of running rail on viaduct as well as in tunnel having multiple tracks and At-Grade section locations specified by the Metro Railway. For single track tunnel, location for providing derailment guard is given in note. In tunnels, the

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derailment guard should preferably be provided inside the track, so that it permits less sway of coach towards tunnel wall in case of derailment.

Note:

Location for providing Derailment Guard in single track tunnel

i) Entry of tunnel: 200 m from tunnel portal outside the tunnel to 50 m inside the tunnel.

ii) Exit of tunnel: 50 m from inside of tunnel portal to 200 m outside the tunnel.

iii) In curved track having radius 500 m or less including transition portion but excluding locations where check rail is provided.

iv) 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.

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.

1.10.2. The lateral clearance between the running rail and the derailment guard shall be 210±30 mm. It shall not be higher than 25 mm above the top of the running rail and should be clear of the rail fastenings to permit installation, replacement and maintenance.

Note:

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. This fastening system, if used in tunnel having multiple tracks, KE of adjacent tracks is not to be infringed so long as the wheels of any derailed vehicles are within the main rail and derailment guard.

1.10.3. Derailment guard shall be designed such that in case of derailment:

i) The wheels of a derailed vehicle under crush load, moving at maximum speed are retained on the viaduct or tunnel.

ii) Damage to track and supporting structures is minimum.

1.11 SPECIAL OPERATING CONDITIONS

(Common for Underground and Elevated/At-Grade)

1.11.1. In case of At-Grade section, the track is expected to be laid on the surface and passing through populated areas. Considering this fact, to prevent the access to the track by general unauthorized public from the adjacent areas, all At-Grade sections and wherever needed, the ramp sections (between consecutive Elevated and At-Grade/Underground sections), will be

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robustly fenced as 750 V DC traction system exists with Third Rail bottom current collection and track return current.

1.11.2. In view of chances of collision of derailed train with train coming from the other direction, adequate measures shall be taken to restrict lateral movement of derailed vehicles on Elevated/At-Grade sections. Proper communication facilities shall also be available at the stations.

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Chapter – II: STATIONS

2.1 SPACING OF TRACKS AT STATIONS

Spacing of tracks at station on straight and on curve of radius of 1000 m and flatter, without any structure between adjoining tracks for:

a.	Underground Section	3650 mm
b.	Elevated Section	3750 mm
c.	At-Grade Section (Ballasted Track)	3800 mm
d.	At-Grade Section (Ballastless Track)	3750 mm

2.2 PLATFORMS

2.2.1. Maximum horizontal distance from center of track to face of passenger platform coping (Ballastless Track)

a.	Underground Station	1525 mm	(A)
b.	Elevated Station	1535 mm	
c.	At-Grade Station	1535 mm	

2.2.2. Minimum horizontal distance from center of track to face of passenger platform coping (Ballastless Track)

a.	Underground Station	1515 mm	(B)
b.	Elevated Station	1530 mm	
c.	At-Grade Station	1530 mm	

Notes:

(i) Platform faces shall be flared away smoothly from the center line of the track at either end for a distance of 1500 mm so as to give from center of track a dimension:

- 1575 +/-5 for Underground and Elevated Stations
- 1590 +/-5 for Surface (At-Grade) Stations

(ii) For additional clearance for platforms on curves, refer to Para 2.7.

(iii) Maximum and Minimum distances specified at Para 2.2.1 and 2.2.2 are for 2900 mm wide Rolling Stock. The distance (A) and (B) shall be adjusted with the variation in width of Rolling Stock.

2.2.3. Height Above Rail Level for Passenger Platform on Ballastless Track

a.	Maximum height above Rail Level for Passenger platform	1095 mm
b.	Minimum height above Rail Level for Passenger platform	1085 mm

Note: No Station is proposed to be located on Ballasted Track

2.2.4.

a.	Minimum horizontal distance of any isolated structure on a passenger platform from the edge of coping with/without platform screen door/gate.	2500 mm
b.	Minimum horizontal distance of any continuous Structure on a passenger platform from the edge of coping with/without platform screen door/gate.	3000 mm

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Note:

(i) The structure on the platform is treated as 'isolated' if the length along the platform length is 2000 mm or less. Any structure having a length exceeding 2000 mm is treated as 'continuous structure' except platform screen doors.

(ii) There shall be no superelevation on passenger platform lines.

2.2.5. For Structure Gauge at stations, refer to Figures as under:

a. For Elevated and At-Grade Stations (Side platform) with/without platform screen gate	Drawing No. MEGA/ GEN/SOD/ELE-03 at page 51
b. For elevated and At-Grade Stations (Island platform) with/without platform screen gate.	Drawing No. MEGA/ GEN/SOD/ELE-04 at page 52
c. For Underground Stations (Island platform) with/without platform screen door	Drawing No. MEGA/ GEN/SOD/UND-05 at page 53

2.2.6. For Kinematic Envelope on platform at station, refer to: Drawing No. MEGA/ GEN/SOD/ELE &UND- 70 Kmph at page 45

2.3 TRACK GRADIENTS IN PLATFORM

2.3.1. Track gradient in platform

a) Maximum 1 in 400

b) Desirable Level

Note: There shall be no change of grade in platform track

2.4 INTERLOCKING AND SIGNAL GEAR

Maximum height above Rail Level of any part of interlocking or signal gear on either side of center of track falling within the structure gauge limits shall be as under, subject to the restrictions as per Note below:

a) <u>In Underground Stations</u>

From center of track to 1610 mm	0 mm
Beyond 1610 mm from center of track up to 1705 mm	250 mm

b) <u>In Elevated Stations</u>

From center of track up to 1610 mm	0 mm
Beyond 1610 mm from center of track up to 1755 mm	250 mm

c) <u>In Surface Stations</u>

From center of track up to 1610 mm	0 mm
Beyond 1610 mm from center of track up to 1880 mm	250 mm

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Note:

Except for check rails of ordinary and diamond crossings, upstands or wing rails and point rails of crossings leading to snag dead ends, or such parts of signaling gear as are required to be actuated by the wheels, no gear or track fittings shall project above Rail Level for a distance of 1150 mm on either side of center of the track.

2.5 POINTS & CROSSING

2.5.1.	Maximum clearance of check rail opposite nose of crossing:	42 mm
2.5.2.	Minimum clearance of check rail opposite nose of crossings:	37 mm
2.5.3.	Maximum clearance of wing rail at nose of crossing:	43 mm
2.5.4.	Minimum clearance of wing rail at nose of crossings:	41 mm
2.5.5.	Minimum clearance between toe of open switch and stock rail:	160 mm

2.5.6. Minimum radius of lead curve for slip points, turnouts and crossover roads

1 in 9 turnouts – Minimum: 190 m

1 in 7 turnouts – Minimum: 140 m

The design of the turnout shall be as per approved track structure

2.5.7. Minimum angle of crossing (ordinary)

a) For passenger running lines — 1 in 7

b) For depots, yards and other non-running lines — 1 in 7

2.5.8. Diamond crossings not to be flatter than — 1 in 6

Notes:

i. The above restrictions shall not apply to moveable diamond crossings

ii. There must be no change of superelevation (of outer rail over inner rail) between a point 18 meters outside toe of switch rail and heel of crossing, except in the case of special crossing leading to snag dead-ends or under circumstances as provided for in item 2.6 below.

2.5.9. Minimum length of tongue rail — 10,000 mm

2.6 SUPERELEVATION AND SPEED AT STATIONS ON CURVES WITH TURNOUTS OF CONTRARY & SIMILAR FLEXURE

2.6.1. **Main Line:**

Subject to the permissible run through speed based on the standard of interlocking, the equilibrium superelevation, calculated for the speed of the fastest train may be reduced by a maximum amount of Cant Deficiency permitted without reducing speed on the main line.

2.6.2. **Turnouts:**

a) Curves of contrary flexure:

The equilibrium superelevation (s) in mm should be = $\{(1435+c)/127)\}\ (V^2/R)$

Where, c= Rail head width, R = radius of turnout in meters and V is speed on turnout in kmph.

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The permissible negative superelevation on the turnout (which is also the actual superelevation of the main line) may then be = (Cant Deficiency permitted – s) mm

b) Curves of Similar flexure:

The question of reduction or otherwise of superelevation on the main line in order to keep the cant deficiency on turnout track within limits for the speed permitted on turnout track must 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

The additional clearance for platforms on curves is to be provided as under:

On inside of curve:	Mid throw
On outside of curve:	End throw

The additional clearance for platforms on curves is shown in Appendix- 5 at page no. 38

No superelevation and gauge widening shall be provided on passenger platform lines.

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CHAPTER — III: ROLLING STOCK

3.1 PASSENGER ELECTRIC MULTIPLE UNITS

3.1.1.	a)	Maximum Length of Coach body (including end fairings)	21965 mm
	b)	Maximum width of the vehicle	2900 mm
	c)	Maximum Height of Coach Body	3980 mm
3.1.2.		Distance between Bogie centers	14800 ± 200 mm
3.1.3.	a)	Kinematic Envelope for level tangent track except for passenger platform	
		• For Underground Ballastless track, refer drawing no:	MEGA/GEN/SOD/UND-02 at page 43
		• For At-Grade & elevated sections, Ballastless track, refer drawing no:	MEGA/GEN/SOD/ELE- 01 at page 42
	b)	Kinematic Envelope for level tangent track at passenger platform (for Underground, At-Grade and Elevated sections) refer drawing no:	MEGA/GEN/SOD/ELE &UND- 70 Kmph at page 45
3.1.4.		Net Minimum Clearance above Rail Level under dynamic condition of fully loaded vehicle under worst condition ** for bogie and axle mounted equipment excluding Current Collection Device (CCD) and Obstacle Deflection Device after considering upto 25mm projection of Check rails, wing rails and upstand above Rail Level.	50 mm *#
3.1.5.		Minimum Clearance above Rail Level under dynamic condition of fully loaded vehicle under worst condition *** for body mounted equipment	102 mm

Note:

*The Current Collection Device in worst condition (with the deflection of primary springs and with maximum tread wear) in retracted position shall have a net minimum clearance of 25mm above Rail Level.

The Obstacle Deflection Device working height shall be 125mm above Rail Level and in worst condition (with the deflection of primary springs and with maximum tread wear) shall have a minimum clearance of 25mm above Rail Level.

** The "worst condition" means that it is with deflection of Primary suspension with Maximum tread wear.

*** The "worst condition" means that it is with deflection of Primary suspension, deflated air spring and maximum tread wear.

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3.1.6.		Wheel	
	a)	Maximum wheel gauge back to back distance	1360 mm
	b)	Minimum wheel gauge back to back distance	1358 mm
3.1.7.	a)	Maximum diameter on the tread measured at 70mm from the wheel gauge face	860 mm
	b)	Minimum diameter on the tread measured at 70mm from the wheel gauge face	780 mm
3.1.8.	a)	Minimum projection for flange of new wheel measured from tread at 70mm from the wheel gauge face	28 mm
	b)	Maximum projection for flange of worn wheel measured from tread at 70mm from the wheel gauge face	36 mm
3.1.9.	a)	Maximum thickness of flange of wheel measured from wheel gauge face at 18mm from outer edge of flange	32.5 mm
	b)	Minimum thickness of flange of wheel measured from wheel gauge face at 18mm from outer edge of flange	22 mm
3.1.10.		Width of wheel	135 ± 1 mm
3.1.11.		Incline of tread	1 in 20
3.1.12.		Floor Height	
	a)	Maximum Height of floor above Rail Level, for an unloaded vehicle	1130 mm
	b)	Minimum Height of floor above Rail Level, for a fully loaded normal vehicle	1100 mm
3.1.13.	a)	Maximum height of center of coupler above Rail Level for unloaded vehicle	815 mm
	b)	Minimum height of center of coupler above Rail Level for fully loaded vehicle	740 mm
3.1.14.		Maximum length over couplers	22600 mm
3.1.15.	1.	Length of rigid wheel base for single bogie	2200 to 2400 mm
	2.	Maximum distance between any two adjacent axles	12800 mm

3.2 LOCOMOTIVES AND ENGINEERING SERVICE VEHICLES

Other items of rolling stock, viz. shunting locomotives, inspection cars, emergency re-railing van, track machines, etc., used on Ahmedabad Metro System (Standard Gauge) will conform with the Kinematic Envelope of the Passenger Electric Multiple Units as shown in:

3.2.1. For Underground refer Drawing no. MEGA/GEN/SOD/UND/02, at page 43

For At-Grade & Elevated sections refer Drawing no. MEGA/GEN/SOD/ELE/01, at page 42

For Surface (At-Grade) Sections for ballasted track refer Drawing no. MEGA/GEN/SOD/ATG/01 at page 44.

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CHAPTER — IV: ELECTRIC TRACTION

4.1 ELECTRIC TRACTION – 750V DC, THIRD RAIL WITH BOTTOM CURRENT COLLECTION

4.1.1.	a)	Minimum height from Rail Level to current collecting Surface of the conductor rail	148 mm
	b)	Maximum height from Rail Level to current collecting Surface of the conductor rail including worn-out condition	164 mm
4.1.2.	a)	Distance of centre line of the conductor rail from the track centre	1480 mm
	b)	Tolerance of (a) above	- 5 mm, + 5 mm
4.1.3.		Minimum clearance between the bottom of the shroud and the bottom of the conductor rail	19 mm
4.1.4.		Maximum distance between the centre line of the conductor Rail and the outer edge of the shroud structure	91 mm
4.1.5.	a)	Minimum clearance between live parts of third rail and the structure in static and dynamic conditions	25 mm
	b)	Minimum clearance between live parts of conductor rail and vehicle body	25 mm

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CHAPTER — V: PLATFORM SCREEN DOORS/GATES

5.1 PLATFORM SCREEN DOOR SETTING OUT

5.1.1.		Minimum Platform Screen Door/Gate width	2000 mm
5.1.2.		Minimum Platform Screen Door height from Platform level	2150 mm
5.1.3.		Minimum Platform Screen Gate height from Platform level	1500 mm
5.1.4.	a)	Minimum Platform Screen Door/ Gate panel offset from track center Line — Tangent track	1600 mm
	b)	Minimum Platform Screen Door/ Gate threshold offset from track center Line —Tangent track	
		i. Underground Station	1555 mm
		ii. Elevated Station	1570 mm
5.1.5.		Station platform (Finished Floor Level) height from Rail Level	
	a)	Ballastless Track	1090 ± 5 mm
5.1.6.		Station platform Edge offset from centerline of track (Minimum)	
	a)	Underground Station	1515 mm
	b)	Elevated Station	1530 mm
	c)	At-Grade Station (Ballastless Track)	1530 mm
5.1.7.		Station platform Edge offset from centerline of track (Maximum)	
	a)	Underground Station	1525 mm
	b)	Elevated Station	1535 mm
	c)	At-Grade Station (Ballastless Track)	1535 mm

Notes:

(i) Assumed ± 250 mm stopping accuracy of the train on the platforms.

(ii) Extra Clearance on station situated on curved track shall be as per Appendix 5 at Page no 38

(iii) Platform Screen Doors/Platform Screen Gates are designated as railway operational structures which are allowed to infringe the structure gauge but are clear of Kinematic Envelope at stations.

(iv) The deflector attached to the bottom of the sliding door shall be designed in order not to protrude beyond the door threshold.

(v) Platform located in curves shall be fitted with gap filler to maintain the maximum stepping distance of 78 mm.

5.1.8. For static and Kinematic Envelope for stations in UG with Platform Screen Door, see Drawing No. MEGA/GEN/SOD/PSD-1 at page 54

5.1.9. For Static and Kinematic Envelope for Elevated/At-Grade (Stations with Platform Gate, see Drawing No. MEGA/GEN/SOD/PSD-2 at page 55

Examined & found in order
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Metro Link Express For Gandhinagar And Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

S Shakti

Project Directorate Railway Board Approved on 03/10/18

APPENDIX-1

PERMISSIBLE SPEED, CANT AND MINIMUM TRACK SPACING ON CURVES BALLASTLESS TRACK ON UNDERGROUND (TUNNELS) & ELEVATED SECTIONS AND BALLASTED TRACK ON AT- GRADE (SURFACE) SECTIONS

(REFERENCE PARA 1.1)

RADIUS OF CURVE	CANT	MAXIMUM PERMISSIBLE SPEED	MINIMUM DISTANCE BETWEEN ADJACENT TRACKS		
			BALLASTLESS		BALLASTED
			UNDERGROUND	ELEVATED & AT-GRADE	AT-GRADE
Metres	mm	kmph	mm	mm	mm
≥ 3000	15	80	3650	3750	3800
2800	15	80	3650	3750	3800
2600	15	80	3650	3750	3800
2400	20	80	3650	3750	3800
2200	20	80	3650	3750	3850
2000	20	80	3650	3750	3850
1900	20	80	3650	3750	3850
1800	25	80	3650	3750	3850
1700	25	80	3650	3750	3850
1600	25	80	3650	3750	3850
1500	30	80	3700	3800	3850
1400	30	80	3700	3800	3850
1300	35	80	3700	3800	3850
1200	35	80	3700	3800	3850
1100	40	80	3700	3800	3850
1000	40	80	3700	3800	3850
950	45	80	3700	3800	3850
900	45	80	3700	3800	3850
850	50	80	3700	3800	3850
800	50	80	3700	3800	3850
750	60	80	3700	3800	3850
700	60	80	3700	3800	3850
650	60	80	3700	3800	3850
600	70	80	3700	3800	3850
550	75	80	3750	3850	3900
500	85	80	3750	3850	3900
450	110	80	3750	3850	3900
400	110	75	3800	3900	3950
350	110	70	3800	3900	3950
300	110	65	3850	3950	4000
250	110	60	3900	4000	4050
200	115	55	3950	4050	4100
190	110	55	NA	4050	4100
175	110	50	NA	4100	4150
150	110	45	NA	4150	4200
120	110	40	NA	4250	4300
100	110	40	NA	NA	4400

Notes:

(i) The track spacing shown in the table above is without any column/structure between two tracks and is with equal cant both for outer and inner tracks.

(ii) The table above is not applicable to Platform Tracks.

(iii)Figure for any intermediate radius of curvature may be obtained by adopting the value for sharper curve.

Examined & found in order

20/9/18

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Project Directorate Railway Board
Approved
03/10/18

Metro Link Express for Gandhinagar and Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

APPENDIX-2A

EXTRA HORIZONTAL CLEARANCE ON CURVES (CURVATURE EFFECT) – AT GRADE (SURFACE) SECTIONS (BALLASTED TRACK) INSIDE OF CURVE

(REFERENCE PARAs 1.7.1 A., 1.8.1 AND 1.8.2)

RADIUS (METERS) R	MID THROW (28125/R) (mm) (V)	NOSING INCLUDED IN K. E./STRUCTURE GAUGE FOR TANGENT TRACK (mm) (N)	GAUGE WIDENING ON CURVES (mm) (G)	EXTRA HORIZONTAL CLEARANCE ON CURVE (mm) (T1)	REMARKS
100	281.3	37	9	253	GAUGE WIDENING ON CURVES = 9 mm; FOR CURVES SHARPER THAN 500 m RADIUS; 5mm FOR CURVES OF 500m RADIUS & ABOVE, BUT LESS THAN 1000m RADIUS AND 0 mm FOR CURVES WITH RADIUS OF 1000 m AND ABOVE
120	234.4	37	9	206	
150	187.5	37	9	160	
175	160.7	37	9	133	
190	148.0	37	9	120	
200	140.6	37	9	113	
250	112.5	37	9	85	
300	93.8	37	9	66	
350	80.4	37	9	52	
400	70.3	37	9	42	
450	62.5	37	9	35	
500	56.3	37	5	24	
550	51.1	37	5	19	
600	46.9	37	5	15	
650	43.3	37	5	11	
700	40.2	37	5	8	
750	37.5	37	5	6	
800	35.2	37	5	5	T1 = V-N+G FOR V EQUAL TO OR GREATER THAN (N) AND T1 = G FOR V < (N)
850	33.1	37	5	5	
900	31.3	37	5	5	
950	29.6	37	5	5	
1000	28.1	37	0	0	
1100	25.6	37	0	0	
1200	23.4	37	0	0	
1300	21.6	37	0	0	
1400	20.1	37	0	0	
1500	18.8	37	0	0	
1600	17.6	37	0	0	
1700	16.5	37	0	0	
1800	15.6	37	0	0	
1900	14.8	37	0	0	
2000	14.1	37	0	0	
2200	12.8	37	0	0	
2400	11.7	37	0	0	
2600	10.8	37	0	0	
2800	10.0	37	0	0	
3000	9.4	37	0	0	

Mid throw (in mm) V = (125 x C^2)/R = 28125 /R

Where 'C' is the distance between bogie centres = 14.800+0.200 = 15.000 m OR 14.800-0.200 = 14.600 m

The worst case will be with C = 15.000 m

R is the radius of curve in metres.

Examined & found in order

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Project Directorate Approved on 03/10/18 Railway Board

Metro Link Express For Gandhinagar And Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

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APPENDIX-2B

EXTRA HORIZONTAL CLEARANCE ON CURVES (CURVATURE EFFECT) – AT GRADE (SURFACE) SECTIONS (BALLASTED TRACK) OUTSIDE OF CURVE

(REFERENCE PARAs 1.7.2 A., 1.8.1 AND 1.8.2)

RADIUS (METRES) R	END THROW (34020/R) (mm) (V_o)	GAUGE WIDENING ON CURVES (mm) (G)	NOSING DUE TO GAUGE WIDENING (mm) (EN) = G x 0.219723183	EXTRA HORIZONTAL CLEARANCE ON CURVE (mm)	REMARKS
100	340.2	9	2.0	351	GAUGE WIDENING ON CURVES = 9 mm; FOR CURVES SHARPER THAN 500 m RADIUS; 5mm FOR CURVES OF 500m RADIUS & ABOVE, BUT LESS THAN 1000m RADIUS AND 0 mm FOR CURVES WITH RADIUS OF 1000 m AND ABOVE
120	283.5	9	2.0	295	
150	226.8	9	2.0	238	
175	194.4	9	2.0	205	
190	179.1	9	2.0	190	
200	170.1	9	2.0	181	
250	136.1	9	2.0	147	
300	113.4	9	2.0	124	
350	97.2	9	2.0	108	
400	85.1	9	2.0	96	
450	75.6	9	2.0	87	
500	68.0	5	1.1	74	
550	61.9	5	1.1	68	
600	56.7	5	1.1	63	
650	52.3	5	1.1	58	
700	48.6	5	1.1	55	
750	45.4	5	1.1	51	T2 = Vo+G+EN
800	42.5	5	1.1	49	
850	40.0	5	1.1	46	
900	37.8	5	1.1	44	
950	35.8	5	1.1	42	
1000	34.0	0	0.0	34	
1100	30.9	0	0.0	31	
1200	28.4	0	0.0	28	
1300	26.2	0	0.0	26	
1400	24.3	0	0.0	24	
1500	22.7	0	0.0	23	
1600	21.3	0	0.0	21	
1700	20.0	0	0.0	20	
1800	18.9	0	0.0	19	
1900	17.9	0	0.0	18	
2000	17.0	0	0.0	17	
2200	15.5	0	0.0	15	
2400	14.2	0	0.0	14	
2600	13.1	0	0.0	13	
2800	12.2	0	0.0	12	
3000	11.3	0	0.0	11	

Project Directorate Approved on 03/10/18 Railway Board

Metro Link Express For Gandhinagar & Ahmedabad (MEGA) Co. Ltd A Govt. of Gujarat Undertaking

End throw (in mm) V = $(125 \times C_1^2)/R - (125 \times C^2)/R$ = 34020 /R

Where 'C' is the distance between bogie centres = 14.800+0.200 = 15.000 m OR 14.800-0.200 = 14.600 m

The worst case will be with C = 14.600 m

'C1' is the length of coach in metres = 22.030 m and R is the radius of curve in metres

COACH LENGTH = 21900 mm

FOR DMC IT CAN INCREASE TO 21965 mm

DIFFERENCE IN LENGTH 65 mm

(THIS INCREASE WILL BE ON ONE SIDE FOR DRIVING CAB)

HALF LENGTH FROM CENTRE OF 2 BOGIES 11015 mm. = ((21900)/2)+65)

LENGTH FOR CALCULATIONS OF END THROW = 22030 mm

2 x HALF LENGTH FROM CENTRE OF 2 BOGIES

Examined & Found in order 20/9/18

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APPENDIX-2C

EXTRA HORIZONTAL CLEARANCE ON CURVES (CURVATURE EFFECT) TUNNEL/ELEVATED/AT-GRADE (SURFACE) SECTIONS (BALLASTLESS TRACK) INSIDE OF CURVE

(REFERENCE PARAs 1.7.1 A., 1.8.1 AND 1.8.2)

RADIUS (METRES) R	MID THROW (28125/R) (mm) (V)	NOSING INCLUDED IN K. E./STRUCTURE GAUGE FOR TANGENT TRACK (mm) (N)	EXTRA GAUGE WIDENING ON CURVES (mm) (G)	EXTRA HORIZONTAL CLEARANCE ON CURVE (mm) (T1)	REMARKS
120	234.4	34	9	209	GAUGE WIDENING ON CURVES = 9 mm ; FOR CURVES SHARPER THAN 500 m RADIUS; 5mm FOR CURVES OF 500m RADIUS & ABOVE, BUT LESS THAN 1000m RADIUS AND 0 mm FOR CURVES WITH RADIUS OF 1000 m AND ABOVE
150	187.5	34	9	163	
175	160.7	34	9	136	
190	148.0	34	9	123	
200	140.6	34	9	116	
250	112.5	34	9	88	
300	93.8	34	9	69	
350	80.4	34	9	55	
400	70.3	34	9	45	
450	62.5	34	9	38	
500	56.3	34	5	27	
550	51.1	34	5	22	
600	46.9	34	5	18	
650	43.3	34	5	14	
700	40.2	34	5	11	
750	37.5	34	5	9	
800	35.2	34	5	6	
850	33.1	34	5	5	
900	31.3	34	5	5	
950	29.6	34	5	5	T1 = V-N+G FOR V EQUAL TO OR GREATER THAN (N) AND T1 = G FOR V < (N)
1000	28.1	34	0	0	
1100	25.6	34	0	0	
1200	23.4	34	0	0	
1300	21.6	34	0	0	
1400	20.1	34	0	0	
1500	18.8	34	0	0	
1600	17.6	34	0	0	
1700	16.5	34	0	0	
1800	15.6	34	0	0	
1900	14.8	34	0	0	
2000	14.1	34	0	0	
2200	12.8	34	0	0	
2400	11.7	34	0	0	
2600	10.8	34	0	0	
2800	10.0	34	0	0	
3000	9.4	34	0	0	

Mid throw (in mm) $V = (125 \times C^2)/R =$ 28125 /R

Where 'C' is the distance between bogie centres=14.800+0.200 = 15.000 m OR 14.800-0.200=14.600 m

The worst case will be with C = 15.000 m

R is the radius of curve in metres

Examined & Found in order

20/9/18
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Project Directorate
Approved on
03/10/18
Railway Board

Metro Link Express For Gandhinagar And Ahmedabad (MEGA) Co. Ltd.
A Govt. of Gujarat Undertaking

APPENDIX-2D

EXTRA HORIZONTAL CLEARANCE ON CURVES (CURVATURE EFFECT) TUNNEL/ELEVATED/AT-GRADE (SURFACE) SECTIONS (BALLASTLESS TRACK) OUTSIDE OF CURVE

(REFERENCE PARAs 1.7.2 A., 1.8.1 AND 1.8.2)

RADIUS (METRES) R	END THROW (34020/R) (mm) (V_o)	EXTRA GAUGE TOLERANCE ON CURVES (mm) (G)	EXTRA NOSING DUE TO EXTRA GAUGE TOLERANCE (mm) (EN) = G x 0.219723183	EXTRA HORIZONTAL CLEARANCE ON CURVE (mm) T2 = Vo+G+EN	REMARKS
120	283.5	9	2.0	295	GAUGE WIDENING ON CURVES = 9 mm ; FOR CURVES SHARPER THAN 500 m RADIUS; 5mm FOR CURVES OF 500m RADIUS & ABOVE, BUT LESS THAN 1000m RADIUS AND 0 mm FOR CURVES WITH RADIUS OF 1000 m AND ABOVE
150	226.8	9	2.0	238	
175	194.4	9	2.0	205	
190	179.1	9	2.0	190	
200	170.1	9	2.0	181	
250	136.1	9	2.0	147	
300	113.4	9	2.0	124	
350	97.2	9	2.0	108	
400	85.1	9	2.0	96	
450	75.6	9	2.0	87	
500	68.0	5	1.1	74	
550	61.9	5	1.1	68	
600	56.7	5	1.1	63	
650	52.3	5	1.1	58	
700	48.6	5	1.1	55	
750	45.4	5	1.1	52	
800	42.5	5	1.1	49	
850	40.0	5	1.1	46	
900	37.8	5	1.1	44	
950	35.8	5	1.1	42	
1000	34.0	0	0.0	34	
1100	30.9	0	0.0	31	
1200	28.4	0	0.0	28	
1300	26.2	0	0.0	26	
1400	24.3	0	0.0	24	
1500	22.7	0	0.0	23	
1600	21.3	0	0.0	21	
1700	20.0	0	0.0	20	
1800	18.9	0	0.0	19	
1900	17.9	0	0.0	18	
2000	17.0	0	0.0	17	
2200	15.5	0	0.0	16	
2400	14.2	0	0.0	14	
2600	13.1	0	0.0	13	
2800	12.2	0	0.0	12	
3000	11.3	0	0.0	11	

End throw (in mm) $V = (125 \times C_1^2)/R - (125 \times C^2)/R =$ 34020 /R

Where 'C' is the distance between bogie centres = 14.800+0.200 = 15.000 m OR 14.800-0.200 = 14.600 m

The worst case will be with C = 14.600 m

'C_1' is the length of coach in metres = 22.03 m and R is the radius of curve in metres

Examined & Found in order

20/9/18

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COACH LENGTH =	21900 mm	
FOR DMC IT CAN INCREASE TO	21965 mm	
DIFFERENCE IN LENGTH	65 mm.	(THIS INCREASE WILL BE ON ONE SIDE FOR DRIVING CAB)
HALF LENGTH FROM CENTRE OF 2 BOGIES	11015 mm. = ((21900)/2)+65)	
LENGTH FOR CALCULATIONS OF END THROW = 2 x HALF LENGTH FROM CENTRE OF 2 BOGIES	22030 mm	

Metro Link Express for Gandhinagar & Ahmedabad (GMRC) Ltd. A Govt. of Gujarat Enterprise

Project Director

03/10/18

APPENDIX-3A

CANT EFFECT ON STRUCTURE GAUGE

AT-GRADE (SURFACE) SECTION (BALLASTED TRACK)

(REFERENCE DRAWING NO. MEGA/GEN/SOD/ATG/02, MEGA/GEN/SOD/GEN/01 AND PARAs 1.7.1 B., 1.7.2 B. and 1.8.2)

Height above rail level measured perpedicular to plane of track					h=	87			h=	3202			h=	3672			h=	4203			h=	4215		
Distance from centre line of track to Structure Gauge for tangent track					ab=	1895			ab=	1895			ab=	1587			ab=	639			ab=	0		
Cant	Angle α	sin α	cos α	tan α	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2
125	4.764	0.083	0.997	0.083	1895.7	1881.2	306.6	-8.2	2154.4	1622.5	3410.8	3096	1886.5	1276.5	3853.6	3590	985.9	287.7	4304.1	4197.9	350.1	-350.1	4262.9	4262.9
120	4.573	0.080	0.997	0.080	1895.9	1882	297.8	-4.4	2144.3	1633.7	3402.9	3100.7	1874.7	1289.2	3846.8	3593.8	972.1	301.8	4300.6	4198.7	336.1	-336.1	4261.6	4261.6
115	4.382	0.076	0.997	0.077	1896.1	1882.8	289	-0.6	2134.1	1644.8	3394.9	3105.3	1862.9	1301.8	3840	3597.5	958.3	316	4297	4199.4	322.1	-322.1	4260.2	4260.2
110	4.191	0.073	0.997	0.073	1896.3	1883.6	280.3	3.3	2124	1655.9	3386.9	3109.9	1851.1	1314.4	3833.2	3601.2	944.5	330.1	4293.5	4200.1	308.1	-308.1	4258.7	4258.7
105	4.001	0.070	0.998	0.070	1896.5	1884.3	271.5	7.1	2113.8	1667	3378.9	3114.5	1839.3	1326.9	3826.3	3604.8	930.7	344.2	4289.8	4200.7	294.1	-294.1	4257.2	4257.2
100	3.810	0.066	0.998	0.067	1896.6	1885	262.7	10.9	2103.6	1678.1	3370.8	3119	1827.5	1339.5	3819.3	3608.4	916.9	358.3	4286.2	4201.3	280.1	-280.1	4255.7	4255.7
95	3.619	0.063	0.998	0.063	1896.7	1885.7	253.9	14.7	2093.3	1689.1	3362.7	3123.5	1815.6	1352	3812.4	3612	903	372.4	4282.5	4201.8	266.1	-266.1	4254.1	4254.1
90	3.428	0.060	0.998	0.060	1896.8	1886.4	245.2	18.5	2083.1	1700.1	3354.6	3127.9	1803.7	1364.6	3805.3	3615.5	889.2	386.5	4278.7	4202.3	252.1	-252.1	4252.5	4252.5
85	3.238	0.056	0.998	0.057	1896.9	1887.1	236.4	22.3	2072.8	1711.1	3346.4	3132.4	1791.9	1377.1	3798.3	3619	875.4	400.6	4274.9	4202.7	238.1	-238.1	4250.8	4250.8
80	3.047	0.053	0.999	0.053	1896.9	1887.7	227.6	26.1	2062.5	1722.1	3338.2	3136.7	1779.9	1389.6	3791.2	3622.4	861.5	414.7	4271	4203.1	224.1	-224.1	4249	4249
75	2.856	0.050	0.999	0.050	1897	1888.3	218.8	30	2052.2	1733.1	3330	3141.1	1768	1402	3784	3625.9	847.7	428.8	4267.1	4203.4	210	-210	4247.3	4247.3
70	2.666	0.047	0.999	0.047	1897	1888.9	210	33.8	2041.9	1744	3321.7	3145.4	1756.1	1414.5	3776.8	3629.2	833.8	442.8	4263.2	4203.7	196	-196	4245.4	4245.4
65	2.475	0.043	0.999	0.043	1897	1889.5	201.3	37.6	2031.5	1754.9	3313.4	3149.7	1744.1	1426.9	3769.6	3632.5	819.9	456.9	4259.2	4204	182	-182	4243.6	4243.6
60	2.285	0.040	0.999	0.040	1897	1890	192.5	41.4	2021.1	1765.8	3305	3153.9	1732.1	1439.3	3762.3	3635.8	806.1	470.9	4255.1	4204.2	168	-168	4241.6	4241.6
55	2.094	0.037	0.999	0.037	1896.9	1890.6	183.7	45.2	2010.8	1776.7	3296.6	3158.1	1720.1	1451.7	3755	3639.1	792.2	485	4251	4204.3	154	-154	4239.7	4239.7
50	1.904	0.033	0.999	0.033	1896.8	1891.1	174.9	49	2000.3	1787.6	3288.2	3162.3	1708.1	1464.1	3747.7	3642.2	778.3	499	4246.9	4204.5	140	-140	4237.7	4237.7
45	1.713	0.030	1.000	0.030	1896.8	1891.6	166.1	52.8	1989.9	1798.4	3279.7	3166.4	1696.1	1476.5	3740.3	3645.4	764.4	513	4242.7	4204.5	126	-126	4235.6	4235.6
40	1.523	0.027	1.000	0.027	1896.6	1892	157.3	56.6	1979.4	1809.2	3271.2	3170.5	1684	1488.8	3732.9	3648.5	750.5	527.1	4238.5	4204.5	112	-112	4233.5	4233.5
35	1.333	0.023	1.000	0.023	1896.5	1892.5	148.5	60.4	1969	1820	3262.7	3174.6	1672	1501.2	3725.4	3651.6	736.6	541.1	4234.2	4204.5	98	-98	4231.4	4231.4
30	1.142	0.020	1.000	0.020	1896.4	1892.9	139.8	64.2	1958.5	1830.8	3254.1	3178.6	1659.9	1513.5	3717.9	3654.6	722.7	555.1	4229.9	4204.4	84	-84	4229.2	4229.2
25	0.952	0.017	1.000	0.017	1896.2	1893.3	131	68	1947.9	1841.5	3245.5	3182.6	1647.8	1525.8	3710.4	3657.6	708.7	569.1	4225.5	4204.3	70	-70	4226.9	4226.9
20	0.761	0.013	1.000	0.013	1896	1893.7	122.2	71.8	1937.4	1852.3	3236.9	3186.5	1635.7	1538.1	3702.8	3660.6	694.8	583.1	4221.1	4204.1	56	-56	4224.6	4224.6
15	0.571	0.010	1.000	0.010	1895.8	1894	113.4	75.6	1926.8	1863	3228.2	3190.5	1623.5	1550.3	3695.1	3663.5	680.9	597.1	4216.7	4203.9	42	-42	4222.3	4222.3
10	0.381	0.007	1.000	0.007	1895.5	1894.4	104.6	79.4	1916.2	1873.7	3219.5	3194.3	1611.4	1562.6	3687.5	3666.4	666.9	611.1	4212.2	4203.7	28	-28	4219.9	4219.9
5	0.190	0.003	1.000	0.003	1895.3	1894.7	95.8	83.2	1905.6	1884.4	3210.8	3198.2	1599.2	1574.8	3679.8	3669.2	653	625	4207.6	4203.4	14	-14	4217.5	4217.5
0	0.000	0.000	1.000	0.000	1895	1895	87	87	1895	1895	3202	3202	1587	1587	3672	3672	639	639	4203	4203	0	0	4215	4215

REFER TO DRAWING NO. MEGA/GEN/SOD/ATG/02 at Page no 49 & MEGA/GEN/SOD/GEN/01 at Page no 39

E1=[Ab+(h x tan α)] x cos α

F1=[ab-(h x tan α)] x cos α

H1=(Ca/2)+(h/cos α)+(Ab-h x tan α) x sin α

H2=(Ca/2)+(h/cos α)-(ab+h x tan α) x sin α

ab=Ab= Distance from inclined centre line of vehicle to Structure Gauge for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

ac=Distance from vertical centre line of canted track to Structure Gauge for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

bc= h x tan α= Lateral increment due to cant (measured along the line parallal to line joining the top of rails).

Project Directorate Approved on 03/10/18

Metro Link Express for Gandhinagar And Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

Examined & Found in order

28/9/18

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ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
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APPENDIX-3B

CANT EFFECT ON STRUCTURE GAUGE

ELEVATED AND AT-GRADE (SURFACE) SECTIONS (BALLASTLESS TRACK)

(REFERENCE DRAWING NO. MEGA/GEN/SOD/ELE/02, MEGA/GEN/SOD/ATG/03 & MEGA/GEN/SOD/GEN/01 AND PARAs 1.7.1 B., 1.7.2 B. and 1.8.2)

Height above rail level measured perpedicular to plane of track					h=	875			h=	1769			h=	3122			h=	3463			h=	4203			h=	4203		
Distance from centre line of track to Structure Gauge for tangent track					ab=	1736			ab=	1758			ab=	1702			ab=	1624			ab=	640			ab=	0		
Cant	Angle α	sin α	cos α	tan α	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2
125	4.764	0.083	0.997	0.083	1802.7	1657.3	1078.7	790.3	1898.9	1605	1971.4	1679.4	1955.4	1436.8	3315.1	3032.4	1906	1330.8	3648.4	3378.7	986.9	288.7	4304.1	4197.8	349.1	-349.1	4251	4251
120	4.573	0.080	0.997	0.080	1800.2	1660.7	1070.6	793.8	1893.5	1611.4	1963.5	1683.2	1945.5	1447.7	3307.8	3036.4	1894.9	1342.7	3641.5	3382.5	973.1	302.8	4300.6	4198.6	335.1	-335.1	4249.6	4249.6
115	4.382	0.076	0.997	0.077	1797.8	1664.1	1062.6	797.3	1888	1617.7	1955.7	1687	1935.6	1458.5	3300.4	3040.3	1883.9	1354.6	3634.5	3386.3	959.3	317	4297.1	4199.3	321.2	-321.2	4248.2	4248.2
110	4.191	0.073	0.997	0.073	1795.3	1667.4	1054.5	800.8	1882.6	1624	1947.8	1690.8	1925.6	1469.3	3293	3044.3	1872.8	1366.5	3627.4	3390	945.5	331.1	4293.5	4200	307.2	-307.2	4246.8	4246.8
105	4.001	0.070	0.998	0.070	1792.8	1670.7	1046.5	804.3	1877.1	1630.3	1939.8	1694.5	1915.7	1480	3285.6	3048.1	1861.6	1378.4	3620.4	3393.8	931.7	345.2	4289.9	4200.6	293.2	-293.2	4245.3	4245.3
100	3.810	0.066	0.998	0.067	1790.3	1674	1038.4	807.7	1871.7	1636.6	1931.9	1698.3	1905.7	1490.8	3278.2	3052	1850.5	1390.3	3613.3	3397.4	917.9	359.3	4286.2	4201.2	279.3	-279.3	4243.7	4243.7
95	3.619	0.063	0.998	0.063	1787.8	1677.3	1030.3	811.2	1866.2	1642.8	1923.9	1702	1895.7	1501.5	3270.7	3055.8	1839.4	1402.2	3606.1	3401.1	904	373.4	4282.5	4201.7	265.3	-265.3	4242.1	4242.1
90	3.428	0.060	0.998	0.060	1785.2	1680.6	1022.2	814.6	1860.6	1649.1	1916	1705.7	1885.7	1512.3	3263.2	3059.6	1828.2	1414	3598.9	3404.7	890.2	387.5	4278.8	4202.2	251.3	-251.3	4240.5	4240.5
85	3.238	0.056	0.998	0.057	1782.6	1683.8	1014.1	818.1	1855.1	1655.3	1908	1709.4	1875.6	1523	3255.6	3063.4	1817	1425.8	3591.7	3408.3	876.4	401.6	4274.9	4202.6	237.4	-237.4	4238.8	4238.8
80	3.047	0.053	0.999	0.053	1780.1	1687	1006	821.5	1849.5	1661.5	1899.9	1713.1	1865.5	1533.6	3248.1	3067.1	1805.8	1437.6	3584.4	3411.8	862.5	415.7	4271.1	4203	223.4	-223.4	4237.1	4237.1
75	2.856	0.050	0.999	0.050	1777.4	1690.2	997.9	824.9	1844	1667.7	1891.9	1716.7	1855.5	1544.3	3240.4	3070.8	1794.6	1449.4	3577.1	3415.3	848.7	429.8	4267.2	4203.4	209.5	-209.5	4235.3	4235.3
70	2.666	0.047	0.999	0.047	1774.8	1693.4	989.8	828.3	1838.4	1673.8	1883.9	1720.3	1845.4	1554.9	3232.8	3074.5	1783.3	1461.2	3569.8	3418.7	834.8	443.8	4263.2	4203.7	195.5	-195.5	4233.5	4233.5
65	2.475	0.043	0.999	0.043	1772.2	1696.6	981.7	831.7	1832.8	1680	1875.8	1723.9	1835.2	1565.6	3225.1	3078.1	1772	1472.9	3562.4	3422.1	820.9	457.9	4259.2	4203.9	181.5	-181.5	4231.6	4231.6
60	2.285	0.040	0.999	0.040	1769.5	1699.7	973.5	835.1	1827.1	1686.1	1867.7	1727.5	1825.1	1576.2	3217.4	3081.7	1760.8	1484.6	3555	3425.5	807.1	471.9	4255.2	4204.1	167.6	-167.6	4229.7	4229.7
55	2.094	0.037	0.999	0.037	1766.8	1702.9	965.4	838.5	1821.5	1692.2	1859.6	1731.1	1815	1586.8	3209.6	3085.2	1749.5	1496.4	3547.5	3428.8	793.2	486	4251.1	4204.3	153.6	-153.6	4227.7	4227.7
50	1.904	0.033	0.999	0.033	1764.1	1706	957.2	841.8	1815.8	1698.3	1851.4	1734.6	1804.8	1597.3	3201.8	3088.7	1738.2	1508.1	3540	3432.1	779.3	500	4246.9	4204.4	139.6	-139.6	4225.7	4225.7
45	1.713	0.030	1.000	0.030	1761.4	1709.1	949	845.2	1810.1	1704.3	1843.3	1738.1	1794.6	1607.9	3194	3092.2	1726.8	1519.7	3532.5	3435.4	765.4	514	4242.8	4204.5	125.7	-125.7	4223.6	4223.6
40	1.523	0.027	1.000	0.027	1758.6	1712.1	940.8	848.6	1804.4	1710.4	1835.1	1741.7	1784.4	1618.4	3186.1	3095.7	1715.5	1531.4	3524.9	3438.6	751.5	528.1	4238.5	4204.5	111.7	-111.7	4221.5	4221.5
35	1.333	0.023	1.000	0.023	1755.9	1715.2	932.6	851.9	1798.7	1716.4	1826.9	1745.1	1774.1	1628.9	3178.2	3099.1	1704.1	1543	3517.3	3441.8	737.6	542.1	4234.2	4204.5	97.7	-97.7	4219.4	4219.4
30	1.142	0.020	1.000	0.020	1753.1	1718.2	924.4	855.2	1792.9	1722.4	1818.7	1748.6	1763.9	1639.4	3170.3	3102.5	1692.7	1554.6	3509.7	3444.9	723.7	556.1	4229.9	4204.4	83.8	-83.8	4217.2	4217.2
25	0.952	0.017	1.000	0.017	1750.3	1721.2	916.2	858.5	1787.1	1728.4	1810.5	1752.1	1753.6	1649.9	3162.3	3105.8	1681.3	1566.3	3502	3448	709.7	570.1	4225.6	4204.3	69.8	-69.8	4214.9	4214.9
20	0.761	0.013	1.000	0.013	1747.5	1724.2	908	861.9	1781.4	1734.3	1802.2	1755.5	1743.3	1660.4	3154.3	3109.1	1669.9	1577.8	3494.3	3451.1	695.8	584.1	4221.1	4204.1	55.9	-55.9	4212.6	4212.6
15	0.571	0.010	1.000	0.010	1744.6	1727.2	899.8	865.2	1775.5	1740.3	1793.9	1758.9	1733	1670.8	3146.3	3112.4	1658.4	1589.4	3486.5	3454.1	681.9	598.1	4216.7	4203.9	41.9	-41.9	4210.3	4210.3
10	0.381	0.007	1.000	0.007	1741.8	1730.1	891.5	868.4	1769.7	1746.2	1785.6	1762.3	1722.7	1681.2	3138.2	3115.6	1647	1601	3478.7	3457.1	667.9	612.1	4212.2	4203.7	27.9	-27.9	4207.9	4207.9
5	0.190	0.003	1.000	0.003	1738.9	1733.1	883.3	871.7	1763.9	1752.1	1777.3	1765.6	1712.4	1691.6	3130.1	3118.8	1635.5	1612.5	3470.9	3460.1	654	626	4207.6	4203.4	14	-14	4205.5	4205.5
0	0.000	0.000	1.000	0.000	1736	1736	875	875	1758	1758	1769	1769	1702	1702	3122	3122	1624	1624	3463	3463	640	640	4203	4203	0	0	4203	4203

REFER TO DRAWING NO. MEGA/GEN/SOD/ELE/02 at page no 46 & MEGA/GEN/SOD/GEN/01 at page no 39

E1=[Ab+(h x tan α)] x cos α

F1=[Ab-(h x tan α)] x cos α

H1=(Ca/2)+(h/cos α)+(Ab-h x tan α) x sin α

H2=(Ca/2)+(h/cos α)-(Ab+h x tan α) x sin α

ab=Ab= Distance from inclined centre line of vehicle to Structure Gauge for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

ac=Distance from vertical centre line of canted track to Structure Gauge for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

bc= h x tan α= Lateral increment due to cant (measured along the line parallal to line joining the top of rails).

Examined & found in order
20/9/18

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APPENDIX-3C

CANT EFFECT ON STRUCTURE GAUGE

UNDERGROUND SECTION (RECTANGULAR BOX TUNNELS) -- BALLASTLESS TRACK

(REFERENCE DRAWING NO. MEGA/GEN/SOD/UND/03, MEGA/GEN/SOD/GEN/01 AND PARAs 1.7.1 B., 1.7.2 B. and 1.8.2)

Height above rail level measured perpedicular to plane of track					h=	317			h=	883			h=	1771			h=	3121			h=	3659			h=	4153			h=	4153		
Distance from centre line of track to Structure Gauge for tangent track					ab=	1593			ab=	1676			ab=	1678			ab=	1604			ab=	1428			ab=	628			ab=	0		
Cant	Angle α	sin α	cos α	tan α	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2	E1	F1	H1	H2
125	4.764	0.083	0.997	0.083	1613.8	1561.2	510.7	246.1	1743.5	1596.9	1081.7	803.2	1819.3	1525.1	1966.7	1688	1857.7	1339.2	3305.9	3039.5	1727	1119.2	3827.5	3590.3	970.8	280.9	4253.3	4149	344.9	-344.9	4201.2	4201.2
120	4.573	0.080	0.997	0.080	1613.2	1562.7	503	249	1741.1	1600.3	1073.8	806.6	1813.9	1531.4	1959.2	1691.6	1847.7	1350	3299	3043.2	1715.2	1131.7	3821.2	3593.5	957.1	294.9	4249.9	4149.7	331.1	-331.1	4199.8	4199.8
115	4.382	0.076	0.997	0.077	1612.6	1564.1	495.3	251.8	1738.6	1603.6	1066	809.9	1808.4	1537.8	1951.5	1695.1	1837.8	1360.8	3291.9	3046.8	1703.4	1144.2	3814.9	3596.7	943.5	308.8	4246.3	4150.4	317.3	-317.3	4198.4	4198.4
110	4.191	0.073	0.997	0.073	1611.9	1565.6	487.6	254.7	1736.1	1607	1058.1	813.1	1803	1544.1	1943.9	1698.6	1827.8	1371.6	3284.9	3050.4	1691.6	1156.7	3808.6	3599.8	929.9	322.8	4242.8	4151	303.5	-303.5	4196.9	4196.9
105	4.001	0.070	0.998	0.070	1611.2	1567	479.9	257.6	1733.5	1610.3	1050.3	816.4	1797.5	1550.4	1936.3	1702.1	1817.8	1382.3	3277.8	3054	1679.8	1169.2	3802.2	3603	916.2	336.7	4239.2	4151.6	289.7	-289.7	4195.4	4195.4
100	3.810	0.066	0.998	0.067	1610.5	1568.4	472.1	260.5	1731	1613.6	1042.4	819.7	1792	1556.6	1928.6	1705.6	1807.8	1393.1	3270.7	3057.5	1668	1181.7	3795.8	3606	902.6	350.7	4235.5	4152.1	275.9	-275.9	4193.8	4193.8
95	3.619	0.063	0.998	0.063	1609.8	1569.8	464.4	263.3	1728.4	1616.9	1034.5	822.9	1786.4	1562.9	1920.9	1709	1797.8	1403.8	3263.5	3061	1656.1	1194.2	3789.3	3609.1	888.9	364.6	4231.9	4152.6	262.1	-262.1	4192.2	4192.2
90	3.428	0.060	0.998	0.060	1609.1	1571.2	456.7	266.2	1725.8	1620.2	1026.6	826.2	1780.9	1569.1	1913.2	1712.5	1787.8	1414.5	3256.3	3064.5	1644.3	1206.6	3782.8	3612.1	875.2	378.5	4228.1	4153	248.4	-248.4	4190.6	4190.6
85	3.238	0.056	0.998	0.057	1608.4	1572.6	449	269	1723.2	1623.5	1018.7	829.4	1775.3	1575.3	1905.4	1715.9	1777.7	1425.2	3249.1	3067.9	1632.4	1219.1	3776.3	3615	861.6	392.4	4224.3	4153.4	234.6	-234.6	4188.9	4188.9
80	3.047	0.053	0.999	0.053	1607.6	1573.9	441.2	271.9	1720.6	1626.7	1010.8	832.7	1769.8	1581.5	1897.7	1719.3	1767.6	1435.8	3241.9	3071.3	1620.5	1231.5	3769.7	3617.9	847.9	406.4	4220.5	4153.7	220.8	-220.8	4187.1	4187.1
75	2.856	0.050	0.999	0.050	1606.8	1575.2	433.5	274.7	1717.9	1629.9	1002.9	835.9	1764.2	1587.7	1889.9	1722.7	1757.5	1446.5	3234.6	3074.7	1608.6	1243.9	3763.1	3620.8	834.2	420.3	4216.6	4154	207	-207	4185.3	4185.3
70	2.666	0.047	0.999	0.047	1606	1576.5	425.7	277.6	1715.3	1633.1	995	839.1	1758.6	1593.8	1882.1	1726	1747.4	1457.1	3227.2	3078	1596.6	1256.3	3756.5	3623.6	820.5	434.2	4212.7	4154.3	193.2	-193.2	4183.5	4183.5
65	2.475	0.043	0.999	0.043	1605.2	1577.8	418	280.4	1712.6	1636.3	987.1	842.3	1752.9	1599.9	1874.3	1729.4	1737.3	1467.7	3219.9	3081.3	1584.7	1268.6	3749.8	3626.4	806.8	448	4208.7	4154.5	179.4	-179.4	4181.6	4181.6
60	2.285	0.040	0.999	0.040	1604.4	1579.1	410.3	283.2	1709.9	1639.5	979.1	845.5	1747.3	1606.1	1866.5	1732.7	1727.2	1478.3	3212.5	3084.6	1572.7	1281	3743	3629.2	793.1	461.9	4204.7	4154.7	165.6	-165.6	4179.7	4179.7
55	2.094	0.037	0.999	0.037	1603.5	1580.4	402.5	286.1	1707.1	1642.6	971.2	848.7	1741.6	1612.2	1858.6	1736	1717	1488.9	3205	3087.8	1560.8	1293.3	3736.2	3631.9	779.4	475.8	4200.7	4154.8	151.8	-151.8	4177.7	4177.7
50	1.904	0.033	0.999	0.033	1602.7	1581.6	394.7	288.9	1704.4	1645.7	963.2	851.8	1735.9	1618.2	1850.8	1739.3	1706.8	1499.4	3197.6	3091	1548.8	1305.7	3729.4	3634.5	765.6	489.7	4196.6	4154.8	138	-138	4175.7	4175.7
45	1.713	0.030	1.000	0.030	1601.8	1582.8	387	291.7	1701.7	1648.8	955.2	855	1730.2	1624.3	1842.9	1742.5	1696.6	1510	3190.1	3094.1	1536.8	1318	3722.6	3637.2	751.9	503.5	4192.4	4154.9	124.2	-124.2	4173.6	4173.6
40	1.523	0.027	1.000	0.027	1600.9	1584	379.2	294.5	1698.9	1651.9	947.2	858.1	1724.5	1630.3	1835	1745.8	1686.4	1520.5	3182.5	3097.3	1524.7	1330.2	3715.7	3639.8	738.2	517.4	4188.2	4154.8	110.4	-110.4	4171.5	4171.5
35	1.333	0.023	1.000	0.023	1599.9	1585.2	371.5	297.4	1696.1	1655	939.2	861.3	1718.7	1636.4	1827	1749	1676.1	1531	3175	3100.4	1512.7	1342.5	3708.7	3642.3	724.4	531.2	4184	4154.8	96.6	-96.6	4169.4	4169.4
30	1.142	0.020	1.000	0.020	1599	1586.4	363.7	300.2	1693.3	1658.1	931.2	864.4	1713	1642.4	1819.1	1752.2	1665.9	1541.5	3167.4	3103.4	1500.7	1354.8	3701.7	3644.8	710.7	545.1	4179.7	4154.7	82.8	-82.8	4167.2	4167.2
25	0.952	0.017	1.000	0.017	1598	1587.5	355.9	303	1690.4	1661.1	923.2	867.5	1707.2	1648.3	1811.1	1755.4	1655.6	1551.9	3159.7	3106.4	1488.6	1367	3694.7	3647.3	696.9	558.9	4175.4	4154.5	69	-69	4164.9	4164.9
20	0.761	0.013	1.000	0.013	1597.1	1588.6	348.1	305.8	1687.6	1664.1	915.2	870.6	1701.4	1654.3	1803.1	1758.5	1645.3	1562.4	3152	3109.4	1476.5	1379.2	3687.7	3649.7	683.1	572.8	4171	4154.3	55.2	-55.2	4162.6	4162.6
15	0.571	0.010	1.000	0.010	1596.1	1589.8	340.4	308.6	1684.7	1667.1	907.2	873.8	1695.6	1660.3	1795.1	1761.7	1635	1572.8	3144.3	3112.4	1464.4	1391.5	3680.6	3652.1	669.4	586.6	4166.6	4154	41.4	-41.4	4160.3	4160.3
10	0.381	0.007	1.000	0.007	1595.1	1590.9	332.6	311.4	1681.8	1670.1	899.1	876.8	1689.7	1666.2	1787.1	1764.8	1624.7	1583.2	3136.6	3115.3	1452.3	1403.7	3673.4	3654.4	655.6	600.4	4162.1	4153.7	27.6	-27.6	4157.9	4157.9
5	0.190	0.003	1.000	0.003	1594	1591.9	324.8	314.2	1678.9	1673.1	891.1	879.9	1683.9	1672.1	1779.1	1767.9	1614.4	1593.6	3128.8	3118.2	1440.1	1415.8	3666.2	3656.7	641.8	614.2	4157.6	4153.4	13.8	-13.8	4155.5	4155.5
0	0.000	0.000	1.000	0.000	1593	1593	317	317	1676	1676	883	883	1678	1678	1771	1771	1604	1604	3121	3121	1428	1428	3659	3659	628	628	4153	4153	0	0	4153	4153

Examined & found in order

REFER TO DRAWING NO. MEGA/GEN/SOD/UND/03 at page no 48 & MEGA/GEN/SOD/GEN/01 at page no 39

E1=[Ab+(h x tan α)] x cos α

F1=[Ab-(h x tan α)] x cos α

H1=(Ca/2)+(h/cos α)+(Ab-h x tan α) x sin α

H2=(Ca/2)+(h/cos α)-(Ab+h x tan α) x sin α

ab=Ab= Distance from inclined centre line of vehicle to Structure Gauge for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

ac=Distance from vertical centre line of canted track to Structure Gauge for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

bc= h x tan α= Lateral increment due to cant (measured along the line parallal to line joining the top of rails).

20/9/18
ए.डी.ई./यू०टी०एच०एस०
ADE/U.T.H.S.
रेल मंत्रालय
(Ministry of Railways)
R.D.S.O.
Manak Nagar, Lucknow-226011

Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking Metro Link Express for Gandhinagar and Ahmedabad

Project Directorate Railway Board Approved on 03/10/18

APPENDIX-3D

CANT EFFECT ON KINEMATIC ENVELOPE-HORIZONTAL

AT-GRADE (SURFACE) SECTION (BALLASTED TRACK)

(REFERENCE DRAWING NO. MEGA/GEN/SOD/ATG/01 & MEGA/GEN/SOD/GEN/03 AND PARA 1.8.1)

Height above rail level measured perpedicular to plane of track					h=	895			h=	1768			h=	3102			h=	3392			h=	3587			h=	3750			h=	4053			h=	4053		
Distance from centre line of track to Structure Gauge for tangent track					ab=	1598			ab=	1620			ab=	1565			ab=	1498			ab=	1326			ab=	1141			ab=	600			ab=	0		
Cant	Angle 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
125	4.764	0.083	0.997	0.083	1666.8	1518.1	1087.1	821.7	1761.2	1467.6	1958.9	1689.8	1817.2	1302	3283.8	3023.8	1774.6	1211.1	3567.2	3318.4	1619.3	1023.5	3747.2	3527	1448.5	825.6	3894.3	3704.8	934.6	261.3	4151.3	4051.7	336.6	-336.6	4101.5	4101.5
120	4.573	0.080	0.997	0.080	1664.3	1521.6	1079.6	824.7	1755.8	1473.9	1951.5	1693.2	1807.4	1312.7	3276.9	3027.3	1763.7	1222.8	3560.6	3321.8	1607.8	1035.8	3741.3	3529.9	1436.4	838.4	3889	3707.1	921.3	274.9	4147.9	4052.3	323.2	-323.2	4100.1	4100.1
115	4.382	0.076	0.997	0.077	1661.7	1524.9	1072	827.8	1750.4	1480.2	1944.1	1696.5	1797.5	1323.4	3270	3030.8	1752.8	1234.4	3554	3325.1	1596.2	1048	3735.3	3532.7	1424.2	851.1	3883.7	3709.4	907.9	288.5	4144.5	4052.8	309.7	-309.7	4098.7	4098.7
110	4.191	0.073	0.997	0.073	1659.1	1528.3	1064.4	830.8	1744.9	1486.4	1936.7	1699.9	1787.5	1334.1	3263.1	3034.3	1741.9	1246.1	3547.4	3328.4	1584.6	1060.3	3729.3	3535.5	1412	863.9	3878.4	3711.6	894.6	302.2	4141	4053.3	296.2	-296.2	4097.2	4097.2
105	4.001	0.070	0.998	0.070	1656.5	1531.7	1056.8	833.8	1739.4	1492.7	1929.2	1703.2	1777.6	1344.8	3256.1	3037.8	1731	1257.7	3540.7	3331.7	1573	1072.5	3723.3	3538.2	1399.8	876.6	3873	3713.8	881.3	315.8	4137.5	4053.8	282.8	-282.8	4095.6	4095.6
100	3.810	0.066	0.998	0.067	1653.9	1535	1049.2	836.8	1733.9	1498.9	1921.7	1706.5	1767.7	1355.4	3249.1	3041.2	1720.1	1269.3	3534	3335	1561.4	1084.7	3717.2	3541	1387.6	889.3	3867.5	3715.9	868	329.4	4133.9	4054.2	269.3	-269.3	4094	4094
95	3.619	0.063	0.998	0.063	1651.3	1538.3	1041.6	839.8	1728.4	1505.2	1914.2	1709.7	1757.7	1366.1	3242.1	3044.5	1709.1	1280.9	3527.3	3338.2	1549.8	1096.9	3711	3543.6	1375.4	902	3862	3718	854.6	343	4130.3	4054.5	255.8	-255.8	4092.4	4092.4
90	3.428	0.060	0.998	0.060	1648.7	1541.6	1034	842.8	1722.8	1511.4	1906.7	1713	1747.7	1376.7	3235	3047.9	1698.2	1292.5	3520.5	3341.3	1538.1	1109.1	3704.9	3546.3	1363.2	914.7	3856.5	3720.1	841.3	356.6	4126.6	4054.9	242.4	-242.4	4090.7	4090.7
85	3.238	0.056	0.998	0.057	1646	1544.9	1026.3	845.8	1717.3	1517.6	1899.2	1716.2	1737.7	1387.3	3227.9	3051.2	1687.2	1304	3513.7	3344.5	1526.5	1121.3	3698.7	3548.9	1351	927.4	3851	3722.1	827.9	370.1	4122.9	4055.1	228.9	-228.9	4089	4089
80	3.047	0.053	0.999	0.053	1643.3	1548.2	1018.7	848.8	1711.7	1523.7	1891.6	1719.4	1727.7	1397.9	3220.8	3054.4	1676.2	1315.6	3506.8	3347.6	1514.8	1133.5	3692.4	3551.4	1338.7	940.1	3845.3	3724	814.6	383.7	4119.2	4055.4	215.4	-215.4	4087.3	4087.3
75	2.856	0.050	0.999	0.050	1640.6	1551.4	1011	851.8	1706.1	1529.9	1884	1722.6	1717.6	1408.5	3213.6	3057.7	1665.2	1327.1	3499.9	3350.6	1503.1	1145.6	3686.1	3554	1326.5	952.7	3839.7	3726	801.2	397.3	4115.4	4055.6	202	-202	4085.5	4085.5
70	2.666	0.047	0.999	0.047	1637.9	1554.6	1003.4	854.7	1700.5	1536	1876.4	1725.7	1707.6	1419	3206.4	3060.9	1654.1	1338.6	3493	3353.7	1491.4	1157.7	3679.8	3556.4	1314.2	965.3	3834	3727.9	787.9	410.8	4111.5	4055.7	188.5	-188.5	4083.6	4083.6
65	2.475	0.043	0.999	0.043	1635.2	1557.9	995.7	857.6	1694.8	1542.1	1868.8	1728.9	1697.5	1429.6	3199.2	3064	1643.1	1350.1	3486	3356.6	1479.7	1169.8	3673.4	3558.9	1301.9	978	3828.3	3729.7	774.5	424.4	4107.6	4055.8	175	-175	4081.7	4081.7
60	2.285	0.040	0.999	0.040	1632.4	1561	988	860.6	1689.2	1548.2	1861.2	1732	1687.4	1440.1	3191.9	3067.1	1632	1361.6	3479	3359.6	1467.9	1181.9	3667	3561.3	1289.6	990.6	3822.5	3731.5	761.1	437.9	4103.7	4055.9	161.6	-161.6	4079.8	4079.8
55	2.094	0.037	0.999	0.037	1629.6	1564.2	980.3	863.5	1683.5	1554.3	1853.5	1735.1	1677.3	1450.6	3184.6	3070.2	1621	1373	3472	3362.5	1456.2	1194	3660.6	3563.6	1277.3	1003.2	3816.7	3733.3	747.7	451.5	4099.7	4055.9	148.1	-148.1	4077.8	4077.8
50	1.904	0.033	0.999	0.033	1626.9	1567.4	972.6	866.4	1677.8	1560.4	1845.8	1738.2	1667.2	1461.1	3177.3	3073.3	1609.9	1384.5	3464.9	3365.4	1444.4	1206.1	3654.1	3566	1265	1015.8	3810.8	3735	734.3	465	4095.7	4055.8	134.7	-134.7	4075.8	4075.8
45	1.713	0.030	1.000	0.030	1624	1570.5	964.9	869.3	1672.1	1566.4	1838.1	1741.3	1657.1	1471.5	3169.9	3076.3	1598.8	1395.9	3457.8	3368.2	1432.7	1218.2	3647.5	3568.2	1252.6	1028.4	3804.9	3736.7	720.9	478.5	4091.6	4055.7	121.2	-121.2	4073.7	4073.7
40	1.523	0.027	1.000	0.027	1621.2	1573.6	957.2	872.2	1666.4	1572.4	1830.4	1744.3	1646.9	1482	3162.5	3079.3	1587.6	1407.3	3450.6	3371	1420.9	1230.2	3641	3570.5	1240.3	1040.9	3799	3738.3	707.5	492.1	4087.5	4055.6	107.7	-107.7	4071.6	4071.6
35	1.333	0.023	1.000	0.023	1618.4	1576.8	949.4	875.1	1660.7	1578.4	1822.7	1747.3	1636.7	1492.4	3155.1	3082.3	1576.5	1418.7	3443.4	3373.7	1409.1	1242.2	3634.4	3572.7	1227.9	1053.5	3793	3740	694.1	505.6	4083.4	4055.5	94.3	-94.3	4069.4	4069.4
30	1.142	0.020	1.000	0.020	1615.5	1579.8	941.7	878	1654.9	1584.4	1814.9	1750.4	1626.5	1502.9	3147.6	3085.2	1565.3	1430.1	3436.2	3376.5	1397.2	1254.2	3627.7	3574.9	1215.5	1066	3787	3741.5	680.7	519.1	4079.2	4055.2	80.8	-80.8	4067.2	4067.2
25	0.952	0.017	1.000	0.017	1612.6	1582.9	933.9	880.8	1649.1	1590.4	1807.2	1753.3	1616.3	1513.3	3140.1	3088.1	1554.1	1441.4	3428.9	3379.1	1385.4	1266.2	3621	3577	1203.1	1078.6	3780.9	3743	667.2	532.6	4074.9	4055	67.3	-67.3	4064.9	4064.9
20	0.761	0.013	1.000	0.013	1609.8	1586	926.2	883.7	1643.4	1596.4	1799.4	1756.3	1606.1	1523.6	3132.5	3090.9	1542.9	1452.8	3421.6	3381.8	1373.6	1278.2	3614.3	3579.1	1190.7	1091.1	3774.8	3744.5	653.8	546.1	4070.6	4054.7	53.9	-53.9	4062.6	4062.6
15	0.571	0.010	1.000	0.010	1606.8	1589	918.4	886.5	1637.5	1602.3	1791.6	1759.3	1595.8	1534	3124.9	3093.7	1531.7	1464.1	3414.3	3384.4	1361.7	1290.2	3607.5	3581.1	1178.3	1103.6	3768.7	3745.9	640.4	559.6	4066.3	4054.3	40.4	-40.4	4060.3	4060.3
10	0.381	0.007	1.000	0.007	1603.9	1592	910.6	889.4	1631.7	1608.2	1783.7	1762.2	1585.6	1544.4	3117.3	3096.5	1520.5	1475.4	3406.9	3387	1349.8	1302.1	3600.7	3583.1	1165.9	1116.1	3762.5	3747.3	626.9	573.1	4061.9	4053.9	26.9	-26.9	4057.9	4057.9
5	0.190	0.003	1.000	0.003	1601	1595	902.8	892.2	1625.9	1614.1	1775.9	1765.1	1575.3	1554.7	3109.7	3099.3	1509.3	1486.7	3399.5	3389.5	1337.9	1314.1	3593.9	3585.1	1153.5	1128.5	3756.3	3748.7	613.5	586.5	4057.5	4053.5	13.5	-13.5	4055.5	4055.5
0	0.000	0.000	1.000	0.000	1598	1598	895	895	1620	1620	1768	1768	1565	1565	3102	3102	1498	1498	3392	3392	1326	1326	3587	3587	1141	1141	3750	3750	600	600	4053	4053	0	0	4053	4053

REFER TO DRAWING NO. MEGA/GEN/SOD/ATG/01 at page no 44 & MEGA/GEN/SOD/GEN/03 at page no 41

E=[Ab+(h x tan α)] x cos α

F=[Ab-(h x tan α)] x cos α

H1=(Ca/2)+(h/cos α)+(Ab-h x tan α) x sin α

H2=(Ca/2)+(h/cos α)-(Ab+h x tan α) x sin α

ab=Ab= Distance from inclined centre line of vehicle to Kinematic Envelope for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

ac=Distance from vertical centre line of canted track to Kinematic Envelope for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

bc= h x tan α= Lateral increment due to cant (measured along the line parallal to line joining the top of rails).

Examined & found in order
20/9/18

ए.डी.इं. / यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

03/10/18

Metro Link Express For Gandhinagar And Ahmedabad (MEGA) Co. Ltd
A Govt. of Gujarat Undertaking

APPENDIX-3E
CANT EFFECT ON KINEMATIC ENVELOPE
ELEVATED/UNDERGROUND AND AT-GRADE (SURFACE) -- BALLSTLESS TRACK
(REFERENCE DRAWING NO. MEGA/GEN/SOD/UND/02, MEGA/GEN/SOD/ELE/01 & MEGA/GEN/SOD/GEN/03 AND PARA 1.8.1)

Height above rail level measured perpedicular to plane of track					h=	895			h=	1768			h=	3102			h=	3392			h=	3587			h=	3750			h=	4053		
Distance from centre line of track to Structure Gauge for tangent track					ab=	1586			ab=	1608			ab=	1553			ab=	1486			ab=	1314			ab=	1129			ab=	600		
Cant	Angle 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
125	4.764	0.083	0.997	0.083	1654.9	1506.2	1086.1	822.7	1749.3	1455.6	1957.9	1690.8	1805.3	1290	3282.8	3024.8	1762.6	1199.1	3566.2	3319.4	1607.4	1011.5	3746.2	3528	1436.6	813.6	3893.3	3705.8	934.6	261.3	4151.3	4051.7
120	4.573	0.080	0.997	0.080	1652.3	1509.6	1078.6	825.7	1743.9	1461.9	1950.6	1694.2	1795.4	1300.7	3276	3028.3	1751.7	1210.8	3559.7	3322.7	1595.8	1023.8	3740.4	3530.8	1424.4	826.4	3888.1	3708	921.3	274.9	4147.9	4052.3
115	4.382	0.076	0.997	0.077	1649.8	1513	1071.1	828.7	1738.4	1468.2	1943.2	1697.5	1785.5	1311.4	3269.1	3031.8	1740.8	1222.5	3553.1	3326	1584.2	1036.1	3734.4	3533.6	1412.2	839.2	3882.8	3710.3	907.9	288.5	4144.5	4052.8
110	4.191	0.073	0.997	0.073	1647.2	1516.3	1063.5	831.7	1732.9	1474.5	1935.8	1700.7	1775.6	1322.1	3262.2	3035.2	1729.9	1234.1	3546.5	3329.3	1572.7	1048.3	3728.4	3536.4	1400.1	851.9	3877.5	3712.5	894.6	302.2	4141	4053.3
105	4.001	0.070	0.998	0.070	1644.6	1519.7	1056	834.7	1727.4	1480.7	1928.4	1704	1765.6	1332.8	3255.3	3038.6	1719	1245.7	3539.9	3332.6	1561.1	1060.5	3722.4	3539.1	1387.9	864.6	3872.1	3714.6	881.3	315.8	4137.5	4053.8
100	3.810	0.066	0.998	0.067	1642	1523	1048.4	837.6	1721.9	1487	1920.9	1707.2	1755.7	1343.5	3248.3	3042	1708.1	1257.3	3533.2	3335.8	1549.4	1072.8	3716.4	3541.8	1375.7	877.3	3866.7	3716.7	868	329.4	4133.9	4054.2
95	3.619	0.063	0.998	0.063	1639.3	1526.3	1040.8	840.6	1716.4	1493.2	1913.5	1710.5	1745.7	1354.1	3241.3	3045.3	1697.1	1268.9	3526.5	3338.9	1537.8	1085	3710.3	3544.4	1363.5	890	3861.3	3718.8	854.6	343	4130.3	4054.5
90	3.428	0.060	0.998	0.060	1636.7	1529.6	1033.2	843.6	1710.8	1499.4	1906	1713.7	1735.7	1364.7	3234.3	3048.6	1686.2	1280.5	3519.8	3342.1	1526.2	1097.1	3704.2	3547	1351.2	902.7	3855.8	3720.8	841.3	356.6	4126.6	4054.9
85	3.238	0.056	0.998	0.057	1634	1532.9	1025.6	846.5	1705.3	1505.6	1898.5	1716.9	1725.7	1375.3	3227.3	3051.8	1675.2	1292.1	3513	3345.2	1514.5	1109.3	3698	3549.6	1339	915.4	3850.3	3722.8	827.9	370.1	4122.9	4055.1
80	3.047	0.053	0.999	0.053	1631.3	1536.2	1018	849.4	1699.7	1511.7	1891	1720	1715.7	1385.9	3220.2	3055.1	1664.2	1303.6	3506.2	3348.2	1502.8	1121.5	3691.8	3552.1	1326.7	928.1	3844.7	3724.7	814.6	383.7	4119.2	4055.4
75	2.856	0.050	0.999	0.050	1628.6	1539.4	1010.4	852.4	1694.1	1517.9	1883.4	1723.2	1705.7	1396.5	3213	3058.3	1653.2	1315.1	3499.3	3351.2	1491.1	1133.6	3685.5	3554.6	1314.5	940.7	3839.1	3726.6	801.2	397.3	4115.4	4055.6
70	2.666	0.047	0.999	0.047	1625.9	1542.7	1002.8	855.3	1688.5	1524	1875.9	1726.3	1695.6	1407	3205.9	3061.4	1642.2	1326.6	3492.4	3354.2	1479.4	1145.7	3679.2	3557	1302.2	953.4	3833.5	3728.4	787.9	410.8	4111.5	4055.7
65	2.475	0.043	0.999	0.043	1623.2	1545.9	995.2	858.2	1682.9	1530.1	1868.3	1729.4	1685.5	1417.6	3198.7	3064.5	1631.1	1338.1	3485.5	3357.2	1467.7	1157.9	3672.9	3559.4	1289.9	966	3827.8	3730.2	774.5	424.4	4107.6	4055.8
60	2.285	0.040	0.999	0.040	1620.4	1549.1	987.5	861.1	1677.2	1536.2	1860.7	1732.5	1675.4	1428.1	3191.4	3067.6	1620	1349.6	3478.5	3360.1	1456	1170	3666.5	3561.8	1277.6	978.6	3822	3732	761.1	437.9	4103.7	4055.9
55	2.094	0.037	0.999	0.037	1617.6	1552.2	979.9	863.9	1671.5	1542.3	1853.1	1735.6	1665.3	1438.6	3184.2	3070.7	1609	1361	3471.5	3362.9	1444.2	1182	3660.1	3564.1	1265.3	991.2	3816.3	3733.7	747.7	451.5	4099.7	4055.9
50	1.904	0.033	0.999	0.033	1614.9	1555.4	972.2	866.8	1665.8	1548.4	1845.4	1738.6	1655.2	1449.1	3176.9	3073.7	1597.9	1372.5	3464.5	3365.8	1432.4	1194.1	3653.7	3566.4	1253	1003.8	3810.4	3735.4	734.3	465	4095.7	4055.8
45	1.713	0.030	1.000	0.030	1612.1	1558.5	964.5	869.7	1660.1	1554.4	1837.8	1741.6	1645.1	1459.6	3169.5	3076.7	1586.8	1383.9	3457.4	3368.6	1420.7	1206.2	3647.2	3568.6	1240.6	1016.4	3804.6	3737.1	720.9	478.5	4091.6	4055.7
40	1.523	0.027	1.000	0.027	1609.2	1561.7	956.8	872.5	1654.4	1560.4	1830.1	1744.6	1634.9	1470	3162.2	3079.6	1575.6	1395.3	3450.3	3371.3	1408.9	1218.2	3640.7	3570.8	1228.3	1028.9	3798.7	3738.7	707.5	492.1	4087.5	4055.6
35	1.333	0.023	1.000	0.023	1606.4	1564.8	949.1	875.4	1648.7	1566.4	1822.4	1747.6	1624.7	1480.4	3154.8	3082.5	1564.5	1406.7	3443.1	3374	1397.1	1230.2	3634.1	3573	1215.9	1041.5	3792.7	3740.2	694.1	505.6	4083.4	4055.5
30	1.142	0.020	1.000	0.020	1603.5	1567.8	941.4	878.2	1642.9	1572.4	1814.7	1750.6	1614.5	1490.9	3147.3	3085.4	1553.3	1418.1	3435.9	3376.7	1385.2	1242.2	3627.5	3575.1	1203.5	1054	3786.8	3741.7	680.7	519.1	4079.2	4055.2
25	0.952	0.017	1.000	0.017	1600.6	1570.9	933.7	881	1637.1	1578.4	1807	1753.5	1604.3	1501.3	3139.9	3088.3	1542.1	1429.4	3428.7	3379.3	1373.4	1254.2	3620.8	3577.2	1191.1	1066.6	3780.7	3743.2	667.2	532.6	4074.9	4055
20	0.761	0.013	1.000	0.013	1597.8	1574	926	883.8	1631.4	1584.4	1799.2	1756.5	1594.1	1511.6	3132.4	3091.1	1530.9	1440.8	3421.4	3382	1361.6	1266.2	3614.1	3579.2	1178.7	1079.1	3774.7	3744.7	653.8	546.1	4070.6	4054.7
15	0.571	0.010	1.000	0.010	1594.8	1577	918.3	886.6	1625.5	1590.3	1791.4	1759.4	1583.8	1522	3124.8	3093.9	1519.7	1452.1	3414.1	3384.5	1349.7	1278.2	3607.4	3581.2	1166.3	1091.6	3768.6	3746.1	640.4	559.6	4066.3	4054.3
10	0.381	0.007	1.000	0.007	1591.9	1580	910.5	889.4	1619.7	1596.2	1783.6	1762.3	1573.6	1532.4	3117.3	3096.6	1508.5	1463.4	3406.8	3387.1	1337.8	1290.1	3600.7	3583.2	1153.9	1104.1	3762.4	3747.4	626.9	573.1	4061.9	4053.9
5	0.190	0.003	1.000	0.003	1589	1583	902.8	892.2	1613.9	1602.1	1775.8	1765.1	1563.3	1542.7	3109.6	3099.3	1497.3	1474.7	3399.4	3389.5	1325.9	1302.1	3593.8	3585.1	1141.5	1116.5	3756.2	3748.7	613.5	586.5	4057.5	4053.5
0	0.000	0.000	1.000	0.000	1586	1586	895	895	1608	1608	1768	1768	1553	1553	3102	3102	1486	1486	3392	3392	1314	1314	3587	3587	1129	1129	3750	3750	600	600	4053	4053

REFER TO DRAWING NO. MEGA/GEN/SOD/UND/02 at page no 43, MEGA/GEN/SOD/ELE/01 at page no 42 & MEGA/GEN/SOD/GEN/03 at page no 41

E=[Ab+(h x tan α)] x cos α

F=[Ab-(h x tan α)] x cos α

H1=(C_s/2)+(h/cos α)+(Ab-h x tan α) x sin α

H2=(C_s/2)+(h/cos α)-(Ab+h x tan α) x sin α

ab=Ab= Distance from inclined centre line of vehicle to Kinematic Envelope for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

ac=Distance from vertical centre line of canted track to Kinematic Envelope for tangent track at height 'h' from rail level in the direction parallel to the line joining the top of rails.

bc= h x tan α= Lateral increment due to cant (measured along the line parallal to line joining the top of rails).

Examined & found in order
19/1/18
ADEN/THS
R.D.SO. (Ministry of Railways)
Manak Nagar, Lucknow-226011

Ahmedabad (MEGA) Co. Ltd
A Govt. of Gujarat Undertaking
Metro Link Express for Gandhinagar

Project Directorate
Approved on 13/10/18
Railway Board

APPENDIX-4

LATERAL AND VERTICAL SHIFT OF CENTRE OF CIRCULAR TUNNEL FOR DIFFERENT CANT VALUES

(REFERENCE Drawing No. MEGA/GEN/SOD/UND/04 AND PARAs 1.7.1 B. b) AND 1.7.2 B. (b))

All figures are in mm

CANT (mm)	Angle α in Degrees	Lateral Shift of tunnel centre=X	Vertical Shift of tunnel centre=Y
125	4.757937	172	55
120	4.567207	165	54
115	4.376527	158	52
110	4.185896	151	50
105	3.995312	144	48
100	3.804772	137	46
95	3.614274	130	43
90	3.423816	123	41
85	3.233396	116	39
80	3.043011	109	37
75	2.852660	102	35
70	2.662341	96	33
65	2.472051	89	31
60	2.281789	82	28
55	2.091551	75	26
50	1.901337	68	24
45	1.711144	61	22
40	1.520969	54	19
35	1.330811	48	17
30	1.140668	41	15
25	0.950538	34	12
20	0.760418	27	10
15	0.570306	20	7
10	0.380200	14	5
5	0.190099	7	2
0	0.000000	0	0

REMARKS

(a) THE CANT IS PROVIDED BY ROTATING THE TUNNEL ABOUT THE MID POINT OF TOP OF INNER RAIL
THIS WILL RESULT IN LATERAL AND VERTICAL SHIFT OF THE CENTRE OF THE CIRCULAR TUNNEL.

(b) LATERAL SHIFT OF THE CENTRE OF TUNNEL (TOWARDS INSIDE OF CURVE)

$X= [\{2 \times (r-D1)/\sin\theta\} \times \{\sin\alpha/2\}] \times \cos(90-\theta-\alpha/2)$

(c) VERTICAL SHIFT OF THE CENTRE OF TUNNEL (UPWARDS)

$Y=[\{2 \times (r-D_1)/\sin\theta\} \times \{\sin\alpha/2\}] \times \sin(90-\theta-\alpha/2)$

Where 'r' is internal radius of the circular tunnel=2800 mm

D_1 = depth from rail level to invert of circular tunnel=760 mm

α = angle of rotation=$\sin^{-1}$ (Cant/g) and

θ = angle subtended by line joining top of two rails and the line joining mid point of top of inner rail and the centre of circular Tunnel

$= \tan^{-1}[(r-D_1) / (g/2)]$ in degrees =

69.72764836

g= Centre to centre of rails = 1507 mm

Note: Please see Drawing no. MEGA/GEN/SOD/UND-04 at page 50 for details

Metro Link Express For Gandhinagar (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

Examined & Found in order
20/9/18
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ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Project Directorate Approved 03/10/18 Railway Board

APPENDIX-5
ADDITIONAL CLEARANCE FOR PLATFORMS ON CURVES
UNDER GROUND, ELEVATED AND SURFACE SECTIONS
(REFERENCE PARA 2.7)

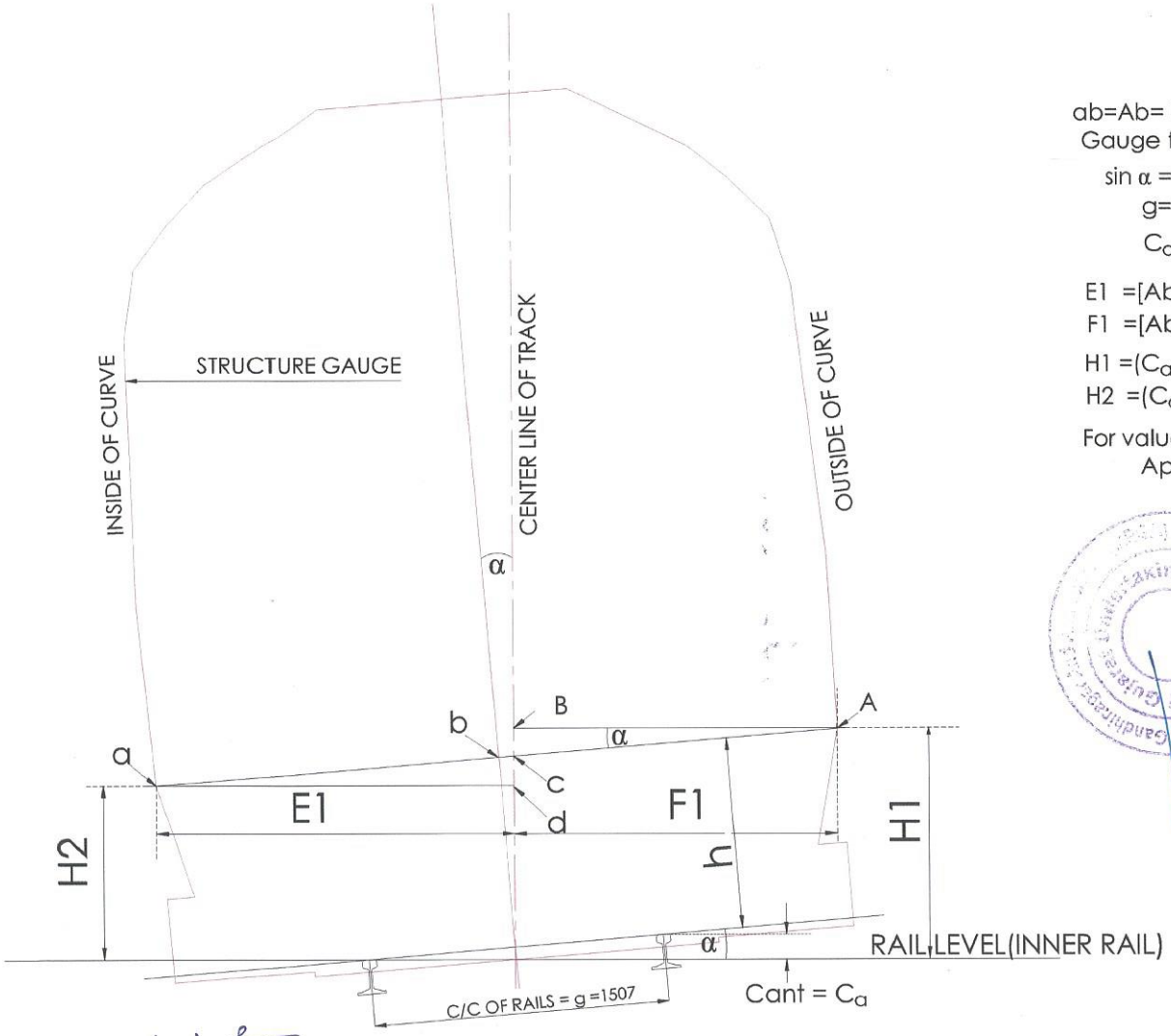
RADIUS (meters)	CANT C_a (mm)	EXTRA CLEARANCE (mm) FOR PASSENGER PLATFORM		REMARKS
		INSIDE OF CURVE	OUTSIDE OF CURVE	
3000	0	10	10	Extra CLEARANCE for curves (a) Inside of curve =Midthrow = 28125/R (b) Outside of curve = Endthrow = 34020/R Please see Appendix 2A,2B, 2C & 2D. Additional sway (nosing Effect) has been neglected in the calculation as a measure of additional safety to passengers.
2800	0	10	10	
2600	0	15	15	
2400	0	15	15	
2200	0	15	15	
2000	0	15	15	
1800	0	20	20	
1700	0	20	20	
1600	0	20	20	
1500	0	20	25	
1400	0	20	25	
1300	0	25	25	
1200	0	25	30	
1100	0	30	30	
1000	0	30	35	

Examined & found in order
20/9/18
ए.डी.ई. / यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Metro Link Express For Gandhinagar and Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

S S Rathi

Project Directorate Railway Board
03/10/18



ab=Ab= Distance from centerline of track to Structure Gauge for Tangent Track at height 'h'

$\sin \alpha = cant/g = C_a/g$

g= 1507 mm

C_a = Cant applied in mm

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

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

$H1 = (C_a/2) + (h/\cos \alpha) + (Ab - h \times \tan \alpha) \times \sin \alpha$

$H2 = (C_a/2) + (h/\cos \alpha) - (Ab + h \times \tan \alpha) \times \sin \alpha$

For values of E1, F1 , H1 AND H2, refer to Appendix 3A, 3B & 3C

LEGEND:

—— STRUCTURE GAUGE

Examined & Found in order

20/9/18

ए.डी.ई./यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

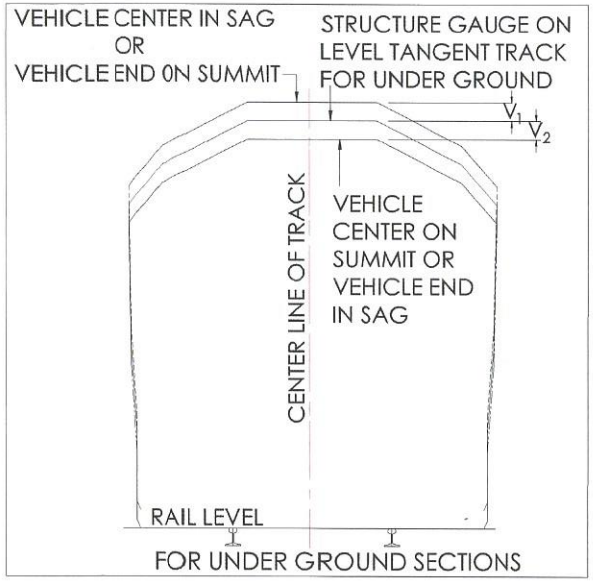
SCALE: Not to Scale

DRAWING NO. : MEGA/GEN/SOD/GEN-01 | REFERENCE PARA NO.: 1.7.1B, 1.7.2B &1.8.2

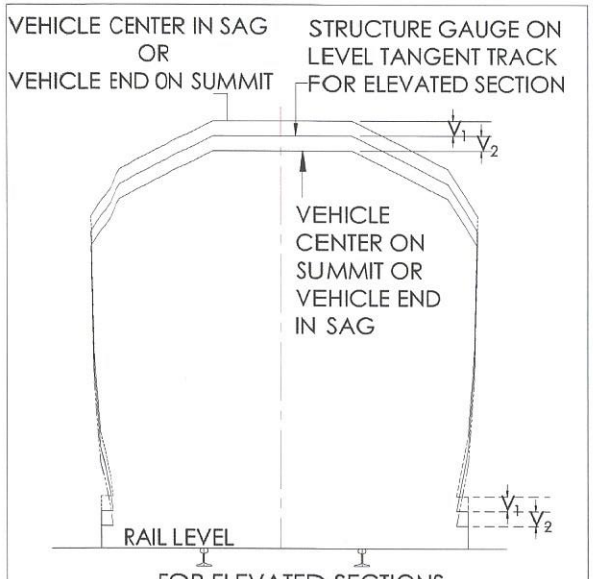
(AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

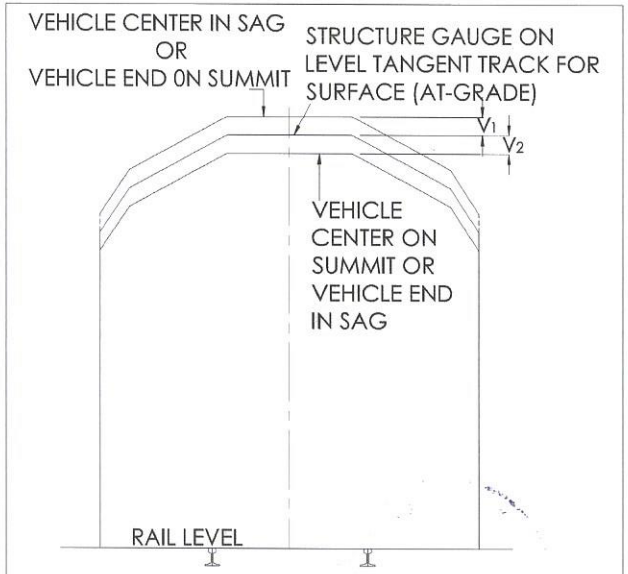
EFFECT OF CANT ON STRUCTURE GAUGE (TYPICAL)



FOR UNDER GROUND SECTIONS



FOR ELEVATED SECTIONS



FOR SURFACE (AT GRADE) SECTIONS

Note:

1. THE VALUES OF V_1 AND V_2 ARE APPROXIMATELY EQUAL AND APPLICABLE TO UNDERGROUND, ELEVATED AND SURFACE SECTIONS

VERTICAL THROW

RADIUS OF VERTICAL CURVE(M)	V_1 mm	V_2 mm
1500	19	21
1600	18	20
1700	17	19
1800	16	18
1900	15	17
2000	14	16
2100	13	15
2200	13	15
2300	12	14
2400	12	13
2500	11	13
2600	11	12
2700	10	12
2800	10	11
2900	10	11
3000	9	11

$V_1 = 125 \times \frac{C^2}{R}$

$V_2 = (125 \times C_1^2/R) - (125 \times C^2/R)$

C = BOGIE CENTER DISTANCE

C_1 = COACH LENGTH

Examined & found in order

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

DRAWING NO. : MEGA/GEN/SOD/GEN-02

REFERENCE PARA NO.: 1.7.1C &1.7.2C

(AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

EFFECT OF VERTICAL CURVE ON STRUCTURE GAUGE

ab=Ab= Distance from centerline of track to Kinematic Envelope for Tangent Track at height 'h'

$\sin \alpha = C_a/g$

g= 1507 mm

C_a = Cant applied

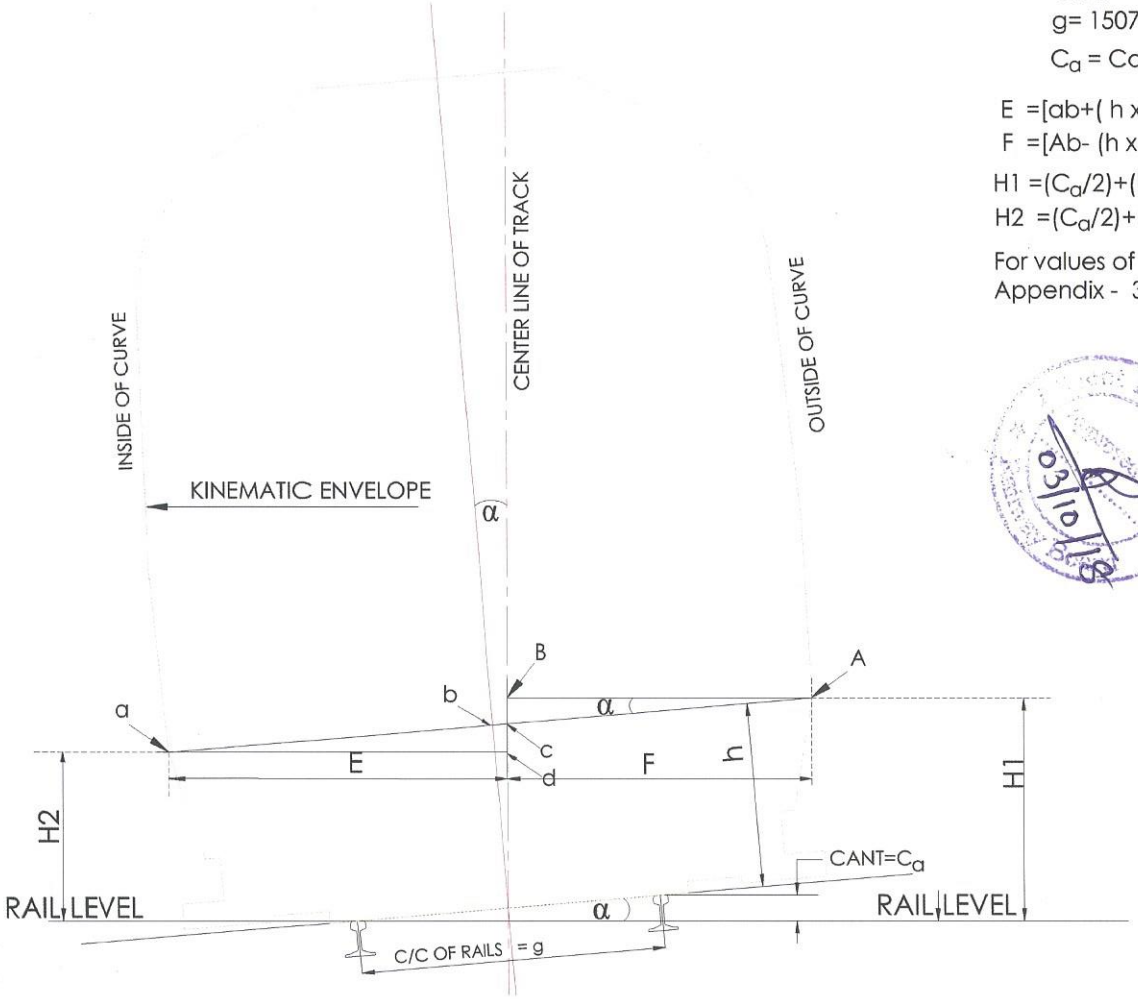
$E = [ab + (h \times \tan \alpha)] \times \cos \alpha$

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

$H1 = (C_a/2) + (h/\cos \alpha) + (Ab - h \times \tan \alpha) \times \sin \alpha$

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

For values of E, F, H1 AND H2, refer to Appendix - 3D and 3E



Examined & Found in order
20/9/18

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अ० अ० मा० सं० (रेल मंत्रालय)
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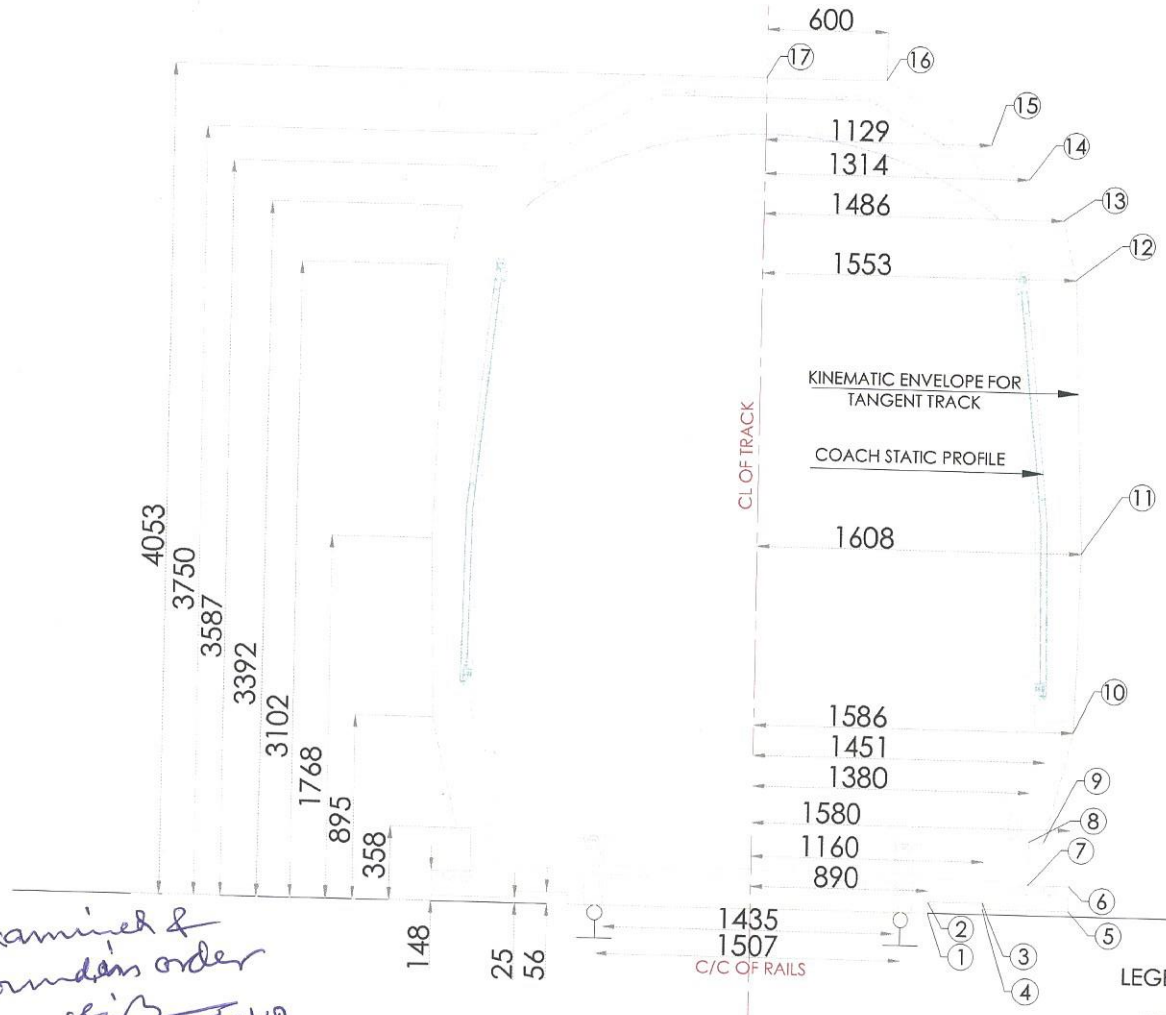
LEGEND:

KINEMATIC ENVELOPE OF COACH

DRAWING NO. : MEGA/GEN/SOD/GEN-03	REFERENCE PARA NO.: 1.8.1
(AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.	
STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION	

MARK	DATE	DETAILS OF REVISION	CONSULTANTS:	DATE: AUGUST – 2018	EFFECT OF CANT ON KINEMATIC ENVELOPE (TYPICAL)
				SCALE: Not to Scale	



COORDINATES:

POINT	X	Y
1	890	0
2	890	56
3	1160	56
4	1160	25
5	1580	25
6	1580	148
7	1380	148
8	1380	358
9	1451	358
10	1586	895
11	1608	1768
12	1553	3102
13	1486	3392
14	1314	3587
15	1129	3750
16	600	4053
17	0	4053

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. COACH SIZE W-2900, H-3980.
5. THE KINEMATIC ENVELOPE IS FOR DESIGN SPEED OF 90KMPH WITH MAXIMUM PERMISSIBLE TOLERANCE FOR TRACK & ROLLING STOCK. THE KINEMATIC ENVELOPE AND STRUCTURE GAUGE WILL BE ALSO VALID FOR NEW ROLLING STOCK HAVING SIMILAR SUSPENSION SYSTEM AND DIMENSIONS.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 100KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

Examined & Foundin order
26/9/18
ए.डी.ई. / यू.टी.एच.एस.
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Metro Link Express For Gandhinagar And Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

Project Directorate Approved of Railway Board 03/10/18

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

DRAWING NO.: MEGA/GEN/SOD/ELE-01

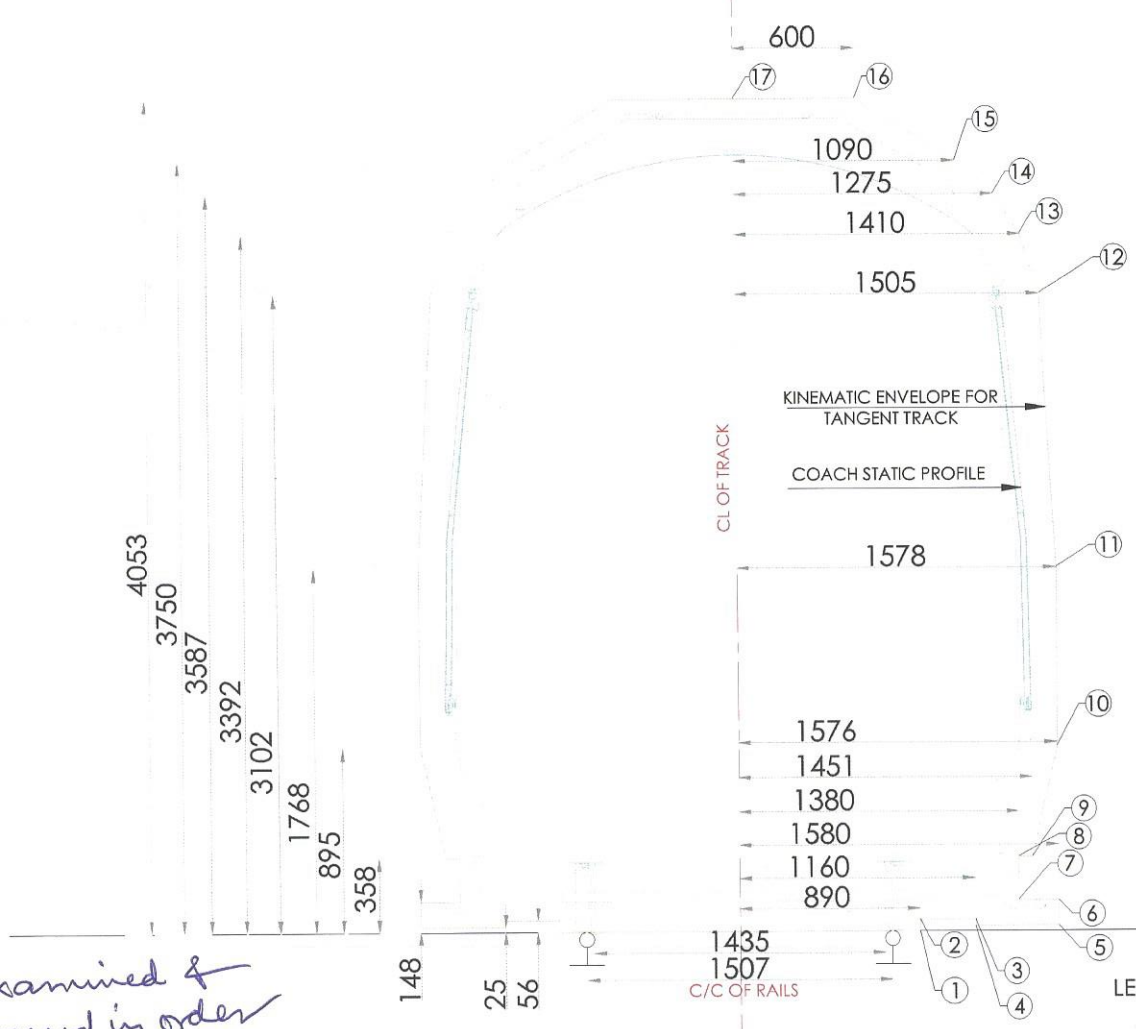
REFERENCE PARA NO.: 1.5

MEGA (AHMEDABAD METRO RAIL)

METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

KINEMATIC ENVELOPE FOR AT-GRADE & ELEVATED SECTION WITH BALLASTLESS TRACK ON LEVEL/CONSTANT GRADE (TANGENT TRACK) OUTSIDE STATION



COORDINATES:

POINT	X	Y
1	890	0
2	890	56
3	1160	56
4	1160	25
5	1580	25
6	1580	148
7	1380	148
8	1380	358
9	1451	358
10	1576	895
11	1578	1768
12	1505	3102
13	1410	3392
14	1275	3587
15	1090	3750
16	600	4053
17	0	4053

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. COACH SIZE W-2900, H-3980.
5. THE KINEMATIC ENVELOPE IS FOR DESIGN SPEED OF 90 KMPH WITH MAXIMUM PERMISSIBLE TOLERANCE FOR TRACK & ROLLING STOCK. THE KINEMATIC ENVELOPE AND STRUCTURE GAUGE WILL BE ALSO VALID FOR NEW ROLLING STOCK HAVING SIMILAR SUSPENSION SYSTEM AND DIMENSIONS.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 0KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

Examined & Found in order
25/9/18
ए.डी.ई. / यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Project Directorate
03/10/18

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

DRAWING NO. : MEGA/GEN/SOD/UND-02

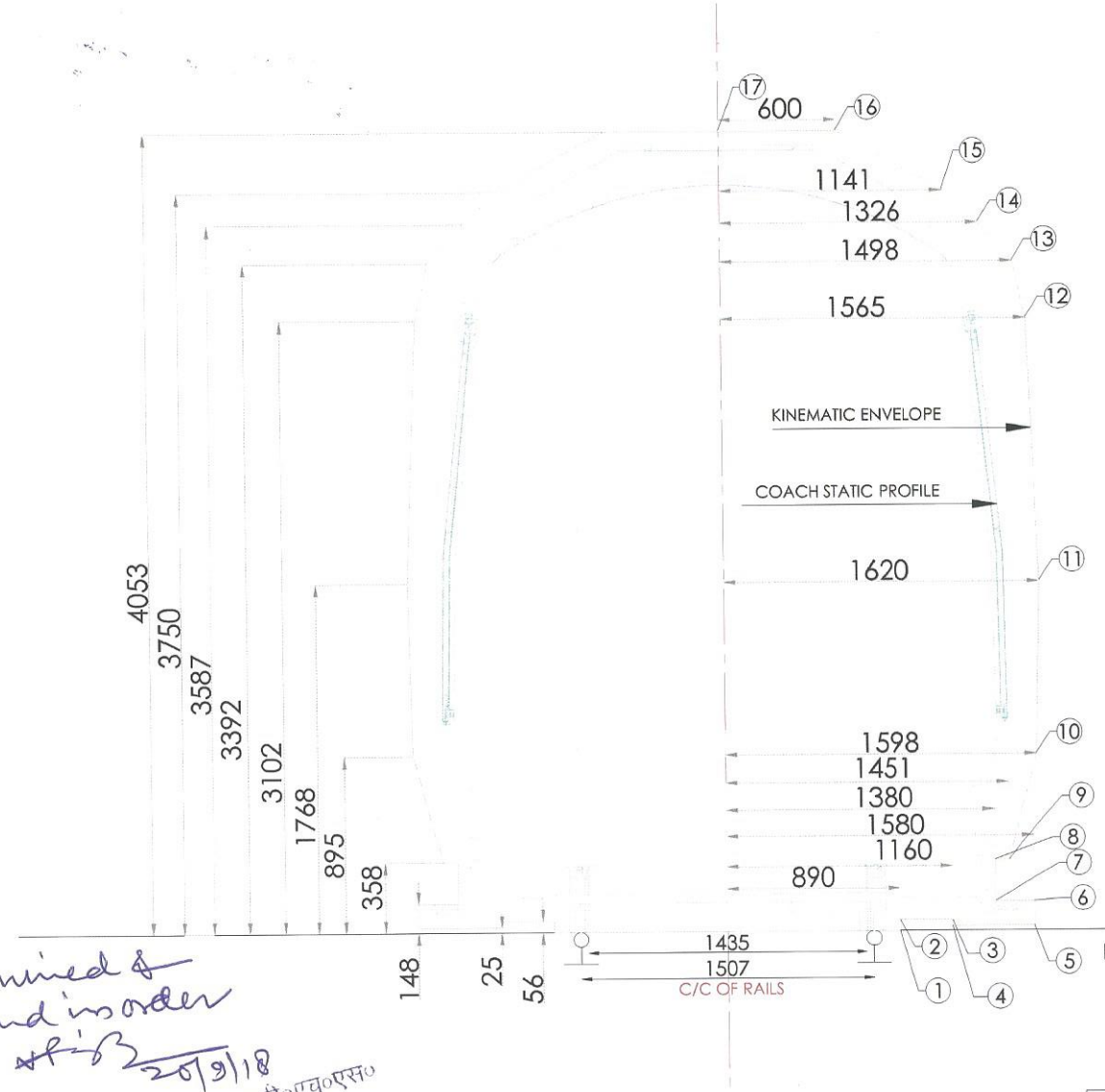
REFERENCE PARA NO.: 1.5

MEGA (AHMEDABAD METRO RAIL)

METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

KINEMATIC ENVELOPE FOR UNDERGROUND SECTION WITH BALLASTLESS TRACK ON LEVEL/CONSTANT GRADE (TANGENT TRACK) OUTSIDE STATION



COORDINATES:

POINT	X	Y
1	890	0
2	890	56
3	1160	56
4	1160	25
5	1580	25
6	1580	148
7	1380	148
8	1380	358
9	1451	358
10	1598	895
11	1620	1768
12	1565	3102
13	1498	3392
14	1326	3587
15	1141	3750
16	600	4053
17	0	4053

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. COACH SIZE W-2900, H-3980.
5. THE KINEMATIC ENVELOPE IS FOR DESIGN SPEED OF 90 KMPH WITH MAXIMUM PERMISSIBLE TOLERANCE FOR TRACK & ROLLING STOCK. THE KINEMATIC ENVELOPE AND STRUCTURE GAUGE WILL BE ALSO VALID FOR NEW ROLLING STOCK HAVING SIMILAR SUSPENSION SYSTEM AND DIMENSIONS.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 100KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

Examined & Found in order
20/9/18
ए.डी.ई./यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, LUCKNOW-226011

Metro Link Express for Gandhinagar and Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

Project Directorate Approved by Railway Board 23/10/18

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

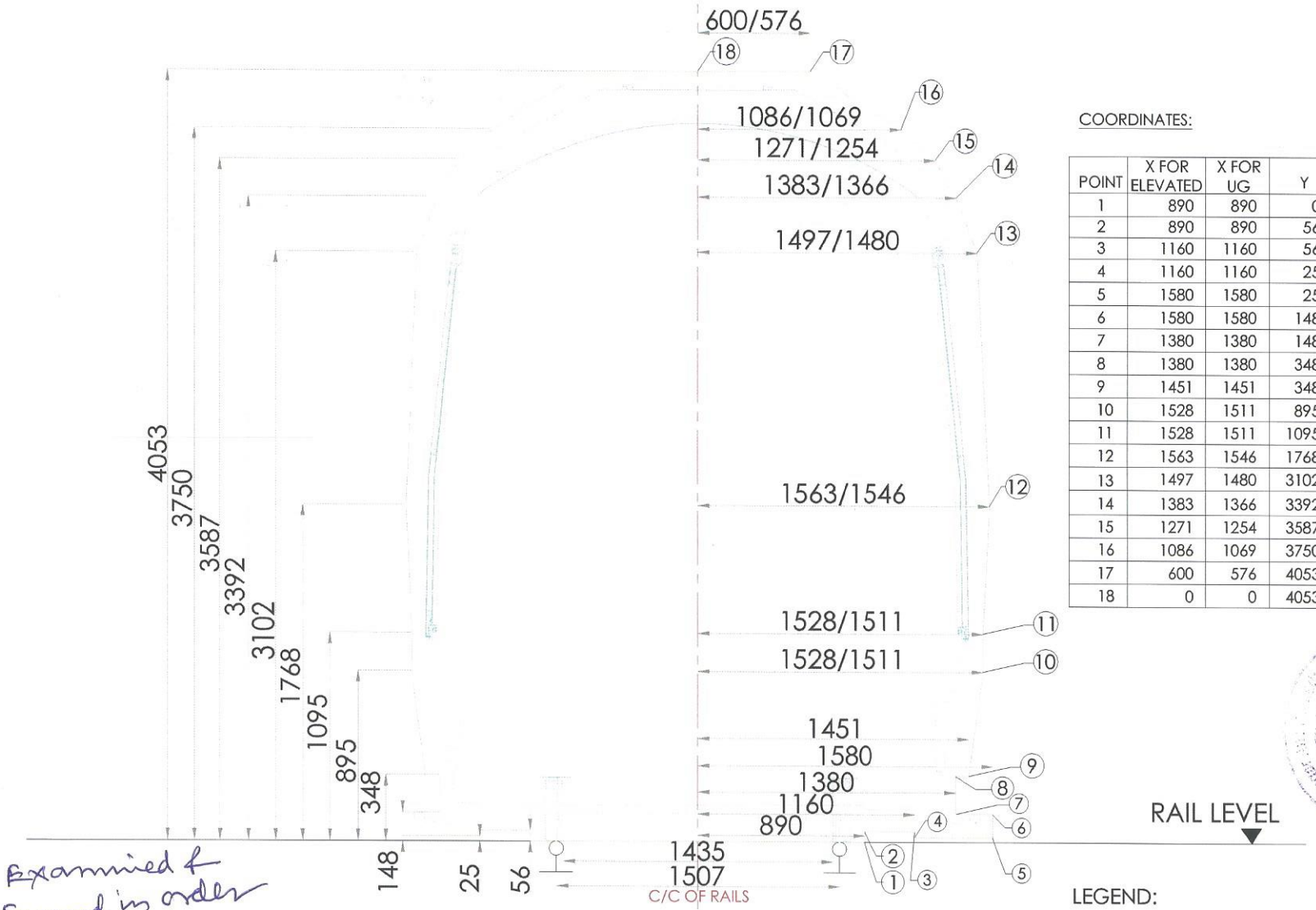
DRAWING NO. : MEGA/GEN/SOD/ATG-01

REFERENCE PARA NO.: 1.5

MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

KINEMATIC ENVELOPE FOR SURFACE (AT-GRADE) SECTION BALLASTED TRACK ON LEVEL/CONSTANT GRADE (TANGENT TRACK) OUTSIDE STATION



COORDINATES:

POINT	X FOR ELEVATED	X FOR UG	Y
1	890	890	0
2	890	890	56
3	1160	1160	56
4	1160	1160	25
5	1580	1580	25
6	1580	1580	148
7	1380	1380	148
8	1380	1380	348
9	1451	1451	348
10	1528	1511	895
11	1528	1511	1095
12	1563	1546	1768
13	1497	1480	3102
14	1383	1366	3392
15	1271	1254	3587
16	1086	1069	3750
17	600	576	4053
18	0	0	4053

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. DESIGN SPEED OVER PLATFORM LINES SHALL NOT EXCEED 70KMPH
5. COACH SIZE W-2900, H-3980.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 70KMPH FOR ELEVATED/ AT-GRADE SECTION AND 0KMPH FOR UNDERGROUND SECTION

LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

Examined & found in order
20/9/18

ए.डी.ई. / यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Metro Link Express for Gandhinagar & Ahmedabad (MEGA) Co. Ltd. Underground Project Gandhinagar

Director

03/10/18

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

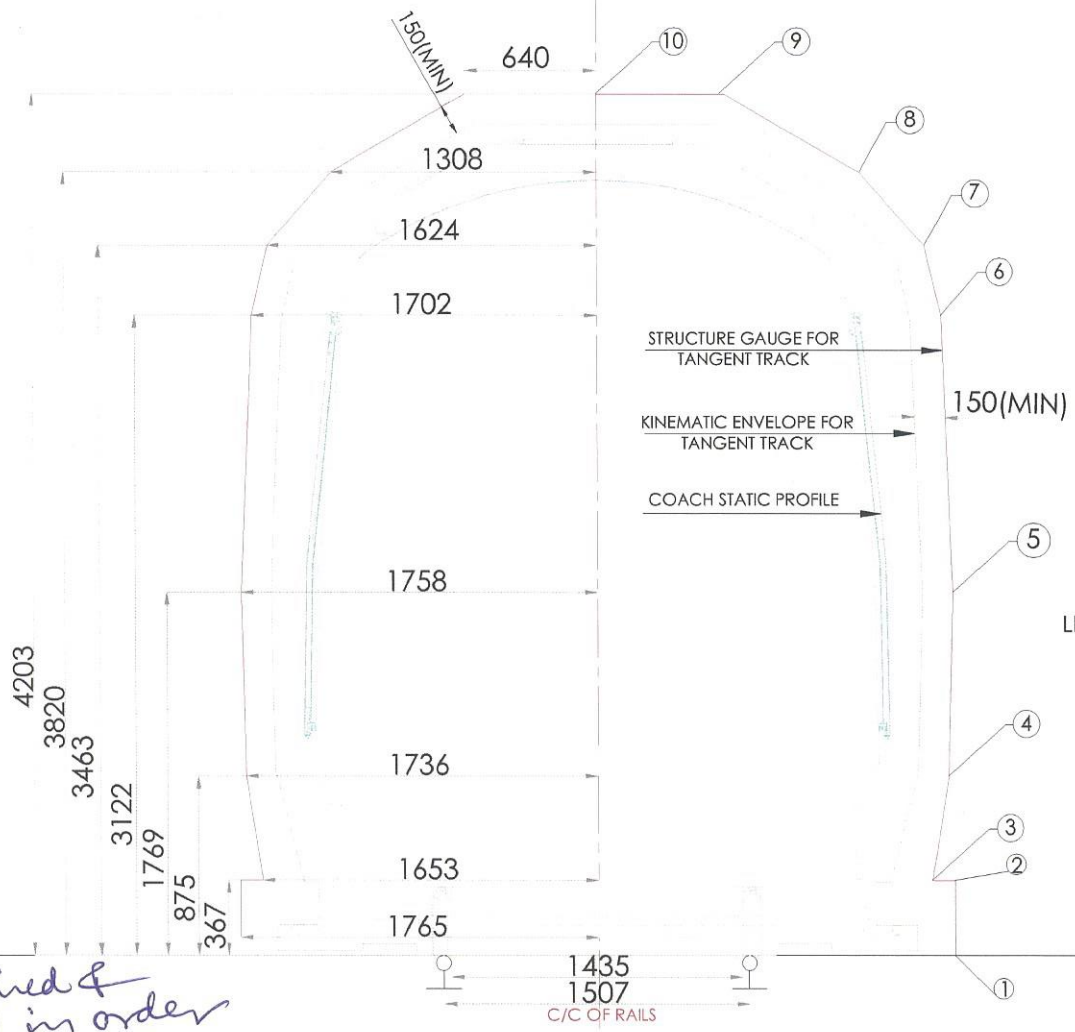
SCALE: Not to Scale

DRAWING NO. : MEGA/GEN/SOD/ELE & UND-70 KMPH | REFERENCE PARA NO.: 1.5

MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

KINEMATIC ENVELOPE FOR UNDERGROUND & AT-GRADE SECTION AND ELEVATED SECTION WITH BALLASTLESS TRACK OVER PLATFORM LINE ON LEVEL/CONSTANT GRADE (TANGENT TRACK) (DESIGN SPEED - 70KMPH)



COORDINATES:

POINT	X	Y
1	1765	0
2	1765	367
3	1653	367
4	1736	875
5	1758	1769
6	1702	3122
7	1624	3463
8	1308	3820
9	640	4203
10	0	4203

LEGEND:

- KINEMATIC ENVELOPE OF COACH
- STATIC PROFILE OF COACH
- STRUCTURE GAUGE

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. MIN. CLEARANCE BETWEEN KINEMATIC ENVELOPE & STRUCTURE GAUGE IS 150mm
5. COACH SIZE W-2900, H-3980.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 100KMPH.

Examined & Found in order
20/9/18
ए.डी.ई./यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Project Directorate Railway Board Approved on 03/10/18

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

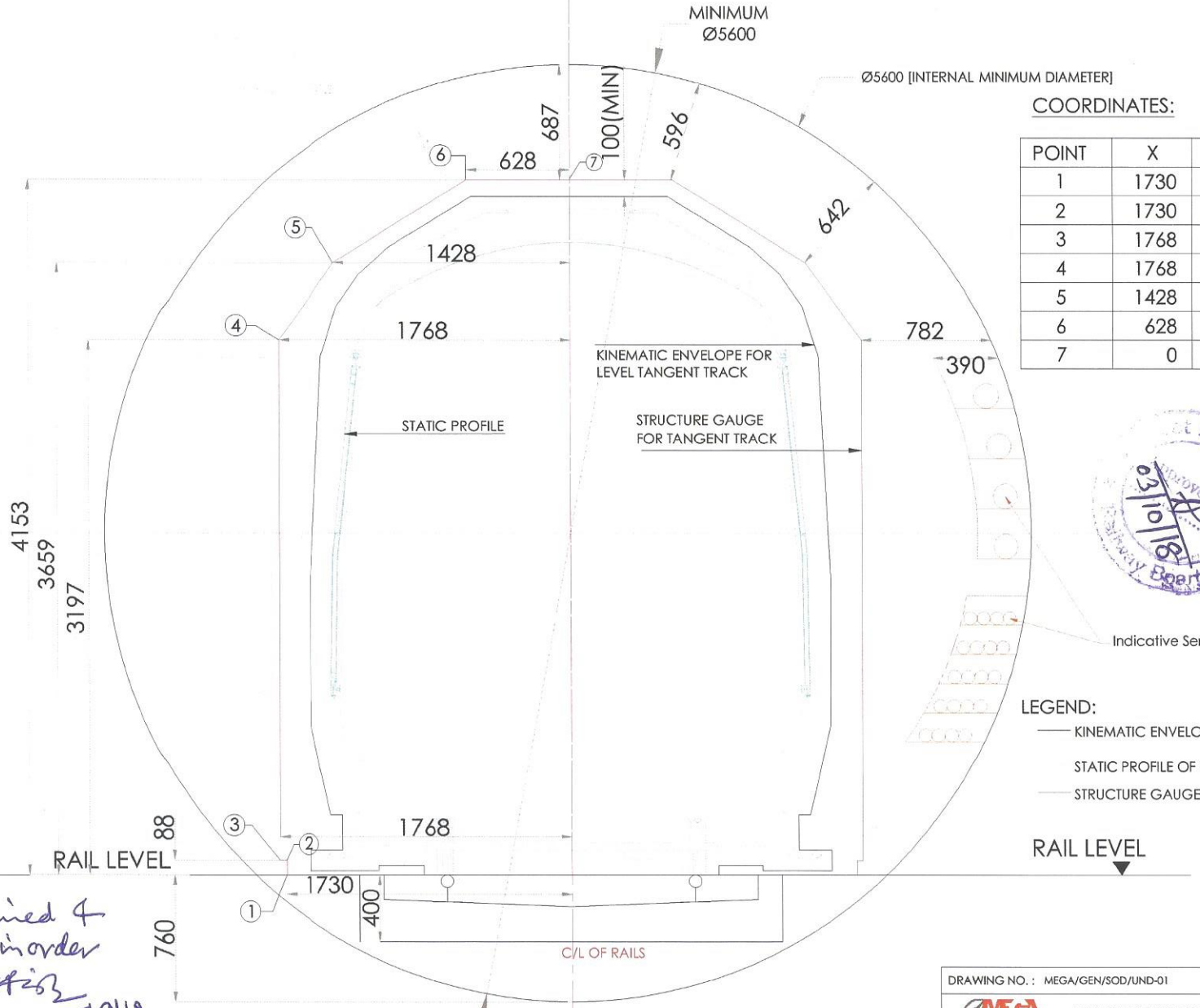
DRAWING NO. : MEGA/GEN/SOD/ELE-02

REFERENCE PARA NO.: 1.4 B & 1.6.2

(AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

STRUCTURE GAUGE ON ELEVATED & AT-GRADE SECTION BALLASTLESS TRACK ON LEVEL/CONSTANT GRADE TRACK (TANGENT TRACK) OUTSIDE STATION



COORDINATES:

POINT	X	Y
1	1730	0
2	1730	88
3	1768	88
4	1768	3197
5	1428	3659
6	628	4153
7	0	4153

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. COACH SIZE W-2900, H-3980.
5. THE KINEMATIC ENVELOPE IS FOR A DESIGN SPEED OF 90 KMPH WITH MAXIMUM PERMISSIBLE TOLERANCE FOR TRACK & ROLLING STOCK. THE KINEMATIC ENVELOPE AND STRUCTURE GAUGE WILL BE ALSO VALID FOR NEW ROLLING STOCK HAVING SIMILAR SUSPENSION SYSTEM AND DIMENSIONS.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 0KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

STRUCTURE GAUGE

Examined & Found in order
20/9/18
ए.डी.इ./यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Director
Approved on 03/10/18
Railway Board

Metro Link Express for Gandhinagar & Ahmedabad (MEGA) Co. Ltd.
A Govt. of Gujarat Undertaking

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

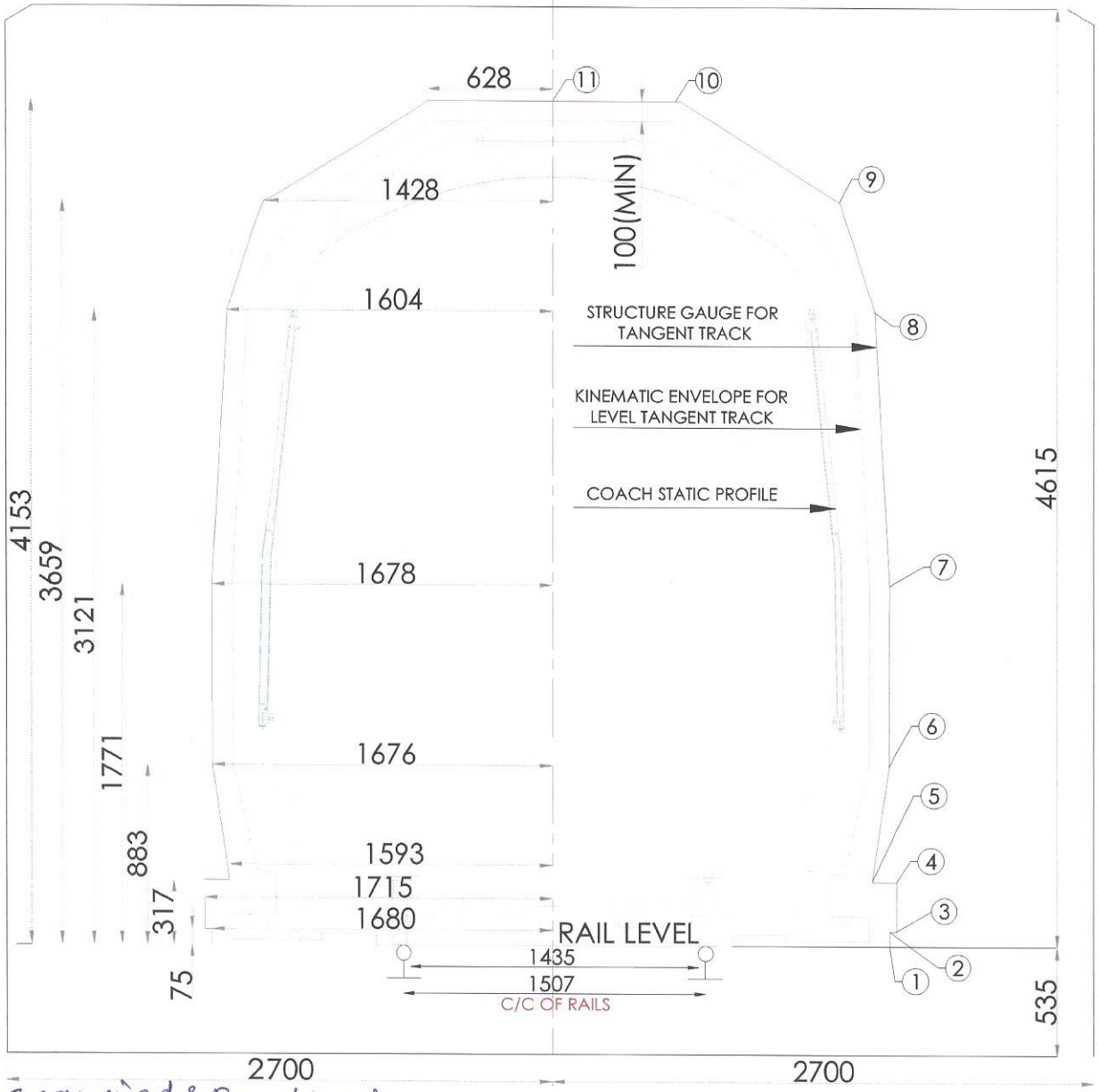
SCALE: Not to Scale

DRAWING NO. : MEGA/GEN/SOD/UND-01 | REFERENCE PARA NO.: 1.4 A 1 &1.6.1

MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

STRUCTURE GAUGE FOR UNDERGROUND SECTION (CIRCULAR TUNNELS) WITH BALLASTLESS TRACK ON LEVEL/CONSTANT GRADE (TANGENT TRACK)



COORDINATES:

POINT	X	Y
1	1680	0
2	1680	75
3	1715	75
4	1715	317
5	1593	317
6	1676	883
7	1678	1771
8	1604	3121
9	1428	3659
10	628	4153
11	0	4153

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. CANT WILL BE PROVIDED BY RAISING OUTER RAIL
4. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
5. MIN. CLEARANCE BETWEEN KINEMATIC ENVELOPE & STRUCTURE GAUGE IS 100mm
6. COACH SIZE W-2900, H-3980.
7. THE KINEMATIC ENVELOPE IS FOR A DESIGN SPEED OF 90 KMPH WITH MAXIMUM PERMISSIBLE TOLERANCE FOR TRACK & ROLLING STOCK. THE KINEMATIC ENVELOPE AND STRUCTURE GAUGE WILL BE ALSO VALID FOR NEW ROLLING STOCK HAVING SIMILAR SUSPENSION SYSTEM AND DIMENSIONS.
8. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 0KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

STRUCTURE GAUGE

Ahmedabad (MEGA) Co. Ltd. • Metro Link Express for Gandhinagar • A Govt. of Gujarat Undertaking

Project Directorate Approved on 30/10/18 Railway Board

Examined & found in order
20/9/18
म.डी.इ. / यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

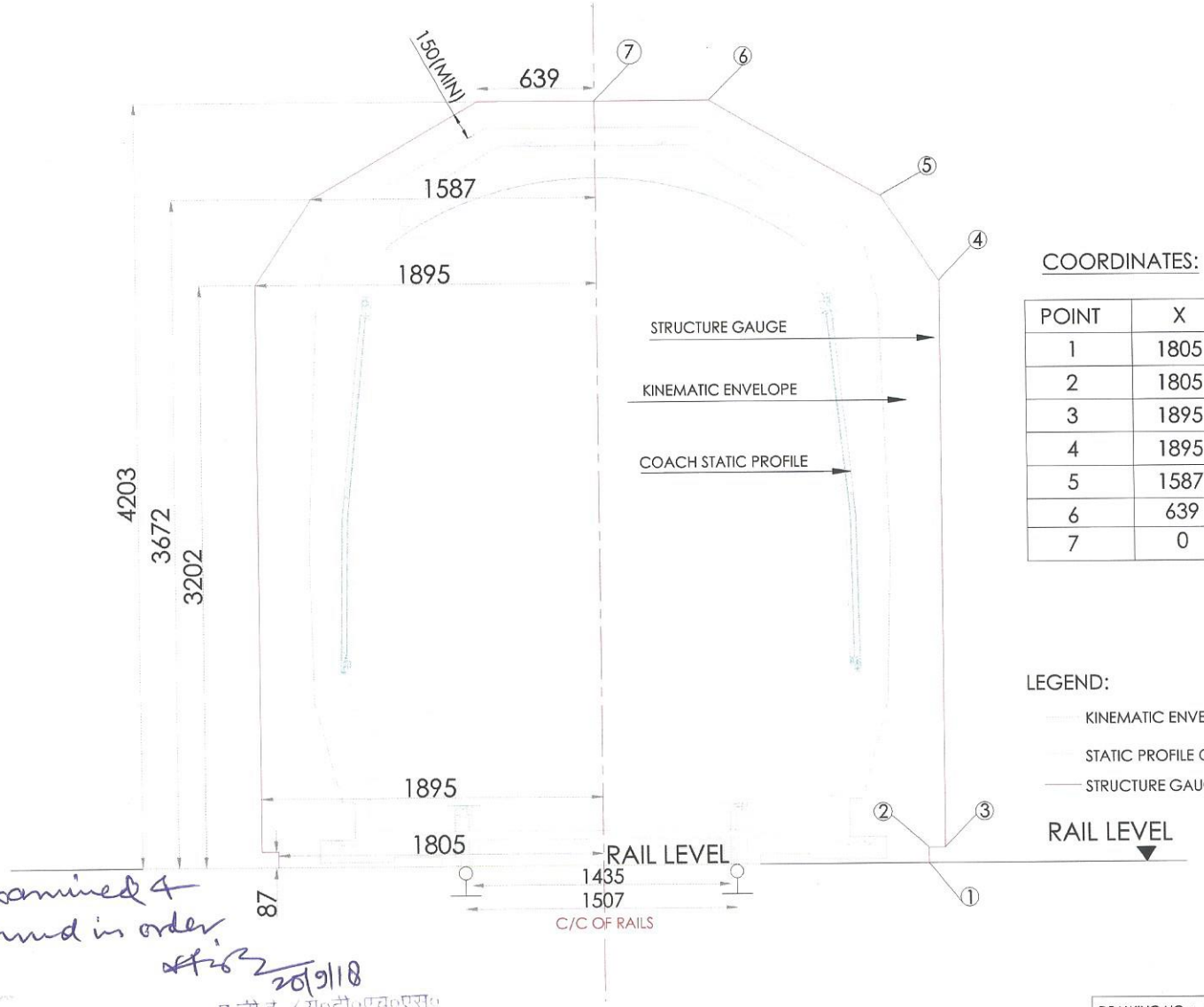
SCALE: Not to Scale

DRAWING NO. : MEGA/GEN/SOD/UND-03 | REFERENCE PARA NO.: 1.4 A 2 & 1.6.1

MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

STRUCTURE GAUGE FOR UNDERGROUND SECTION (RECTANGULAR BOX TUNNELS) WITH BALLASTLESS TRACK ON LEVEL/CONSTANT GRADE (TANGENT TRACK)



Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. MIN. CLEARANCE BETWEEN KINEMATIC ENVELOPE & STRUCTURE GAUGE IS 150mm
5. COACH SIZE W-2900, H-3980.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 100KMPH.

COORDINATES:

POINT	X	Y
1	1805	0
2	1805	87
3	1895	87
4	1895	3202
5	1587	3672
6	639	4203
7	0	4203

LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

STRUCTURE GAUGE

Examined & found in order
20/9/18
ए.डी.ई. / यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Project Directorate Railway Board 03/10/18

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

DRAWING NO.: MEGA/GEN/SOD/ATG-02

REFERENCE PARA NO.: 1.4 C & 1.6.3

MEGA (AHMEDABAD METRO RAIL)

METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

STRUCTURE GAUGE FOR AT-GRADE SECTION (BALLASTED) TRACK ON LEVEL/CONSTANT TRACK (TANGENT TRACK) OUTSIDE STATION

$\tan\theta = (r-D_1)/(g/2)$

$\theta = \tan^{-1}[(r-D_1)/(g/2)]$

$\sin\alpha = cant/g$

$\alpha = \sin^{-1}(cant/g)$

Chord $C_1C_2 = 2 \times [(r-D_1)/\sin\theta) \times (\sin\alpha/2)]$

$X = C_1C_2 \times \cos(90-\theta-\alpha/2)$

$= 2 \times [(r-D_1)/\sin\theta \times (\sin\alpha/2)] \times \cos(90-\theta-\alpha/2)$

$Y = 2 \times [(r-D_1)/\sin\theta \times (\sin\alpha/2)] \times \sin(90-\theta-\alpha/2)$

Where 'r' is internal radius of tunnel,

D_1 = depth from Rail level to invert of tunnel

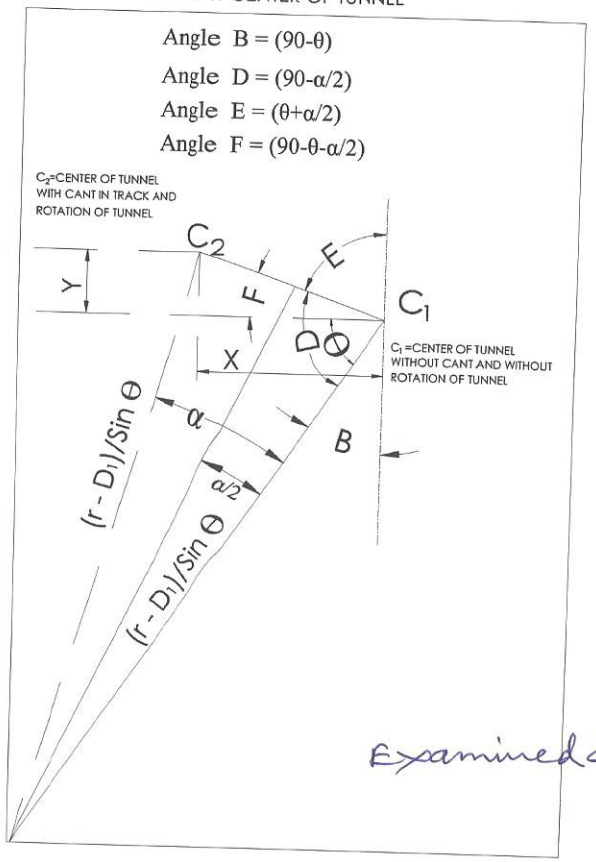
g = distance between centers of rails

= 1507 mm

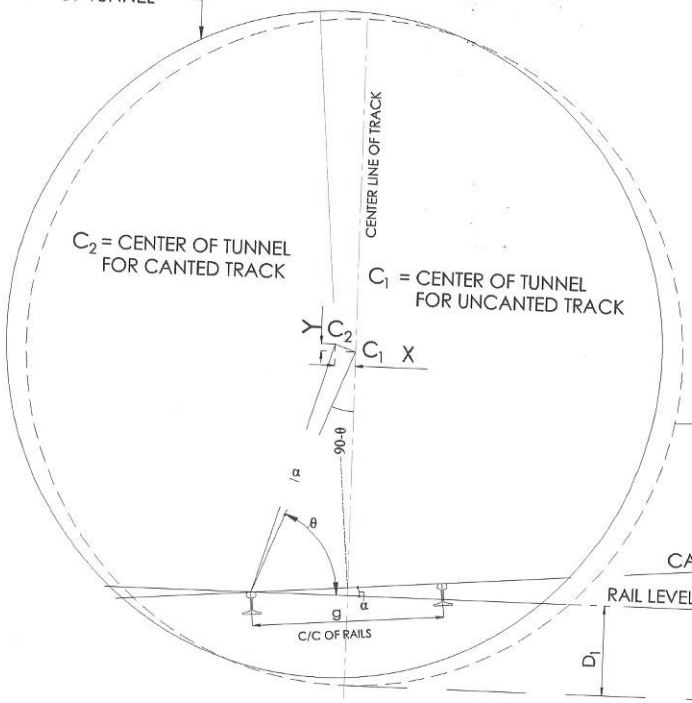
Note:

1. THE CIRCULAR TUNNEL IS ROTATED ABOUT CENTER OF TOP OF INNER RAIL.
2. FOR VALUES OF CLEARANCE 'X' AND 'Y' FOR VARIOUS VALUES OF CANT, REFER TO APPENDIX - 4

DETAIL AT CENTER OF TUNNEL



POSITION OF TUNNEL WITH CANT AND ROTATION OF TUNNEL



Examined & found in order
20/9/18
ए.डी.इ. / यू०टी०एच०एस०
ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Project Directorate
03/10/18
Board

Ahmedabad (MEGA) Co. Ltd
A Govt. of Gujarat undertaking
Metro Link Express for Gandhinagar

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

DRAWING NO. : MEGA/GEN/SOD/UND-04

REFERENCE PARA NO.: 1.7.1B.(b) AND 1.7.2 B.(b)

MEGA (AHMEDABAD METRO RAIL)

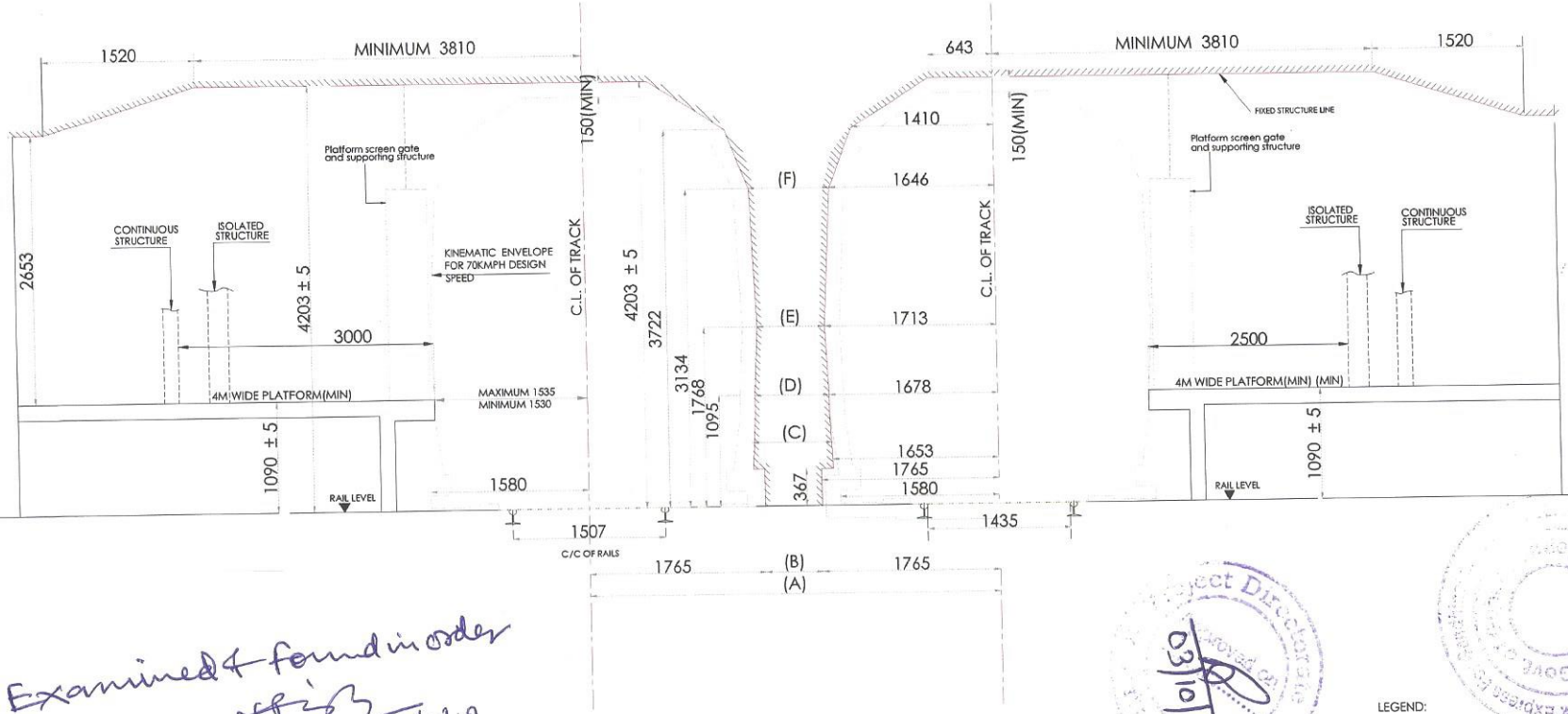
METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

SHIFT OF THE CENTER OF CIRCULAR TUNNEL DUE TO ROTATION OF TUNNEL FOR CANT

MINIMUM CLEARANCES BETWEEN ADJOINING STRUCTURE GAUGES FOR DIFFERENT TRACK CENTERS

TRACK CENTER (A)	B	C	D	E	F
3750	220	444	394	324	659
3800	270	494	444	374	709
3900	370	594	544	474	609
4000	470	694	644	574	709
4100	570	794	744	674	809
4150	620	844	794	724	859
4200	670	894	844	774	909
4250	720	944	894	824	959



Note:

1. ALL DIMENSION ARE IN mm.
2. CLEARANCE FOR CURVE SHALL BE EXTRA. HOWEVER THE TRACK CENTERS (A) WILL NOT BE AFFECTED FOR CURVES OF RADII 1000 M AND FLATTER IF THERE IS NO STRUCTURE BETWEEN THE TRACKS. IN CASE OF A STRUCTURE BETWEEN THE TRACKS, (A) SHALL BE CALCULATED.
3. VERTICAL THROW DUE TO VERTICAL CURVE IF ANY SHALL BE EXTRA
4. STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION
5. THE TRACK CENTERS DOES NOT ACCOUNT FOR PROVISION OF CROSS OVERS, STRUCTURES & OTHER SERVICES, IF REQUIRED, IN BETWEEN THE TRACKS
6. FOR KINEMATIC ENVELOPE OVER PLATFORM LINE REFER TO DRAWING NO. MEGA/GEN/SOD/ELE & UND-DESIGN SPEED 70KMPH AT PAGE 45
7. FOR PLATFORM SCREEN GATE DETAILS REFER TO DRAWING NO MEGA/GEN/SOD/PSD-2 AT PAGE NO 55
8. DESIGN SPEED OVER PLATFORM LINES SHALL NOT EXCEED 70KMPH.
9. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 70KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STRUCTURE GAUGE

Examined & found in order
20/9/18
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ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Project Director's Approval on Railway Board
03/10/18

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

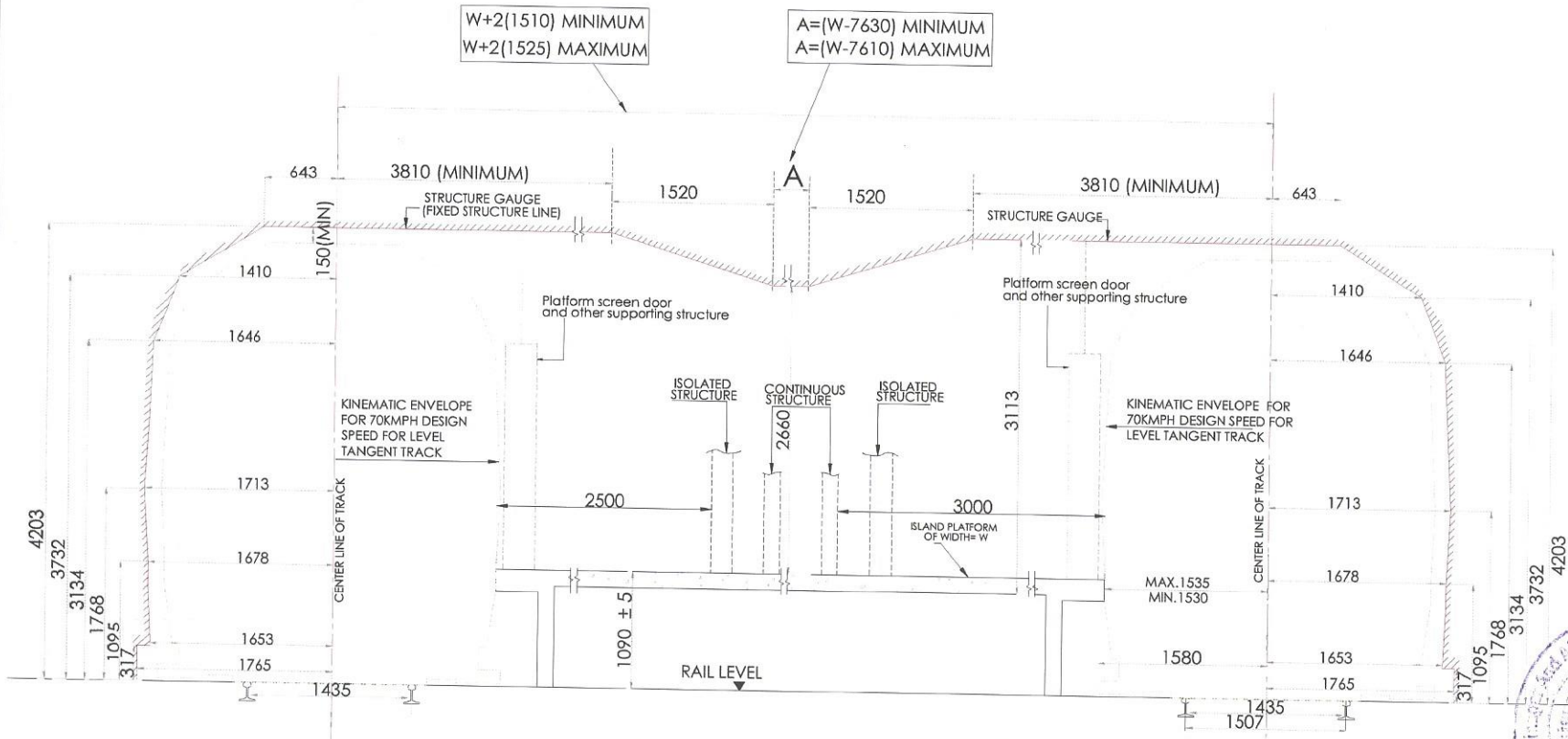
DRAWING NO. : MEGA/GEN/SOD/ELE-03

REFERENCE PARA NO.: 2.2.5

MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

STRUCTURE GAUGE FOR ELEVATED/AT-GRADE STATION WITH 4m WIDE (MINIMUM) SIDE PLATFORMS WITH BALLASTLESS TRACK ON LEVEL/CONSTANT GRADE TRACK WITH/WITHOUT PLATFORM SCREEN GATE



Note:

1. ALL DIMENSION ARE IN mm.
2. FOR STATION ON CURVE, EXTRA CLEARANCES FOR CURVATURE AND CANT SHALL BE PROVIDED
3. VERTICAL THROW DUE TO VERTICAL CURVE IF ANY SHALL BE EXTRA
4. THE STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
5. FOR KINEMATIC ENVELOPE OVER PLATFORM LINE REFER TO DRAWING NO. MEGA/GEN/SOD/ELE & UND-DESIGN SPEED 70KMPH AT PAGE 45
6. FOR PLATFORM SCREEN GATE DETAILS REFER TO DRAWING NO MEGA/GEN/SOD/PSD-2 AT PAGE NO 55
7. DESIGN SPEED OVER PLATFORM LINES SHALL NOT EXCEED 70KMPH
8. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 70KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STRUCTURE GAUGE

Examined & found in order

20/9/18

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ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Approved on 03/10/18

Metro Link Express for Gandhinagar and Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

DRAWING NO. : MEGA/GEN/SOD/ELE-04	REFERENCE PARA NO.: 2.2.5

MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

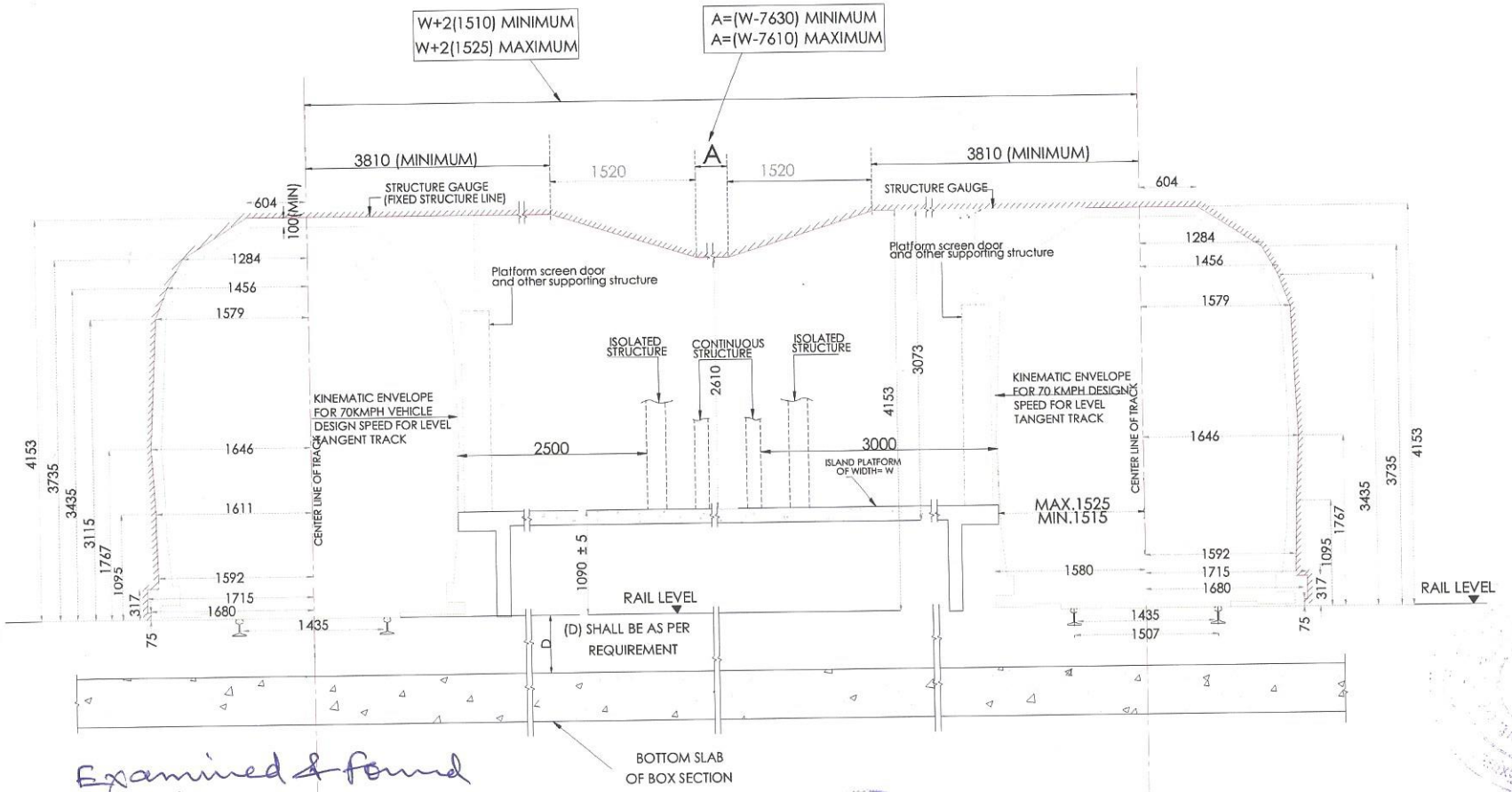
STRUCTURE GAUGE FOR ELEVATED/AT-GRADE STATION WITH AN ISLAND PLATFORM WITH BALLASTLESS TRACK ON LEVEL/CONSTANT GRADE (TANGENT TRACK) WITH/WITHOUT PLATFORM SCREEN GATE

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale



Note:

1. ALL DIMENSION ARE IN mm.
2. FOR STATION ON CURVE, EXTRA CLEARANCES FOR CURVATURE AND CANT SHALL BE PROVIDED
3. VERTICAL THROW DUE TO VERTICAL CURVE IF ANY SHALL BE EXTRA
4. THE STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
5. FOR KINEMATIC ENVELOPE, REFER TO DRAWING NO.-MEGA/GEN/SOD/ELE & UND-DESIGN SPEED 70KMPH AT PAGE 45
6. PLATFORM SCREEN DOOR SHOWN IN DRAWING NO MEGA/GEN/SOD/PSD-1 AT PAGE 54, PLATFORM SCREEN GATE CAN ALSO BE USED IN PLACE OF PLATFORM SCREEN DOOR.
7. DESIGN SPEED OVER PLATFORM LINES SHALL NOT EXCEED 70KMPH
8. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 0KMPH.

LEGEND:

KINEMATIC ENVELOPE OF COACH

STRUCTURE GAUGE

Examined & found in order

27/9/18

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ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

03/10/18

DRAWING NO. : MEGA/GEN/SOD/UND-05	REFERENCE PARA NO.: 2.2.5

MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.

STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION

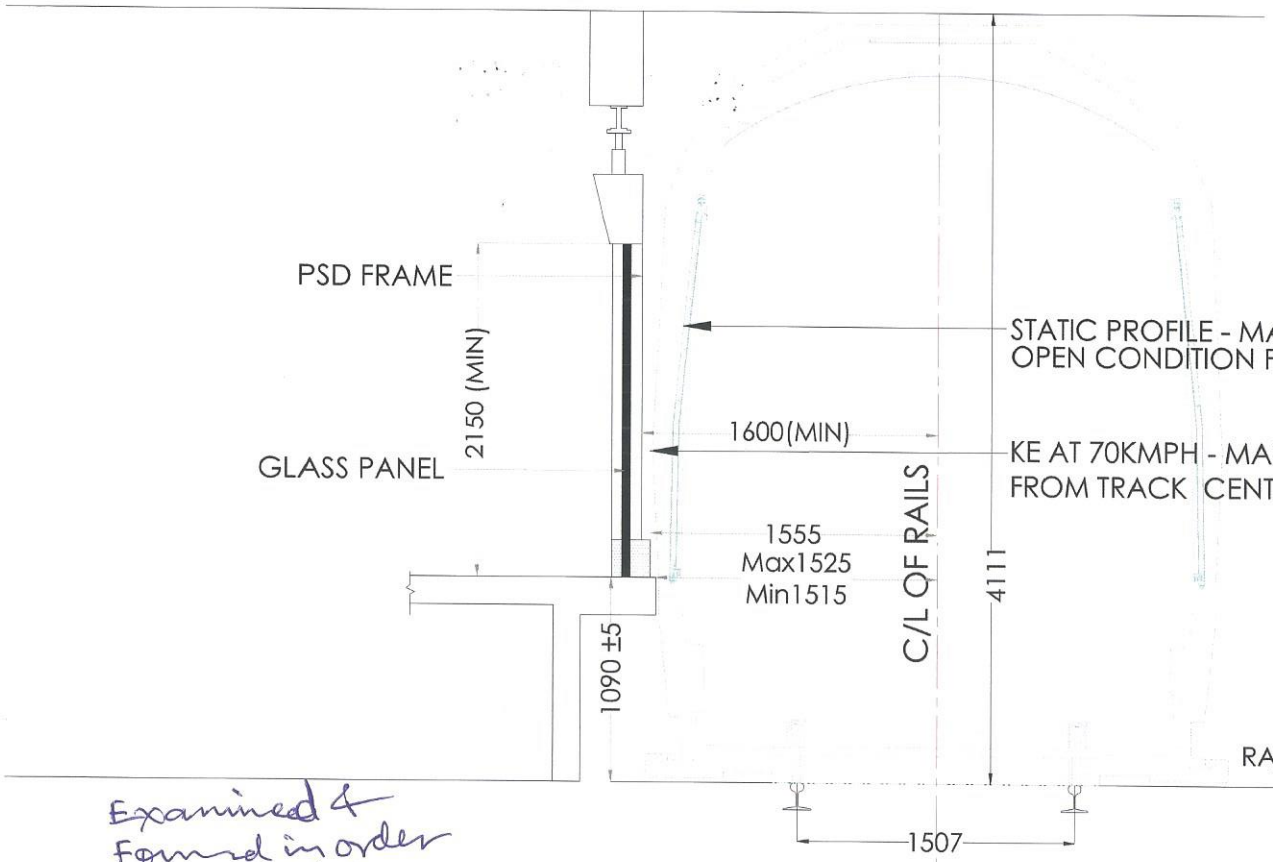
MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

STRUCTURE GAUGE FOR UNDERGROUND STATION WITH AN ISLAND PLATFORM ON LEVEL/CONSTANT GRADE (TANGENT TRACK) WITH/WITHOUT PLATFORM SCREEN DOOR



LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. COACH SIZE W-2900, H-3980.
5. FOR CURVED PLATFORM, THESE DIMENSIONS TO BE INCREASED IN TERMS OF TABLE
6. DESIGN SPEED OVER PLATFORM LINES SHALL NOT EXCEED 70KMPH
7. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 0KMPH.

Examined & Found in order
20/9/18
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ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
R.D.SO. (Ministry of Railways)
मानक नगर, लखनऊ-226011
Manak Nagar, Lucknow-226011

Metro Link Express for Gandhinagar And Ahmedabad (MEGA) Co. Ltd. A Govt. of Gujarat Undertaking

Project Directorate Approved on 6/10/18 Railway Board

DRAWING NO. : MEGA/GEN/SOD/PSD-1	REFERENCE PARA NO.: 1.5
(AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.	
STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION	

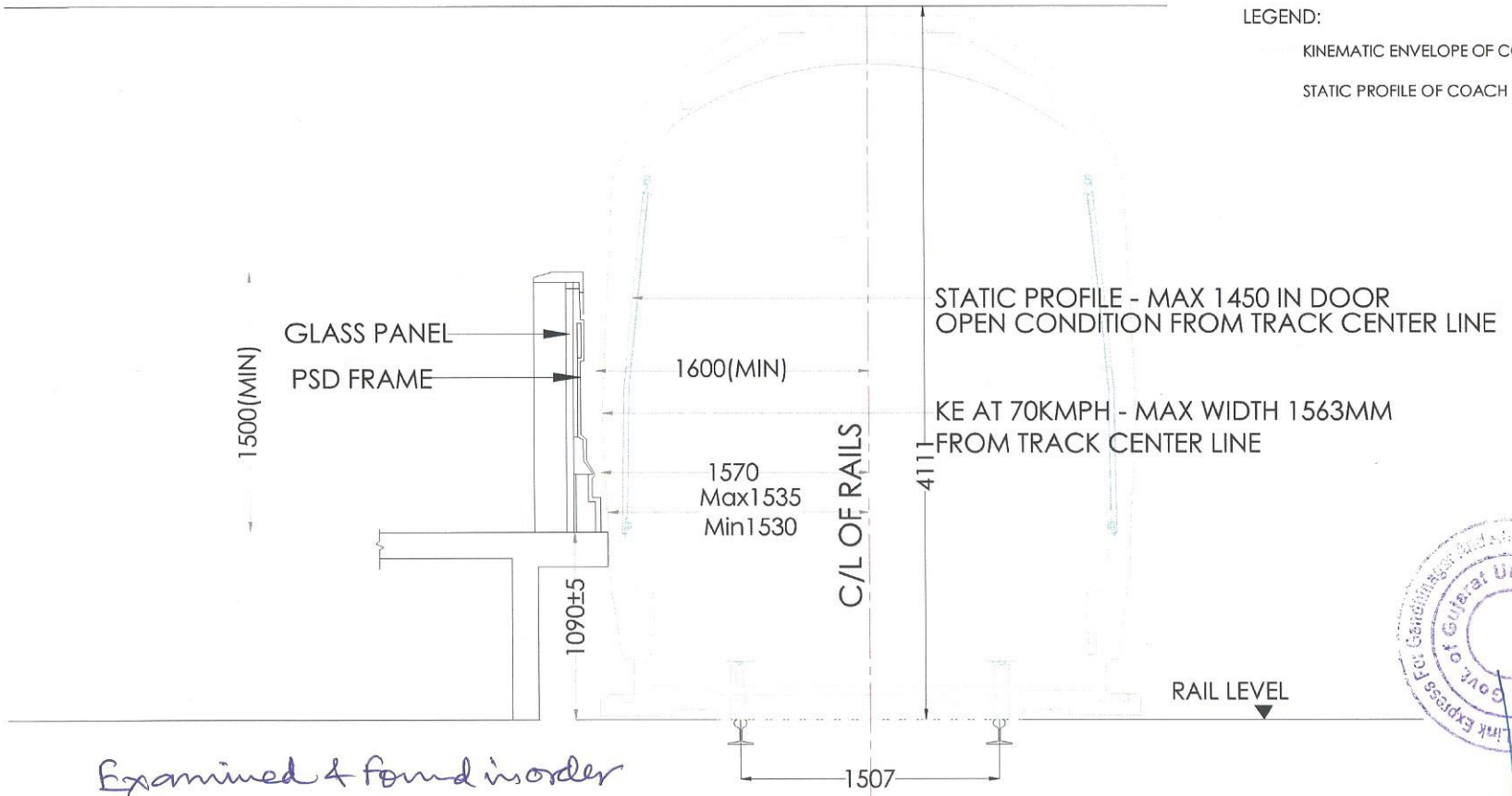
MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

STATIC AND KINEMATIC ENVELOPE FOR UNDERGROUND STATIONS WITH PLATFORM SCREEN DOOR



LEGEND:

KINEMATIC ENVELOPE OF COACH

STATIC PROFILE OF COACH

Note:

1. ALL DIMENSIONS ARE IN mm.
2. HORIZONTAL AND VERTICAL CLEARANCES DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA.
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. COACH SIZE W-2900, H-3980.
5. DESIGN SPEED OVER PLATFORM LINES SHALL NOT EXCEED 70KMPH.
6. THE KINEMATIC ENVELOPE IS VALID FOR A WIND SPEED OF 70KMPH.

Examined & found in order
20/9/18
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ADE/U.T.H.S.
अ० अ० मा० सं० (रेल मंत्रालय)
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Manak Nagar, Lucknow-226011

Metro Link Express For Gandhinagar and Ahmedabad (MEGA) Co. Ltd. Govt. of Gujarat Undertaking

Project Directorate Railway Board
03/10/18

DRAWING NO. : MEGA/GEN/SOD/PSD-2	REFERENCE PARA NO.: 1.5
MEGA (AHMEDABAD METRO RAIL) METRO LINK EXPRESS GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LTD.	
STANDARD GAUGE (1435) - 750 VOLT D.C. TRACTION	

MARK	DATE	DETAILS OF REVISION

CONSULTANTS:

DATE: AUGUST – 2018

SCALE: Not to Scale

PLATFORM GATE AT ELEVATED/AT-GRADE (PLATFORM) ON LEVEL/CONSTANT GRADE (TANGENT TRACK)