



भारत सरकार, रेल मन्त्रालय

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

**SPECIFICATION FOR SPILL- PROOF FUELLING ARRANGEMENT
FOR DIESEL LOCOMOTIVES IN INDIAN RAILWAYS**

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SPECIFICATION FOR SPILL- PROOF FUELLING ARRANGEMENT FOR DIESEL LOCOMOTIVES IN INDIAN RAILWAYS

1. SCOPE

This specification covers general and technical requirements for conversion of existing fuel filling arrangement of diesel locomotives with a dry break coupling for spill proofing system for use in Indian Railways.

2. INTRODUCTION

2.1 This specification defines the interface between a fueling points and a diesel locomotive for the purpose of transferring fuel.

2.2 The benefits of the standardized fueling interface described here include the following:

- Reduced risk of fuel spillage between a dry disconnect fuel nozzle and tank receptacle.
- Compatibility among locomotives and fuel sites of different fuel filling points, for fueling and interchangeability of replacement parts.
- Reduced need for operators to supervise locomotive fueling directly by providing a secure mechanical connection.

2.3 In addition, this standardized interface will support operational improvements to fueling in the following areas:

- Maintenance burden
- Reliability of operation
- Safety of operation

3. BACKGROUND

Indian Railway has a large no. of Diesel Locomotives. These locomotives require frequent filling of their fuel tank at various locations of fuelling points. It has been seen that at fuelling point, lot of Diesel oil is come out on the floor for the various reasons like spillage and over filling of tanks.

Fuel is a major item of expenditure in railway operation. Conservation of fuel, therefore, is an important factor in bringing down operational costs. Proper attention needs to be given to the handling of fuel oil, in order to prevent losses from spillage and over filling of tanks.

4. DISCLAIMER

This specification is based on the studies and a committee's report on "Upgradation of Diesel Locomotive Fuelling Arrangement" submitted to Railway Board vide letter no. CRSE/Fr./Misc. dated 15.07.2015/2015.

5. BASIC SYSTEM REQUIREMENTS FOR SPILL PROOF COUPLING

- Spill Prevention Coupling is to be considered with the standard of the industry useable at liquid transfer points where product loss could occur.
- Fuelling systems constructed in compliance with this specification shall be compatible with existing fueling systems in Indian Railways.

- Spill Prevention Coupling should provide a reliable solution to prevent spillage during connection or disconnection.
- Spill Prevention Coupling should be compatible with Petroleum products with adequate seals and Gaskets and used by manufacturers particularly for handling petroleum products, solvents, ag-chemicals, vegetable oils, detergents and many acids and caustics.
- Dry Disconnect coupling shall have two parts 1) Adaptor/Receptacle and 2) Coupler/nozzle

5.1 Spill Prevention Coupling Adaptor / Receptacle

5.1.1 Spill Prevention Coupling Adaptor shall be of 2 inch size and with male NPT thread matching the Locomotive threads shown in **Annexure-1**. Spill Prevention Coupling Adaptor shall have fine groove for Autolok cams of coupler.

5.1.2 Material for Adapter

Body:	Aluminum
Poppet:	A356-T6 ASTM B-26 or Equivalent
Seals:	Fluorocarbon / Viton / Buna-N
Spool coupling:	CST/ Aluminium

5.1.3 Design Standard: ASME B31.3 or Equivalent

Design Temperature: (250°F/121°C Max Temp)

Max Design Pressure: 10.5 Bar /150 psi

5.1.4 A sealing-type cap shall be provided with each fuel receptacle to keep the mating surfaces clean and to act as a secondary seal to the poppet in the receptacle.

5.1.5 Essential Features & Benefits of Adapter

Spill Prevention: Spill Prevention Coupling Adaptor poppet-actuated design should be opened with the Spill Prevention Coupling coupler and designed to provide a tight seal when closed.

Reliability of Operation: Adaptor shall have spring-loaded poppet design and heavy-duty construction provide for reliable, long-life operation.

Optimum Flow Rate: Adaptor shall have built-in deflector for even flow and low pressure drop & shall reduce turbulence.

5.2 Spill Prevention Coupling Coupler / Nozzle

5.2.1 Spill Prevention Coupling Coupler shall be of 2 inch size and with female NPT thread ends and spool coupling with one end matching Coupler thread and other end with hose shank for matching terminal hose. Spill Prevention Coupling Coupler shall have 2 cams Arms with Autolok system to avoid opening during normal operation and in vibrating situation during loading.

5.2.2 Essential Features & Benefits of Coupler

Spill Protection: Spill Prevention Coupling Coupler should help to reduce the hazards involved in the connection/disconnection process of transferring hazardous materials.

Added protection: Autolok locking arms with an automatic locking mechanism shall be signaled by a positive click. Uncoupling requires only an easy tug on the lock release.

Finger Ring for cams: Autolok locking finger Ring operation shall be such that during locking the position of that ring shall be in axis with coupler. Finger Ring shall always remain straight so that accident opening will not occur.

Dual protection: Poppeted seal cylinder with snap-on nose seal shall be provided for automatic closure from both directions – the coupler and the adaptor – to prevent accidental spills. Nose seal can be easily replaced without need for new seal cylinder.

Closed-Loop Loading: Spill Prevention Coupling Coupler shall provide total Closed-Loop Loading Capabilities by keeping hazardous liquids and vapors in-line and out of the environment.

Ease of Use: Spill Prevention Coupling Coupler shall have simple connection and disconnection design and lever actuated internal poppet configuration makes this ease for operation during liquid transfer operations.

Lever Actuation: Coupler shall have open/close lever action helps to ensure that liquid flow can only begin once the coupling and adaptor are securely coupled. The lever provides for smooth opening and closing even for high pressure applications.

5.3 Performance Requirements-System

5.3.1 Maximum Pressure Drop

The maximum pressure drop across the fuel nozzle and fuel receptacle, when interlocked for fueling, and assuming flow of 850 litre per minute of reference fuel through a nominal 3-in. bore inlet and outlet line, shall be no more than 10 psi.

5.3.2 Maximum Exit Pressure

The maximum total pressure of fuel flow measured at the exit port of the fuel receptacle, at all flow rates from zero to maximum flow, shall be no more than 3.25 psi.

5.3.3 Leakage During Fueling

The fuel delivery system shall not leak fuel externally during fueling.

5.3.4 Fuel Loss at disconnect

5.3.4.1 No more than 5 cm³ of fuel shall remain on or outside the nozzle and receptacle at each disconnect.

5.3.4.2 The fuel nozzle shall be designed to trap or retain lost fuel and prevent spillage until the nozzle can be properly cleaned or drained.

5.4 Support Requirements

5.4.1 Maintenance

5.4.1.1 The components of the locomotive fueling system shall be designed to permit an operator to perform routine maintenance with minimal training.

5.4.1.2 The fuel delivery system shall require no periodic maintenance except for renewal of seals.

5.4.1.3 Any seals (e.g., O-rings) used to seal the connection between the fuel nozzle and the tank fitting shall be easily replaceable by one person, with minimal training, using only common hand tools.

5.4.1.4 The fuel delivery system shall be modular in construction to permit removal and replacement of defective units by railways staff using only common hand tools.

5.4.2 Retrofit

- 5.4.2.1 The fuel delivery system shall be compatible with all standard non pressurized locomotive fuel tanks currently in use by Indian railways.
- 5.4.2.2 Locomotive fuel receptacle retrofit shall require no more than 5 minute of railway staff time per fuel receptacle.
- 5.4.2.3 The required personnel, skill level, tools, and equipment required for retrofit of fuel receptacle shall be consistent with those available at the Fuel points in Diesel sheds, Loco workshops, Loco manufacturing units and Railway Stations.
- 5.4.2.4 Retrofit of wayside facilities i.e. Fueling Points with the minimum equipment prescribed by this recommended practice shall require a minimum of labor.

5.5 Clearance Limitations for Retrofitted Components

All portions of all components of spill proof receptacle installed on the locomotive shall fit within the IR BG MMD Diagram No 1D as shown in **Annexure-2** and conforms to IR BG Schedule of Dimensions (latest revision).

5.6 Climatic and Environmental Conditions of Operation

5.6.1 Altitude

Mean sea level to an altitude of 1200 meters above mean sea level.

5.6.2 Temperature

0°C to 55 °C

The air temperature around equipment may reach as high as 70 °C.

5.6.3 Relative Humidity: Up to 100%.

5.6.4 Vibrations and Shocks

The spill proof fuel filling system should be capable to withstand, without damage, the vibrations and shocks normally encountered during service. The conditions are indicated below:

1. Maximum vertical acceleration = 1.0 g
2. Maximum longitudinal acceleration = 3.0 g
3. Maximum transverse acceleration = 0.5 g
(‘g’ being acceleration due to gravity)

5.6.5 Equipment shall be capable of operating efficiently in spite of dirt, dust, mist, torrential rain, heavy sand or stone storms and presence of oil vapors and radiant heat etc. to which the rolling stock is normally exposed in service.

6. MECHANICAL INTERFACE CHARACTERISTICS

6.1 Dry Disconnect Connection

Both the fuel nozzle and the fuel receptacle shall be sealed (e.g., with poppet valves) such that no fuel can flow from either except while it is engaged and opened for fueling.

6.2 Proof Pressure

6.2.1 The seal between the nozzle and the fuel receptacle, when the two are connected for fueling, shall withstand an internal proof pressure of up to 50 psi at the plane of coupling without leakage of fluid.

6.2.2 The fuel nozzle, when closed and not mated to the receptacle, shall withstand an internal proof pressure of 240 psi without leakage of fluid.

6.3 Burst Pressure

6.3.1 The fuel receptacle, with or without the cap installed, shall withstand an internal burst pressure of 75 psi.

6.3.2 The fuel nozzle, when closed and not connected to a receptacle, shall withstand an internal burst pressure of 360 psi.

6.4 Flow Controls

The fuel nozzle, once properly engaged and interlocked, should require no operator attention (e.g., holding of triggers or levers) during routine fueling.

7. TEST AND EVALUATION REQUIREMENTS

7.1 Test and Evaluation

Adaptor shall have AAR approved design.

7.2 Performance Track Record

Spill Prevention coupling i.e. Adapter & Nozzle should have satisfactory performance track record of use for fueling Diesel Locomotive having experience of transfer of at least 1000000 liters.

7.3 Field Trial

One prototype set of filling nozzle and receptacle shall be installed on a diesel electric locomotive at a nominated diesel shed. Before according final approval to the equipment it has to perform satisfactorily for six months on the locomotive.

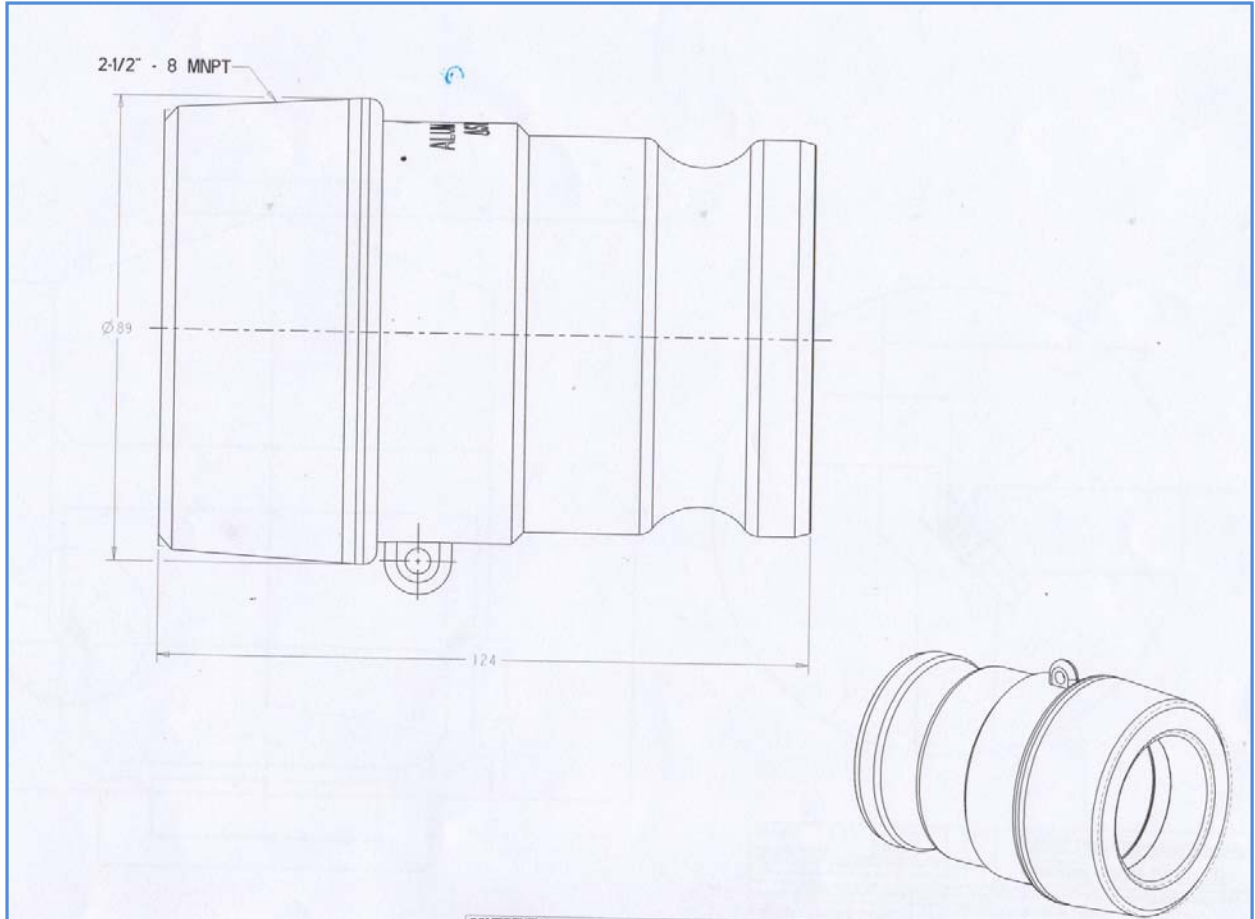
8. WARRANTY

The equipment shall work satisfactorily for a period of 18 months from the date of supply or 12 months from date of fitment/commissioning on locomotive, whichever is earlier. Any equipment which fails during the warranty period shall be replaced or modified free of cost by the vendor. In case, it becomes necessary to modify the design, all the units will have to be modified by the vendor free of cost.

9. AFTER SALES / SPARES

Vendor shall provide repair kits with seals for 1 year smooth operations and should have shelf-life of one year. Vendor shall also arrange to supply maintenance manuals of the equipment (one with every 5 sets). Manual shall contain information pertaining to detailed dimensional drawings indicating mounting arrangement layout, sub assemblies, principle of operation, maintenance schedules, trouble shooting, details of special tools, if required, parts catalogue and testing procedure of the equipment being supplied. Updated position of modifications will also be incorporated.

Annexure-I



Annexure-II

