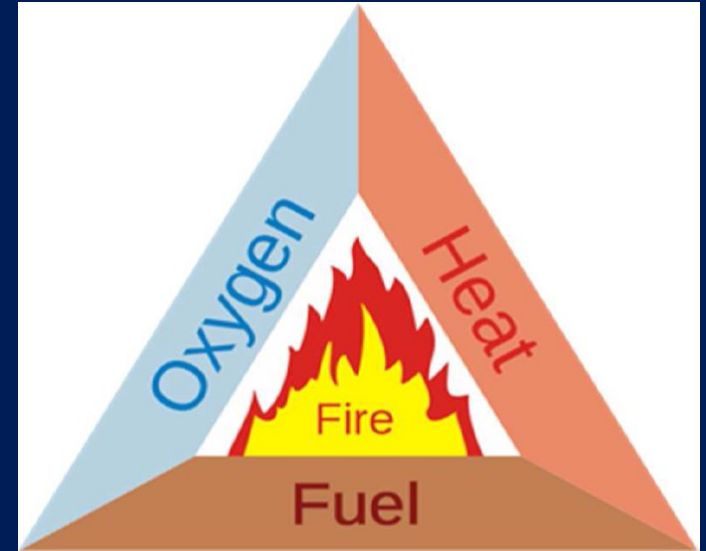


# Fire Safety In Trains

# Brief on fire

- Essentially Fire requires three ingredients:
  - Fuel (combustible material)
  - Oxygen
  - Activation energy/  
Flame source (Heat)



- **Absence of any of these will not result fire**

# Possible sources of fire in coaches

- Coal fire/lighted stove carried by unauthorized vendors
- Throwing lighted cigarette/Beedi/Match sticks by passengers
- Insertion behind ceiling panels, electrical junction boxes etc. the discarded waste and combustible materials by travelling passengers
- Illegal carriage of inflammable goods by passengers
- Spilling of alcoholic drinks inside coach
- Misuse/ overloading of Electrical Equipments ...

# Possible sources of fire in coaches

- Miscreant activities and vandalism
- Throwing of packing waste on floor
- Unsafe cooking in pantry car
- DG set in Power Cars and spillage of Oil
- Locomotive fires
- Heavy brake binding/hot axles

# Peculiarity of fire in trains

- Fire grows very fast
- Propagation is very fast
- Results in suffocation
- Affects visibility
- Limited escape routes for exit
- No relief from out side
- Hardly any time for rescue
- Passengers are caught un-aware at wee-hours

# Strategy for fire safety in coaches

1. Prevent initiation of fire
  - Prevention of possible fire sources
  - Use of Fire retardant material
  - Onboard staff to be vigilant during wee hours
2. Quick Detection of fire
  - Smoke/Fire detectors with alarm system along with automatic braking
3. Quick and safe evacuation
  - Escape routes to be provided through vestibules and after ACP/brake through doors
  - Escape routes should be clearly visible and unobstructed
  - Toxic fumes and smoke from coach furnishing material should be as low as possible

# Strategy for fire safety in coaches .....Contd

## 4. Prevent Propagation of fire

- Provision of fire extinguishers
- Fire Barriers & Fire proof coach ends
- Wireless Communication - passengers, guard, station

## 5. Awareness among the passengers

- Awareness in passengers through Clearly visible Notices
- Easy to read and understand Pictorial to the extent possible
- Briefing about 'Fire Safety Measures' like use of emergency windows, fire extinguishers etc. & alarm chain pulling thru PA system
- Electronic media
- PA System in trains/stations

## 6. Awareness and training of fire fighting to:

- All on board staff
- Staffs who are directly/indirectly involved in train operation

# List of furnishing items

- **Seat Covering**
  - Vinyl coated upholstery fabric
  - Fire retardant Upholstery cloth
- **Seat cushions**
  - Densified Thermal Bonded Polyester Blocks (DTBPB)
- **Flooring**
  - PVC Flooring
  - Wood-based impregnated compressed laminates (Compreg)
- **Side wall paneling**
  - Decorative thermosetting synthetic resin bonded laminated sheets (L P sheets)
  - Pre-laminated shaded compreg
  - FRP windows
- **Curtains**
  - Fire retardant Curtain
- **Roof ceiling**
  - NFTC roof ceiling
- **Vestibule** - UIC type Elastomer



# Fire retardancy of furnishing items

The coach furnishing material should have properties of:

- Less ignitability
- Delay/retard/stop propagation of fire so as to increase evacuation time and to start fire fighting operations
- Toxicity of released fumes/gases should be as less as possible.
- On burning it should release least fumes/smoke/gases so that visibility is least affected
- On burning, it shall not melt & drop and should form a carbonaceous char
- The furnishing materials in coach end area should be able to withstand the elevated temperature to avoid propagation of fire from one coach to another coach.

# Fire retardancy norms

## Only flammability test was specified till 2004

- Other properties concerning Fire, Smoke & Toxicity were not specified i.e.
  - Visibility due to smoke
  - Limiting Oxygen Index
  - Toxicity
- Further in consultation with M/s SNCF in 2004, FST properties of all the furnishing materials were streamlined as per UIC norms and specifications for various furnishing items were developed in 2007-08 and circulated to PU & Rlys for implementation.

# FST properties

- **Resistance to spread of flame**

material burns slowly, takes longer time & property of self extinguishing when the fire source is removed

- **Visibility due to smoke**

The deterioration in visibility due to smoke, measured by passing light of known intensity –100 Lux. Criteria is density of smoke and the total opacity

- **Limiting oxygen index**

Defined as percentage of oxygen in air required to maintain fire propagation in test specimen

- **Toxicity**

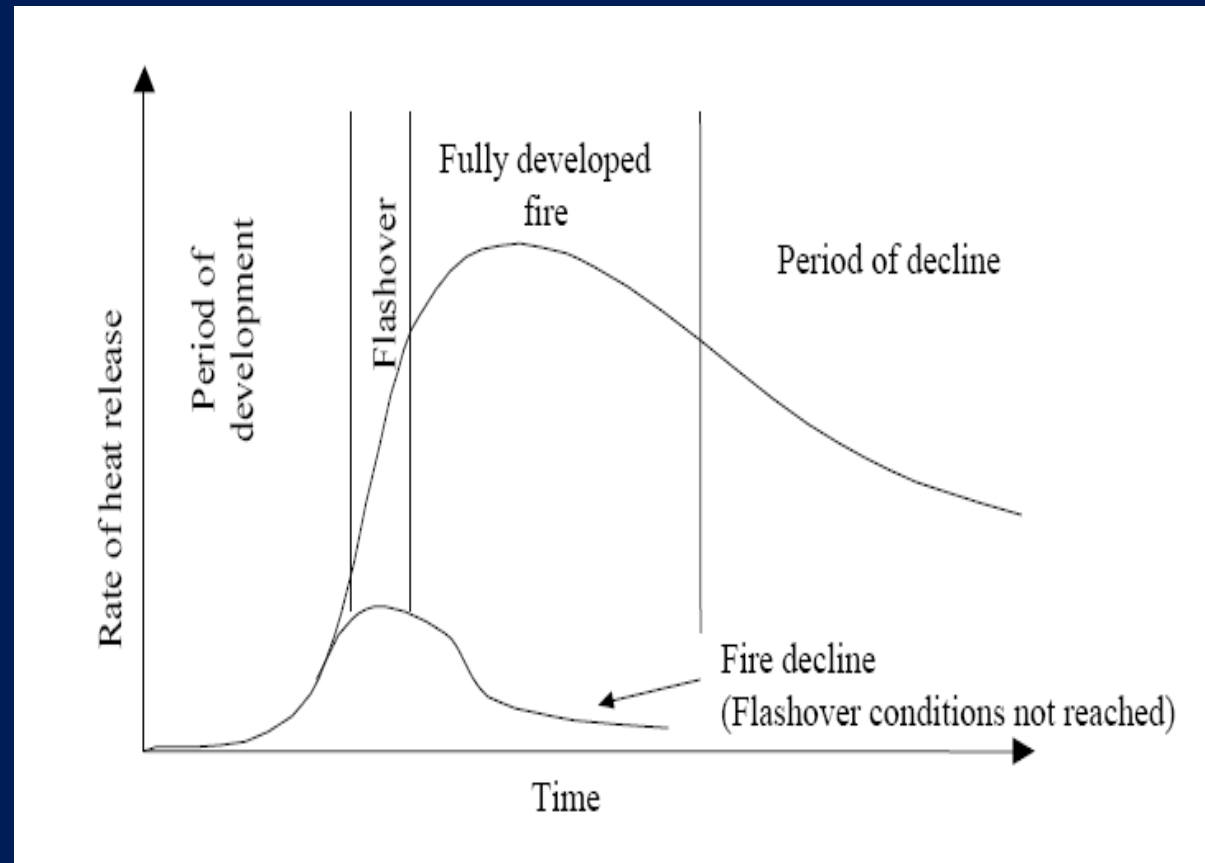
In order to minimize suffocation, all furnishing items have been mandated with “Toxicity” less than 1

# Resistance to spread of flame

- To ensure that the material burns slowly, takes longer time & property of self extinguish when the fire source is removed
- Observations during the test,
  - Length of time of continued burning or glowing after extinction/removal of flame in 2 seconds, 2 to 10 seconds and more than 10 seconds
  - Fire damaged surface area in  $\text{cm}^2$
  - Release of burning drops or particles
  - Whether specimen burn through to upper surface or not
- Presently min. Class A is adopted

# Fire stages

- 5 stages of fire
  - Ignition
  - Growth
  - Flashover or back-draft
  - Fully developed fire
  - decline



*Fire retardant material delay Flashover- facilitate egress*

# Visibility due to smoke

- The deterioration in visibility due to smoke is measured by passing light of known intensity –100 Lux. Criteria is density of smoke and the total opacity as per the following table:

$T$ ( $l_x \min$ )	$E_4 \geq 50$	$20 \leq E_4 \leq 50$	$E_4 < 20$
$T \geq 300$	A	B	B
$150 \leq T \leq 300$	B	B	C
$T < 150$	C	C	C

- Important for évacuation of passengers
- The adopted value is Minimum Class A when tested as per Appendix-15 of UIC: 564-2 OR

# Visibility due to smoke

- The deterioration in visibility due to smoke is measured by passing light of known intensity –100 Lux. Criteria is density of smoke and the total opacity as per the following table:

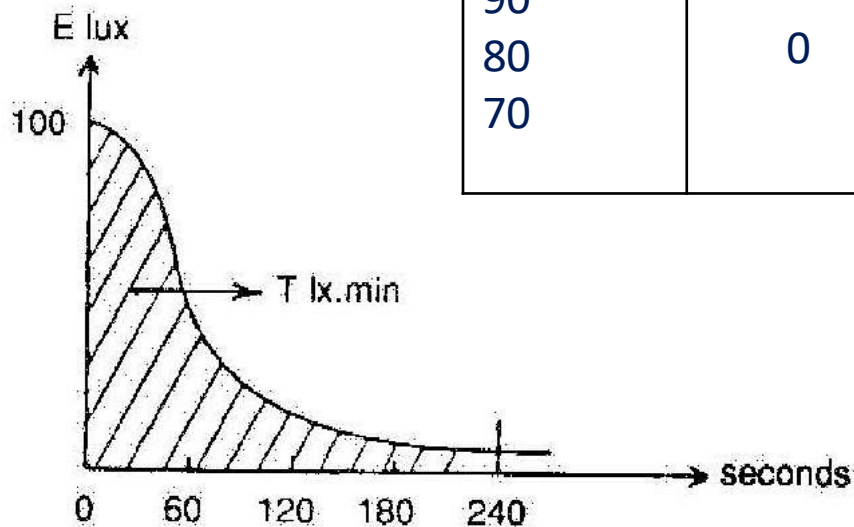
$T$ ( $l_x \text{ min}$ )	$E_4 \geq 50$	$20 \leq E_4 < 50$	$E_4 < 20$
$T \geq 300$	A	B	B
$150 \leq T < 300$	B	B	C
$T < 150$	C	C	C

- Important for évacuation of passengers
- The adopted value is Minimum Class A when tested as per Appendix-15 of UIC: 564-2 OR

***However passenger's belongings can generate a lot of smoke and Railways have no control over these items***

# Model representation of results to determine deterioration visibility of due to smoke:

E (Lux)	t (seconds)			
	1 <sup>st</sup> Test	2 <sup>nd</sup> Test	3 <sup>rd</sup> Test	Arithmetic Mean
100				
90				
80	0	0	0	0
70				





# Limiting oxygen index

- Defined as percentage of oxygen in air required to maintain fire propagation in test specimen. The value of index  $((\text{Oxygen}/(\text{Oxygen} + \text{Nitrogen}) \times 100))$  shall be noted where the specimen ignites. Higher the value, better the material
- Minimum requirement is 35 which is equivalent to Class – A of Appendix – 7 of UIC – 564 –2 OR
- Incidentally, usual oxygen available in air is 21%
- The adopted value for all furnishing materials is Minimum 35 when tested as per IS: 13501

# Toxicity

- In order to minimize suffocation, all furnishing items have been mandated with “Toxicity” less than 1.
- It will help in safe evacuation of passengers giving a time of approximately 25 to 30 minutes.
- For assessment of the Toxicity, concentration of following gases is determined:

*However belongings of passengers like briefcases, laptop bag, purses, jackets etc. are highly toxic and Railways have no control over these items.*

SN	Name of the Gas	Toxicity concentrations in ppm
1	Carbon Dioxide (CO <sub>2</sub> )	100000
2	Carbon Monoxide (CO)	4000
3	Hydrogen Fluoride (HF)	100
4	Hydrogen chloride (HCl)	500
5	Hydrogen Bromide (HBr)	150
6	Hydrogen Cyanide (HCN)	150
7	Nitrogen Oxide (NO, NO <sub>2</sub> )	250
8	Sulphur Dioxide (SO <sub>2</sub> )	400
9	Formaldehyde (HCHO)	500
10	Ammonia (NH <sub>3</sub> )	750
11	Acrylonitrile (CH <sub>2</sub> CHCN)	400
12	Hydrogen Sulphide (H <sub>2</sub> S)	750
13	Phenol (C <sub>6</sub> H <sub>5</sub> OH)	250
14	Phosgene (COCl <sub>2</sub> )	25

# Fire Retardant Properties

SN	Fire Retardant properties	Important parameters
1	Resistance to spread of flame (UIC -564-2-OR)	Surface area burnt and spread (Class A: <80 cm <sup>2</sup> , B: 80 – 200 cm <sup>2</sup> for upholstery)
		After glow time (Class A: <2 sec, B: 2 to 10 sec)
		Non-release of burning drops
2	Deterioration of visibility due to smoke (UIC -564-2-OR)	Light intensity after 4 min (Class A: >=50 lux, B: 20 to 50 lux)
		Light volume in first 4 min (Class A: >300 lux min, B: 150 to 300 lux min)
3	Limiting oxygen index (IS: 13501/ IS:13360)	Min. oxygen % in air required to maintain fire propagation on 5 sec exposure to naked flame.
4	Toxicity (NCD 1409)	< 1 (NCD 1 = Death with 30 min exposure)

## Latest Amendment- Inclusion of Heat Release Rate

In April-2015, latest amendments were issued to the specification of furnishing items. The value of FST properties were improved and the following property has been included:

➤ Heat Release Rate (MARHE i.e. Maximum Average Rate of Heat Emission in KW/m<sup>2</sup> ) as specified in EN 45545-2:2013

# Fire retardant properties – Limits (As per amendments issued in April-15)

ITEM	RESISTANCE TO SPREAD OF FLAME	DETERIORATION OF VISIBILITY DUE TO SMOKE	LIMITING OXYGEN INDEX	TOXICITY
	UIC 564 – 2 OR	UIC 564 – 2 OR	IS:13501	NCD 1409
LP Sheet	A	A	35 min.	< 1
UIC Vestibules	A	A	35 min.	< 1
PVC Flooring	A	A	35 min.	< 1
Rexine	A	A	35 min.	< 1
Upholstery Cloth				
DTBPB	A	A	35 min.	< 1
Curtain Fabric	A	A	35 min.	< 1
FRP Products				
Compreg sheets	A	A	35 min.	< 1
NFTC	A	A	35 min.	< 1

## HEAT RELEASE RATE

ITEM	VALUE	METHOD OF TEST
LP Sheet	R1(HL3)	ISO 5660-1: 50 KW/m2
UIC Vestibules	R1(HL3)	ISO 5660-1: 50 KW/m2
PVC Flooring	R1(HL3)	ISO 5660-1: 50 KW/m2
Rexine	R21(HL3)	ISO 5660-1: 25 KW/m2
Upholstery Cloth		
DTBPB	R20(HL3)	ISO 5660-1: 25 KW/m2
Curtain Fabric	R1(HL3)	ISO 5660-1: 50 KW/m2
FRP Products		
Compreg sheets	R1(HL3)	ISO 5660-1: 50 KW/m2
NFTC	R1(HL3)	ISO 5660-1: 50 KW/m2

## HEAT RELEASE RATE

Test for Heat release rate (HRR) shall be a type test and carried out on every six month till 01.01.2016. Thereafter it will be part of acceptance test.

The firm should have in-house testing facilities as per ISO 5660-1 for conducting test for Heat release rate (HRR) w.e.f. 01.01.2016. Till such time, firm should arrange testing at reputed laboratory as decided between IR/Inspecting Authority and manufacturer. The cost of testing will be borne by the manufacturer.

# Fire Retardant Materials In use

S. No	Description of item	Specification No.	Date of receipt of Specification	Date implemented
1	LP sheet	C-K514 Corrigendum 1 Amendment No.4	December 2005 (Reaffirmed Jan'06)	September 2006
2	UIC type Vestibule	RDSO/2007/CG-05 Corrigendum 1 Amendment No.2	June 2007	March 2008
3	PVC flooring	C-K604 (Amend.1) CG-12 (Rev.1)	April 2006 December 2006 (Reaffirmed August 2008)	July 2006 March 2007
4	Rexine	RDSO/2006/CG-16 RDSO/2008/CG-07 Amendment 1	December 2006 August 2008	March 2007 August 2008
5	Upholstery cloth	C-9901 (Rev.2) Amendment 1	February 2005	February 2005
6	DTBP	C-K607(Rev.1)	April 2006 (Reaffirmed June 2011)	October 2006
7	Curtain Fabric	C-9911 (Rev.3) Amendment 3	February 2005 (reaffirmed 2014)	March 2005
8	NFTC	C-K511 Amendment 2	October 2005	November 2005
9	Wood based impregnated compressed laminates (ompreg)	C-9407 (Rev.3)	October 2004 (reaffirmed Feb'2007)	October 2004
10	FRP products	RDSO/2007/CG-01	April 2007	May 2008



# Fire Retardant Material – Compliance

ITEM	SCR HOLDING	FULLY PROVIDED	PARTIALLY PROVIDED
LP Sheet	4355	2374	1981 (to an extent of 60%)
UIC Vestibules	2493	2120	Balance coaches will be provided in one year
PVC Flooring	4355	4355	complete
Rexine	4301	4014	287 (to an extent of 80%)
Upholstery Cloth	54	54	complete
DTBPB	4355	3649	706 (to an extent of 80%)
Curtain Fabric	644	644	complete
FRP Products	3711	2936	All FRP windows are fire retardant. Others are Aluminum windows.
Compreg	4355	3214	1141 (to an extent of 60%)
NFTC	3822	3822	complete

# Fire Prevention

- Preventing ingress of foreign material in FDBs
- Preventing entry of foreign material in roof ventilators
- Preventing ingress of water in coach
- Maintaining LPG installation in coach

# Prevent ingress of foreign combustible material



Unmodified FDB cover



Modified FDB cover

Modified fuse distribution board covers to prevent insertion of Beedi Cigarette, sachets, etc., by passengers in non AC coaches

# Prevent ingress of combustible material

- Modification to the ventilator
- Stainless steel wire mesh in ventilator prevents insertion of papers, gutka packs, beedi stubs and cigarettes



# Prevent ingress of foreign material

- Shower test to detect Roof leakage
- Done during POH of coaches
- Detection
  - 6 in 2012
  - 17 in 2013(Approx. 1%)



# Fire Fighting and Evacuation

- Fire safety instructions
- Fire extinguishers
- Alarm chain apparatus
- Emergency Windows
- Modification to main door  
(Removal of bottom latch from doors)

# Fire Safety Instructions



Unified notice for fire prevention and safety ( RDSO SK 3028) is provided in diagonally opposite doors in all coaches as per RDSO SK-3032

<h2 style="text-align: center;">भारतीय रेल आपकी सेवा में</h2>			
<p><b>सुरक्षित यात्रा करें</b></p> <ul style="list-style-type: none"> <li>उपकी गाड़ी में बढ़ना, उतरना, दरवाजे खुले रखना या विद्युती से कोई भी गार्ड सिगनल या खलरफाक है।</li> <li>कुपया पायदान पर यात्रा न करें और इसे रोके।</li> <li>कुपया हल्का तथा छोटा सामान लेकर यात्रा करें और भारी/बड़ा सामान बैग यात्रा में नुक करायें।</li> <li>कुपया सिगनलियों एवं अतिरिक्त सिगनलों को बढ़ना न दें।</li> <li>संभरी गाड़ी में लम्बा खड़ेकर सामान राष्ट्रीय सखलि है।</li> <li>कुपया इसे बोड़ी व नुकसान से बचायें।</li> <li>यदि कोई सिगनाल है तो कुपया गार्ड/गाड़ी अधीक्षक/कंडक्टर/स्टेशन मास्टर को पास सिगनाल पुलिसमन में दर्ज कराए।</li> </ul> <p><b>क.आई.आर.</b></p>	<p><b>TRAVEL SAFETY</b></p> <ul style="list-style-type: none"> <li>IT IS DANGEROUS TO ENTRAIN, DETRAIN, TO KEEP DOORS OPEN OR TO LEAN OUT OF THE WINDOWS WHEN THE TRAIN IS IN MOTION.</li> <li>PLEASE AVOID AND PREVENT FOOT BOARD TRAVEL.</li> <li>PLEASE TRAVEL LIGHT AND BOOK HEAVY/BULKY LUGGAGE IN BRAKE VAN.</li> <li>PLEASE DISCOURAGE BEGGARS AND UNAUTHORIZED VENDORS.</li> <li>PLEASE PREVENT DAMAGE AND THEFT OF FITTINGS, THESE ARE NATIONAL PROPERTIES.</li> <li>PLEASE RECORD COMPLAINTS, IF ANY WITH THE GUARDS/TRAIN SUPDT./CONDUCTOR/STATION MASTER, THEY HAVE COMPLAINT BOOK.</li> </ul> <p><b>F.I.R</b></p> <p>Passengers can fill up "FIR" forms, available with train staff (guard, TTE &amp; RPF etc.) in case of theft, robbery and dacoity etc., &amp; Hand over the same to them for onward transmission to government railway police.</p>	<p><b>आग रोकिये</b></p> <p>रेल डिब्बे के अन्दर</p> <ul style="list-style-type: none"> <li>आगिज की उपकी बोडियों में न रोकिये।</li> <li>पटाखे, गैस - सिलिण्डर आदि जैसे विस्फोटक और खलरफाक सामान मत ले जाइये।</li> <li>गिद्धी का लेन, घोटल आदि जैसे ज्वलनशील पदार्थ मत ले जाइये।</li> <li>स्टोव जस्ता सिगारी मत जलाइये।</li> <li>"दोरी व्यक्ति को तीन वर तक की कैद और रु. 1000/- तक का जुर्माना या दोनों ही सखला है।"</li> </ul> <p>रेलवे की सखला करें। सुरक्षित यात्रा करें।</p> <p><b>आग रोकिये</b></p> <p><b>PREVENT FIRE</b></p> <p><b>PREVENT FIRE</b></p> <p><b>INSIDE THE TRAIN COMPARTMENT</b></p> <ul style="list-style-type: none"> <li>DO NOT THROW LIGHTED MATCH STICK.</li> <li>DO NOT CARRY EXPLOSIVE AND DANGEROUS GOODS LIKE FIRE CRACKERS, GAS CYLINDERS ETC.</li> <li>DO NOT CARRY INFLAMMABLE ARTICLES LIKE KEROSENE, PETROL ETC.</li> <li>DO NOT LIGHT UP STOVE OR SIGRIL.</li> </ul> <p>"OFFENDERS MAY BE PUNISHABLE WITH IMPRISONMENT UPTO THREE YEARS AND FINE UP TO RS. 1000/- OR WITH BOTH."</p> <p><b>HELP THE RAILWAYS REACH YOU SAFELY</b></p>	<p><b>धूमपान निषेध</b></p> <p>रु. 200/- जुर्माना हो सखला है।</p> <p><b>SMOKING IS PROHIBITED</b></p> <p><b>PUNISHABLE WITH Rs. 200/-</b></p> <p>अपने सामान से दरवाजे, वेस्टीबुल एवं कॉरीडोर, मात अवरुध न करें।</p> <p><b>DO NOT OBSTRUCT DOORWAYS VESTIBULE AND CORRIDORS WITH LUGGAGE.</b></p>
<p><b>अच्छी सेवा के लिए रेलवे की सहायता करें</b></p> <p>उपयुक्त टिकट सखिल यात्रा करें और इसे अतिरिक्त रेलवे कर्मचारी द्वारा मासले पर टिकट/बिना टिकट/अतिरिक्त यात्रा करवने की सजा रु. 1000/- तक जुर्माना या 6 माह तक की कैद या दोनों।</p> <ul style="list-style-type: none"> <li>अपने सामान की सुरक्षा हेतु उसे सीट के नीचे लगे फल्लो/तार की बोड़ी के सुरक्षा की यात्री स्वयं जिम्मेदार है।</li> <li>आवश्यक न हो तो सुरक्षा चौकी और सखिलों बंद कर दें।</li> <li>कुपया अपने आवसाम अवरुध न करें एवं डिब्बे में न सुईं।</li> <li>कुपया हॉलिवुड/रेडियो बिना "इयर फोन" के न बजायें।</li> <li>कुपया दरवाजों और विद्युतियों को निरवसत: राल में तीक नरुध से नरुध कर लें।</li> </ul> <p><b>मरुपान निषेध है।</b></p> <ul style="list-style-type: none"> <li>कुपया सखलायियों के लिये परिशाली पैदा न करें।</li> <li>कुपया सखलायियों की अरुधिन साखियन/सीट न चयें।</li> </ul> <p><b>आवसाम के लिये अरुधेन</b></p> <ul style="list-style-type: none"> <li>गाड़ी सखी करवने के लिये खरवे की अंधीर सिगिण्ट।</li> <li>आग लालने की दशा में परिशाल के पास उपलब्ध अखिलसामक का प्रयोग करें।</li> <li>डिब्बे से गार्ड सिगनल के लिये आवसामकालीन सिगनल का प्रयोग करें।</li> <li>आवसामकालीन सिगनल से गार्ड सिगनल की लिये सिगनल का प्रयोग सिगनलर उरुधेन से करवने सिगनल।</li> <li>यदि हथौडा उरुधेन हुआ है, सब हथौडे के सखने का कर्तव्य लोड कर इमीडा सिगनल और सिगनल के बोडों की लोड कर गार्ड सिगनल।</li> </ul>	<p><b>HELP THE RAILWAYS SERVE BETTER</b></p> <ul style="list-style-type: none"> <li>TRAVEL ONLY WITH PROPER TICKET AND SHOW IT TO AUTHORISED RAILWAY PERSONNEL ON DEMAND. PENALTY FOR TICKETLESS/IRREGULAR TRAVEL IS FINE UP TO RS. 1000/- OR IMPRISONMENT UP TO 6 MONTHS OR BOTH.</li> <li>SECURE YOUR LUGGAGE WITH THE RINGS/WIRE ROPES PROVIDED BELOW THE SEAT. PASSENGERS THEMSELVES ARE RESPONSIBLE FOR SECURITY OF THEIR LUGGAGE.</li> <li>PLEASE SWITCH OFF FANS &amp; LIGHTS IF NOT REQUIRED.</li> <li>PLEASE KEEP SURROUNDINGS CLEAN. DO NOT SPIT IN THE COACH.</li> <li>PLEASE DO NOT USE TRANSISTOR OR RADIO WITHOUT EARPHONE.</li> <li>PLEASE SECURE DOORS &amp; WINDOWS PROPERLY, PARTICULARLY AT NIGHT.</li> </ul> <p><b>CONSUMPTION OF ALCOHOLIC DRINKS PROHIBITED.</b></p> <ul style="list-style-type: none"> <li>PLEASE DO NOT DISTURB FELLOW PASSENGERS.</li> <li>PLEASE DO NOT OCCUPY BERTH/SEAT RESERVED FOR SOMEBODY ELSE.</li> </ul> <p><b>GUIDE LINES IN EMERGENCY</b></p> <ul style="list-style-type: none"> <li>Pull the chain to stop the train.</li> <li>In case of fire, use fire extinguisher available with attendant.</li> <li>Use emergency window to escape.</li> <li>To exit from the emergency window follow the instructions given on the window and exit.</li> <li>If hammer is provided then, break glass of hammer box, pick up the hammer and break window glass unit and exit.</li> </ul>	<p><b>हार्सिंग वुमन</b></p> <p><b>PASSENGERS IS A PUNISHABLE OFFENCE</b></p> <p>OBSCENS REMARKS, TEASING, TOUCHING, STARES, GESTURES, SONGS, AND UNWANTED ATTENTION ARE ALL FORMS OF SEXUAL VIOLENCE, PUNISHABLE BY UP TO TWO YEARS OR A FINE UNDER SECTION 354A, 354 AND 294 OF THE INDIAN PENAL CODE AND SECTION 145 AND 146 OF THE RAILWAYS ACT. TO REGISTER A COMPLAINT, CONTACT THE TTE OR RPF ON THE TRAIN, LODGE AN FIR AT THE GRP POST ON PLATFORM AT ANY STATION. INDIAN RAILWAYS COMMITTED TO THE SAFETY OF WOMEN PASSENGERS.</p>	<p><b>महिलाओं से</b></p> <p><b>उपकीय अरुधेन</b></p> <p>उपकीय अरुधेन एवं अरुधेन की उरुधेन करवने की अरुधेन सिगनल करवने की सजा 145 व 146 के अरुधेन से अरुधेन करवने की सजा लम्बा सुखिलों से करवने है।</p> <p>सिगनलर की सखला के सिगनल से अरुधेन करवने की सजा लम्बा सुखिलों से करवने है।</p> <p>सिगनलर की सखला के सिगनल से अरुधेन करवने की सजा लम्बा सुखिलों से करवने है।</p> <p>सिगनलर की सखला के सिगनल से अरुधेन करवने की सजा लम्बा सुखिलों से करवने है।</p>
<p><b>IN GENERAL COACHES EMERGENCY EXIT WINDOWS ARE PAINTED RED - IN AC COACHES EMERGENCY EXIT WINDOWS ARE MARKED - "EMERGENCY WINDOW"</b></p>			

# Fire Extinguisher - Scale and location

To prevent propagation of fire, 'Fire extinguishers' are provided in coaches where railway personnel are available

TYPE	Drg.no.	Location at
Pantry car	ICF DRG WCB - 6-4-122	2 - outside store room 2 - corridor/outside store.
Composite AC	WGFSWAC <sub>7</sub> -6-4-701	2 in attendant's compartment
AC Chair car	WGSCZAC <sub>5</sub> -6-4-501	2 on partition wall in front of seat no.2
First AC	WGFAC <sub>8</sub> -6-4-801	2 in attendants compartment
AC 2 Tier	WGSCWAC <sub>7</sub> -6-4-701	2 in linen room
AC 3 Tier	AE64130 Alt-b	2 near attendant's seat



# Better Fire Extinguishers

- Various make Fire extinguishers with variable pitch (147 mm to 234mm) holding brackets results in its improper placing in coach
- Being switched over from Portable fire extinguishers dry powder (cartridge type) of 5Kg to Stored pressure ABC type DCP fire extinguishers of 6 Kg
- Procurement to revised description has been started with effect from May.2013



# Maintenance of Alarm chain Apparatus

- Alarm chain pull force kept within 6 to 10 kgf.
- Witnessed by NTXR during POH
- Verified during 'A' schedule in depots

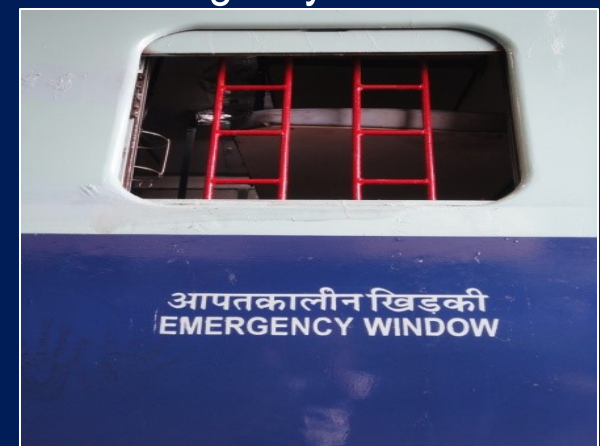


# Emergency Windows - Type

- All coaches provided with emergency window exit
- Graphic instructions provided in coach for guidance
- Location in coach, indicated with fluorescent signage



Emergency window AC



Emergency window Non-AC

# Instructions to Passengers

## Existing Fire prevention Measures

- Displaying of stickers requesting the passengers not to carry inflammable items as a part of their luggage

**SOUTH CENTRAL RAILWAY**  
**!! यात्री कृपया ध्यान दें !!**  
**!! KIND ATTENTION PASSENGERS !!**

**मैर यातानुकूलित डिब्बों के लिए आपतकालीन खिड़की**  
**EMERGENCY WINDOW FOR NON AC COACHES**

**सवारी डिब्बों के लिए आपतकालीन खिड़की**  
**EMERGENCY WINDOW FOR AC COACHES**

**सामान हेल्पाइन**  
**CATERING HELPLINE**

**सफाई बनाए रखें**  
**MAINTAIN HYGIENE**

**अपनी जान को जोखिम में न डालें**  
**DO NOT RISK LIVES**

**सुरक्षा चेतावनी**  
**SECURITY ALERT**

**सतर्क रहें सुरक्षित रहें**  
**BE ALERT BE SECURE**

**सुझाव बक्स**  
**SUGGESTION BOX**

**CLEANLINESS IS NEXT TO GODLINESS**

**HEALTH IS WEALTH**











**040-27833366**  
**09701370728**

**In Case of Need Contact / SMS to**  
**(0) 9701371727 (040) 27820725**  
**RPF Secunderabad Division.**

**09701370964, 040-27834044**  
**Toll Free No. 1800 425 5090**

**HAPPY JOURNEY**

**Secunderabad Division**

27/12/2013

# Emergency Windows - Scale & Location

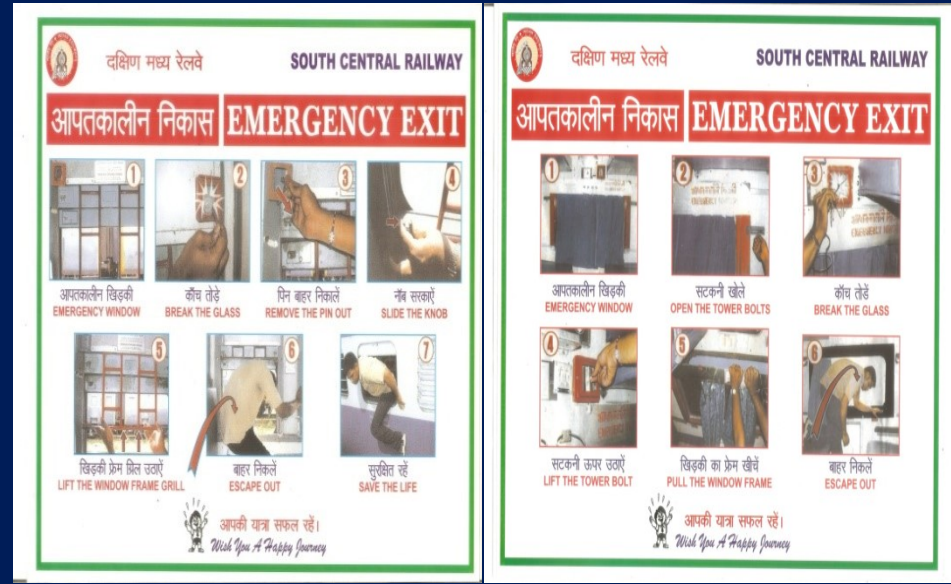
To enable safe escape of passengers from a fire affected coach, provision of emergency windows have been provided as under:

Coach Type	Nos	Location	Reference
GS /CN/CZ	4	3 <sup>rd</sup> & 7 <sup>th</sup> Window from Door Way in staggered manner	GS <sub>5</sub> -5-4-501, SCN <sub>7</sub> -5-4-701, SDC <sub>5</sub> -5-4-501
SLR	2	3 <sup>rd</sup> window from doorway	
SLRD	4	middle window of compartment for Physically handicap and general compartment	
FAC	2	3 <sup>rd</sup> window from the either door on aisle.	WGFAC <sub>8</sub> -5-4-801
FACCW	3	4 <sup>th</sup> window from door in 1 <sup>st</sup> AC portion, 1 <sup>st</sup> coupe & 3 <sup>rd</sup> Side Berth	WGFSCWAC <sub>7</sub> -5-4-701
ACCW	2	3 <sup>rd</sup> & 6 <sup>th</sup> bay on diagonally opposite side.	WGSCWAC <sub>8</sub> -5-4-801
ACCN	4	2 each in 3 <sup>rd</sup> & 6 <sup>th</sup> bay	
ACCZ/ACCZJ	2	Between 5 <sup>th</sup> & 6 <sup>th</sup> Row -diagonally opposite	WGSCZAC <sub>9</sub> -5-4-901

# Emergency Windows – Identification signs



Location in coach indicated with fluorescent signage



Graphic instructions in coaches for passenger guidance

# Emergency windows - Use

## Height of Emergency window from Track level



# Provision Of Hammer in AC coaches





# Modification to Main door

- Bottom latch removed to facilitate opening of door in a panic situation
- Opening direction of handle indicated in coaches



# Fire Safety in pantry cars

- Centralized gas pipe line system
- Keeping Fire Extinguishers with manager
- Annual maintenance contract for maintenance of gas pipe line system
- Daily certification of gas pipe line jointly signed by contractor, pantry car manager and C&W supervisor
- Training of pantry car staff in fire fighting

# Securing of Gas cylinders in pantry car



Clamps provided to secure Gas cylinders.

# Safety Precautions in Pantry cars



Pressure Gauge and Flash back arrester in gas pipe line system.

# Daily certification of Gas pipe line system

## HYDRO PNEUMATIC ENGINEERS (HYD) PVT. LTD.

# 1-3-183/40/46, Plot No. 36, Sai Nagar, New Bakaram, Hyderabad-80. Ph.: (040) 27535123/27530224

### SERVICING REPORT & CERTIFICATE FOR LEAKAGE

(DAILY REPORT)

②

Station : Hydrabad

No. 1737

#### I. Leakage Test with Soap Solution (as per IS 6044/71 Part-I)

- a. Click on adaptors and its pigtails : No Leakage / Attended
- b. Manifold blocks and pipelines : No Leakage / Attended
- c. Hot cases and cooking ranges : No Leakage / Attended
- d. Flexible burner pigtails : No Leakage / Attended
- e. Line Shutt off valves : No Leakage / Attended
- f. Union joints : No Leakage / Attended

II. Flame Test on cooking ranges and hot-cases : Carried / Not Carried  
Gas-Cylinder not Available

III. Working of Pressure guage and valves : Working / Attended

IV. Repairs / Replacement to defective parts if any :

V. Other Observations noticed if any :

This is certify that the gas pipeline system of Pantry Car Coach # 97808  
Connected to Train # 12721/12722 Date 21/12/13 was checked thoroughly.  
This is also to certify that there are no gas leakages in the pipeline provided in the Pantry Car.

D. K. Rao  
Signature of the Representative of CDO  
For SOUTH CENTRAL RAILWAY

D. K. Rao  
Signature of Pantry Car  
Manager

No. 1  
Signature of Technician  
For HYDRO PNEUMATIC ENGINEERS  
(HYD) PVT. LTD.

# Safety Precautions in Pantry cars

- A JPO no 04/2011 for maintenance safety in Pantry cars has been issued by CCM(C&PS), CRSE and CESE
- List of Do's and Don'ts for Pantry cars circulated to all divisions
- The Equipment in Pantry car is standardized

# Safety Precautions in Pantry cars

*A check list has been made for improving safety in Pantry cars*

- Securing of gas cylinders in gas room
- working of gas regulators, flame arrestors and pressure gauges
- Availability of gas manifold
- Whether the main doors are free to be opened
- Four fire extinguishers are at nominated places
- Due dates of Fire extinguishers for testing and Refilling
- Gas pipe line testing Certificate
- Securing of gas stoves / burners to prevent dislocation while train is on run
- Pantry car staff are conversant with fire extinguishers operation
- Working of emergency windows

# Non-fire retardant material

- Paint – interior & exterior
- PU ladders
- Nylon magazine bags / bottle holders
- Bed rolls / linen
- Luggage of passengers –belongings & bags



# Diesel Locomotives & DMUs

# Diesel locomotives



# Mechanical areas

- Arresting leakages:
  - Exhaust manifold
  - Fuel pipe line & joints / fuel injection system
  - Lube oil pipelines & joints
- Thermal insulation to exhaust gas manifold
- Optimised working of compressor : cut-in & cut-out
- Thermal insulation to compressor high pressure pipe line
- Radiator room – no leakage of oil, RTTM bearing working, drain holes cleaning
- Under frame – removal of oil soaked dust , brake adjustment

# Electrical areas

- Generator room – sealing by steel plate partition
- Condition of carbody filters
- Connection of control cables on TB
- Power cable connection
- Use of fire retardant E-beam cables
- Checking of IR of wiring/ Equipment
- Loose Traction Motor Cable Joints in undertruck-tightening being ensured
- Loose connection in roof mounted grids- proper tightening and working and blowers being ensured

# Fire protection in DMUs

- Over voltage protection (OVP) are being provided on RRUs by LGDS during POH. Shed has also planned for procurement of OVPs
- Shed has replaced all old blowers with equal rating blowers and kept them working on all DPCs
- As a safety drive, all DPCs junction boxes have been opened and checked. Proper tightness of the cables have been ensured and damaged cables have been changed
- IR values of all coaches being tested by isolating all circuits individually during Quarterly (3 months)

# Fire protection in DMUs

- LED Twin Lamp to detect grounding Provided on all DPCs
- Shed started replacing all DC fans with BLDC fans. Till date it has been done in 56 DPCs/TCs, out of total 104
- Replacement of 35 Amps Breaker with 16 Amps
- All individual junction boxes of fans and lights are opened every three months to check –Tightness of jumpers & Tightness of fuses and condition
- Negative breakers on all old coaches have been provided

# Provision of Stored Pressure type Fire Extinguishers in DPCs

CARTRIDGE TYPE



- Earlier 4 Cartridge type DCP fire extinguishers were provided in DPCs

- Now, 4 stored pressure type fire extinguishers have been provided in 700 HP DPCs and six nos. in 1400 HP DPCs. These are simple to operate & are fitted with pressure gauge



STORED  
PRESSURE  
TYPE  
55

# Fire safety measures – Action taken

- 'Fire – causes & prevention' included in training module for new recruits & in refresher course
- Random testing of FST properties on pre-inspected fire retardant material being introduced
- Checks for fire safety items in workshops on off POH coaches ensured
- Special drive commenced to ensure compliance of fire safety measures



# Fire safety measures in the offing

- Fire retardant paint to be developed
- Fire detection system in coaches
- Checking of oil/petrol in two wheelers
- Outer door to be provided with rubber lining to prevent door jamming
- AC compartment door to swing both ways
- Provision to enable opening of vestibule from wrong direction
- Wooden berths in exit areas to be removed
- System for removal of smoke to prevent deaths due to asphyxiation
- Lighting of emergency path way with glow sticker
- Announcement in AC coaches

The End