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भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय MINISTRY OF RAILWAYS



HANDBOOK ON 'V'-BELTS OF TL & AC COACHES

TARGET GROUP: TL & AC COACH MAINTENANCE STAFF

CAMTECH/ E/15-16/V-Belts/1.0

September 2015



महाराजपुर, ग्वालियर — 474 005
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*HANDBOOK ON 'V'-BELTS OF
TL & AC COACHES*

QUALITY POLICY

"To develop safe, modern and cost effective Railway Technology complying with Statutory and Regulatory requirements, through excellence in Research, Designs and Standards and Continual improvements in Quality Management System to cater to growing demand of passenger and freight traffic on the railways".

FOREWORD

For effective power transmission from axle to alternator, the health of V-belts and pulleys should be good. It ensures continuous power supply for passenger amenities like air-conditioning, lights and fans in self generating coaches.

Maintenance staff should know the correct maintenance practices, checking and testing of V-belts as well as pulleys. To fulfil this requirement, CAMTECH has prepared this handbook on “V-Belts of TL & AC Coaches”.

It is expected that this handbook will be very useful for coaching maintenance staff and will improve the reliability of power supply in coaching stock.

CAMTECH, Gwalior
Date : 5th October 2015

A. R. Tupe
Executive Director

PREFACE

Endless V-belts are used for transmission of mechanical power from the coach axle to the alternator which supplies power to the train-lighting and air conditioning loads in Railway coaches.

This handbook on “V-Belts of TL & AC Coaches” has been prepared by CAMTECH for the use of coaching maintenance staff. This handbook comprises correct maintenance practices, checking and testing of V-belts alongwith pulleys. This also includes proper storage conditions, V-belt failures, their probable causes and preventive measures.

It is clarified that this handbook does not supersede any existing provisions/guidelines laid down by RDSO or Railway Board/ Zonal Railways. The handbook is for guidance only and it is not a statutory document.

I am sincerely thankful to all field personnel who helped us in preparing this handbook.

Technological upgradation and learning is a continuous process, hence feel free to write us for any addition/ modification in this handbook. We shall highly appreciate your contribution in this direction.

CAMTECH, Gwalior
Date: 28th September 2015

Peeyoosh Gupta
Director Electrical

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CHAPTER 1

GENERAL DESCRIPTION

1.0 INTRODUCTION

Endless V-belts (multiple drive) are used for transmission of mechanical power from the coach axle to the alternator which supplies power to the train-lighting and air conditioning loads in Railway coaches.

The reliability of the V-belt is essential to ensure that there is no breakdown in the passenger amenities, viz. lighting, air conditioning and air circulation devices i.e. fans in the railway coaches.

Railways are using C-122/3155 Lp V-belts as per RDSO specification no. RDSO/PE/SPEC/AC/0059-2004 Rev-0) with amendment No. 1. RDSO has also issued specification no. RDSO/PE/SPEC/AC/00160-2014 (Rev. 1) for long life V belts with 'Aramid' cord which are under trial.

1.1 TERMINOLOGY

For better understanding of V belt and drive, the following definitions will be helpful:

1.1.1 V-belt Drive

A drive which consists of one or more V-belts mounted on grooved pulleys. The profiles of the belts and the pulley grooves are such that the belts come into contact with the **sides of the pulley grooves** only and not with the base of the grooves.

1.1.2 V-Belt

A belt, the cross section of which is shaped roughly like a trapezium. The latter is usually isosceles. On the cross-section the trapezium is outlined by the base, sides and top of the belt.

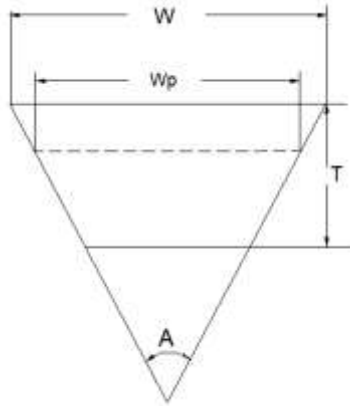


Figure 1.1. Cross Section of V-Belt

1.1.3 Angle of V-Belt (A)

The included angle obtained by extending the sides of the belt.

1.1.4 Nominal Inside Length

The approximate length along the inside of belt while is an untensioned condition.

1.1.5 Nominal Height of a V-belt (T)

Height of the trapezium outlined on a cross section.

1.1.6 Nominal top width of a V-belt (W)

Top width of the trapezium outlined on a cross-section.

1.1.7 **Pitch width of a V-belt (W_p)**

The width of the belt at its pitch zone. The width remains unchanged when the belt is bent perpendicularly to its base. This is a basic dimension of standardization for the belt and for the corresponding pulley groove, considered as a whole.

1.1.8 **Effective belt length (under specified tension)**

The sum of the effective circumference of one of the measuring pulleys and twice the distance between pulley centres.

1.1.9 **Pulley groove pitch width (W_p)**

That width of the pulley groove which is dimensionally the same as the pitch width of the belt associated with the pulley.

1.1.10 **Pulley pitch diameter (d_p)**

The diameter of the pulley measured at the groove pitch width and represents the effective diameter of the pulley.

1.1.11 **Matched Set**

A set of selected number of belts, the lengths of which are within the specified limits enabling them to be used together on a multiple V-belt drive.

1.2 **TECHNICAL DETAILS**

The C-122/3155 Lp endless V-belts of isosceles trapezoidal cross section consist of a combination of elastomeric compound(s) with polyester cord reinforcement and outside polycot fabric coated with polychloroprene, the whole is moulded together in a uniform manner and shaped in accordance with the belt manufacturing practice.

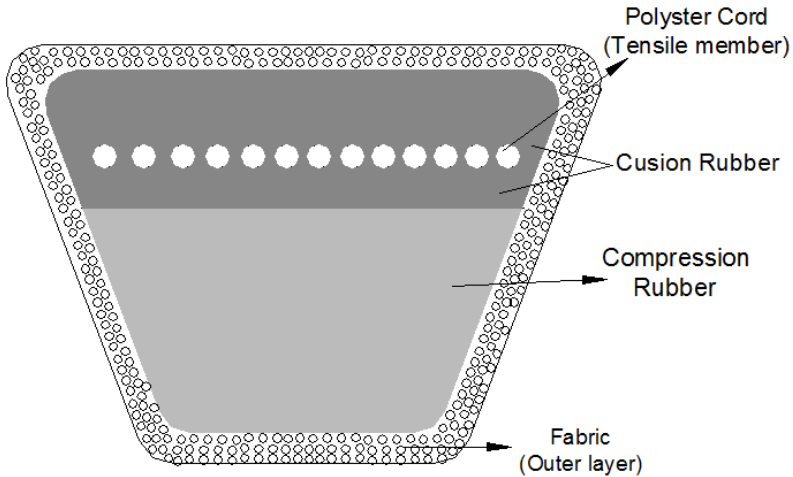


Figure 1.2. Constructional cross sectional view of C-122 V-Belt

1.2.1 V-belt base material has the following properties:

Parameters	Requirement
Hardness, IRHD	82 ± 4
Tensile strenth, Kg/sq cm	100 min.
Elongation at break, %	150 min.

1.2.2 The finished belting has the following physical properties:

Elongation on a length of 200 mm between reference lines.	Maximum percentage elongation at load of 300kgf shall be 3% and upto break 15%
Breaking strength	1150 Kgs (Min.)

1.2.3 Tension during actual conditions:

1	Maximum permissible tension during running operating	100 kgs.
2	Maximum static tension per belt (Kg)	29.5 Kg for 25 kW 26.5 Kg for 4.5 kW
3	Service correction factor	1.6
4	Length correction factor	0.97
5	Correction factor for arc of contact	0.94

1.3 CONSTRUCTIONAL DETAILS

1.3.1 Belt Cross Section

The cross section of the endless V-belt in 'C' section is as shown below with the nominal top, width and thickness in mm for C-122/3155 Lp as indicated.

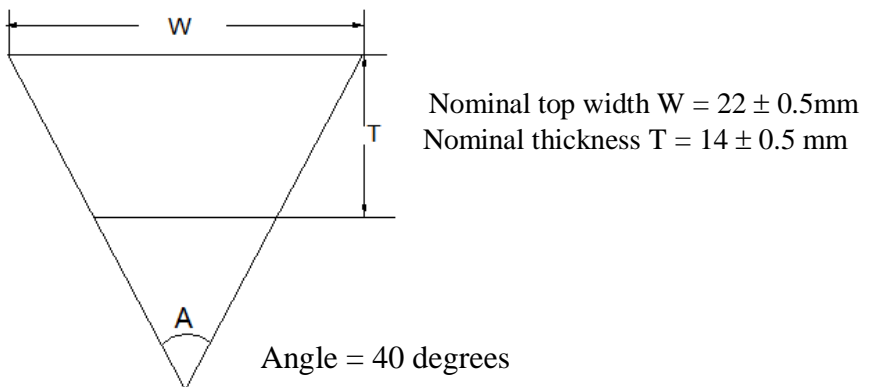


Figure 1.3. Cross sectional dimensions

1.3.2 Belt Pitch Length

The pitch lengths of belts corresponding to given pulley pitch diameters and centre distances may be obtained by the following formula :

$$L = 2C + 1.57 (D+d) + \frac{(D-d)^2}{4C}$$

Where,

L = pitch length of the belt

C = centre distance of the drive

D = pitch diameter of larger pulley, and

d = pitch diameter of smaller pulley.

1.4 CODING SYSTEM

If the actual pitch length of the belt is equal to nominal pitch length ± 1.0 mm, the belt is given the code number as **50**. A deviation of **2.0 mm** in length is represented by one unit and the code number increases or decreases as the length is more or less.

Example:

A belt having designation as **C-122/3155** Lp having actual length between 3154 mm and 3156 mm shall be coded as 50. Any belt between 3154 mm and 3152 mm shall be coded as 49. Any belt between 3156 mm and 3158 mm shall be coded as 51 and so on.

1.5 MATCHED SETS

In order to avoid unequal distribution of load, the belts running on a multiple V-belt drive should be matched sets. The belts of the same nominal pitch length matched to the same grading number only shall be used for a particular set.

The belts are kept/supplied in the matched set tied together consisting of 12 or 4 belts as per requirement with grade between 48 to 52 only.

1.6 METHOD OF TESTS

1.6.1 Visual Inspection

Belt shall be checked for any deformity, bulging, waviness, cracks blemishes, unevenness etc..

1.6.2 Marking

The v-belts confirming are marked legibly and durably on the top surface with the symbol indicating the belt cross-section, the nominal pitch length in mm, grading number (length-code), year of manufacture and manufacturer's name or trade mark.



Figure 1.4: Marking on V belt

1.6.3 Pitch length measurement

The pitch length of the belts shall be checked in accordance with para 1.3.2 of this chapter.

1.6.4 Angle checking

The angle of V-Belt shall be checked with Profile projector.

1.6.5 Section checking

The section of v-belt shall be checked in accordance para 2.1.3 of chapter 2.

1.7 STORAGE

(Ref: IS 2494 Pt.1-1994)

Unfavorable storage conditions can lead to reduced belt life and to variations in belt length. Following are few recommendations on the more important criteria for good storage.

- The V belts should be stored in a cool, dry and well ventilated stock room away from direct sunlight, steam pipes, oil & corrosive fumes, high voltage apparatus.
- The ambient room temperature shall be preferably below 30 degree C.
- Belts should not be stored on the floor or near windows, radiators or airflow from heaters.
- Some fibres used in strength members of belts are subject to shrinkage in storage, the amount depending on the temperature, relative humidity, and storage time.
- During storage avoid excess weight on and distortion of belts.
- The ideal means of storage is hanging on **saddle type pegs**. When the longer belts hung on pegs should be coiled so that the loops are not greater than approximately 2500 mm in circumference.
- Pegs should be crescent (semi-circular) shaped and large enough to avoid compression set from corners or from acute bends of the belt.
- It should preferably, not be stored for more than one year after the date of manufacture.
- Ensure that issue of V belts is being done according to FIFO (First in First out) policy.

1.8 PARTICULARS OF DRIVE FOR PULLEY OF AC/TL COACHES

S.No.	Description	Particulars
1.	25 KW Axle pulley – dia (pcd) width	572.6 ± 0.4 mm 200 ± 1 mm
2.	25 KW Alternator pulley dia(pcd) width	200 ± 0.3 mm 210 ± 1 mm
3.	12 KW Axle pulley dia (pcd) width	415 ± 0.4 mm 200 ± 1 mm
4.	12 KW Alternator pulley dia(pcd) width	160 ± 0.3 mm 200 ± 1 mm
5.	4.5 KW Axle pulley dia (pcd) width	572.6 ± 0.4 mm 136.5 ± 1 mm
6.	4.5 KW Alternator pulley dia(pcd) width	200 ± 0.3 mm 136.5 ± 1 mm

Power to be transmitted	4.5 KW/12KW/25 KW 4.5 KW 12 KW 25 KW
Minimum speed for full output	600 rpm 900 rpm 800 rpm
Cut-in speed	357 rpm 550 rpm 400 rpm
Maximum speed to be encountered	2500 rpm (for 4.5/25 KW)
Maximum speed to be encountered	2000 rpm (for 12 KW)

- Note :**
- i) 25 KW alternators are provided with double end drive with six belts on either side.
 - ii) 12 KW alternators are provided with single end drive with six belts.
 - iii) 4.5 KW alternators are provided with single ended drive with four belts.

CHAPTER 2

CHECKS AND TESTS ON V- BELTS AND PULLEYS

2.1 CHECKING OF V BELTS IN DEPOTS / WORKSHOPS

The checking and testing of V- belts drive is essential to ensure proper working of TL & AC alternators, reliable generation and proper load sharing between two alternators in AC coaches. In order to ensure proper fitment of V belts following instructions are to be followed.

(Ref: RDSO/PE/SMI/TL/0027-2004, Rev.'0' and guidelines issued vide RDSO letter no. EL/6.9.9 dated 23.05.2013 & EL/7.1.38/1 dated 20.01.2011)

- (i) In order to check the new V-belts for proper fitment, gadgets should be available at each depot/workshop for checking the following:
 - a) Pitch length of V belt
 - b) Angle of V belt
 - c) Section of V belt
- (ii) Pitch length of all the belts shall be measured by pitch length testing machine before providing the belts in the coaches.
- (iii) It should be ensured that in case of 25 kW alternator all the 12 belts and in case of 4.5 kW alternator all the 4 belts shall be of same pitch length/Grade.
- (iv) Two or more makes of belts should not be used in a set.
- (v) Re-tension of newly fitted belts shall be done after 1st trip or 500 km run, whichever is convenient.

2.1.1 Gadget to Check Pitch Length of 'V' Belt

Checking of length is important to judge whether set is matched or not and all belts are of same grading.



Figure 2.1. Electronic grade testing (pitch length) machine

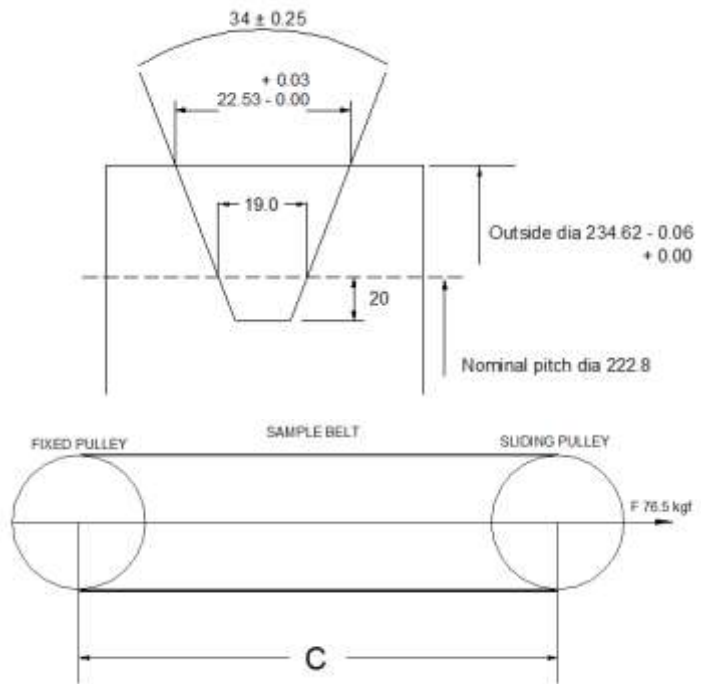


Figure 2.2. Gadget to check pitch length of V belt

Nominal circumference of the pulley at pitch dia is 700 mm

Nominal pitch length of the belt is $= 2C+700$ mm

2.1.2 Method of Checking Angle of V-Belts

Along a straight portion of the belt in an un-tensioned state, the cross-section shall be such that the edges of the broader (top) side of the belt shall touch the sides of V-groove having an included angle of 38 degree and the edges of the narrower (bottom) side of the belt shall touch the sides of V-groove having an included angle of 42 degree. The flanks of the belt shall not touch the sides of the V-grooves.

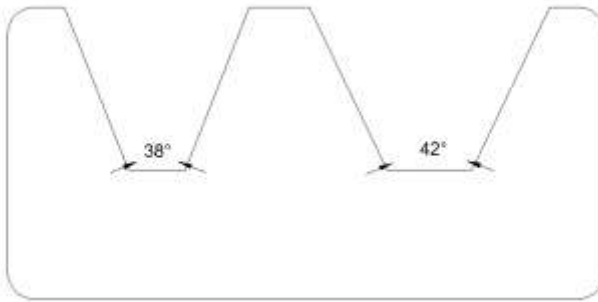


Figure 2.3. Gauge for checking angle of V belt

2.1.3 Section Checking of V-Belts

Along a straight portion of the belt in an un-tensioned state, the cross-section of the belt shall be such that when placed in a gauge as shown in above figure , it shall not touch the bottom of the gauge, the edges of the top width 's' and 't' shall not be higher than the points 'u' and 'v' at the top of the template and the guiding mark 'mn' on the template shall cut the whole width of the belt in its upper half.

Note: The pitch width of the belt 19 mm, is the width of the gauge at the level of this guiding mark **mn** drawn on the gauge.

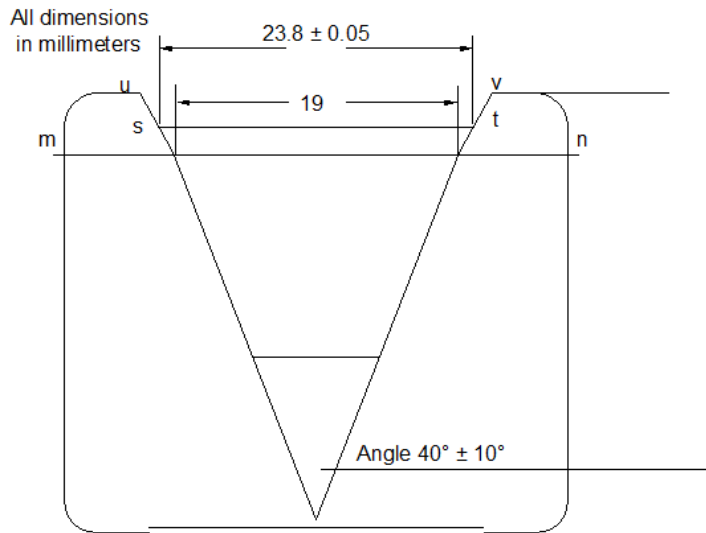


Figure 2.4. Gauge for section checking of V belt

2.2 CHECKING OF PULLEYS

For effective power transmission from axle to alternator, health of pulleys should be good. Following Instructions to be followed during POH/IOH, C schedule and maintenance at Workshops and coaching depots. (Ref: RDSO/PE/SMI/TL/0030-2005, Rev '0')

2.2.1 Instructions for Workshops (POH/IOH)

- i. If bottom of the groove is observed shining throughout uniformly, the pulley should be replaced.
- ii. The pulley groove walls should be examined for ovality with the help of a steel scale. If the walls are worn out by more than 0.5 mm the pulley should be replaced.

- iii. Surface matching between pulley bore and shaft should not be less than 80%. The key in shaft should be fitted properly. Worn key must be replaced by spare EN8 key. If matching of 80% is ensured then the chances of key failure are very less.
- iv. The angle of grooves should be checked by gauges. If angle has increased, the pulley should be replaced. There are different gauges for axle pulley and alternator pulley as per RDSO Drg. No.RDSO/PE/SK/TL/0087-2005 rev.0.



Figure 2.5. Gauge for checking groove angle of Alternator and Axle pulley

- v. Replace rubber pads of axle pulley 100%. Check rubber quality in each lot from M&C lab.
- vi. Ensure gap between two halves of axle pulley to 3.0 ± 0.5 mm and tightening torque should be upto 30 kg - mtr (maximum)



Figure 2.6. Checking of gap between two halves of Axle pulley

- vii. Life of pulleys is approximately 4 years. Date of replacement should be punched on it as well as the alternator number on alternator pulley, as they are matched.
- viii. After removal of alternator for POH, gap between bogie suspension brackets should be checked. Excess gap between bogie bracket and alternator suspension bracket will lead to misalignment of alternator.
- ix. After fitment of alternator in the bogie suspension bracket, alignment of alternator and axle pulley should be checked. It can be checked by cord which should touch 4 edges of both pulleys simultaneously. It can be checked by **laser beam also**. Beam from alternator pulley groove center should fall in the center of corresponding axle pulley groove.
- x. Do not paint the pulleys after cleaning. It will affect heat dissipation.

2.2.2 Instructions for Depots during C schedule and IOH

- i. Do not use repaired pulleys.
- ii. Clean pulleys, they should not have any dirt/grime/oil traces.
- iii. Replace pulleys if grooves are worn out by **0.8 mm** depression on sides or bottom of groove is uniformly shining.
- iv. Ensure gap between two halves of axle pulley to **3.0 ± 0.5 mm** and tightening torque should be upto 30 kg - mtr (maximum).

2.3 CHECKING OF BELT TENSIONING DEVICE ASSEMBLY

Before commissioning of new belt tensioning device during production of coaches, POH/ IOH or whenever spring or belt tensioning device are replaced during normal maintenance, the following instructions shall be followed.

(Ref: RDSO/PE/SMI/AC/0042-2009, Rev '0')

- i. It should be ensured that proper belt tensioning device with spring as given below is provided.

Alternator capacity	Drawing No.	No. of turns of spring	Dia. of spring wire
25 kW	ROSO/PE/SK/AC/0068- 2004 (Rev.0)	11	16
4.5 kW	SKEL 3940	14	14

- ii. Indication plate of belt tensioning device is cut to 250mm irrespective of the kW rating of the alternator. It is only to indicate that spring has to be changed if proper tension with 4 kg weight test is not achieved.
- iii. Belt should be tightened to the maximum extent possible and measurement of proper tension is to be done as under:

A weight of 4 kg should be hanged from the centre of the belt span and see that the top surface of this belt does not go below bottom surface of remaining belts.

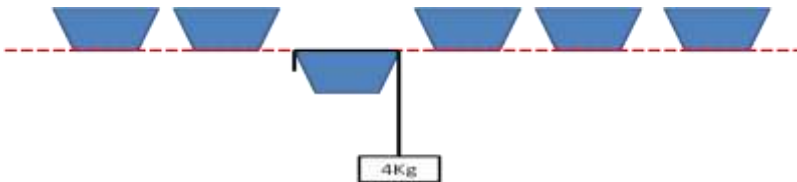


Figure 2.7. Checking of V belt tension with 4 kg weight

Belt to be tightened till it reaches red mark which may be confirmed by a 30cm steel scale.

For this following may be followed:

- a. Insert steel scale of size 30cm as shown and check that it is passing easily between the V-belts.
- b. In case desired V-belt tension is not achieved up to 250mm of spring length, then tension rod should be replaced.
- c. Ensure **35/50 mm barrel bush gap in the bogie bracket** of TL/AC coaches respectively.



Figure 2.8. Checking of V belt tension with 4 kg weight and steel scale

2.3.1 Testing of Springs of Belt tensioning device (Ref: RDSO/PE/SMI/AC/0042-2009, Rev'0')

(i) Spring testing

Ensure testing of springs before fitment by conducting, compression test. Compression test shall be conducted on compression testing machine or fabricated system in depot/workshop.

Spring compression in step of 10mm and weight applied shall be recorded in the given format and deflection in mm per kg of load shall be calculated.

Sr. No	Spring length in mm	Wt. in kg.	Spring rate derived	Remarks
1.	345	0 (Zero)	Value of	Obtained value of spring stiffness should be verified for 4.5kW as per RDSO's drg. No. SKEL-3040 sheet 2 as well as modified springs for 25kW alternator as per RDSO's drg. no. RDSO/PE/SK/AC/0068-2004 (Rev.0). Average value of old spring as per RDSO's drg. no. SKEL -3040 sheet 2 should be within 2.8-3.2kg/mm for 4.5kW and 4.8-5.5kg/mm for modified springs for 25 kW alternator as per RDSO drg. No.RDSO/PE/SK/ AC/0068-2004 (Rev.0)
2.	335	Weight should be recorded	kg/mm	
3.	325		should be	
4.	315		calculated.	
5.	305			
6.	295			

(ii) Spring Dimensions

S. No.	Parameter Checked	Old spring drg. No. SKEL 3940 sheet 2	Modified spring drg. No. RDSO/PE/SK/A C/ 0068-2004 (Rev.0)
1.	Free length	345±3	345 ± 3
2.	Wire dia	Φ 14 ± 0.1	Φ 16 ± 0.2
3.	Outer dia of spring	Φ 114 ± 1	Φ 118 ± 1
4.	No. of coils	14 ½	12 ½
5.	Tensioning rod length	780mm	780 mm

2.3.2 Visual checking

Following shall be checked in belt tensioning device:

- Tensioning rod thread for any damage
- Deformity in spring sheet
- Deformity in rotary spring sheet
- Damage of threads in special nut
- Cut/ rubbing mark in spring coil

2.4 IMPORTANT INFORMATION FOR IMPROVING RELIABILITY OF V BELTS

- (i) Ensure the voltage setting of 4.5kW/25kW RRU/ERRU of TL and AC coaches as specified in the RDSO SMI No. RDSO/PE/SMI/AC/0045-2012 (Rev. 0).

- (ii) Ensure proper load sharing of both alternators equipped in the AC coaches as per RDSO SMI No. RDSO/PE/SMI/AC/**0018-1999** (Rev. 0). The latest instructions for the difference in current of both alternators are **30 Amp & 10 Amp** in case of RRU & ERRU respectively.
- (iii) Ensure that every RRU & ERRU have equipped with healthy OVP (Over Voltage Protection) relay and its correct voltage setting is to be tested as per RDSO SMI No. RDSO/PE/SMI/TL/**0047-2013** (Rev. 0) both in AC and TL coaches.
- (iv) Ensure proper battery charging / pre-cooling during maintenance before train departure to avoid sudden loading of alternators. This will reduce the cases of belt dropping.
- (v) Ampere setting of RRU/ERRU shall be ensured as per specified limits.

CHAPTER 3

‘V’ BELTS FAILURES AND PREVENTIVE MEASURES

3.1 FAILURE MODES AND PROBABLE CAUSES OF V-BELTS

S. No.	Mode of failure	Probable causes
1.	Belt slippage	i. Alternator/ axle pulley worn out ii. Improper tension of V belts
2.	Belt turn over and face twisted	i. Misalignment of alternator/ axle pulley ii. Particular V belt loose
3.	Rapid wear	i. Excess tension on V belts ii. Improper spring tension of belt tensioning device iii. Pulley groove pitted iii. Misalignment of alternator/ axle pulley iv. Poor material quality of V belts
4.	Excessive stretch	Improper spring tension of belt tensioning device
5.	Belt bottom cracks	i. Alternator/ axle pulley groove worn out ii. Poor material quality of V belts

S. No.	Mode of failure	Probable causes
6.	Belt top cracks	<ul style="list-style-type: none"> i. Pulley groove angle small ii. Poor material quality of V belts
7.	Belt dropping	<ul style="list-style-type: none"> i. Sudden loading on alternators ii. Improper load sharing between alternators iii. Current controlling of RRU/ERRU not proper iv. Shifting of axle pulley v. Misalignment of alternator/ axle pulley vi. Lateral play in alternator vii. Shifting of alternator shaft resulting in shifting of alternator pulley and misalignment.
8.	Smoking of belts	<ul style="list-style-type: none"> i. Alternator/ axle pulley groove worn out ii. Sudden loading on alternators iii. Unequal tension among the V belts

3.2 VARIOUS CAUSES AND RECTIFICATION

3.2.1 Improper Alignment of Pulleys

During maintenance/after fitment of alternator in the bogie suspension bracket, alignment of alternator and axle pulley should be checked. It can be checked by **cotton cord** which should touch all the four edges of the both pulleys simultaneously. It can be checked by **laser beam** also. Beam from alternator pulley groove center should fall in the center of corresponding axle pulley groove.

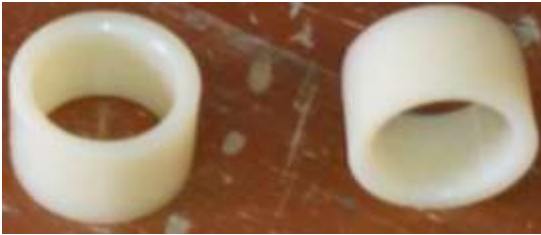
If misalignment is found, locate the cause of misalignment and rectify it.



Figure 3.1. Alignment checking of alternator and axle pulleys using metal bar

3.2.2 Bogie bush-wear

The gap formed due to the wear of bogie bush must be measured during maintenance and if it is more than 1mm, it should be replaced with proper nylon bush because it may lead to wear of suspension bracket that further contribute to destroy the alignment of suspension arrangement permanently.



3.2.3 Increased Clearance between suspension brackets

The clearance between suspension brackets found more due to improper workmanship/ measurement during the manufacturing process of bogies.

For a TL coach the distance between the suspension brackets should be **270mm** since the length of alternator collar is **269 mm**. if the distance is more than 270mm, there may be lateral play of alternator which affects the life of V belts and the parallelism of brackets due to the hammering effect of the

horizontal play of the alternator. This also damages the bogie bushes.

It is better to put a suitable washer between the alternator collar and one of the suspension brackets duly checking the alignment.

3.2.4 Alternator bearings seizure

The alternator may get stuck up due to the seizure of bearing that may in turn results the belt dropping. To avoid this type of failures, the following practices shall be followed:

1. Bearings should be cleaned and greased properly during POH.
2. End shield of alternator should be properly tightened to avoid entry of abrasive particles.
3. Vibration checking and clearance checking for bearing should be done during POH.



Figure 3.3. Washer put in the gap between suspension bracket

3.2.5 Alternator & axle pulley groove-wear

Groove of alternator pulley and axle pulley should be checked during POH and at the time of replacement of V belt for worn out and groove base shining and ovality. The pulley is to be replaced if pulley groove width is increase by 0.5mm at workshop level and 0.8mm at depot level or the groove base of the pulley is shining or mechanically damaged.

The standard groove angle is **36 degree** for alternator pulley and it is **40 degree** for axle pulley. If the groove angle is more, excessive wear at the base section or belt bottom crack may happen and if the groove angle is small, crushing and wear of belt at top or belt top crack may happen.



Figure 3.4. Groove checking of Alternator pulley and axle pulley

3.2.6 Replacement of pulleys

1. Both the alternator pulley and axle pulley shall be replaced during alternate POH or when ever mechanical damage of pulley occurs.
2. Replace the old axle pulley fixing rubber pads with new rubber pads during POH and whenever replacement of axle pulley is required.

3. The number embossed in both halves of the axle pulleys must be same.
4. Ensure gap between two halves of axle pulley to 3.0 ± 0.5 mm with the tightening torque of 30 kg-m (maximum).
5. The gap between axle pulley halves should be checked with feeler gauge during maintenance.
6. After fixing of axle pulley, verticality of the pulley should be checked with plumb or spirit level.
7. It is to be ensured that diameters of the pulleys are same as specified.



Figure 3.5. Checking the verticality of Axle pulley

3.2.7 Initial provision of 'V' belts

Special care should be given during the provision of V belts since it is one of the root causes of premature failures:

- The reinforcement cords are broken if the belts are forced over pulleys during fitment.
- Change the belt set and install them in grooves only after loosening the tension spring of belt tensioning device.
- During replacement, do not ride the wheel over belts that definitely damage the reinforcement cord of V belt.
- If belts are replacing, replace all the belts as set with same grade, same make and of same batch.

3.2.8 Improper tension of 'V' belts

In absence of proper tension in V-belts, they may get failed due to belt slippage that increases the screeching noise and heat. Thus smoking may start from the belts that result in V-belt drop. The following actions shall be ensured to maintain proper tension.

1. Tensioning of the final recommended value after every first trip or 500 kms immediately after provision of V belts at workshop or depots & thereafter as per standard maintenance practices mentioned in schedules.
2. Check the stiffness of springs as per RDSO SMI no. 0042-2009 (Rev 'o').
3. It shall also ensure that correct type of belt tensioning device spring as prescribed by RDSO equipped in coaches during POH as well as at depot level.
4. Check the tightness of belts by 4 kg weight.

3.2.9 Excessive stretch

Excessive stretch may arise due to overloading and internal breaks. Overloading may be due to bad design, failed bearings of the alternator, failure of output control of the regulator of the alternator, or internal breaks during manufacture or due to forcing the belts over top of the grooves.

3.2.10 Temperature rise

The temperature of the axle pulley groove may approach to 27 °C above from the ambient temperature. However in hot summer, ambient temperature reaches as above as 49 °C. This increases the belt temperature more than that of the design temperature. This is also one of the causes of smoke emission from V belts and belt drop.

3.3 OTHER MEASURES

- (i) Anti-rotating lug welding shall be done precisely in-butt with suspension pin. Suspension pin head thickness and anti rotating 'U' thickness must match perfectly to avoid rotation of S/pin & therefore damage to Trans-mounting bush.



Figure 3.5. Anti rotating arrangement for suspension pin

3.4 TOOLS AND GADGETS REQUIRED FOR CHECKING AND TESTING

- Standard tool kit for AC Escorting staff
- Feeler gauge sets (0.05 mm to 1.00 mm)
- Measurement of belt tensioning device
- Free length of spring 345 mm
- Length of indicator 250 mm
- GO/NOGO gauges for checking the grooves of alternator pulley and axle pulley.
- Gadget of 4 kg weight for checking the tension of V-belts
- V- Belts pitch length testing machine
- Test bench for checking of RRU/ERRU & alternator 4.5 kW
- Test bench for checking of RRU/ERRU & alternator 25 kW
- BTD spring testing machine
- VVVF type machine for load sharing in AC coaches
- In-Situ testing kit of OVP
- Gauges for measurement of cross section of V-belt

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OUR OBJECTIVE

To upgrade maintenance technologies and methodologies and achieve improvement in productivity, performance of all Railway assets and manpower which inter-alia would cover reliability, availability, utilization and efficiency.

If you have any suggestions and any specific Comments please write to us.

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