

INDIAN RAILWAYS



सत्यमेव जयते

SCHEDULE OF TECHNICAL REQUIREMENTS FOR “HIGH CAPACITY SEMI PERMANENT COUPLER EITHER WITH INTERMEDIATE TUBE OR WITH TYPE-10 HEAD FOR MAXIMUM SPEED UP TO 200 Kmph FOR FITMENT ON COACHES IN INDIAN RAILWAYS (BROAD GAUGE - 1676 mm)

भारतीय रेलवे में कोचों पर फिटमेंट के लिए “उच्च क्षमता वाला
अर्ध-स्थायी कपलर या तो इन्टरमीडीएट ट्यूब के साथ अथवा
टाइप -10 हेड के साथ” 200 किमी प्रति घंटे तक की अधिकतम
गति के लिए तकनीकी आवश्यकताओं की अनुसूची
(ब्रॉड गेज - 1676 मिमी)

ISSUED BY

RESEARCH DESIGNS AND STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR, LUCKNOW - 226011

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Revision History

Sl. No	Month / Year of Issue	Revision	Page No.	Reasons for revision
1	Oct-2023	01	All	To incorporate the properties for semi-permanent couplers for use in Indian Railways.

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IMPORTANT

Manufacturers/Firms are advised to go through this schedule carefully. In case they need clarification regarding any of the clauses of this schedule they should contact Director General (Carriage), RDSO, Annexe-I, Manak Nagar, Lucknow-226 011 (U. P.), India.

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PREAMBLE

It is proposed to adopt the **revised** specification for developmental purpose **before large scale proliferation** and the technical parameters may be considered as tentative which may be modified once sufficient experience is gained in to products supplied under the specification. All the new products supplied under the specification shall be put in service trials for a period of not less than **12** months.

SCHEDULE OF TECHNICAL REQUIREMENTS FOR HIGH

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CAPACITY SEMI-PERMANENT COUPLER EITHER WITH INTERMEDIATE TUBE OR WITH TYPE-10 HEAD FOR MAXIMUM SPEED UP TO 200 kmph FOR FITMENT ON COACHES OF INDIAN RAILWAYS

1.0 SCOPE

- 1.1 This specification covers the design, manufacture, supply and acceptance of semi-permanent couplers (SPC) either with intermediate tube or with Type-10 head (mechanical & pneumatic coupling only) between units of rake and its associated components like draw and buff gear mounting gear etc. for Indian Railways.
- 1.2 This specification is intended to include everything requisite to the manufacturing of the couplers, notwithstanding that everything required may not be mentioned herein.
- 1.3 Though the properties contained in the specification were/are generally for SPC either with intermediate tube or with Type-10 head with Balanced Draft Gear (BDG), however, Technologies other than BDG meeting all the functional & technical requirements can also be considered provided it is a proven and established system globally to be demonstrated by Firm and subject to clearance by RDSO.
- 1.4 The OEM/Suppliers should have designed, manufactured and supplied the tendered type of coupler for trains operating at 200 kmph or above on at least 200 coaches or their principles have designed, manufactured and supplied the system for trains operating at 200 kmph or above on at least 200 coaches. The couplers installed by the tenderer in the past should have completed minimum 2 years' satisfactory service till the date of advertisement of the tender for bulk purchase.
- 1.5 In order to promote "Make in India" initiative of Govt. of India, indigenous suppliers will be allowed to design & develop these couplers after approval of design documents by RDSO, for such suppliers. One rake quantity will be put in service trials for a period of not less than 12 months and subsequently clearance by RDSO before being considered for bulk quantity.
- 1.6 Though the specification deals with retractable type jerk free couplers however certain specific properties/ features as applicable for Type-10 head automatic coupler is contained in Annexure-F.
- 1.7 Following relevant standards (latest version) may be referred unless specified otherwise for reference.

SN	Standards	Descriptions
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1.	EN 15551	Railway Application-Buffers
2.	EN 16019	Railway Application- Automatic coupler
3.	EN 15227	Crashworthiness requirement of Rly. vehicle
4.	EN 12663	Railway Application-Structural requirement
5.	AAR- M 201 E	Coupler&draft gear components steel castings
6.	AAR-M 211	Coupler, Yoke-purchase and acceptance
7.	APTA-PR-M-RP-003-98	Purchase & acceptance of Type- H Coupler

The above list is not exhaustive and relevant standards (latest version) especially for testing/ validation should have to be followed by the OEM/Supplier.

2.0 DEFINITIONS

- 2.1 "PURCHASER" means the Ministry of Railways, or an administration under the Ministry of Railways on behalf of the President of the Republic of India.
- 2.2 IR means Indian Railways.
- 2.3 RDSO means Research Designs and Standards Organization, Manak Nagar, Lucknow 22601 1.
- 2.4 INSPECTING AUTHORITY means the representative of Indian Railways/RDSO to inspect the supply on behalf of the purchaser.
- 2.5 OEM/supplier means the firm/company that has designed & developed High capacity Semi-Permanent Couplers as mentioned in clause 1.4 and on whom order for supply of couplers, draft gears and associated components, in full or parts as per this specification may be placed. Suppliers (who are not OEM's) will be considered based upon a valid MOU/Agreement. The MOU/Agreement should clearly state that the OEM undertakes to fulfil the warranty and support obligations with respect to technology up-gradations as and when required for the system assembly, even in case the MOU/Agreement is rescinded at some later stage throughout the life of the product.
- 2.6 Sub-vendor means any Firm or company from whom the OEM/Supplier may obtain an item of supply not necessarily manufactured by the vendor himself.
- 2.7 SPECIFICATION unless otherwise mentioned, refers to specifications of IR/RDSO and the same could be procured from RDSO on normal payment basis, as applicable.

3.0 PARTICULAR REQUIREMENTS

- 3.1 All the couplers in the rake shall be mechanically couplable.
- 3.2 The OEM/Supplier shall develop a design based on sound engineering practice and submit general arrangement and working drawings and all

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technical data to RDSO, Lucknow for approval before commencing manufacture.

- 3.3 The semi-permanent coupler shall work unrestricted and reliably under all environment conditions, e.g. rain, washing water, snow and particularly in hot summers as well as in cold winters. These conditions shall not have any influence on the function of the coupler
- 3.4 In event of failure of the horizontal or vertical support the coupler head shall not fall down and reach the track.
- 3.5 If the semi-permanent coupler gets exposed to unacceptable load that may have caused a damage to the draw and buffing gear, this damage shall be obviously visible.
- 3.6 Manual coupling or uncoupling shall be possible by two persons within 15-20 minute with normal tools for SPC with intermediate tube.
- 3.7 The coupler draft gear/bearing bracket with horizontal and vertical support (if applicable) and fastening element shall withstand the operating load during its lifetime
- 3.8 The contractor shall provide maintenance manuals that includes all required activity/actions for the maintenance of the couplers.
- 3.9 The coupler head, coupler shank (draw bar), draw and buffing gear, centring device and bearing bracket (if applicable) shall be indelibly marked with the supplier's brand, the date of manufacturing and the serial number.
- 3.10 The semi-permanent coupler shall move freely backwards into the underframe of the car body after irreversible energy absorption element has been used completely to enable employment of further crash elements behind the coupler's position. (Note: The construction of the car body has to be taken into consideration.).
- 3.11 The draw bar (draw and buffing gear) shall be equipped with a reversible elastic element for energy absorption. The elastic energy absorption system shall endure a life cycle test analogous to EN 15551 life cycle test.
- 3.12 The semi-permanent coupler shall have a visible indicator that shows that the irreversible energy absorption element has been triggered.

4.0 GENERAL DESIGN FEATURES

Semi-permanent couplers are required to be retractable type of coupler. The underframe drawings mentioned in the specification are indicative in nature. OEM's are expected to design a product suitable for fitment in existing pocket. However, if any change in pocket size is required, the OEM will be required to submit FEA details of modified design meeting the relevant standards.

- 4.1 The fixing of High capacity Semi-Permanent coupler to under frame shall be as per various ICF drawing which can be collected from either RDSO or ICF. Nos: ~~72611001, 72711001, 72811001, 74411001, 88911001, 89011001, 89111001, 89311001.~~ However, there will be slight variations in the design

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without affecting the overall dimensions and supplier has to confirm the drawings before taking up manufacturing and supply.

- 4.2 The draft / buffing gear shall be with elastomeric springs or gas hydraulic or any other suitable globally proven technology.
- 4.3 The distance between the end wall and coupling line shall be 230 mm in LHB coaches and 450 mm in Vande Bharat coaches when High capacity Semi-permanent couplers are fitted.
- 4.4 The end coaches should be able to couple with the locomotives which are generally having Transition Centre Buffer Coupler with AAR-H/E type head. In such case, CBC should also have push back mechanism in cases of collision/derailment.
- 4.5 There should be provision of uncoupling device and supporting device for the end coaches fitted with AAR-H type coupler as per spec. no. RDSO/2011/CG-03 (Rev.- 1 or latest)
- 4.6 The semi-permanent coupler design shall withstand the following forces without permanent deformation:
 - Tensile load = 1500 kN;
 - Compressive load=2000 kN
- 4.7 Crash energy management (crash buffers/energy absorber with anti-climbing feature) shall be provided additionally on coach ends.
- 4.8 The provision of semi-permanent coupler and crash buffer/energy absorber with anti-climbers shall not cause a climbing of car bodies or derailment in case of collision i.e. it shall comply the European std. EN16019 and minimum shear strength shall be 445 kN.
- 4.9 The semi-permanent coupler with crash buffer/energy absorber with anti-climbers shall fulfil the energy absorption concept requirement for the complete train rake i.e. compliance to EN 15227.
- 4.10 The muff coupling to be used for connection should be forged for meeting strength requirement.
- 4.11 The semi-permanent coupler should behave like retractable push back type with draft capacity 667 kN in deformed condition.
- 4.12 The push back property should activate at 2000 kN load.
- 4.13 The vertical and horizontal pivoting of the semi-permanent coupler shall be at least $\pm 6^\circ$ & 12° respectively.
- 4.14 Manual coupling or uncoupling shall be possible on curve radii ≥ 175 m.
- 4.15 When using the semi-permanent coupler, connected vehicles shall run through S-curves with radii ≥ 175 m without any restrictions.

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- 4.16 An energy absorption of 80 % of the elastic system in new condition is considered to be the limit. A value below this level is not appropriate to keep the elastic system in service.
- 4.17 The reversible elastic system shall detect and show whether it is still working after it has been exposed to an impact or crash without dismantling any parts of the elastic system.
- 4.18 The reversible elastic element shall absorb energy during coupling up to 5-6 km/h with the longest possible train formation without any damage on the coupler (and to the train).
- 4.19 ~~The reversible and irreversible elements shall absorb energy during coupling up to 10 km/h with the longest possible train formation without any damage on the coupler (and to the train).~~
- 4.20 The irreversible energy absorption element shall be replaced after a collision or heavy shunt.

5.0 MATERIAL

5.1 The material used for coupler shall be High strength steel casting to AAR M-201 Grade 'E' standard ~~or equivalent or superior~~

5.2 CHEMICAL COMPOSITION-(in case of AAR M-201 Grade 'E')

5.2.1 The percentage by weight of different elements in Grade 'E' steel of specification M-201 shall not exceed the following limits:

Carbon, Maximum percent	0.32
Manganese, maximum percent	1.85
Phosphorus, maximum percent	0.04
Sulphur, maximum percent	0.04
Silicon, maximum percent	1.50

Note: Other alloying element may be added in order to improve strength requirement.

5.2.2 HEAT TREATMENT

Heat treatment process shall be done as per AAR M-201, Grade 'E' steel specification (latest version).

6.0 DRAFT GEAR

Draft Gear shall be ~~either~~ balanced type with force flow diagram as shown in diagram in Sketch CG-K8207 Alt.-I (Annexure-C) ~~or gas hydraulic or any other globally accepted design/mechanism~~. The draft gear shall be with elastomeric spring ~~or gas hydraulic or any other globally accepted design~~ and suitable for running long train. Documents related with draft gear characteristics are to be submitted during prototype approval and Endurance test has to be carried out in presence of RDSO representative before approval of prototype.

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7.1 Performance and Test Requirements

- (i) The complete High Capacity Semi-Permanent Coupler with Draft gear assembly shall withstand tensile load of 1000 kN with the residual strain being below 0.2% after release of load and tensile load of 1500 kN without any rupture of any part of the assembly.
- (ii) The complete High capacity Semi-Permanent Coupler with ~~Draft~~ Gear assembly shall withstand compressive load of 2000 kN without showing any permanent deformation. The residual strain should be below 0.2% after release of load.
- (iii) The push back/ retractable arrangement will be checked which should be activated @ load 2000 kN.
- (iv) Anti-climbing test for minimum 445 kN shall be checked, no permanent set/fracture should be observed there.

7.2 Draft gear characteristics- The draft gear characteristics (for BDG with elastomeric pad) shall be

1	Travel (in draw mode)	58mm (maximum)
2.	Travel (in buff mode)	90mm (maximum)
3.	End force	1500 kN (maximum)
4.	Pre compression of draft gear	10-20 kN
5.	Energy storage capacity (dynamic). The energy storage capacity shall be obtained observing both the limits of travel and end force as mentioned above simultaneously	Buff mode 20-35 kJ (maximum)
		In draw mode. 8 kJ min.
6	Damping Factor	0.6 (minimum)

NOTE: Draft gear (with gas hydraulic or any other globally accepted technology) characteristics shall be ~~chosen~~ decided between Indian Railway & by OEM/Suppliers with proven design suitable for longer trains of Indian Railways.

Balanced Draft Gear Pad shall be made of Elastomer having non- linear characteristic with low spring rate at low travel and significantly higher rates at high travel. In the case of draft gears with internal articulation, it shall be the responsibility of the supplier to certify suitability of the same for use in Indian Railways applications.

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The **OEM/Supplier** shall also submit static and dynamic force travel diagram indicating the preload/ pre-compression, end force, energy absorbed and the damping factor (both in draw and buff modes) of the draft gear along with the offer.

7.3 The couplers shall allow coupled coaches to negotiate curves of radius 175 meters and shall be capable of passage in either direction over standard 1 in 8 1/2 turnouts and shall function satisfactorily with a 75 mm difference in headstock heights of adjacent coaches.

7.3.1 **When using the semi-permanent coupler, connected vehicles shall run through S-curves with radii ≥ 175 m without any restrictions.**

7.4 The couplers should be jerk free in service.

7.5 Coaches with coupled condition the coupler should take minimum vertical swing 75 mm. in either direction.

7.6 Coaches with coupled condition the coupler should take minimum horizontal swing 284 mm in either direction.

7.7 **Firm will submit the test plan to RDSO for approval and** type testing shall be carried as per RDSO approved test plan as per this specification

8.0 CRASH ELEMENT

8.1 **Crash element should be integral part of coupler& draft gear assembly in addition to other crash buffers/energy absorber with anticlimbers and/or crash energy management system provided in train. The coupler should behave like a retractable push back type within draft gear pocket (as per Annexure B or ICF drg. No. 72611001, 72711001, 72811001, 74411001, ~~88911001, 89011001, 89111001, 89311001~~), in case of collision or derailment. The deformed coupler should have draft capacity of 667 kN for toeing purpose. The crash element should trigger at 2000kN and should absorb energy for minimum displacement of 200mm. Energy absorption should be more than 250 kJ in compliance to EN 15551 for crash buffers.**

8.1.1 **Additional crash buffers/energy absorber with anti-climber or crash energy management system to be fixed at coach end should have anti-climbing feature (min. 445 kN) in addition to crash energy absorbing property. Energy absorption of individual crash buffer/energy absorber or crash energy management system should be more than 250 kJ in compliance to EN 15551 for crash buffers.**

8.2 In case of new design, service trial of the couplers shall be carried out post fitment for a period of 12 months for assessing the field performance. **For, OEM/Supplier as covered under clause 1.4 shall be exempted from service trial.**

9.0 SUPPLY OF TECHNICAL DATA

9.1 **OEM/Supplier** shall develop/adopt a design based on sound engineering practice and submit complete assembly drawings and related specifications of the coupler and assembly being offered by him.

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- 9.2 **OEM/Supplier** should prepare Quality Assurance Plan for the manufacture and inspection of the coupler and draft gear system [sub-vendor and it should be submitted to RDSO for approval. The heat treatment processes shall be verified at the supplier's end through process flow and control plan defining all critical processes and characteristics, to be confirmed by test reports.
- 9.3 List of the manufacturing and acceptance gauges used by the **OEM/Supplier** or the Sub-vendor to check the components of the coupler to ensure interchangeability should be submitted to RDSO..
- 9.4 Onus of obtaining license, if required any shall lie with **OEM/Supplier**.
- 9.5 Separate drawings in A1/A2/A3 size for each of the coupler assembly shall be submitted with the offer. Each drawing shall indicate sufficient sectional views of the component. These drawings shall be complete in respect of:
- Material specification
 - Estimated weight
 - Dimensions
 - Reference of detailed manufacturing drawings.
- 9.6 Following parameters shall also be furnished*
- Characteristics of Draft gear
 - Energy absorption capacity
 - Initial pre-compression

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- 9.7 The use of special tools for the maintenance and replacement of the semi-permanent coupler or its parts shall be avoided. Where the use of special tools for maintenance and replacement the semi-permanent coupler or its parts is required, the customer shall be provided with the detailed information as well as necessary tools along with the supply. This document informs about the operation purpose, ~~which measurements have to be made, which values are acceptable (e.g. system technical threshold value)~~ and how the calibration of the special tools has to be made (point of time, procedure).

10.0 QUALIFYING REQUIREMENTS:

10.1 **OEM/Supplier** meeting any one of the following criteria shall qualify.

- (i) The supplier should have designed, manufactured and supplied the tendered type of coupler for trains operating at 200 kmph or above on atleast 200 coaches or their principles have designed, manufactured and supplied the system for trains operating at 200 kmph or above on atleast 200 coaches. The couplers installed by the tenderer in the past should have completed minimum 2 years' satisfactory service till the date of advertisement of the tender.
- (ii) In order to promote "Make in India" initiative of Govt. of India, indigenous suppliers will be allowed to design & develop these couplers after approval of design document by RDSO, for such suppliers. One rake quantity will be put in service trials for a period of not less than 12 months before being considered for bulk quantity.
- (iii) **Subsidiary of OEM/Supplier** having experience in manufacturing of Semi-Permanent Coupler / AAR 'H' type coupler and supplying to reputed international Railway like European, American, Japanese or any other developed country is also eligible to submit the offer **for trial orders if it is located in India.**

10.2 **OEM/Supplier** or Sub-vendor should have adequate plant and manufacturing capacity to manufacture and supply the couplers within the delivery schedule.

10.3 **OEM/Supplier** should have a well-established quality control system and organizational set up to ensure adequate quality at all stages of manufacture.

10.4 **OEM/Supplier** not submitting the above mentioned requisite information should note that incomplete offer is liable to be rejected.

10.5 In addition to the above, further information, if required by the PURCHASER, shall be promptly provided by the **OEM/Supplier**.

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11.0 GENERAL REQUIREMENTS

- 11.1 Inspection of coupler assemblies and associated components shall be carried out by the INSPECTING AUTHORITY and notwithstanding what has been specified in this specification, inspection shall be conducted as per relevant standard international practices/specifications and as mutually agreed to by the INSPECTING AUTHORITY and **OEM/Supplier**. In case of a dispute, however, the decision of the PURCHASER shall be final. If purchaser desires in process inspection can be carried out at the manufacturing stage also.
- 11.2 A test plan should be submitted by the **OEM/Supplier** and after the assessment of the test plan, RDSO may modify or supplement the test plan before granting approval to it.
- 11.3 The type test of the product shall be witness by RDSO if testing in India otherwise witness by representative of **Railways** if testing in abroad.
- 11.4 The general design and the arrangement drawings of the coupler and draft gear system should be got approved from RDSO. Further modifications and improvements to the product design if any in future, should be got approved from RDSO.
- 11.5 The inspection of coupler assemblies and associated components shall be done at the **OEM/Supplier's** premises- **OEM/Supplier** shall also provide at his cost labour and appliances (gadgets) required by the INSPECTING AUTHORITY for conducting complete inspection as required under the contract.
- 11.6 **OEM/Supplier** shall be responsible for execution of the contract in accordance with this specification and for satisfactory fitment and operational performance of the couplers supplied, irrespective of any approval which the PURCHASER/RDSO may have given.
- 11.7 **OEM/Supplier** shall provide adequate supervision to ensure satisfactory fitment of 10 coupler sets for the first supply of new design under this specification and satisfactory service performance.
- 11.8 **OEM/Supplier** shall also provide training to IR officials at his own cost, regarding maintenance practices of the coupler system.
- 11.9 The design of coupler and associated components must be such that it may not warrant any major maintenance/ attention up to 6 years.
- 11.10 The coupler offered shall render a service life of 35 years.
- 11.11 All the provisions contained in RDSO's ISO procedures laid down in document No. QO-D-8.1-11 dated 07-07-2023 (titled "Vendor-Change in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful **OEM/Supplier** in the contracts floated by Railways to maintain quality of products supplied to Railways.

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12.0 MAINTENANCE OF COUPLERS

OEM/Supplier shall provide detailed instructions for day-to-day and workshop maintenance and shall include the following:

- 12.1 Detailed work content of various inspection/maintenance practices including procedure for assembly and fitment of couplers. The work content of each schedule shall also be intimated.
- 12.2 **OEM/Supplier** shall also submit a list of technical specification (for procurement purpose) of all special purpose tools, gauges and testing /measuring instruments required for examination repair and over hauling / reconditioning of couplers. Price proposal for these tools gauges and testing /measuring instruments shall also be submitted with the offer separately. One set of gauges should be supplied for every supply of **100 (hundred)** nos. of couplers.
- 12.3 **OEM/Supplier** shall make recommendations suggesting scale of spares to be maintained per 100 couplers for a period of 6 (Six) years. Price proposals for these spares shall also be submitted with the offer separately **during procurement**.
- 12.4 **OEM/Supplier** shall specifically advise criteria for replacement of components of couplers during maintenance.
- 12.5 **OEM/Supplier** shall supply min. 10 (Ten) copies of Maintenance Manuals for every supply of 500 (five hundred) couplers to PURCHASER and subsequently whenever revised. A soft copy of the Maintenance manual shall also be submitted.

13.0 WARRANTY

OEM/Supplier shall assist the coach builders in the fitting testing and commissioning of these couplers and shall be responsible for their satisfactory working. **OEM/Supplier** shall at his cost replace/ **repair** the couplers and associated components failing prematurely or proving unsatisfactory in service for reasons attributed to defective/faulty design, defective material or poor workmanship within a period of **84** months from the date of delivery or **72** months from the date of fitment, whichever is earlier. This warranty shall survive notwithstanding the fact that the couplers may have been inspected, accepted and payment thereof made by the PURCHASER. The sole judge in this case shall be the PURCHASER.

- 14.0 Any design/ manufacturing/ raw material deviation/**alteration** on the items should be approved by RDSO.

15.0 MARKING:

Each item of scope of supply shall be embossed /punched clearly with UNIQUE numbers along with manufacturer logo and year of manufacture.

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16.0 PACKING:

- 16.1 All the items shall be covered in polythene cover thickness not less than 25 microns and shall be packed in wooden crates. Machined/unpainted areas shall be treated with rust preventive oil. Items shall be packed separately and labelled in individual wooden boxes. These boxes shall be adequately protected to avoid damage during handling and transit. No organic material such as dry grass shall be used as filling material.
- 16.2 Air coupling ends shall be provided with dummy caps to avoid corrosion of bushes. Threaded holes to be protected suitably.
- 16.3 All mounting screws and dowels shall be secured to the respective items. Dummy nuts shall be provided to avoid the missing of the fasteners.

ANNEXURE-A

Operating Conditions for High Capacity Semi-Permanent Coupler **either with intermediate tube or with Type-10 head:**

1. Coach Type : Broad Gauge LHB/Vande Bharat Passenger Coaches
2. Axle Load : 16.25t (max.)
3. Gross Load (Coach) : 65t (max.)
4. Gross Load (Train) : 1700 t (max. Without loco)
5. Grade : 1 in 37 (steepest)
6. Speed (maximum) : 200 km/h
7. Curve (Sharpest) : 175 m (radius)
8. Climatic & Environmental Conditions
 - Maximum Temperature (under the sun) : 70°C
 - Maximum Temperature (under shade) : 45°C
 - Minimum Temperature (at night) : -15°C
 - Rainfall : Fairly Heavy
 - Humidity : 100% saturation
 - Humidity : 100% saturation
 - Environment : Dusty during hot weather and saline in coastal areas

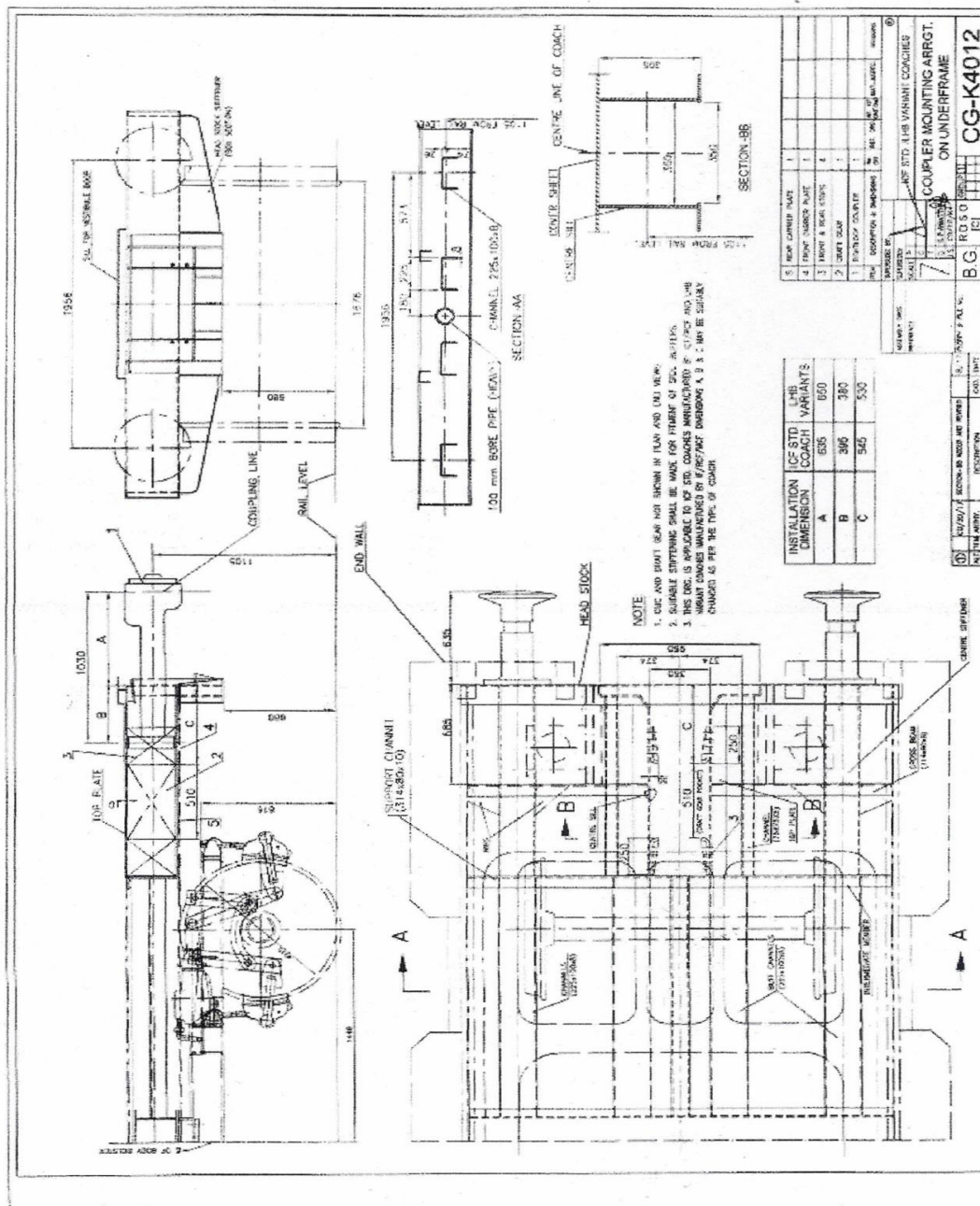
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9. Coupler Height (for coaches) : 1105 mm for **LHB & end coaches**
(from Rail Level) **940 mm for intermediate coaches**
(for Vande Bharat)
10. Coupler Height (for locos) : 1090 mm (from Rail Level)
11. Wheel Diameter (for coaches) : **915** mm in new (LHB)
845 mm in condemn (LHB)
952 mm in new (VB)
877 mm in condemn (VB)
12. (i) Maximum coupling/uncoupling operations : One per day on an average.
(ii) Speed at the time of coupling **the** loco with rake: 3 kmph
13. Braking Distance of Train : 1200 m at a speed of 160 km/h
14. Maximum deceleration : 1.3 m/sec²
15. Rolling Resistance of Coaching stock
 $R = 0.685 + 0.0211V + 0.000082 V^2$
Where, R= Rolling Resistance in kg/t of coach weight and V= Speed in km/h
16. **Crash buffer/energy absorber with anti-climber:** On end of each coaches
17. Coach Strength: Satisfies end load requirements as per UIC 566

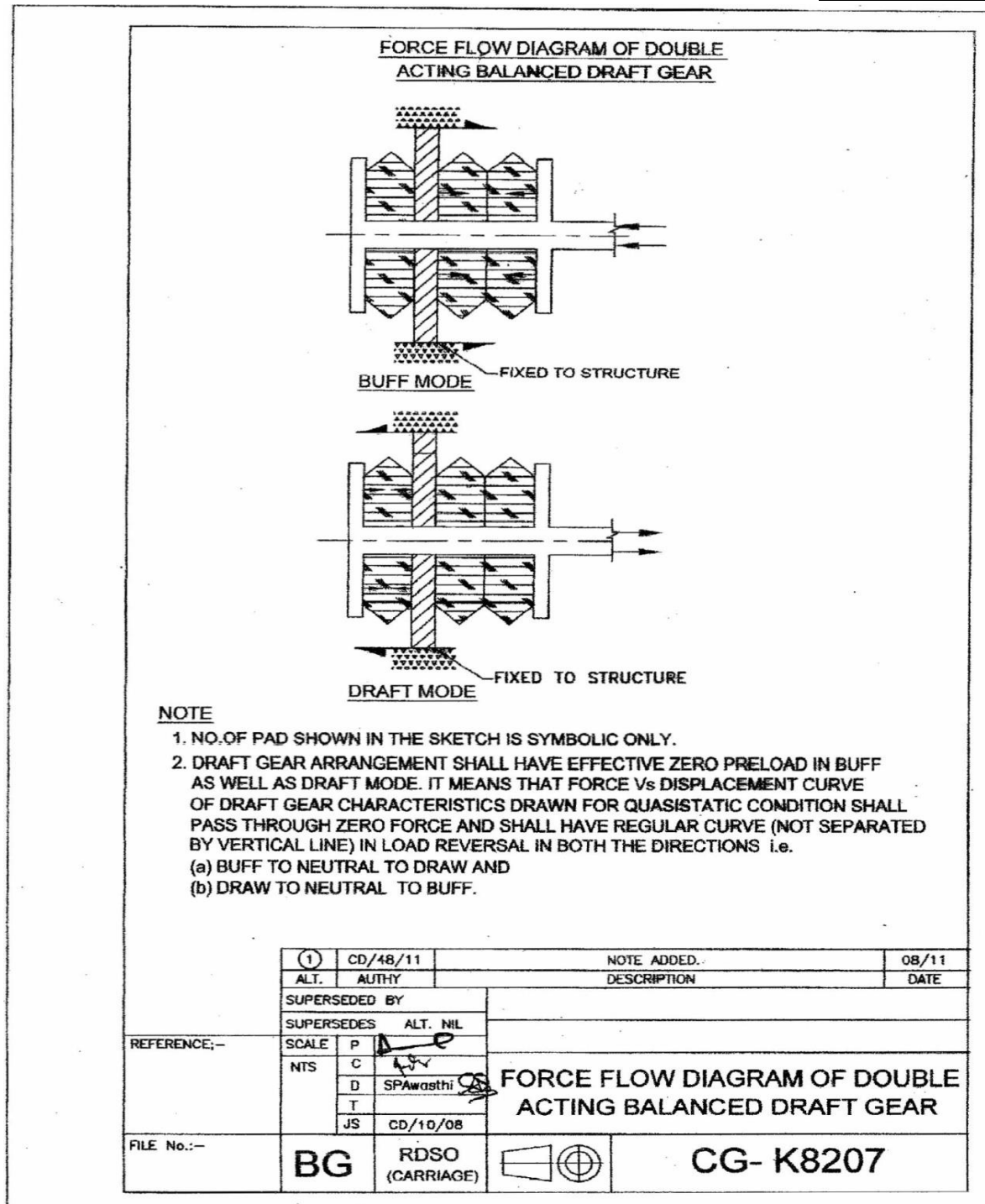
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ANNEXURE-B



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ANNEXURE-- C



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ANNEXURE- D

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Signature			
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	Subhash Oraon SSE(D)/Carriage	Arjun S. Dugtal ADE/CD/Carriage	Gaurav Kumar Singh Exe. Dir/Carriage-II

ANNEXURE- E

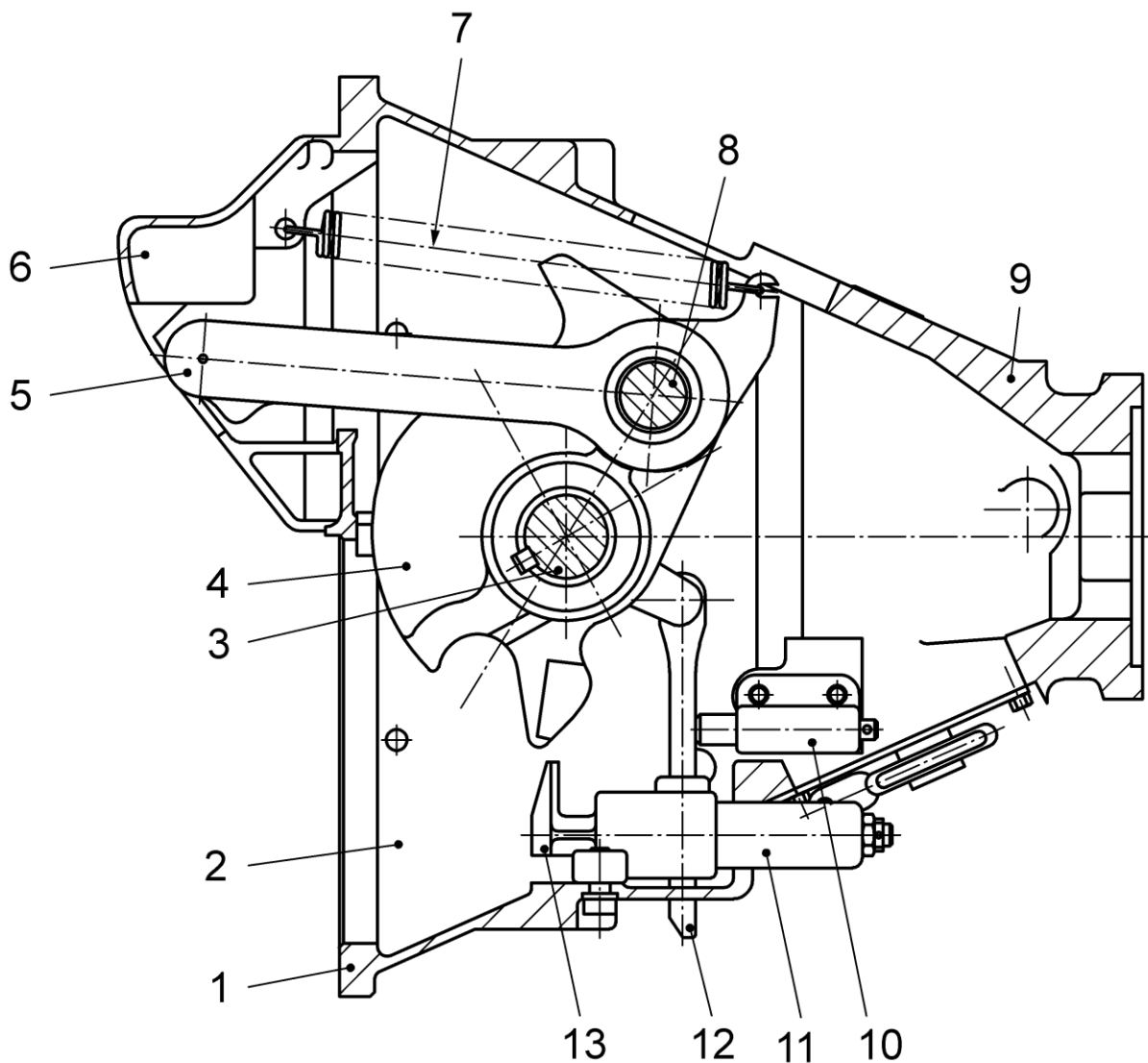


Fig: Type 10 Head as per EN-16019.

Note: This Type-10 Automatic (Mechanical coupling only) shall be fitted atleast in between the units of the rake.

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ANNEXURE- F

Requirement for the Type -10 Head:

The requirements mentioned in Annexure-F are specific to Type -10 head for automatic coupling. In case of any mismatch in requirements for Type-10 head as detailed in specification vis-a-vis as mentioned below, the details available in Annexure-F will prevail.

1. The Type -10 Head alongwith other crash energy absorber on coach end shall comply the EN 15227 requirement.
2. The design & function of Type -10 head shall be as per EN-16019 except strength requirement.
3. Proof Strength requirement for the Type -10 head shall be 1000 kN(within 0.2% yielding), 1500 kN (without fracture) in Tensile & 2000 kN(within 0.2% yielding) in compression mode.
4. There will be no specific requirement of draft gear for the Type -10 head, but they should meet the strength requirement as per 1000 kN (within 0.2% yielding) as well as 1500 kN (without fracture) in Tensile and 2000 kN (within 0.2% yielding) in compression mode.
5. The Type -10 head coupler should behave like retractable push back type with draft capacity 667 kN in deformed condition. The push back property should activate at 2000 kN load.
6. The provision of Type-10 head coupler and crash buffer/energy absorber with anti-climbers shall not cause a climbing of car bodies or derailment in case of collision i.e. it shall comply the European std. EN16019 and minimum shear strength shall be 445 kN.
7. The couplers shall allow the coupled coaches to negotiate curves of radius 175 meters and shall be capable of passage in either direction over standard 1 in 8 1/2 turnouts and shall function satisfactorily with a 75 mm difference in headstock heights of adjacent coaches.
8. When using the Type -10 Head coupler, connected vehicles shall run through S-curves with radii ≥ 175 m without any restrictions.
9. The vertical and horizontal pivoting of the Type -10 Head coupler shall be at least $\pm 6^\circ$ & 12° respectively.
10. Manual coupling or uncoupling shall be possible on curve radii ≥ 175 m.
11. During couplability test with other coupler head of same make, gathering range will be tested as per clause 5.1.4 of EN-16019.

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12. The couplability of Type-10 head with other make should be ensured within its gathering range.
13. The Type-10 head shall must be fitted with manual uncoupling device which can be used for uncoupling in regular or in emergency case as well.
14. Additionally, the mechanical–pneumatic coupling un-coupling criteria of Type -10 head shall be as per EN-16019.
15. The routine test for couplability, dimension, function shall be done as per EN-16019.
16. An energy absorption of 80 % of the elastic system in new condition is considered to be the limit. A value below this level is not appropriate to keep the elastic system in service.
17. The reversible elastic system shall detect and show whether it is still working after it has been exposed to an impact or crash without dismantling any parts of the elastic system.
18. The reversible elastic element shall absorb energy during coupling up to 5-6 km/h with the longest possible train rake formation (24 coaches) without any damage on the coupler (and to the train).
19. The irreversible energy absorption element shall be replaced after a collision or heavy shunt.

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