Discipline
Engineering Standard - NSW

Category
Signalling

Title
Specification - Hydraulic Train Stop

Reference Number
SPS 14 - (RIC Standard: SC 07 22 00 00 SP)

Document Control

Status	Date	Prepared	Reviewed	Endorsed	Approved
Issue 1 Revision 3	May 05	Standards and Systems	Standards Engineer	GM Infrastructure Strategy & Performance	Safety Committee
		Refer to Reference Number	H Olsen	M Owens	Refer to minutes of meeting 12/08/04

Disclaimer

Australian Rail Track Corporation has used its best endeavors to ensure that the content, layout and text of this document is accurate, complete and suitable for its stated purpose. It makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems of work or operation. Australian Rail Track Corporation will not be liable to pay compensation in respect of the content or subsequent use of this document for any other purpose than its stated purpose or for any purpose other than that for which it was prepared except where it can be shown to have acted in bad faith or there has been willful default.

Document Approval

The technical content of this document has been approved by the relevant ARTC engineering authority and has also been endorsed by the ARTC Safety Committee.

Document Supply and Control

The Primary Version of this document is the electronic version that is available and accessible on the Australian Rail Track Corporation Internet and Intranet website.

It is the document user's sole responsibility to ensure that copies are checked for currency against the Primary Version prior to its use.

Copyright

About This Standard

This specification defines the requirements for train stops operated by an electro-hydraulic power unit for use where specified on Australian Rail Track Corporation's rail system in New South Wales.

Document History

Primary Source – RIC Standard SC 07 22 00 00 SP Version 2.0

List of Amendments –

ISSUE	DATE	CLAUSE	DESCRIPTION
1.1	01/09/2004		Reformatting to ARTC Standard
1.2	14/03/2005	Disclaimer	Minor editorial change
1.3	06/05/2005	All	Document reformatted

Contents

1. General

1.1. Scope

This specification defines the requirements for train stops operated by an electro-hydraulic power unit. The power unit shall essentially consist of an electric motor driven pump with a valve unit to operate a hydraulic ram which will drive the train stop trip arm to the lowered (clear) position and maintain it in that position for as long as required. The train stop mechanism shall include a spring mechanism to raise the trip arm to the trip position. A circuit controller to indicate the position of the trip arm shall be included in the mechanism.

1.2. Quality Assurance and Warranty

Suppliers are required to be accredited to or be in the process of obtaining accreditation to AS 3902.

Trainstops are to be warranted free of defect for a period of 24 months from supply or 12 months from installation whichever is sooner.

Train stops may be stored in open air for extended periods and preparation and packing for storage must take this into account

1.3. Definitions

For the purposes of this Specification, the following definitions shall apply:

Train Stop A mechanism so constructed and arranged that when the trip arm is in the raised position, impact with a trip lever mounted on the leading axle box of a train will result in power shut down and application of the brakes.

Trip Arm That moveable portion of the train Stop which makes contact with the trip lever on the train

Circuit Controller A mechanism which will open and close electric circuits and in so doing indicate to the Signalling System the status of the train stop.

Safety Latch A device provided within the case which will prevent the trip arm being depressed by any external force.

1.4. Referenced Documents

Specification SPS 02 Environmental Conditions

1.5. Information to be Provided by Supplier

- Clause by Clause Statement of Compliance with Specification
- Any variation from Specification
- Maximum, nominal and minimum voltages
- Motor starting current and running current, valve VA rating.
- Trip arm raise and lower times

- Electrical and hydraulic circuit diagrams
- Recommended maintenance procedures
- Recommended spare parts inventory

2. Description of Operation

Electric current from the signalling control system will operate a control valve and an electric motor driving a suitable hydraulic pump which will deliver oil via the control valve to a hydraulic ram which will rotate the trip arm shaft to the lowered (clear or reverse) position. Current to the motor will be open circuited by a limit switch controlling the trip arm shaft rotation at the lowered position. A spring attached to the shaft will return the shaft to the raised (stop or normal) position when power is removed from the control valve and oil can return from the ram to the power unit reservoir.

A safety latch or lever within the case prevents the trip arm being moved from the raised position by applied external force.

A system of levers, shafts, spring(s) and linkages connects the head of the trip arm to the circuit controller so that in the event of breakage of the arm the circuit controller will be moved to a neutral position and both normal and reverse contacts will be open circuit.

3. Construction

3.1. Case

The case may be one piece or two piece. If two piece, one shall contain the mechanism (ram, arm shaft, circuit controller etc) and the other the hydraulic power unit including control valve and reservoir.

The case(s) shall be of all metal corrosion resistant construction and shall be (each) fitted with a hinged lid capable of being laid flat when open. The cover shall be of sufficient strength and rigidity when closed to carry a point load of 90kg at the centre of the lid without permanent deformation or deflection exceeding 3mm.

Where the mechanism is provided with an oil lubrication system supplied from a wet sump, the part of the case containing the mechanism shall be divided into two compartments. One part is to contain the oil sump, ram, arm shaft etc and the other, which is to be dry, is to contain the circuit controller.

Where wet lubricated, provision for checking the level of and refilling with lubricating oil without having to lift the cover is to be provided. A filter shall be included in the oil filler. Provision for drainage of contaminated lubricant shall also be provided within the case in a position, which will permit the use of a catch tray under the drain hole.

An adjustable arm stop shall be provided within the case, which will support and define the position of the trip arm when it is in the raised position. The arm stop and case shall be of sufficient strength to absorb the shock resulting from engagement with the trip lever on the train without damage to any part of the mechanism. The arm stop shall provide for the arm in the raised position to be adjustable over the range +5mm -15mm of the nominal position.

The maximum width of the case, excluding mounting lugs and oil filler, shall not exceed 225mm and the width over case and trip arm shall not exceed 400mm.

Width over mounting lugs should not exceed 390mm.

The maximum height of the case from the underside of the mounting lugs to the top of the cover shall not exceed 175mm. No part of the case shall project below the bottom surface of the mounting lugs.

Mounting Hole centres shall preferably be 630 ±1mm x 274 ±1mm and hole diameter shall be 25mm. The centre line of the arm shaft to the centre line of the nearest mounting hole shall preferably be 140 - 150 mm.

3.2. Trip Arm

The trip arm shall be made from SG Iron and shall have a contact face 152 ± 2 mm wide x 76 ± 1mm wide. The face shall be inclined at approximately 15° to the vertical with the bottom edge of the face leading. Refer to drawing 356-01.

3.3. Internal Components

All internal components, except bearings shall be protected against corrosion either by a suitable plated finish or by being manufactured from a corrosion resistant material. The inside of the cover(s) shall be coated with a finish which will inhibit the formation of condensation.

3.4. Hydraulic Ram

The piston of the hydraulic ram shall be manufactured from Stainless Steel or hard chrome plated mild or alloy steel. Piston/cylinder seals shall consist of at least one hydraulic seal and an outer dust/moisture seal.

The stoke of the ram in the extended position shall be controlled by a limit switch operated from the trip arm shaft. Mounting of the limit switch shall be non-adjustable. The retracted position shall be controlled by the adjustable arm stop.

3.5. Lubrication System

The lubrication system may be either

- A wet system employing an oil sump and a pump operated by the rotation of the trip arm shaft
- A dry system employing pre-lubricated and sealed bearings or self lubricating bearings or a combination of both.

If a wet system, a metered amount of oil shall be delivered to bearings, bearing surfaces etc except those in that part of the case containing the circuit controller, for each complete stroke of the train stop arm (i.e. drive to clear and return to stop).

3.6. Circuit Controller

The circuit controller shall be housed within a transparent readily removable cover which shall be dust and moisture sealed from the rest of the mechanism. The cover material shall be resistant to breakage by impact, discolouring and effect of petroleum products and temperatures from -10°C to 80°C.

Four independent contacts shall be provided, two for the raised (normal) position of the trip arm and two for the lowered (reverse) position. The contacts and each current carrying part of the circuit controller shall be rated to carry a load of 3 amps DC continuously.

Insulation material shall be non-hygroscopic and temperature stable between -10°C and 100°C.

Any bearings used in or in the same part of the case as the circuit controller shall be self- lubricating types.

A centralising spring shall be provided and shall be capable of applying sufficient force to move the contacts to a neutral (O/C normal, O/C reverse) condition in the event of the trip arm being fractured or becoming detached from the mechanism or any part of the linkage between trip arm and circuit controller becoming detached. In addition two external stops are to be provided to prevent over travel within the circuit controller in the event of damage to the mechanism resulting in over travel of the linkages.

3.7. Power Unit

All hydraulic connections and hoses within the power unit and between the power unit and ram shall be working pressure rated to at least 1.75 times the maximum pressure developed by the hydraulic system. An auto-resetting thermal overload unit shall be provided to protect the motor against prolonged running due to obstruction or failure of the mechanism. The thermal overload shall also open circuit the control valve

Construction of the power unit shall be such that the motor, pump, control valve, oil reservoir and thermal overload unit are mounted on a single baseplate, which can readily be removed from the case. A single flexible hose shall connect the power unit to the ram.

3.8. Wiring

Internal wiring shall be 0.6/1.0KV V75 grade PVC fixed or contained so that it is double insulated from the case, held clear of any moving parts and not in direct contact with lubricating or hydraulic oils.

A wiring diagram made from a stable material shall be provided and secured to the inside of (one of) the case covers.

3.9. Terminals

Terminals for external wiring shall preferably be M6 or 2BA screw studs spaced at 20mm centres. Each terminal shall be numbered in accordance with the wiring diagram.

Other terminal types such as screw clamp may be accepted for this application but the particular terminal type and part number will need to be submitted for approval.

Spade type connectors, if used shall be supergrip pre-insulated types and/or shall be fully covered by insulating sleeves.

4. Performance

4.1. Operating Time

The maximum operating time from normal to reverse or reverse to normal shall not exceed two (2) seconds

4.2. Power Requirements

The rated voltage for the train stop shall be 110v 50hz. The operating range shall be at least 95 to 125 volts. Motor power consumption shall not exceed 440 VA and control valve solenoid power consumption shall not exceed 12 VA.

4.3. Insulation

4.4. General

All electrical equipment should be double insulated from the case.

The surface leakage distance between any exposed current carrying parts and any exposed current carrying parts and case or metallic components shall not be less than 15mm. The air gap between any exposed current carrying part and case or other metallic component shall be not less than 6.3mm.

The motor capacitor(s), control valve soleniod diode rectifier (where used) and the thermal overload unit are excluded from the following specified insulation tests.

4.5. High Voltage Tests

a) Applied High Voltage Test

The insulation shall withstand, for a period of one minute, a test voltage of 2000 volts RMS applied between all parts of electrical circuits and other metallic parts insulated therefrom. The test voltage shall be alternating, approximately of sine wave form and of any frequency between 25 and 100 Hz.

b) Insulation Resistance Test

This test shall be carried out immediately after the Applied High Voltage Test and at a potential of 1000 volts DC. The insulation resistance shall be measured between all insulated circuits and earth and the minimum value for the completely wired machine, except for those excluded components noted above, shall be not less than 100 M .

5. Environment

The train stop shall be subject to the conditions specified for Category F equipment in Specification SPS 02.

6. Marking

Each train stop shall be fitted with a nameplate giving manufacture's name, model type, serial number and month and year of manufacture or batch number.

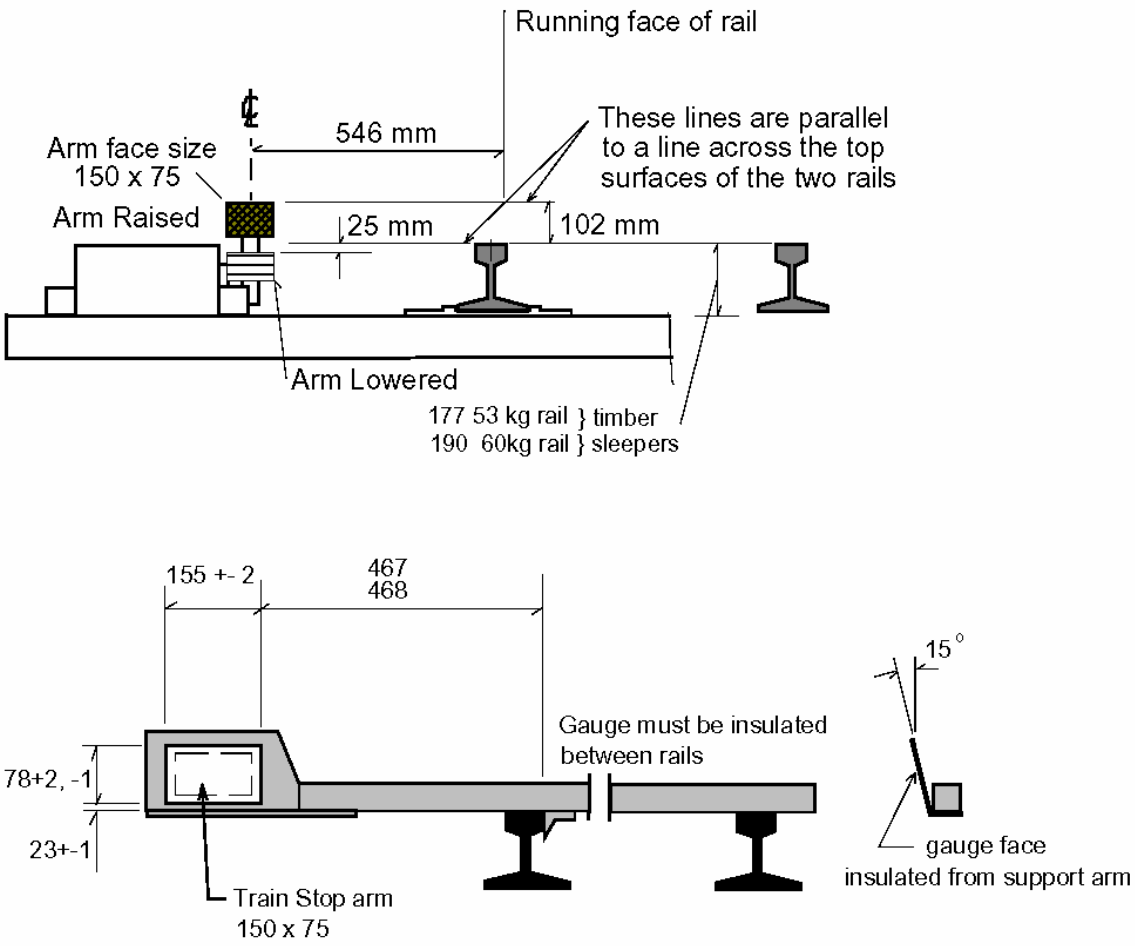
The power unit shall have a separate plate showing serial number, rated voltage, rated operating current.

7. Installation

The train stop will be fixed directly to two 250mm x 150mm timber sleepers with 20mm coach screws or will be attached to a steel bracket with bolts and resilient pads which, in turn, will be attached to two concrete sleepers.

In both cases, no guarantee is given that mounting surfaces will be completely flat or that the relationship between mounting surfaces will be maintained.

For this reason, the train stop shall be capable of operating correctly in all respects with an angular difference of 1.5between the undersides of the mounting lugs at one end of the train stop and the mounting lugs at the other end.



Drawing 356-01

Trainstop Mounting and Gauging Dimensions