सत्यमेव जयते

GOVERNMENT OF INDIA

(भारत सरकार)

MINISTRY OF RAILWAYS

(रेल मंत्रालय)

Annexure – F

KAVACH
RFID Reader, Tag and Fixing Arrangement Guidelines
(Amdt-1)

Issued by

S&T DIRECTORATE
RESEARCH, DESIGNS & STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR
LUCKNOW – 226 011

Amendment History:

Amdt	Date of issue	Amendment
1	21.06.2024	• Cl F.2: Addition of requirement of RFID Tag • Cl F.3.6.10: Deleted • Cl F.3.6.14: New clause added as "After Site Acceptance tesing (SAT), all the RFID Tags installed in the field shall be locked permanently so that it can not be rewritten by unauthorised person.

F.1 Introduction

This document describes the RFID fixing arrangement guidelines to be ensured while designing the RFID fixing arrangement for the purpose of KAVACH System. This document is based on Joint Procedure Order approved by Track, Track Machine and Signal Directorates of RDSO (RDSO-SIG0TCAS(HBL)/1/2021 Date: 07.06.2021).

F.2 **RFID tag shall be as per following specifications:**

(a) Suitable for reliable working at train speed upto 250 KMPH (minimum).

(b) Frequency of operation: 865-867 MHz

(c) Can be programmable with minimum 128 bits (including CRC) of user data.

(d) Communication Protocol – ISO-18000-6D

(e) Shall have minimum IP 68 protection. It shall work after being submerged in 1m depth water for 24 hours.

(f) RFID Tag supplier has to submit the certificate of conformity for:-

(i) Shall be Industrial grade with property of high impact resistance as per ISO 6272 (31-014) and strength and chemical resistance as per ISO 2812. i.e Fuels, Acetone, Paints etc.

(ii) Operating temperature shall be -10° to 85°C.

(iii) Polarisation shall be linear horizontal.

(iv) Shall continue to function normally after exposure of either face to medium-energy X-radiation, with energy 100 keV, of a cumulative dose of 0.1 Gy per year.

(v) UV resistant property with exposure condition (5 cycle) as per ISO 16474 standard of the product material as well as the color as obtained from the primary raw material and color manufacturer.

(g) Other requirements like environmental, climatic etc. as per RDSO/SPN/144 or for any contrdiction, requirement mentioned in specification will be prevailed.

(h) Under field operating conditions RFID reader antenna shall be able to read RFID tag from a vertical distance of 700mm from bottom of RFID reader antenna to top of the rail level.

(i) The installation of RFID reader antenna would be done in such a manner so that the vertical distance from bottom of RFID reader antenna to top of the rail level is 350 mm ±50mm and it is normally at the centre of rolling stock with offset permissible to ± 100mm in horizontal plane. Suitable measures shall be taken by firm to avoid reading of Tags from other tags.

(j) RFID tag shall be interoprable to be read by all type (Makes) of RFID

reader approved by RDSO.

F.3 RFID Fixing Arrangement guidelines

Following guidelines shall be followed while fixing RFID tags:

F.3.1 RFID tags shall be fixed at the center of PSC Sleepers and emit RF signal only when corresponding type of RFID antenna is in vicinity (Normally underneath a Locomotive). The spacing of RFID tags will be about 1 Km (max.), which may get reduced in vicinity of stations.

F.3.2 No holes shall be drilled in the Sleepers and the arrangement of fixing must be through clamps only. Due care shall be taken that damage/ puncturing to PSC sleepers is not caused.

F.3.3 The fixing arrangement shall be strong enough to withstand impact during normal ballast unloading. The RFID tag enclosure shall be good quality of FRP material. The fitment clamp shall be made of Stainless Steel- 316 to avoid corrosion and environmental effect.

F.3.4 The RFID tags shall be fixed at the center of PSC Sleeper. The topmost portion of the Fixing Arrangement, when installed, should not be more than 75mm above the top surface of PSC Sleeper at center. The installation would be done in such a way that the width of the RFID Fixing Arrangement along the length of PSC Sleeper does not exceed 380mm.

F.3.5 All the RFID Tagsfixture shall be marked at the bottom or side with tag number and tag type. The marking shall be as follows:

(i) RFID tag Number

(ii) Type of placement

(iii) Absolute Location

F.3.6 While deciding the location for RFID installation following aspects shall be kept in view:

F.3.6.1 RFID tags & fixtures shall be avoided in turnout portion in general. In any case, these shall not be located in switch portion of turnout i.e. from Actual Toe of Switch (ATS) to heel of switch.

F.3.6.2 The installation of RFID tag & fixture should be avoided at locations susceptible to ballast accumulation at the center of sleeper such as level crossing etc. This aspect needs to be taken care at the time of survey itself.

F.3.6.3 The performance of RFID tag may get degraded during RFID Fixture getting submerged in water. Therefore, installation should be done considering this fact.

F.3.6.4 The RFID technologies being used in Track Recording Cars and KAVACH) are different and non-interfering to each other.

F.3.6.5 During working of Rail Grinding Machine (RGM), the temperature of Rail at grinding location might go upto 350 ºC whereas the RFID arrangement on track

is suitable up to 85 ºC. The RFID tags in Fixtures are installed at the center of sleeper away from Rail. On the basis of an experiment conducted, no short term functional deterioration in RFID was observed after normal functioning of RGM. RFID tags of same temperature endurance are provided for the purpose of Track Monitoring through Track Recording Cars (TRC) also. As such, there is no need to remove RFID tags during RGM working.

F.3.6.6 In case of mobile flash butt welding of rails, the rail temperature may increase to 800 ~ 900 ºC and sometimes hot splinters may also hit the fixture with pressure. So RFID tag installation should be planned well away from Rail Joints. In case of subsequent need of welding on account of in-service failure/ defect removals of rail/welds in vicinity of RFID location (about 5 sleepers on either side of RFID Tags), the removal of RFID will be necessary before undertaking mobile flash butt welding. In such cases, Track Staff would inform Signal Staff in advance so that Signal Staff can attend the site for removal & re-fixing of RFID as required.

F.3.6.7 The RFID tags and fixtures will not affect the machine maintenance of track in anyway and their performance is not likely to get affected due to working of track tamping machines, DGS, ballast regulators, etc. The fixtures without bottom bolt are not likely to affect the working of Ballast Cleaning Machine, as cutter chain will not obstruct the same. So, their removal will not be required for working of Ballast cleaning machine. However, initially the BCM work at locations having RFID tags shall be done under supervision of signal staff.

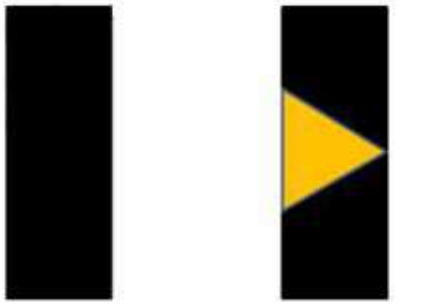
F.3.6.8 In case of complete track renewal work requiring replacement of sleepers on which RFID fixtures are installed, Signal staff shall be advised in advance so that they can attend the site for removal & re-fixing.

F.3.6.9 KAVACH RFID tags do not control conventional Lineside Railway Signals i.e. absence or damage or deterioration of RFID tags does not cause the Lineside Railway Signals to exhibit aspects more restrictive than they otherwise do so in accordance with signal interlocking. Absence or damage or deterioration of KAVACH RFID tags would, however, render non –availability of supervision provided by KAVACH. However, Loco Pilot can still run the train without any route-specific speed restrictions in “Staff Responsible” where the train is completely run under staff (Loco Pilot) responsibility. Therefore, in order to avoid undue adverse effect on train operations, KAVACH trains shall be run under “Staff Responsible” Mode until RFID tags & fixtures restoration is completed.

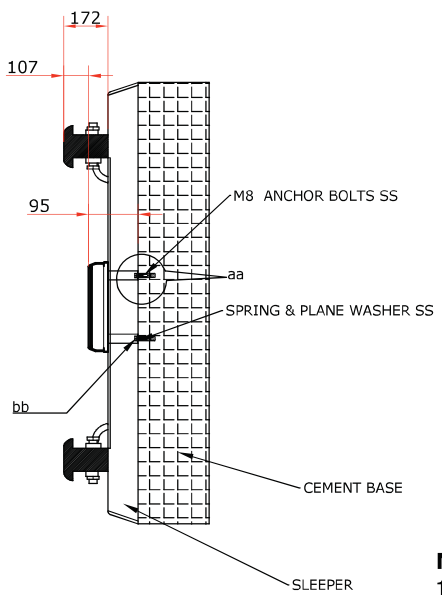
F.3.6.10 S-type tags shall be provided at the Yard Exits not protected by signals like BSLB etc.

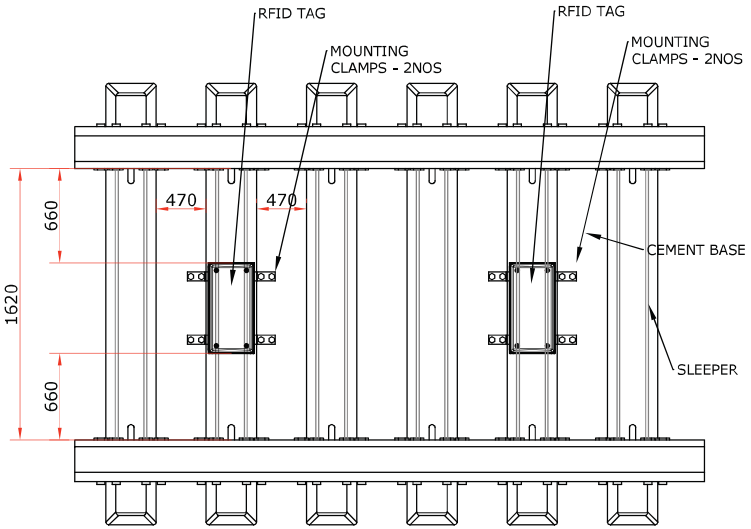
F.3.6.11 The RFID tags shall be fixed in the CC Apron area using mounting clamps as approved by Track Directorate. The RDSO Drawing no is SDO/S&T/TCAS/008. It shall be ensured that there is no infringement to maximum moving direction (MMD)/ IR SOD due to the installation of the RFID tag.

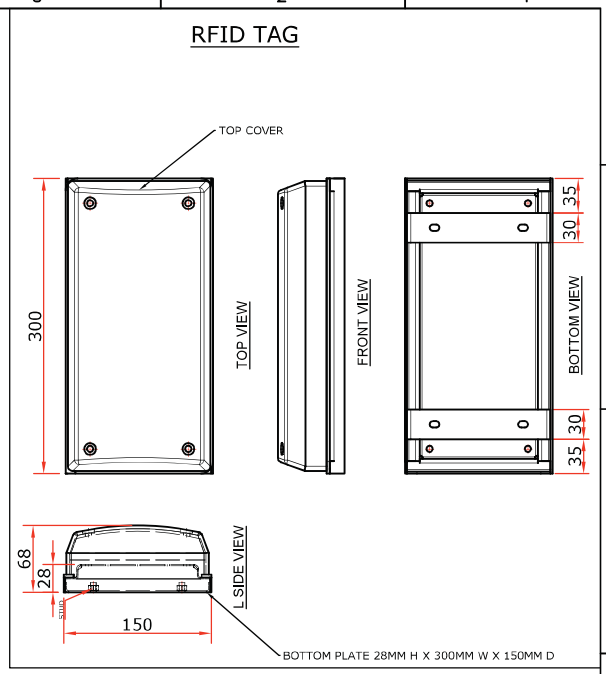
F.3.6.12 The duplicated tag placed in the direction of increasing kilometre shall be embossed with triangular symbol, to avoid misplacement of tags during replacement. Typical diagram is shown below:



F.3.6.13 After Site Acceptance tesing (SAT), all the RFID Tags installed in the field shall be locked permanently so that it can not be rewritten by unauthorised person.







NOTE:-

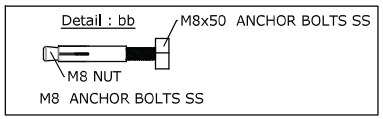
1.14mm drill bit is required for a M8 Anchor bolt.

2.Drill depth 55mm required.

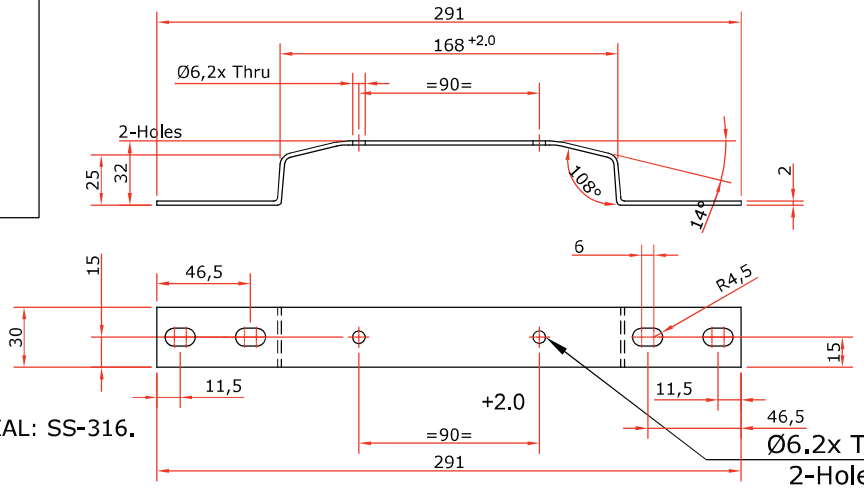
3.Water sealing shall be provided on the bolts after fixing and tightening the bolts

L SIDE VIEW

Note: Bolt Height will be adjusted as per site conditions



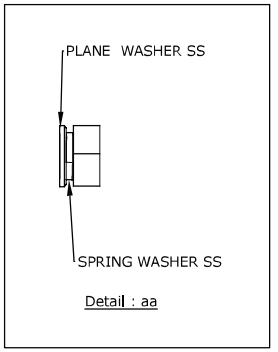
MOUNTING CLAMPS



NOTE:-

1) SHEET MATERIAL: SS-316.

2) QTY : 2No.



Pavan Kumar Gudavalleti

Digitally signed by Pavan Kumar Gudavalleti
Date: 2021.05.04 11:40:25 +05'30'

RDSO DRAWING No SDO/S&T/TCAS/008

Date (DDMMYY)	TITLE: RFID tag assembly, fixing arrangement for CC Apron		
14-04-2021	Product Code:TCAS	Drg No.TCAS/2021_02_15	