DRAFT

AUTOMOTIVE INDUSTRY STANDARD

Interchangeability dimensions for ensuring safe coupling between N3 category Haulage Tractors and T3 & T4 category Semi-Trailers

Date of hosting on website: 18th July 2017
Last date for comments: 10th August 2017

Note: Draft 5 was prepared incorporating agreed decisions in panel meeting held on 10th February 2017 at ARAI. Further as decided in 54th meeting of AISC, AISC secretariat received comments from M/s Ashok Leyland for better clarity on alternate test procedures, draft 6 is prepared after incorporating the comments for better clarity. (deletion in earlier text is shown in double strikethrough and addition in red font).
## CHECK LIST FOR PREPARING AUTOMOTIVE INDUSTRY STANDARD

**Draft AIS 091(Part 3): Interchangeability dimensions for ensuring safe coupling between N3 category Haulage Tractors and T3 & T4 category Semi-Trailers**

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>PARTICULARS</th>
<th>REMARKS</th>
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</thead>
</table>
| 1.      | Indicate details of the base reference standard. (e.g. ECE / EEC Directive/GTR etc.) | IS 8007: 2004  
| 2.      | Add an explanatory note indicating differences between the above standard and the draft, if any. | It appears that IS 8007 was intended to be engineering guideline standard. On the other hand, AIS-091(Part 3) has now been prepared is a type approval standard meant for individually approving tractors & semi-trailers for interchangeability.  
IS 8007 does not cover on trailer Kingpin or rubbing plate Height h2. |
| 3.      | Specify details of technical specifications to be submitted at the time of type approval relevant to the requirements of this standard covered. | Manufacturer has to give drawings /specifications indicating the 6 parameters to be checked for the family of tractors & semi-trailers in order that most appropriate variant can be chosen for evaluation of each parameter. |
| 4.      | Are the details of Worst Case Criteria covered? | Yes |
| 5.      | Are the performance requirements covered? | Yes |
| 6.      | Is there a need to specify dimensional requirements? | Yes |
| 7.      | If yes, are they covered? | Yes |
| 8.      | Is there a need to specify COP requirements?  
If yes, are they covered? | No |
| 9.      | Is there a need to specify type approval and routine test separately, as in the case of some of the Indian Standards?  
If yes, are they covered? | No |
<table>
<thead>
<tr>
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<th>Question</th>
<th>Answer</th>
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| 10. | If the standard is for a part / component or sub-system;  
   i) AIS-037 or ISI marking scheme be implemented for this part?  
   ii) Are there any requirements to be covered for this part when fitted on the vehicle? If yes, has a separate standard been prepared? | No, this is for vehicle level                                                                                                                                                                         |
| 11. | If the standard is intended for replacing or revising an already notified standard, are transitory provisions for re-certification of already certified parts/vehicles by comparing the previous test result, certain additional test, etc. required?  
   If yes, are they included? | IS 8007: 2004 was notified for implementation vide GSR 409(E) dated 18th June, 2014. Now with this replacement standard, new implementation date would need to be notified. |
| 12. | Include details of any other international or foreign national standards which could be considered as alternate standard. | Not available.                                                                                                                                                                                      |
| 13. | Are the details of accuracy and least counts of test equipment/meters required to be specified?  
   If yes, have they been included? | Yes  
   Yes                                                                                                                                                                                                  |
| 14. | What are the test equipment for establishing compliance? | These are covered in the standard                                                                                                                                                                  |
| 15. | If possible, identify such facilities available in India. | These facilities are available with test agencies                                                                                                                                                  |
| 16. | Are there any points on which special comments or information is to be invited from members?  
   If yes, are they identified? | Yes, inputs on current tractor semi-trailer compatibility practice were required for this standard. They have been appropriately included in this standard.                                             |
| 17. | Does the scope of standard clearly identify vehicle categories? | Yes                                                                                                                                                                                                   |
| 18. | Has the clarity of definitions been examined? | No specific definitions are required                                                                                                                                                                |
Status chart of the Standard to be used by the purchaser for updating the record

<table>
<thead>
<tr>
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<th>Revision</th>
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General remarks:
INTRODUCTION

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MoST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the secretariat of the AIS Committee, will publish this standard.

In the meeting related to IS 8007: 2004 held at ARAI on 30th Apr’16, it was discussed and agreed to make a derived AIS standard such that Tractors & Semi-trailers can be independently approved and still ensured to be interchangeable. Those requirements are now included in this standard with separate limits, test procedures & worst case criteria indicated for tractors & semi-trailers individually for each of the requirements.

The dimensional profile requirements for gooseneck portions of Semi-trailers have been incorporated in this standard as example from IS 8007: 2004. The reason for this is that gooseneck profiles on Semi-trailers in use in India vary vastly from the profile indicated in IS 8007: 2004. It was felt that as long as the semi-trailer met the interchangeability requirements of this standard and the safety requirements of AIS-113 “Code of Practice for Type Approval of Trailers / Semi-trailers of categories T2, T3 and T4 being towed by Motor Vehicles of categories N2 and N3”.
Interchangeability dimensions for ensuring safe coupling between N3 category Haulage Tractors and T3 & T4 category Semi-Trailers

1. SCOPE

1.1 This standard specifies dimensions that are aimed to provide interchangeability between N3 category Haulage Tractors and T3 & T4 category Semi-trailers which can be coupled to them. Therefore N3 category Haulage Tractors and T3 & T4 category Semi-trailers shall individually meet the requirements specified against them in this standard. The requirements of this standard are not applicable to tractors and semi-trailers with 4 or more axles.

2. REFERENCES


2.2 AIS-091 (Part 1) - Automotives Vehicles - Mechanical Coupling Components of Combinations of Vehicles other than Agricultural Tractors - Requirements

2.3 AIS-053 / IS 14272: 2011 - Automotive Vehicles-Types-Terminology

3. DEFINITIONS

N3 Haulage tractors & T3 and T4 category semi-trailers definitions given in AIS-053 / IS 14272: 2011 as amended from time to time shall apply.

3.1 Interchangeability: For the purpose of this standard interchangeability means tractor and semi-trailers which are having dimensions specified in this standard to be complied by the tractor and semi-trailers irrespective of the manufacturer.

4. REQUIREMENTS

4.0.1 Suitable Tractor which is complying with requirements of Cl. No. 4.3.1, Cl. No. 4.4.1, Cl. No. 4.5.1, Cl. No. 4.6.1 is required to carry out following tests:

a) Forward & rearward angles of inclination of semi-trailer with respect to Tractor
b) Free space between tractor & semi-trailer
c) Lateral inclination of Tractor Semi-trailer combination
d) Angle of articulation around vertical axis

Note: For checking Trailers, it is recommended that the tractor dimensions h1 (refer Cl. No. 4.1.1.1) and d1 (refer Cl. No. 4.2.1.1) be kept close to the Trailer dimensions h2 (refer Cl. No. 4.1.2.1) and d2 (refer Cl. No. 4.2.2.1) respectively.
4.1 Height of fifth wheel coupling resting face from ground reference plane

4.1.1 Height of fifth wheel coupling resting face of uncoupled Tractor (in case of Tractor)

4.1.1.1 Requirement: The height (h1) of fifth wheel coupling resting face on uncoupled Tractor from ground reference plane (GRP) (see Figure 1) shall be in the range of 1300 to 1500 mm.

4.1.1.2 Test procedure: Height of fifth wheel coupling resting face shall be checked from ground reference plane in uncoupled condition using a device with minimum 1 mm accuracy (e.g. Laser based equipment, engineering measurement tape, etc.).

4.1.2 Height of uncoupled Semi-trailer resting face:

4.1.2.1 Requirement: With the semi-trailer in unladen and uncoupled condition and the landing gear in fully open position, the height (h2) of the fifth wheel coupling resting face of the Semi-trailer shall be in range of 1300-1600 mm above ground reference plane (see Figure 1).

4.1.2.2 Test procedure: Semi-trailer shall be positioned with landing gear in fully open position. The height of Uncoupled Semi-trailer resting face from ground reference plane shall be measured using a device with minimum 1 mm accuracy (e.g. Laser based equipment, engineering measurement tape, etc.).
4.2 Forward clearance zone

4.2.1 Forward clearance zone between Tractor rear & kingpin centre to be complied by tractor manufacturer

4.2.1.1 Requirement: The distance (d1) between kingpin centre & rearmost point of the cabin (including any projections of any other items in the swing path of trailer front) shall be in the range of 1500-3000 mm (See Figure 2). Projections shall not affect required clearances or safe operation of tractor and semi-trailer combination.

4.2.1.2 Test procedure: The horizontal distance between vertical axis passing through kingpin and vertical plane passing through rearmost point of the cabin shall be measured using a device having minimum 1 mm accuracy (e.g. Laser based equipment, engineering measurement tape, etc.)

4.2.1.2.1 A flat plank may be placed on the back face of the cabin rear wall for this measurement and its thickness suitably accounted for.

4.2.1.2.2 Air intake Snorkel if any fitted near the outboard edges of cabin rear walls shall be ignored or removed for this test any projections behind the cabin to be considered and can be ignored if does not fall in front fitting radius.
4.2.2 **Forward clearance zone between Semi-trailer front & kingpin centre** to be complied by Semi-trailer manufacturer

4.2.2.1 **Requirement:** Maximum distance (d2) between kingpin centre & front most point of the Semi-trailer shall be 2040 mm (See Figure 2).

4.2.2.2 **Test procedure:** The vertical line passing through the point on the semi-trailer, most distant from the kingpin, shall fall within a swivel radius which does not exceed 2040 mm vertical axis passing through kingpin.

4.3 **Angles of forward & rearward inclination** (Refer Annexure I as guideline template and guideline process)

4.3.1 **Angles of forward & rearward inclination of Tractors with respect to semi-trailers**

4.3.1.1 **Requirement:** The Fifth wheel coupling fitted on the tractor under approval shall comply with requirements of Cl. No. 7.3.2 of Annex 5 of AIS-091 (Part 1).

The tractor and semi-trailer shall be constructed so that tractor and semitrailer components, except for those concerned with articulation, do not make contact with each other when semitrailer relative to tractor is on a forward inclination of 6° (ω₁) and rearward inclination of 7° (ω₂) (See Figure 2) when the vehicle is moving in a straight line.

4.3.1.2 **Test procedure:** The test procedure shall be as per practice to check compliance with Cl. No. 7.3.2 of Annex 5 of AIS-091 (Part 1)

Or

For the measurement of angle (ω₁) and (ω₂), the fifth wheel plate is assumed to be situated in a horizontal plane and tractor shall be set at the attitude which corresponds to the design laden condition when the tractor is standing on a horizontal plane. An template of the goose neck profile as per clause 4.8 below with max allowable width of trailer can be used to ensure the Rearward articulation. For forward inclination straight template can be with Max FoH (Front over hang) as per 4.2.2.1 can be used. Alternatively same can be ensured with any suitable trailer.

**One of the test methods above shall be chosen as opted by the Tractor manufacturer.**

4.3.2 **Forward & rearward angles of inclination of semi-trailer with respect to Tractor**

4.3.2.1 **Requirement:** The semi-trailer shall be capable of a forward inclination of 6° (ω₁) and rearward inclination of 7° (ω₂) (See Figure 2) when the vehicle is moving in a straight line.
4.3.2.2 **Test procedure:**

Goose neck profile of the trailer to be measured with respect to Kingpin Mounting plate. Goose neck located outside of the surface can be deemed approved for rearward inclination of tractors approved as per the clause 4.3.1 above. Trailer with FoH (Front over hang) within limit can be deemed approved for forward inclination with the tractor approved as per clause 4.3.1. Alternatively following test procedure can be followed.

4.3.2.2.1 The semi-trailer under approval shall be coupled to a (**Master suitable**) Tractor fitted with fifth wheel coupling compliant to Cl. No. 7.3.2 of Annex 5 of AIS-091 (Part 1)

4.3.2.2.2 The combination shall be loaded to GCW with all tractor & semi-trailer axle loads maintained to their fully loaded specifications.

4.3.2.2.3 With the combination vehicle facing downhill and with the Tractor placed on level ground and the semi-trailer placed on a gradient, it shall be possible to achieve a forward inclination of the semi-trailer of 6 degrees without any contact between tractor and semi-trailer parts.

4.3.2.2.4 With the combination vehicle facing uphill and with the Tractor placed on a gradient and the semi-trailer placed on level ground, it shall be possible to achieve a rearward inclination of the semi-trailer of 7 degrees without any contact between tractor and semi-trailer parts.

4.3.2.2.5 The tests in cl. nos. 4.3.2.2.3 & 4.3.2.2.4 shall be conducted using a device having an accuracy of minimum 0.2 degrees.

4.4 **Free space between tractor & semi-trailer to be complied by manufacturer of semi-trailers**

4.4.1 **Requirement:** With forward inclination of 6 degrees, the gap between the Semi-trailer & Tractor cabin (See Figure 2) along a horizontal axis on a plane 250 mm above king pin shall be 80 mm minimum (l4 at point x).

Or

l4 is the horizontal clearance between a cylindrical and conical surface having axis or revolution same as king pin axis. Radius of cylindrical surface is d2 and conical surface is generated by a line making a angle of 6° from the vertical towards the front of the tractor. This line is positioned in such a way that conical surface does not interfere with point of the tractor located above the fifth wheel coupling horizontal plane.

4.4.2 **Test procedure:** For measurement on Trailer, based on actual measurement of combination with maximum swivel radius and max height of trailer body, for interchangeability minimum distance between Cabin Rear and Kingpin Center can be finalized and put in specification.
For measuring the free space between suitable tractor & semi-trailer, it must be possible to insert a rigid gauge (see template in Figure 3) between semi-trailer & tractor centered at a horizontal line 250 mm above kingpin.

4.4.2.1 Air intake Snorkel if any fitted near the outboard edges of cabin rear walls shall be ignored or removed for this test.

![Figure 3: Template for measuring free surface between tractor](image)

4.5 Lateral inclination of Tractor Semi-trailer combination

4.5.1 Lateral inclination of fifth wheel coupling

4.5.1.1 Requirement: Fifth wheel coupling shall comply with requirements of Cl. No. 7.3.3 of Annex 5 of AIS-091 (Part 1)

4.5.1.2 Test procedure: Test procedure shall be as per the practice to check compliance with Cl. No. 7.3.3 of Annex 5 of AIS-091 (Part 1)

4.5.2 Clearance with lateral inclination

When a Semitrailer is at a lateral inclination of a maximum angle of 3° relative to tractor chassis (See Figure 4) there shall be no contact between the tractor chassis and the semi-trailer. This shall be verified as follows:

a) Verification on Tractor: A Rear view drawing of the Tractor showing fifth wheel at the fully laden height showing no contact with the tractor chassis of a template with gooseneck/Flat profile with maximum allowable width of the trailer.

b) Verification on Trailer: Gooseneck profile verification as per clause 4.8 across the width of trailer, if provided with Gooseneck. This requirement shall be optional with respect to Clause nos. 4.5.2.1 ~ 4.5.2.4 at the choice of trailer manufacturer if the semi-trailer has a goose neck profile. Otherwise Clause nos. 4.5.2.1 ~ 4.5.2.4 shall be mandatory for the semi-trailer.

e) Verification on Combination: (In combination Lateral inclination will depend on maximum allowable of fifth wheel which is currently ±3°. If it is less is sample under test than any further load will be taken by the suspension, but no lateral inclination between Tractor Chassis and Trailer will take place.
4.5.2.1 Semi-trailer shall be coupled to suitable Tractor fitted with fifth wheel coupling compliant to Cl. No. 7.3.3 of Annex 5 of AIS-091 (Part 1).

4.5.2.2 The combination shall be loaded to GCW with all axle loads maintained to their fully laden specification.

4.5.2.3 With the Tractor placed on level ground, the Semi-trailer shall be inclined by placing one or more of its wheels at a height (e.g., using a twist track) such that a semi-trailer inclination of 3 degrees with respect to tractor is created (See Figure 4).

![Figure 4: Lateral inclination](image)

4.5.2.4 The inclination shall be measured using an angle measuring device with an accuracy of 0.2 degrees placed on a semi-trailer. With the semi-trailer at a lateral inclination of 3 degrees, there shall be no contact between Tractor & semi-trailer.

4.6 Angle of articulation around vertical axis

4.6.1 Angle of articulation of fifth wheel coupling in case of tractors

4.6.1.1 Requirement: Fifth wheel coupling shall comply with requirements of Cl. No. 7.3.1 of Annex 5 of AIS-091 (Part 1)

4.6.1.2 Test procedure: Test procedure shall be as per practice to check compliance with Cl. No. 7.3.1 of Annex 5 of AIS-091 (Part 1)

4.6.2 Clearance with articulation around kingpin vertical axis in case of tractor and semi-trailers

4.6.2.1 Requirement: With rearward inclination of 7 degrees, no contact shall be observed between semi-trailer & Tractor (including tyre and spray suppression system) up to an articulation of 25 degrees around vertical axis.
4.6.2.1.2 For angles of articulation between 25 & 90 degrees with rearward inclination varying between 7 degrees & 3 degrees again, no contact shall be observed between semi-trailer & Tractor upto an articulation of 90 degrees around vertical axis.

4.6.2.2 Test procedure:

4.6.2.2.1 Semi-trailer to be coupled to Tractor fitted with fifth wheel coupling compliant to Cl. No. 7.3.3 of Annex 5 of AIS-091 (Part 1)

4.6.2.2.2 The combination vehicle shall be loaded to GCW with all axle loads maintained to their fully laden specification.

4.6.2.2.3 With the vehicle placed on level ground, the Tractor shall be articulated in order to get a articulation angle of 25 degrees. Articulation & inclination angle measuring equipment should have an accuracy of 0.2 degrees.

4.6.2.2.4 The Tractor shall be further articulated to achieve angles varying between 25 & 90 degrees with rearward inclination of 7 degrees & 3 degrees. In this interval, there shall be no contact between semi-trailer & Tractor.

Alternatively a calculation / computer simulation method may be used to prove that the tractor/ Semi Trailer will not have any contact under conditions specified in GCW condition with given articulation angle mentioned in clause 4.6.2.1.1 and 4.6.2.1.2. Calculation/ computer simulation method shall be approved by the test agency. The vehicle manufacturer shall establish the validity of the calculation / computer simulation method to the satisfaction of the Test Agency.

4.7 Free space between Tractor rear & semi-trailer front

4.7.1 Free space between Tractor rear & kingpin centre in case of tractors

4.7.1.1 Requirement: Maximum distance between most distant point at rear portion of tractor & kingpin centre shall be 2200 mm

4.7.1.2 Test procedure: The smallest radius of a cylinder whose axis is the kingpin axis & within which radius, all points of rear part of Tractor are located shall be less than 2200 mm as measured using a device with minimum 1 mm accuracy.

4.7.2 Free space between kingpin centre & landing gear in case of semi-trailers

4.7.2.1 Requirement: Minimum distance between kingpin centre & forward most point of the landing gear shall be 2300 mm.
4.7.2.2 **Test procedure:** The smallest radius of a cylinder whose axis is the kingpin axis & within which radius the forward most point of the landing gear of flat bed semi-trailer or goose neck contour of goose neck semi-trailers shall be more than 2300 mm as measured using a device with 1 mm accuracy.

4.8 **Gooseneck contour:** Gooseneck requirements shall be applicable only for those semi-trailer with gooseneck profile.

The gooseneck shall be located on the outside of a surface consisting of two planes and one surface of revolution interconnected without forming a step. These three parts of the total surface are shown in figure 5 and defined as follows:

a) a plane horizontal and perpendicular to the axis of the coupling pin with a length of $l_2$ (AB) and a width of that of the semi-trailer, limited by the intersection of

b) a second plane of the same width, making an angle $\gamma$ with the first plane, limited by the intersection of

c) a surface of revolution generated by rotating the vertical portion DE, situated at a radius, $r_3$, from the axis of the coupling pin, and an arc of a circle of radius $r_2$ (CD – C’D’), between the second plane and DE, such that no discontinuity arises.

The values adopted for these generator elements:

$l_2 = 750$ mm, $\gamma = 4^\circ$, $r_2 = 450$ mm, $r_3 = 2300$ mm

The above dimensions allows the determination of the centre of the circle of radius $r_2$. 

![Gooseneck contour: generator](image)
4.9 Technical Information to be submitted by the Semi-trailer Manufacturer

The semi-trailer manufacturer shall submit the necessary technical details of the semi-trailers to the test agencies as per Annexure-5 and Annexure-6 of AIS-113 standard.

4.10 Technical information to be submitted by a vehicle manufacturer for approval of a vehicle fitted with a fifth wheel coupling.

The vehicle manufacturer shall submit the necessary technical details of the tractor, as per Annex 2 of AIS-091 (Part 1).

**Key**
1. Coupling pin (in accordance with ISO 337)
2. Centre profile
3. Outer profile
4.11 **Worst case criterion:** For the purpose of this standard following criteria for selecting worst case shall be followed.

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<thead>
<tr>
<th>Parameter</th>
<th>Worst case criterion</th>
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<tbody>
<tr>
<td>Height of fifth wheel coupling resting face of uncoupled Tractor (Tractor)</td>
<td>Tractor with largest height of fifth wheel coupling resting face from ground reference plane shall be considered as the worst case.</td>
</tr>
<tr>
<td>Height of uncoupled Semi-trailer resting face</td>
<td>Semi-trailer with smallest height of fifth wheel coupling resting face from ground reference plane shall be considered the worst case.</td>
</tr>
<tr>
<td>Forward clearance zone between Tractor rear &amp; kingpin centre</td>
<td>Tractor with smallest horizontal distance between vertical axis passing through kingpin and vertical plane passing through rearmost point of the cabin shall be considered as the worst case.</td>
</tr>
<tr>
<td>Forward clearance zone between Semi-trailer front &amp; kingpin centre</td>
<td>The semi-trailer having the longest distance of its front most point from kingpin shall be considered as the worst case. Front most point is the point in front portion at the maximum distance from King pin axis.</td>
</tr>
<tr>
<td>Angles of forward &amp; rearward inclination of Tractors with respect to semi-trailers</td>
<td>Tractor with shortest fifth wheel height above the chassis, longest over hang behind kingpin and forward clearance with Fifth wheel center shall be considered. Test agency and manufacturer can work out the worst case for the variant applied.</td>
</tr>
<tr>
<td>Forward &amp; rearward angles of inclination of semi-trailer with respect to Tractor</td>
<td>Semitrailer with lowest and shortest (min distance between kingpin and lower edge of gooseneck profile rear) Goose neck contour shall be considered as worst case. Test agency and manufacturer can work out the worst case for the variant applied.</td>
</tr>
<tr>
<td>Free space between tractor &amp; semi-trailer</td>
<td>The semi-trailer having the longest distance of its front most point from kingpin shall be considered as the worst case.</td>
</tr>
<tr>
<td>Lateral inclination of Tractor Semi-trailer combination - Lateral inclination of fifth wheel coupling - Clearance with lateral inclination</td>
<td>Fifth wheel with maximum lateral inclination as per AIS-091(Part 1) and Maximum width and profile close to required Gooseneck profile</td>
</tr>
<tr>
<td>Free space between Tractor rear &amp; kingpin centre.</td>
<td>The tractor with longest overhang behind kingpin shall be considered as the worst case.</td>
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<tr>
<td>Free space between kingpin centre &amp; landing gear</td>
<td>The semi-trailer having the shortest distance between kingpin axis &amp; goose neck contour or landing gear shall be considered as the worst case.</td>
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ANNEXURE I
(See 4.3)
GUIDELINE TEMPLATE AND GUIDELINE PROCESS
FOR REARWARD CLEARANCE

1. Template as example

2. Guideline Process (as example)

Step 1: Rotate fifth wheel about hinge to make mating face Horizontal

Step 2: Rotate fifth wheel about hinge to make mating face at 7 degree from Horizontal plane

Step 3: Template can be moved (Slide) in lateral direction keeping center aligned and face mating with fifth wheel

Notes: 1. It must be ensured that the template does not sag due to its own weight because it is very slender.
  2. Proper arrangement must be made for supporting the template at the kingpin centre so that excessive clearances in that fit do not cause fouling with an otherwise compliant tractor.
  3. The template shown in this annexure is only as example.
## ANNEXURE II

### PANEL COMPOSITION*

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<tr>
<td>Shri K. Saravanan</td>
<td>King Kaveri Trading Co.</td>
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<tr>
<td>Shri Nikhil Kumar</td>
<td>SATRAC Engg. Pvt. Ltd.</td>
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<tr>
<td>Shri Manoj Varghese</td>
<td>Transport Solution Ind. Pvt. Ltd.</td>
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<td>Shri Nikhil Panchal</td>
<td>Vasant Fabricators Pvt. Ltd.</td>
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<tr>
<td>Shri Pankaj M. Shenoy</td>
<td>YORK</td>
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<tr>
<td>Shri Kiran N. Kadam</td>
<td>YORK</td>
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*At the time of approval of this Automotive Industry Standard (AIS)