भारत सरकार
रेल मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

डीजल इलेक्ट्रिक लोकोमोटिव के इंधन तेल के लिये कम पोर साइज के प्राइमरी तथा सेकेण्डरी फिल्टर एलीमेंट की विशिष्टिका

Specification for Low Mean Pore Size Primary & Secondary Fuel oil Filter Elements for Diesel Electric Locomotives

विशिष्टि संख्या – चा.श. 0.2600–25
जूलाई– 2021
(संशोधन – 01)
SPECIFICATION No. MP.0.2600-25
JULY - 2021
(REVISION - 01)

अनुसंधान अभिकल्प एवं मानक संगठन
मानक नगर, लखनऊ - 226011
RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW-226 011

CONTENTS

DRAWINGS

SPECIFICATION FOR LOW MEAN PORE SIZE PRIMARY AND SECONDARY FUEL OIL FILTER ELEMENT FOR DIESEL ELECTRIC LOCOMOTIVES

1. Scope

1.1 This specification supersedes specification nos. MP.0.2600-02, MP.0.2600-05 & MP.0.2600-23 and covers two types of low mean pore size fuel oil primary and secondary filter elements for use on the ALCO locomotives as a complete set.

- 90 days Primary & Secondary fuel oil filter element to RDSO Drg. Nos. SKDP - 3908 & SKDP - 3909.
- 180 days Primary & Secondary fuel oil filter element to RDSO Drg. Nos. SKDP - 3901 & SKDP - 3902

2. Constructional features:

2.1 The filter paper should have good dirt or contaminant retention efficiency. The mean pore size shall be 10-16 micron for primary fuel filter and 6-10 micron for secondary fuel filter.

2.2 The filter paper pleats shall be uniformly distributed around the centre tube and should be suitably joined together so as not to permit flow of HSD oil through the joint.

3. Type Testing of Filters and approval of media:

The finished filter shall meet the following performance requirements at firm's Test Rig.

3.1 End load test:

A tensile load of 20 kg applied at the end caps of the filter elements for 5 minutes shall not cause any damage.

3.2 Fabrications Integrity:

Fabrication integrity of the filter element shall be verified as per test method described in IS 8383 or ISO 2942. The test fluid for this test shall be clean, filtered HSD oil at room temperature between 15 to 40ºC. No evidence of persistent stream of bubbles shall be visible from the end cap area bonded with adhesive and filter paper area or paper pleat joint, prior to foam coming out from the paper pores. The air pressure shall be applied till the foam starts coming out from the paper.

The foam from filter paper pores should not come out up to a pressure of 15 cms of water gauge (min.) for primary filter and 20 cms water gauge (min.) for secondary filter.

3.3 Pressure drop Vs Flow Rate (In series):

The filter elements shall be tested in series on test rig (as per drg. No.SKDP-3868). The test oil shall be RR606 or any other oil approved by RDSO for use on ALCO engines, with clean oil at a temperature of 80±2ºC inlet pressure of 3.5 Kg/cm², the flow rate and maximum pressure drop of the filter elements should be as per table given below:

Flow Rate (lpm)	Pressure Drop (Kg/cm²)
20	0.25
40	0.40
50	0.50

3.4 Filtering efficiency and Rig Life (In series):

The flow rate shall be maintained at 30 lpm at 3.5 Kg/cm² inlet pressure throughout the test. The standard test dust shall conform to SAE J726 AC fine (Imported). The test dust slurry

addition shall be made with 10 grams of dust in 50 cc of test oil and added to the sump at intervals of 15 minutes. The test shall continue till a pressure differential of 1.4 kg/cm² is built up across the combination of Primary and Secondary filter elements. Rig life shall be the number of additions of contaminant required to build 1.4 kg/cm² pressure differential. The cumulative filtering efficiency during the test and rig life shall not be less than those indicated below:

For Drg. No. SKDP - 3908 & 3909		For Drg. No. SKDP - 3901 & 3902	
Cumulative Filtering Efficiency (min.) %	After No. of Additions	Cumulative Filtering Efficiency (min.) %	After No. of Additions
75	3	75	3
80	10	90	20
85	15	95	40
98	End of Rig Life	98	End of Rig Life
Minimum Rig life 20 Additions		**Minimum Rig life 65 Additions**	

3.5 Test for ability to withstand high-pressure differential (In series):

The cumulative filtering efficiency and rig life test shall be continued further by addition of contaminants as necessary till a pressure differential of 3.5 kg/cm² is reached (irrespective of flow rate) and maintained for at least 5 minutes. The filter elements when checked after the test shall not indicate pleat collapse.

3.6 Tests to establish resistance to water contamination:

This test is designed to assure that pleat collapse and premature plugging does not occur when HSD oil is contaminated with water. The test method is basically the same as for the pressure drop Vs. flow rate test under clause 3.3 with the following difference:

1) Use 40 liters of HSD oil in the sump.

2) After completion of the normal flow rate Vs pressure drop test add 1% of distilled water (by volume) in the sump oil and mix it by circulating the oil water mixture through the by-pass circuit for at least 10 minutes. Pass this contaminated oil through the filter for at least 10 minutes and flow rate Vs pressure drop characteristics of filters shall be determined for flow rates from 10 to 50 lpm, at steps of 10 lpm.

3) An increase in pressure differential when tested shall not exceed 0.2 kg/cm² for a flow rate of 20 liters/minutes. The test oil sample is collected from outlet of the secondary filter at the end of the test. This sample shall be subjected to water contamination test using “AQUADIS MICRODETECTOR CAPSULE” rated at 15 ppm. The filter elements when checked after the test shall not indicate pleat collapse.

3.7 Field Performance:

Both Primary & Secondary filter elements together shall be subjected to field service trials. During field trials on ALCO locomotives, the filter elements should provide satisfactory filtration for a minimum period of 190 days in service to Drg. Nos. SKDP-3901 & SKDP – 3902 and 100 days to Drg. Nos. SKDP – 3908 & SKDP – 3909. The filter elements shall be changed when vacuum across primary filter rises to 10 Cms (4”) of mercury and differential pressure across secondary filter rises to 1.4 kg/cm².

Zonal Rly/Shed will provide Performance Detail of Field Trial for Drg. No. SKDP-3901 & 3902 and Drg. No. SKDP-3908 & 3909 as per formats attached **as Annexure – II**.

4. Approval requirements:

The filter elements offered against this specification should satisfy the test requirement stipulated below:

4.1 Filter Paper:

4.1.1 The filters shall be manufactured with the grade/type and make of filter paper approved by RDSO. The filter manufacturer shall declare the grade/type and make of filter paper proposed to be used. The filter paper manufacturer will be required to give an undertaking for mean pore size of filter paper.

4.1.2 The cured filter paper used in the construction of the element shall be tested for Mean pore size as per AAR Bubble Point test method/ASTM F-316/03 (2011) **OR** corresponding Indian Standard to be referred .

4.2 Filter element:

On preliminary acceptance of the filter paper by RDSO, filter elements made out from the paper offered shall be subjected to type tests. If the results of the type tests are found acceptable, filter elements shall be subjected to field trials as per test scheme issued by RDSO to evaluate their service performance. The field trial shall be conducted in three diesel sheds. Qualifying Quantity and period for field trial and up-gradation will be governed by (latest version) of RDSO ISO Document No. MP-M- 8.1-1 (Master List of Qualifying Quantity for up-gradation to approved vendors and Qualifying Quantity & Qualifying Periods for Approval for RDSO vendor for developmental order of items controlled by MP Directorate).

5. Inspection:

5.1 For each lot of supply, the manufacturer shall submit a certificate to the purchaser / inspector along with the particulars of the paper manufacturer, manufacturer's identifying code or grade, certifying that the filters being offered are made from a paper identical in all respects to the one which had been approved by RDSO under requirements of clause 4.

5.2 For more than 1000 sets of lot one test shall be carried out in respect of tests listed in clause 3 except clause 3.6. Results in respect of filtering efficiency and rig life test shall meet the minimum requirements laid down in clause 3.3 and 3.4. These tests shall be carried out at a firm's Test Rig/laboratory. For 1000 sets and below one test shall be carried out as per clause 3.1, 3.2 & 3.3.

5.3 The samples for checks and testing shall be selected by the inspector at random from filters offered in one lot.

5.4 All filters constituting the lot rejected on the basis of inspection shall be marked suitably by the inspector so as to prevent their being offered again to Indian Railways against this specification. The method of marking shall be at the option of the purchaser/inspector.

5.5 The manufacturer shall, at his own cost, supply samples, labour and appliances and arrange for carrying out of tests as may be necessary. The manufacturer shall bear the cost of carrying out tests etc. at approved test house or laboratory as may be required by purchaser or inspector.

5.6 The purchaser, Inspector or their representatives shall have free access to the works of the manufacturer at all reasonable times. They shall be at liberty to inspect the manufacture at any stage and to reject any material that does not conform to the terms of this specification.

6. Marking

Name of the manufacturer, month and year of manufacture and batch no. of the filter shall be stamped/ embossed/ printed/ marked on the end cap as given in the drawings.

7. Packing:

To avoid damage of filters during transit and storage each filter shall be packed in poly bag and then placed in the carton made of 5-ply corrugated paperboard.

8. Warranty

The supplier shall furnish a warranty that if the service life obtained on locomotives less than 90 days for conventional filter set & 180 days for large filter set, all filter elements belonging to the particular batch will be replaced by him free of cost.

9. **Vendor Changes in Approved Status**

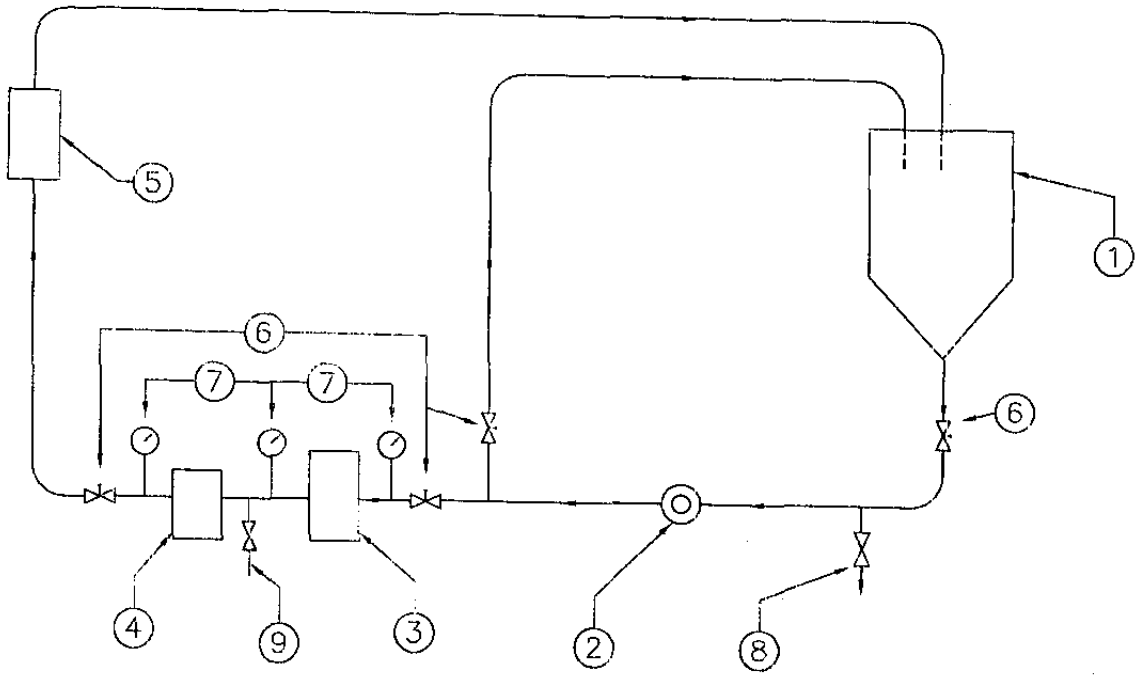
All the provisions contained in RDSO's ISO procedures laid down in document no. QO-D-8.1-11, dated 01.07.2020 or latest (Titled "Vendor -changes in approved status) and subsequent version/amendment thereof, shall be binding and applicable on the successful vendor/vendors in the contract floated by Railways to maintain quality of products supplied to Railways.

10. **Preference to Make In India**

The Government of India policy on `Make in India` shall apply.

11. The revised specification shall be implemented from **1st Sept – 2021**.

INDIAN RLYS RDSO(MP)	APPLICABLE FOR ALCO/DLW DIESEL LOCOS	TEST RIG FOR FUEL OIL FILTERS IN SERIES (SCHEMATIC DIAGRAM)



NOTE:–

1. ALL PIPES SHALL BE OF 25 mm (1") BORE.
2. PIPE BEFORE AND AFTER FILTER HOUSING SHALL HAVE MIN. STRAIGHT LENGTH OF 300 mm.
3. ALL BENDS/ELBOWS SHALL BE OF LARGE RADIUS.
4. ALL VALVES IN HORIZONTAL LINE SHALL HAVE VERTICAL STEM.

9	1/2" DRAIN COCK
8	1" DRAIN COCK
7	PRESSURE GAUGES, LEAST COUNT–0.05Kg/CM^2
6	GATE VALVES
5	FLOW METER LEAST COUNT–1 LPM
4	SECONDARY FILTER HOUSING
3	PRIMARY FILTER HOUSING
2	PUMP
1	RESERVOIR–100 L CAPACITY

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ALT:	NO.OF PLACES	REF. NO.	DESCRIPTION	ALT. NOTE NO.	SIGN:	DATE

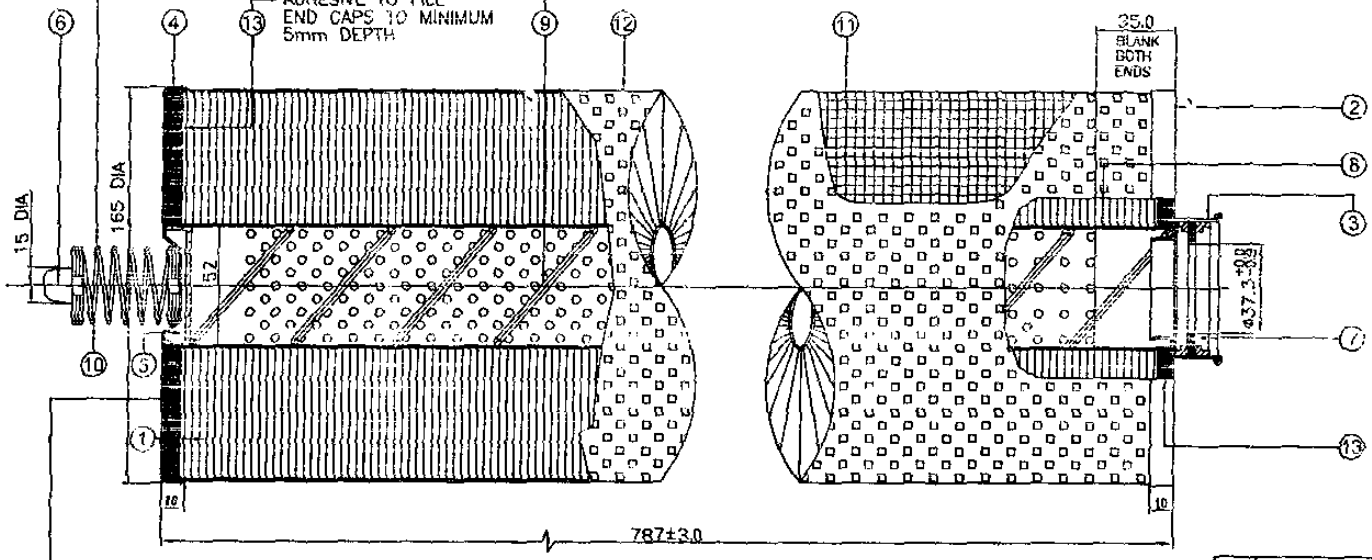
SCALE	REF:
	DRG. NO. **SKDP–3868**

FIRST ISSUED	SUPERSEDES	SUPERSEDED BY

SPRING DATA
WIRE DIA. 2.5mm
OUT SIDE DIA. 33mm
NO. OF COILS $4\frac{1}{2}$ TIP TO TIP
FREE HEIGHT 43mm

REINFORCING SPRING WIRE DIA 2.5 mm

ADHESIVE TO FILL END CAPS TO MINIMUM 5mm DEPTH



TO BE EMBOSSED HERE
MANUFACTURER'S NAME
BATCH NO. MONTH & YEAR

NOTES:-

1. FILTER SHALL BE TESTED AS PER SPEC. NO. MP.0.2600-25.
2. MEAN PORE SIZE 10-16 MICRON HAVING 80±2 PLEATS TO M/s CLARK PART NO. HA-PP KIT IS PRESENTLY APPROVED. AN ALTERNATE SOURCE OF PAPER CAN BE ACCEPTED SUBJECT TO RIG TEST AND FIELD TRIAL BY RDSO.

REF NO	DESCRIPTION	NO OFF	MATL & SPEC
13.	ADHESIVE	-	THERMOSETTING PVC COMPOUND
12.	OUTER WRAPPER 20 TO 25% PERFORATED	1	BURST STRENGTH 3.5 Kg/cm² (MIN.)
11.	COTTON NETTING/THREAD	1	COMMERCIAL QUALITY
10.	ADOPTER SPRING	1	SP. ST. WIRE IS:4454 Pt:1 Gr:2
9.	REINFORCING SPRING	1	
8.	TUBE, 0.4 mm THICK, 20 TO 25% PERFORATED	1	STEEL SHEET TO IS:513-D
7.	GASKET BONDED WITH INSTANT ADHESIVE	1	NITRILE RUBBER COMPOUND, SHORE 'A' HARDNESS 85±5
6.	NIPPLE	1	STEEL SHEET TO IS:513-D, ZINC PLATED
5.	PRESSURE PLATE (OPTIONAL), 0.4 mm THICK	1	
4.	TOP END CAP, 0.4 mm THICK	1	
3.	BOTTOM EXTENSION ASSLY, 0.4 mm THICK	1	
2.	BOTTOM END CAP, 0.4 mm THICK	1	
1.	FILTER MEDIA CORRUGATED	1	M/s CLARK PART NO. HA-PP KIT

APPLICABLE FOR ALCO/DLW LOCOS

LARGE PRIMARY FUEL FILTER ELEMENT (LOW MEAN PORE SIZE)

SCALE N.T.S. | REF: | FIRST ISSUED

INDIAN RLYS RDSO (MP) | DRG. NO. SKDP-3901 | SUPERSEDES | SUPERSEDED BY

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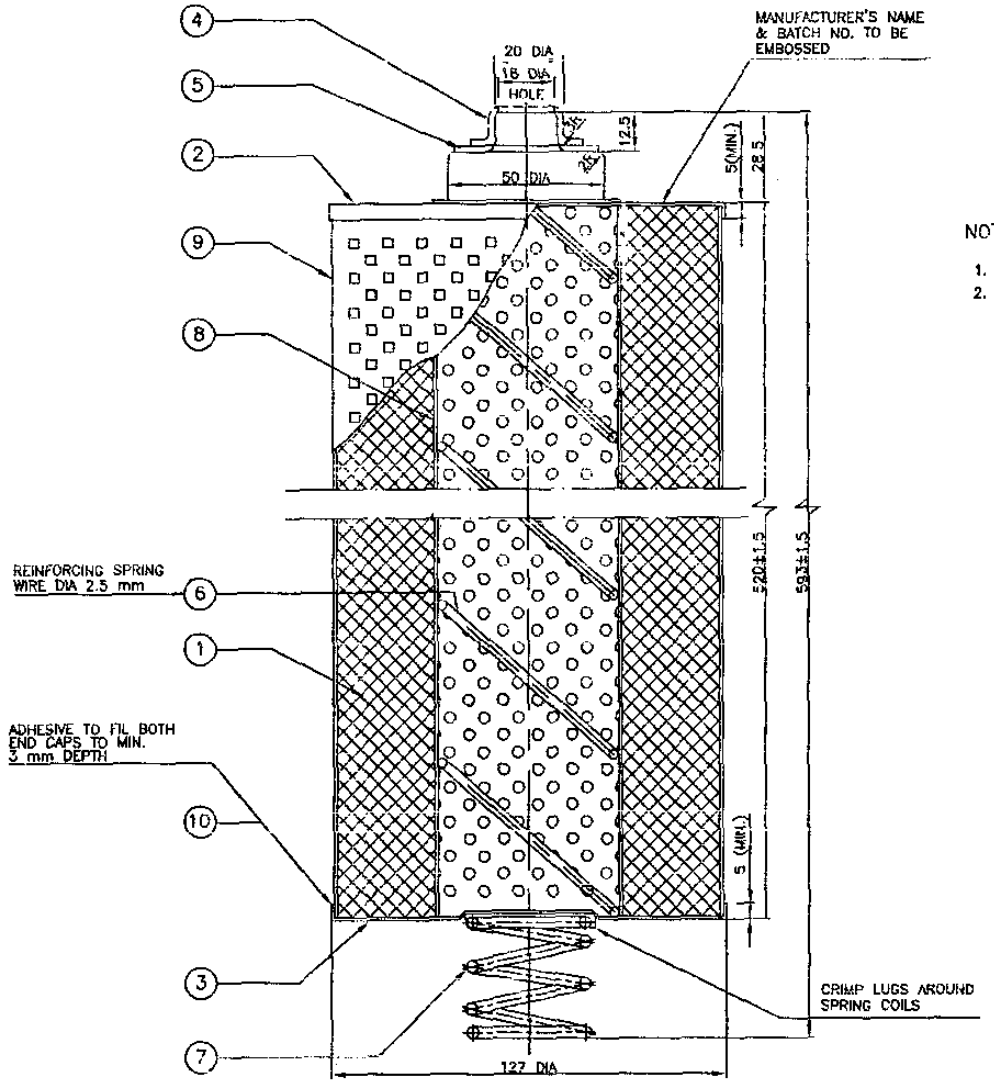
SYMBOL	Ra um (MAX.)	TOLERANCES ON UNTOLERANCED DIMENSIONS TO IS: 2102 (Part I)-COARSE
	50	
▽	25	
▽▽	6.3	
▽▽▽	0.8	*SURFACE ROUGHNESS TO IS:3073
▽▽▽▽	0.1	WELDING SYMBOLS TO IS:813

ALL DIMENSIONS ARE IN mm

ALT	NO. OF PLACES	REF. NO.	DESCRIPTION	ALT.NOTE NO.	SIGN	DATE



SPRING DATA

WIRE DIA. : 3.75 mm
OUT SIDE DIA. : 40 mm
FREE LENGTH : 44.5 $^{+1.5}_{-3.0}$ mm
TYPE OF ENDS: CLOSED GROUND
STIFFNESS : 17±1 Kg/cm

NOTES:-

1. FILTER SHALL BE TESTED AS PER SPEC. NO. MP.0.2600-25.
2. MEAN PORE SIZE 6-10 MICRON HAVING 92±2 PLEATS TO M/s CLARK PART NO. HF-PS Kit IS PRESENTLY APPROVED. AN ALTERNATIVE SOURCE CAN BE ACCEPTED SUBJECT TO RIG TEST AND FIELD TRIAL BY RDSO.

REF NO	DESCRIPTION	NO OFF	MATL. & SPEC.
10	ADHESIVE	-	THERMOSETTING PVC COMPOUND
9	OUTER WRAPPER 20 TO 25% PERFORATED	1	BURST STRENGTH 3.5 Kg/cm²(MIN.)
8	TUBE (ID 58 mm), 04 mm THICK, 20 TO 25% PERFORATED	1	STEEL SHEET TO IS:513-D
7	ADOPTER SPRING	1	SPRING STEEL WIRE
6	REINFORCING SPRING	1	IS:4454 Pt-I, Gr-2
5	GASKET 3.5 mm THICK BONDED WITH INSTANT ADHESIVE	1	NITRILE RUBBER COMPOUND, SHORE 'A' HARDNESS 85±5
4	PROTECTOR CAP	1	PLOYVINYL CHLORIDE
3	BOTTOM SUB ASSLY., 0.4 mm THICK	1	STEEL SHEET TO IS:513-D,
2	TOP SUB ASSLY., 0.4 mm THICK	1	ZINC PLATED
1	FILTER MEDIA CORRUGATED	1	M/s CLARK PART NO. HF-PS Kit

APPLICABLE FOR ALCO/DLW LOCOS	LARGE SECONDARY FUEL FILTER ELEMENT (LOW MEAN PORE SIZE)		
SCALE	REF:		FIRST ISSUED
INDIAN RLYS RDSO (MP)	DRG. NO. SKDP- 3902		SUPERSEDES
			SUPERSEDEDBY

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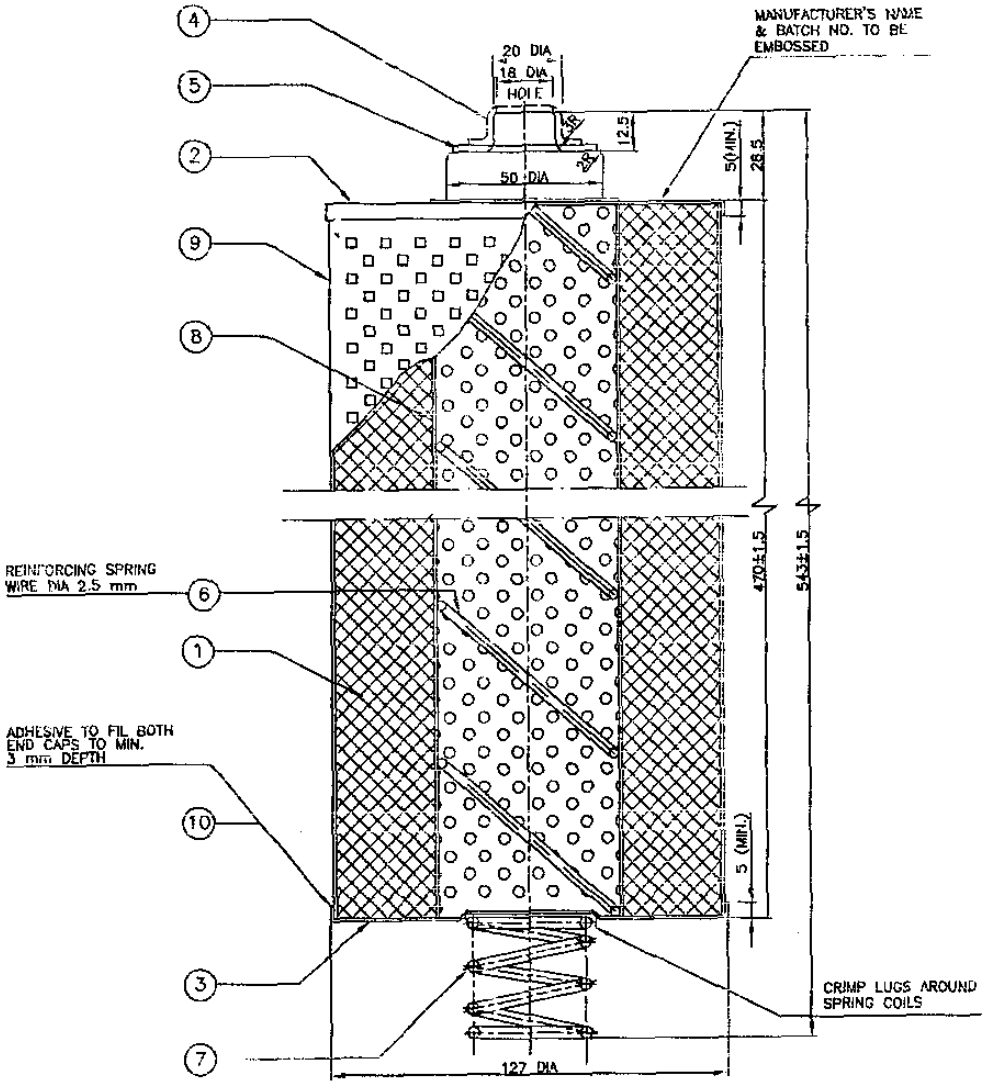
Dt	DEC.-2008

SYMBOL	Ra um (MAX)	
	50	
▽	25	
▽▽	6.3	
▽▽▽	0.8	*SURFACE ROUGHNESS TO IS:3073
▽▽▽▽	0.1	WELDING SYMBOLS TO IS:813
		TOLERANCES ON UNTOLERANCED DIMENSIONS TO IS: 2102 (Part I)-COARSE

ALL DIMENSIONS ARE IN mm

ALT	NO. OF PLACES	REF. NO.	DESCRIPTION	ALT. NOTE NO.	SIGN	DATE



SPRING DATA

WIRE DIA. : 3.75 mm
OUT SIDE DIA. : 40 mm
FREE LENGTH : 44.5 $^{+1.5}_{-0.5}$ mm
TYPE OF ENDS: CLOSED GROUND
STIFFNESS : 17±1 Kg/cm

NOTES:–

1. FILTER SHALL BE TESTED AS PER SPEC. NO. MP.0.2600–25.
2. MEAN PORE SIZE 10–16 MICRON HAVING 80±2 PLEATS TO M/s CLARK PART NO. HB–PP18 Kit IS PRESENTLY APPROVED. AN ALTERNATIVE SOURCE CAN BE ACCEPTED SUBJECT TO RIG TEST AND FIELD TRIAL BY RDSO.

REF NO	DESCRIPTION	NO OFF	MATL. & SPEC.
10	ADHESIVE	–	THERMOSETTING PVC COMPOUND
9	OUTER WRAPPER 20 TO 25% PERFORATED	1	BURST STRENGTH 3.5 Kg/cm²(Min.)
8	TUBE (ID 58 mm), 04 mm THICK, 20 TO 25% PERFORATED	1	STEEL SHEET TO IS:513–D
7	ADOPTER SPRING	1	SPRING STEEL WIRE IS:4454 Pt–I, Gr–2
6	REINFORCING SPRING	1	
5	GASKET 3.5 mm THICK BONDED WITH INSTANT ADHESIVE	1	NITRILE RUBBER COMPOUND, SHORE 'A' HARDNESS 85±5
4	PROTECTOR CAP	1	PLOYVINYL CHLORIDE
3	BOTTOM SUB ASSLY., 0.4 mm THICK	1	STEEL SHEET TO IS:513–D, ZINC PLATED
2	TOP SUB ASSLY., 0.4 mm THICK	1	
1	FILTER MEDIA CORRUGATED	1	M/s CLARK PART NO. HB–PP18 Kit

SYMBOL	Roum (MAX)	TOLERANCES ON UNTOLERANCED DIMENSIONS TO IS: 2102 (Part I)–COARSE
	50	ALL DIMENSIONS ARE IN mm
▽	25	
▽▽	6.3	
▽▽▽	0.8	*SURFACE ROUGHNESS TO IS:3073
▽▽▽▽	0.1	WELDING SYMBOLS TO IS:813

ALT	NO. OF PLACES	REF. NO.	DESCRIPTION	ALT NOTE NO.	SIGN	DATE

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APPLICABLE FOR ALCO/DLW LOCOS

CONVENTIONAL PRIMARY FUEL FILTER ELEMENT (LOW MEAN PORE SIZE)

SCALE

REF:

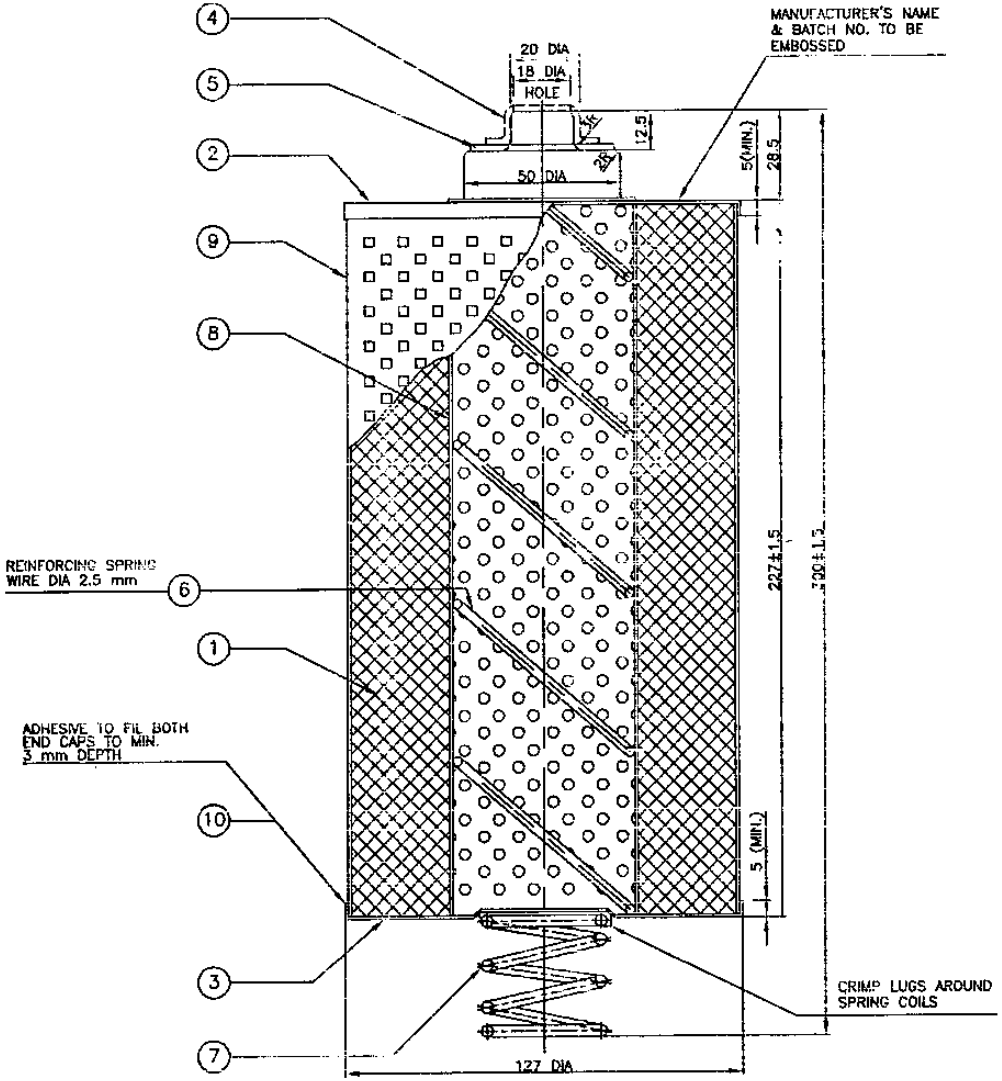
FIRST ISSUED

INDIAN RLYS RDSO (MP)

DRG. NO. **SKDP – 3908**

SUPERSEDES

SUPERSEDED BY



SPRING DATA

WIRE DIA. : 3.75 mm
OUT SIDE DIA. : 40 mm
FREE LENGTH : 44.5 $^{+1.5}_{-1.5}$ mm
TYPE OF ENDS: CLOSED GROUND
STIFFNESS : 17±1 Kg/cm

NOTES:–

1. FILTER SHALL BE TESTED AS PER SPEC. NO. MP.0.2600–25.
2. MEAN PORE SIZE 6–10 MICRON HAVING 92±2 PLEATS TO M/s CLARK PART NO. HF–PS9 KIT IS PRESENTLY APPROVED. AN ALTERNATIVE SOURCE CAN BE ACCEPTED SUBJECT TO RIG TEST AND FIELD TRIAL BY RDSO.

REF NO	DESCRIPTION	NO OFF	MATL. & SPEC.
10	ADHESIVE	–	THERMOSETTING PVC COMPOUND
9	OUTER WRAPPER 20 TO 25% PERFORATED	1	BURST STRENGTH 3.5 Kg/cm²(MIN.)
8	TUBE (ID 58 mm), 04 mm THICK, 20 TO 25% PERFORATED	1	STEEL SHEET TO IS:513–O
7	ADOPTER SPRING	1	SPRING STEEL WIRE IS:4454 Pt–I, Gr–2
6	REINFORCING SPRING	1	
5	GASKET 3.5 mm THICK BONDED WITH INSTANT ADHESIVE	1	NITRILE RUBBER COMPOUND, SHORE 'A' HARDNESS 85±5
4	PROTECTOR CAP	1	PLOYVINYL CHLORIDE
3	BOTTOM SUB ASSLY., 0.4 mm THICK	1	STEEL SHEET TO IS:513–D, ZINC PLATED
2	TOP SUB ASSLY., 0.4 mm THICK	1	
1	FILTER MEDIA CORRUGATED	1	M/s CLARK PART NO. HF–PS9 Kit

SYMBOL	Raum (MAX)	TOLERANCES ON UNTOLERANCED DIMENSIONS TO IS: 2102 (Part I)–COARSE
▽	50	ALL DIMENSIONS ARE IN mm
▽▽	25	
▽▽▽	6.3	
▽▽▽▽	0.8	*SURFACE ROUGHNESS TO IS:3073
▽▽▽▽	0.1	WELDING SYMBOLS TO IS:813

ALT	NO. OF PLACES	REF. NO.	DESCRIPTION	ALT NOTE NO.	SIGN	DATE

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APPD
Dt DEC.–2008

APPLICABLE FOR ALCO/DLW LOCOS

CONVENTIONAL SECONDARY FUEL FILTER ELEMENT (LOW MEAN PORE SIZE)

SCALE | REF: | FIRST ISSUED

INDIAN RLYS RDSO (MP) | DRG. NO. SKDP – 3909 | SUPERSEDES | SUPERSEDEDBY

Annexure - I

Test Plan/Check sheet for Type Test /Purchase Inspection of Low Mean Pore Size Primary and Secondary Fuel Oil Filter Elements for Diesel Electric Locomotives as per RDSO Specification No. MP.0.2600-25 and Drawing No.SKDP – 3901 & 3902 and SKDP – 3908 & 3909.

A. Dimensional check :

SN	Para No. of Specification	Dimension	Specified Value (mm)	Observed Value (mm)	Remarks (OK/NOT OK)
1.	RDSO Drg. No. SKDP – 3901 (Alt. – 0)	Total Length	787 ± 3.0		
		Outer Diameter	165 ± 1.2		
		Inner Dia. of Gasket	37.3 (+/-0.8)		
		Height of End Caps (Top & Bottom)	10 ± 0.5		
		Length of Blank both Ends (Top& Bottom)	35 ± 0.8		
		Depth of Adhesive filling End Caps	5 (min.)		
		Reinforcing Spring Wire Diameter	2.5 ± 0.2		
		Adopter Spring Wire Diameter	2.5 ± 0.2		
		Adopter Spring Outer Diameter	33 ± 0.8		
		Adopter Spring Free Height	43 ± 0.8		
		Adopter Spring No. of Coils (Tip to Tip)	4 +1/2		
		Nipple Diameter	15 ± 0.5		
		Manufacturer's Mark (to be embossed)	[Manufacturer's name, Batch No. (Month/Year)]		
2.	RDSO Drg. No. SKDP – 3902 (Alt. – 0)	**Dimension**	**Specified Value (mm)**	**Observed Value (mm)**	**Remarks (OK/NOT OK)**
		Overall Length (Filter Assembly)	593 ± 1.5		
		Length (Top End Cap To Bottom End Cap)	520 ± 1.5		
		Outer Diameter End Caps (Top & Bottom)	127 ± 1.2		
		Height of End Caps (Top & Bottom)	5 (min.)		
		Extension piece Top Cap base Dia.	50 ± 0.8		
		Outer Dia. (Protector Cap)	20 ± 0.5		
		Hole Dia. (Protector Cap)	18 ± 0.5		
		Height (top end cap to protector cap top)	28.5 ± 0.5		
		Extension piece Height	12.5 ± 0.5		
		Reinforcing Spring Wire Dia.	2.5 ± 0.2		
		Depth of Adhesive to fill both End Caps	3 (min.)		
		Adopter Spring Wire Dia.	3.75 ± 0.3		
		Adopter Spring Coil Dia.	40 ± 0.8		

		Adopter Spring Free Length	44.5 (+1.5/-0.8)		
		Manufacturer's Mark (to be embossed)	(Mfg. name, Batch No.)		
3.	RDSO Drg. No. SKDP – 3908 (Alt. – 0)	**Dimension**	**Specified Value (mm)**	**Observed Value (mm)**	**Remarks (OK/NOT OK)**
		Overall Length (Filter Assembly)	543 ± 1.5		
		Length (Top End Cap To Bottom End Cap)	470 ± 1.5		
		Outer Diameter End Caps (Top & Bottom)	127 ± 1.2		
		Height of End Caps (Top & Bottom)	5 (min.)		
		Extension piece Top Cap base Dia.	50 ± 0.8		
		Outer Dia. (Protector Cap)	20 ± 0.5		
		Hole Dia. (Protector Cap)	18 ± 0.5		
		Height (top end cap to protector cap top)	28.5 ± 0.5		
		Extension piece Height	12.5 ± 0.5		
		Reinforcing Spring Wire Dia.	2.5 ± 0.2		
		Depth of Adhesive to fill both End Caps	3 (min.)		
		Adopter Spring Wire Dia.	3.75 ± 0.3		
		Adopter Spring Coil Dia.	40 ± 0.8		
		Adopter Spring Free Length	44.5 (+1.5/-0.8)		
		Manufacturer's Mark (to be embossed)	(Mfg. name, Batch No.)		
4.	RDSO Drg. No. SKDP – 3909 (Alt. – 0)	**Dimension**	**Specified Value (mm)**	**Observed Value (mm)**	**Remarks (OK/NOT OK)**
		Overall Length (Filter Assembly)	300 ± 1.5		
		Length (Top End Cap To Bottom End Cap)	227 ± 1.5		
		Outer Diameter End Caps (Top & Bottom)	127 ± 1.2		
		Height of End Cap (Top & Bottom)	5 (min.)		
		Extension piece Top Cap base Dia.	50 ± 0.8		
		Outer Dia. (Protector Cap)	20 ± 0.5		
		Hole Dia. (Protector Cap)	18 ± 0.5		
		Height (top end cap to protector cap top)	28.5 ± 0.5		
		Extension piece Height	12.5 ± 0.5		
		Reinforcing Spring Wire Dia.	2.5 ± 0.2		
		Depth of Adhesive to fill both End Caps	3 (min.)		
		Adopter Spring Wire Dia.	3.75 ± 0.3		
		Adopter Spring Coil Dia.	40 ± 0.8		
		Adopter Spring Free Length	44.5 (+1.5/-0.8)		
		Manufacturer's Mark (to be embossed)	(Mfg. name, Batch No.)		

B. Visual and physical checks:

SN.	Test Description	Para No. of Specification	Parameter to be Checked/ Test method	Specified Value (mm)	Observed Value	Remarks (OK/Not OK)
1.	Visual Check	RDSO Drg. No. SKDP – 3902 (Alt. – 0)	Crimping of lugs around spring coils, closed grinding of spring	Crimped & closely ground		Specify non-compliance, if Not OK
		RDSO Drg. No. SKDP – 3908 (Alt. – 0)	Crimping of lugs around spring coils, closed grinding of spring	Crimped & closely ground		Specify non-compliance, if Not OK
		RDSO Drg. No. SKDP – 3909 (Alt. – 0)	Crimping of lugs around spring coils, closed grinding of spring	Crimped & closely ground		Specify non-compliance, if Not OK
		2.2	Distribution of filter paper pleats.	Uniform distribution around centre tube or not		Specify non-compliance, if Not OK
2.	Physical Check	2.1	Mean Pore Size of Filter Paper for primary fuel filter	10-16 microns		
		2.1	Mean Pore Size of Filter Paper for secondary fuel filter	6-10 microns		

C. Performance test :

SN.	Test Description	Para No. of Specification	Parameter to be Checked/ Test method	Specified Value (mm)	Observed Value	Remarks (OK/Not OK)
1.	End Load test	3.1	Apply tensile load of 20 kg at the end caps of the filter elements for 5 min.	Shall not cause any damage.		
2.	Fabrication Integrity test	3.2	As per para 3.2 of the specification and test	No visible evidence of persistent stream of bubbles from the end		

			procedure given in IS:8383 or ISO 2942	caps area bonded with adhesive and filter paper area or paper pleat joint, prior to foam coming out from the paper pores. The foam from filter paper pores should not come out up to a pressure of 15 cm of water gauge (min) for primary filters and 20 cm of water gauge (min) for secondary filter.		
3.	Pressure drop V/s Flow rate (in series)	3.3	As per Para 3.3 of the specification. The flow rate and maximum pressure drop of the filter elements should be recorded in the format given in the end of check sheet.	Flow Rate (lpm) / Pressure Drop (Kg/cm²) 20 — 0.25 40 — 0.40 50 — 0.50		
4.	Filtering Efficiency & Rig Life (In series)	3.4	As per Para 3.4 of the specification (for SKDP – 3908 & 3909) 1. Cumulating filtering efficiency (min.) % (To be recorded in the format given in the end of check sheet). 2. Rig Life (Min)	After 3rd addition of dust: 75 After 10th addition of dust: 80 After 15th addition of dust: 85 At the end of rig life: 98 20 addition of test dust.		
			As per Para 3.4 of the specification (for SKDP – 3901 & 3902) 1. Cumulating filtering efficiency (min.) % (To be recorded in the format given in the end of check sheet). Rig Life (Min)	After 3rd addition of dust: 75 After 20th addition of dust: 90 After 40th addition of dust: 95 At the end of rig life: 98 65 addition of test dust.		
5.	Ability to Withstand High Pressure Differential	3.5	As per Para 3.5 of the specification	Shall not indicate pleat collapse.		
6.	Resistance to	3.6	As per Para 3.6 of the	Pressure differential with		

	Water contamination.		specification	contaminated oil should not increase more than 0.2 kg/cm² compared to un-contaminated oil at 20 litres/minute flow. The filter element when checked after test shall not indicate pleat collapse.		

D. Paper properties test :

SN.	Test Description	Para No. of Specification	Parameter to be Checked/ Test method	Specified Value	Observed Value	Remarks (OK/Not OK)
1.	Filter paper	4.1.1	1. Grade/type of filter paper.	Collect the declaration/undertaking of filter manufacturer regarding make & grade/type of filter paper used and its mean pore size.		

E. Other checks :

SN.	Test Description	Para No. of Specification	Parameter to be Checked/ Test method	Specified Value	Observed Value	Remarks (OK/Not OK)
1.	Certificate/Undertaking	5.1	Certificate to be submitted by the firm in compliance to clause 5.1 of the specification	As per Clause 5.1.		Attach certificate given by firm.
2.	Marking	6.0	Name of manufacturer, month and year of manufacture & batch no. of the filter stamped/embossed/printed/marked on the end cap	As mentioned in Drg. Nos. SKDP – 3901, 3902, 3908 & 3909	Marked/Not Marked	

N.B.

1. All the above tests are to be done during type testing.
2. During type testing, the tests mentioned in clauses 3 of the specification shall be done at firm's Test Rig/Laboratory.

3. Purchase inspection: Tests mentioned in (A) Dimension Check, (B) Visual & Physical Check and (C) Performance Test to be carried out.

Note:- (i) For lot size more than 1000, performance test to be done as per Clause 3.0 of the Specification except Clause 3.6 (test to establish resistance to water contamination.
(ii) For lot size less than 1000, performance test to be done for the tests mentioned in Clauses 3.1, 3.2 & 3.3.
(i) Certificate/Undertaking to be taken for each lot supplied.

Pressure Drop Vs Flow Rate (In Series) (Para 3.3 of the specification)

Test Oil :
Quantity : 40 Ltrs
Temperature :80 ± 2° C
Test Sample:
Test Rig :FuelFilterTest Rig of M/s ----------

Flow Rate	**Pressure in Primary Fuel Filter Element (Kg/cm²)**		**Pressure in Secondary Fuel Filter Element (Kg/cm²)**		**Pressure Drop of Filters (In Series) (Kg/cm²)**	**Empty Housing Pressure Drop (In Series) (Kg/cm²)**	**Net Pressure Drop Across The Filters (In Series) (Kg/cm²)**
LPM	**Inlet (A)**	**Outlet**	**Inlet**	**Outlet (B)**	**X=A-B**	**Y**	**X-Y**
10	3.5						
20	3.5						
30	3.5						
40	3.5						
50	3.5						

Cumulative Filtering Efficiency & Rig Life (In Series) (Para 3.4 of the specification)

Test Oil :
Quantity : 40 Ltrs.
Test Temperature : 80 ± 2 ° C
Test Dust:AC Fine Test Dust SAE J726 FINE (Imported)
Test Dust Addition Rate:10gms (in 50 CC Slurry)
Flow rate : 30 Litres/Minute at 3.5 Kg/cm² inlet pressure throughout the test.
Test Sample :Low Mean Pore Size Primary & Secondary Fuel Oil Filter Elementsmade using Filter Paper Media of M/s ……
Test Rig :Fuel Filter Test Rig of M/s ----------

Sl. No.	***Cumulative Dust Fed (Gms.)**	**Pressure in Primary Fuel Filter Element (Kg/cm²)**		**Pressure in Secondary Fuel Filter Element (Kg/cm²)**		**Pressure Drop of Filter (In Series) (Kg/cm²)**	**Empty Housing Pressure Drop (In Series) (Kg/cm²)**	**Net Pressure Drop Across the Filters (In Series) (Kg/cm²)**	**Cumulative Filtering Efficiency (%)**	
		Inlet (A)	**Outlet**	**Inlet**	**Outlet (B)**	**X=A-B**	**Y**	**X-Y**	**Specified (Min.)**	**Observed**
0	0									
1	10	3.50								
2	20	3.50								
3	30	3.50								
4	40	3.50								
5	50	3.50								
6	60	3.50								
7	70	3.50								
8	80	3.50								
9	90	3.50								
10	100	3.50								
11	110	3.50								
12	120	3.50								
13	130	3.50								
14	140	3.50								
15	150	3.50								

16	160	3.50								
17	170	3.50								
18	180	3.50								
19	190	3.50								
20	200	3.50								
21	210	3.50								
22	220	3.50								
23	230	3.50								
24	240	3.50								
25	250	3.50								
26	260	3.50								
27	270	3.50								
28	280	3.50								
29	290	3.50								
30	300	3.50								
31	310	3.50								
32	320	3.50								
33	330	3.50								
34	340	3.50								
35	350	3.50								
36	360	3.50								
37	370	3.50								
38	380	3.50								
39	390	3.50								
40	400	3.50								
41	410	3.50								
42	420	3.50								
43	430	3.50								
44	440	3.50								
45	450	3.50								
46	460	3.50								
47	470	3.50								
48	480	3.50								

49	490	3.50								
50	500	3.50								
51	510	3.50								
52	520	3.50								
53	530	3.50								
54	540	3.50								
55	550	3.50								
56	560	3.50								
57	570	3.50								
58	580	3.50								
59	590	3.50								
60	600	3.50								
61	610	3.50								
62	620	3.50								
63	630	3.50								
64	640	3.50								
65	650	3.50								

*** N.B.**

1. For Low Mean Pore Size Primary & Secondary Fuel Filters (Drg. No. SKDP 3908 & 3909) Minimum Rig Life shall be 20 additions of Dust.
2. For Low Mean Pore Size Primary & Secondary Fuel Filters (Drg. No. SKDP 3901 & 3902) Minimum Rig Life shall be 65 additions of Dust.

Test to establish resistance to water contamination (Para 3.6 of the specification)

Test Oil :
Quantity : 40 Ltrs.
Temperature :80 ± 2° C
Test Sample:
Test Rig :Fuel Filter Test Rig of M/s ----------

(A) Before Water Addition :

Flow Rate	Pressure in Primary Fuel Filter Element (Kg/cm²)	Pressure in Secondary Fuel Filter Element (Kg/cm²)	Pressure Drop of Filters (In	Only Housing Pressure Drop	Net Pressure Drop Across

					Series)	(In Series)	the Filter (In Series) (Kg/cm²)
LPM	**Inlet (A)**	**Outlet**	**Inlet**	**Outlet (B)**	**X=A-B**	**Y**	**X-Y**
10	3.5						
20	3.5						
30	3.5						
40	3.5						
50	3.5						

(B) After Water Addition :

Flow Rate	**Pressure in Primary Fuel Filter Element (Kg/cm²)**		**Pressure in Secondary Fuel Filter Element (Kg/cm²)**		**Pressure Drop of Filters (In Series)**	**Only Housing Pressure Drop (In Series)**	**Net Pressure Drop Across the Filter (In Series) (Kg/cm²)**
LPM	**Inlet (A)**	**Outlet**	**Inlet**	**Outlet (B)**	**X=A-B**	**Y**	**X-Y**
10	3.5						
20	3.5						
30	3.5						
40	3.5						
50	3.5						

Annexure - II

Trial Scheme for Field Trial of Low Mean Pore Size Primary & Secondary Fuel oil Filter Elements for Diesel Electric Locomotives (for RDSO Drg. No. SKDP – 3901 & 3902 and SKDP – 3908 & 3909

1. Field trial is to be done in three different diesel sheds.
2. Fitment Scheme :

Shed	Loco type	No. of Loco	Filter quantity per loco	Quantity to be fitted (No. of Loco x Qty per loco)	Duration of trial
Shed X	Alco loco for SKDP – 3901 & 3902	5	2	10	190 days
Shed X	Alco loco for SKDP – 3908& 3909	5	2	10	100 days
Shed Y	Alco loco for SKDP – 3901& 3902	5	2	10	190 days
Shed Y	Alco loco for SKDP – 3908& 3909	5	2	10	100 days
Shed Z	Alco loco for SKDP – 3901& 3902	5	2	10	190 days
Shed Z	Alco loco for SKDP – 3908& 3909	5	2	10	100 days

3. The Trial Filters shall be replaced on conditional basis i.e. when the vacuum across primary filter rises to 10cms (4" = 0.136 kg/cm²) of mercury and differential pressure across secondary filter rises to 1.4 kg/cm².

   The shed shall record the data as per the following:

SN	Loco No.	Shed/Rly.	Vacuum across primary filter (cm of Hg of Kg/cm²)	Pressure across secondary filter (Kg/cm²)

   Note:- The vacuum/pressure across primary/secondary filters may be measured by using threaded T-type connection along with matching gauges at the inlet and outlet of filter housings. Threaded T-pipe of the size 5/8" OD x1/2" PT on two branches and a suitable size on the third branch for accommodating matching gauge could be helpful in measuring the vacuum/pressure. The diesel shed may like to keep arranged one such set of items which could be used for measuring vacuum/pressure on each trip when the under-trial loco visits the shed. If required, shed may associate the firm also.

4. On completion of trials:
   (i) Filters may be removed and observations, visual or otherwise, be made on the same with respect to condition for damage, abnormality etc and recorded. The observations may be recorded in comparative form in the light of existing filters which are removed in normal course.

SN	Loco No.	Condition of Existing Filters (SKDP – 3901, 3902 *OR* SKDP – 3908, 3909) at the time of removal during schedule	Condition of Trial Filters (SKDP – 3901, 3902 *OR* SKDP – 3908, 3909) at the time of removal	Remarks (if any)

   (ii) Visual observations may be recorded for injector nozzles of at least 2 locations in a loco and the same may be observed with respect to scoring, damage, abnormality etc.

SN	Loco No.	Condition of Injector Nozzle at at least two different locations		Remarks (if any)
		Location 1	Location 2	

5. A case of fuel dilution, if occurs, may be investigated and root cause may be established. In case filters are replaced in such a case, detailed visual observations on the filters may be recorded.

SN	Loco No.	Case of Fuel dilution (if any) (Yes/No)	Condition of Trial Filters (if replaced due to fuel dilution)	Remarks (if any)

6. The diesel shed shall immediately remove the filters from the service in case the shed arrives at the conclusion that abnormality has arisen in the locomotive and the abnormality is attributable to the filters.

7. The diesel shed for concerned locos shall provide details to RDSO in respect of the above record of observations as per the following,

SN	Loco No.	Shed/Rly.	Date of Fitment	Date of Failure (if any)	Date of Removal	Life obtained (in days)	Reason of Removal