Personal Safety Instruction Manual

Document Number: 5 16 76 0014

Version: 1.0

Date Published: 15-11-2021

Prepared by
HBL Power Systems Ltd
Hyderabad

DOCUMENT DATA SHEET

Title of Document	File Name	Pages	Figures	Tables
Personal Safety Instruction Manual	Personal_safety_manual	20	9	0

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Abstract
This document details Instructions for the personal safety of field staff responsible for TCAS site and Looc installation and maintenance

DOCUMENT CONTROL SHEET

#	Name	Organization	Function	Level
1.	K.Venu	HBL	Sr. Manager (Site I&C)	Prepare
2.	G. Muralidhar Rao	HBL	Sr. Manager (Loco I&C)	Prepare
3.	Ayan Kudu	HBL	Maintenance Head	Verification & Validation
4.	K.V.Rajasekhar	HBL	I&C and Project Engineering Head	Approve

Change History

#	Name of the Document	Date	Reason for changes	Version
1.	Personal Safety Instruction Manual	15-11-2021	Initial version	1.0

REFERENCES

#	Document Name	Document Number	Version	Source
1.	RDSO Specification for Train Collision Avoidance System	RDSO/SPN/ 196/2012	V 3.2 17-05-2017	RDSO
2.	Indian Railways Handbook on Safety Precautions at Worksite Adjacent to Track	CAMTECH/2015/ C/SPWSAT/	V1.0 Sep 2015	CAMTECH
3.	Safety at Work Site	CAMTECH/2015/C /SAWS/1.0	V 1.0 Jan - 2015	CAMTECH
4.	Indian Railways Pamphlet on Electrical Safety	CAMTECH/E/2019 -20/EP- 04/Electrical Safety/	V1.0 Nov, 2019.	CAMTECH

Contents

1. Purpose:

Safety practices, guidelines, protocols defined are to be followed and create safety consciousness amongst staff working in the Indian Railway network.

2. Scope of the work:

HBL Safety committee formulates the guidelines, rules, and regulations, schedule for conducting training, audits the HBL staff working in Indian Railway.

3. Do's & Don'ts:

Do's

1	Always have the hospital contact number nearest to the site
2	Train the engineers/contract labourers working on Tracks/ Towers
3	Safety assessment of the workplace and working environment (weather condition)
4	Barricading of tower foundations.
5	Wear safety Belt while climbing the tower" and "wear Safety jacket and helmet while walking on trackside".
6	All electrical tapping routed through a safety, overload / residual protection circuit breakers
7	Wear safety apparel and accessories to protect the welder and other persons working near the welding area
8	Keep a portable fire extinguisher near welding works.
9	First aid until the ambulance arrives.
10	Take precautions while welding in locomotives, in safeguarding loco equipment

Don'ts

1	Don't troubleshoot without proper system training
2	Don't use Walkie – Talkie, Mobile Phone, or any Radio Equipment while working on Tracks / on Tower.
3	Don't connect/tap the Railway power supply without their supervision
4	Never practice any self-made guidelines which are not recommended in the manual.

5	Don't disturb cables/connectors of Railway power supply feeders/signaling wiring etc.
6	Never Insert bare cables in the sockets, for electric supply connection.
7	Never work on tracks & towers during the night.
8	Don't climb on the loco roof, when traction supply is available

4. Functioning of Safety

4.1 HBL Rail Personal Safety Management:

HBL Rail Management has formulated the safety committee on safety perspective for monitoring the execution and maintenance work of TCAS in the station site including wayside installations and the locos.

Execution of the field activities, in the locomotives and wayside sites, entails several risks to HBL personnel.

Managers shall ensure that

- Suitable safety protocols are defined
- Employees are made aware of the need for adhering to the safety protocols and
- Employees are trained on the use of safety protocols.

Managers' attention is drawn to the **Indian Railways Handbook on Safety Precautions at Worksite Adjacent to Track, Sep 2015**.

- ✓ *Protecting staff, contract workers, or controlling hazards should be the same for all employers and employees.*
- ✓ *A good first step is to do a safety assessment of your workplace.*
- ✓ *Take the first step towards making your workplace safe and create an action plan to correct those issues.*

4.2 Committee for personal safety

#	Committee member	Responsibility
1	K. Venu	Safety training to site personnel
		Maintenance and updation of the safety instruction book
2	G. Muralidhar Rao	Safety training to Loco I&C and maintenance team
		Maintenance and updation of the safety instruction book

3	Ayan Kundu	Safety of site and loco maintenance team
		Maintenance and updation of the safety instruction book
		Statutory compliances
4	K.V. Rajasekhar	Safety of site personnel of I&C team
		Statutory compliances

5. Safety - TCAS Execution.

Management's safety perspective in executing the field activities like locomotives, wayside sites, following are the safety protocols and practices.

5.1 Wayside Sites

Management suggested the following ***SAFETY PRECAUTIONS AT WORKSITE ADJACENT TO TRACK defined***.

The supervisor/workmen should be counseled about safety measures. The staff of the contractor should be fully trained for the work. List of contractor's supervisors who have been issued competency certificates with location and the nature of works they will supervise. A competency certificate as per the proforma given below shall be issued by Assistant Engineer (ADEN) to the supervisor/staff of the contractor and then only they will be allowed to start the work. A competency certificate will be valid only for the work for which it has been issued.

COMPETENCY CERTIFICATE

Certified that Shri _____P.Way supervisor of M/s_____ has been examined regarding P.Way working on _____work. His knowledge has been found satisfactory and he can supervise the work safely.

HBL should submit to ADEN the names of supervisors, who are going to be site in charge.

HBL staff or contractor working at a particular railway station should inform the respective station and ensure to collect the nearest ***hospital contact details***.

The following are the wayside sites:

5.1.1 Tower:

Safety protocols to staff during Tower foundation, installation & maintenance.

Before any tower work begins, a competent person should develop a climbing plan and perform a Pre-climb inspection. The climbing plan should address work permits, notification of carriers who use the tower's antennas, arrangements to reduce RF emissions during the work, the climbing procedures that will be used, the soundness of all attachment points, lockout/tag out procedures for any hazards specific to the tower, and weather and other conditions that may affect workers. It's important to keep in mind that weather conditions may be very different near the top of the tower than at ground level.

Figure 1: Safety Belts for Tower Climbing

i. The worksite shall be suitably ***demarcated*** to keep the public and passengers away from the work area. Necessary ***signage boards*** such as '***Work in progress'*** etc shall be provided at appropriate locations to warn the public/passengers.

ii. Before taking up ***any digging*** activity on a particular work by any agency ***Sr. DSTE/DSTE or Sr. DEE/DEE*** of the section shall be approached in writing by the concerned Eng. or S&T or Electrical officer for permitting to undertake the work.

iii. While digging in the station area, if any ***cable is found***, digging should be stopped and concerned signaling / electrical staff should be informed immediately.

iv. Trenches and foundation pits should be adequately and securely fenced, provided with ***proper caution signs, and marked with red lights*** at suitable intervals during the night to avoid accidents.

v. ***Trained HBL supervisors, staff, and contractor supervisors*** have been deputed at worksites duly ***certified by ADEN/DEN*** in charge of the work.

vi. Visit the tower foundation site by wearing ***Yellow colour helmets, Jackets & safety shoes***, ensure to be a little far from the pit edge.

vii. Shouldn't stand near the foundation pit edge, which is 10 feet in depth.

viii. Shouldn't peep into the pit, while the foundation is in progress while steel rods are being laid.

ix. Ensure to wear ***Yellow colour helmets, Jackets & safety shoes***, while staff working for tower erection.

x. Ensure to wear ***safety belts, Yellow colour helmets, safety shoes*** while climbing the tower. engineer climbs the tower and starts work, he must ***hook the safety belt*** on to tower rod, by any chance engineer shouldn't slip from a tower.

xi. When activity on the tower must be performed, ensure that a minimum of ***two engineers*** visit the site.

xii. Site working staff or contractor should inform the ***site in charge*** at HO.

xiii. Using a hoe to dig on the cable can easily cause damage to the wires, so it is better to dig the cable by hand wearing gloves.

xiv. Display the switchgear layout of the power supply. Employees working on the shop floor/relay room should be aware of which switch to turn off in an emergency.

xv. Working on towers when the weather conditions are bad can also be life-threatening. Water or snow, even in a small amount can induce fatal accidents. It is advisable to postpone the work until the weather conditions normalize or take safety precautions as the situation demands overcoming mishaps.

5.2 Station TCAS:

i. For the safety of engineers or contract workers, they should be properly educated about electrical safety and hazard.

ii. Use a 3pin plug socket in electrical devices. Use phase wire ***red***, neutral wire ***blue,*** and earth wire ***green.***

iii. Always use ELCB, RCCB, and use a fuse of an appropriate current rating.

iv. Selection of the appropriate fuse or ELCB and RCCB is required. A fuse of 150% of the normal circuit current is usually selected to avoid short circuits.

v. Never overload plugs, sockets, or extension cords, while a 230V AC supply is being used in a Relay room.

vi. Do not pull the cord to exit the outlet. Hold the plug and exit the outlet.

vii. Don't insert bear cables in the sockets, instead use a plug with cable for electric supply connection.

viii. Always use insulated tools while working. Always use appropriate rubber gloves when working on any live electrical circuit.

ix. Display the switch-gear layout of the power supply. Employees working on the shop floor should be aware of which switch to turn off in an emergency.

5.2.1 RFID Tags:

Staff or contractor workers working on the rail track for track length measurement or RFID tag installation should inform to station master with an authorized letter taken from railway officials like SSE/DSTE / Sr.DSTE.

i. Caution orders speed restriction may not be allowed when TCAS – RFID tags installation is considered.

ii. Special care should be taken for labourers to stay away from running trains from both directions while passing over the worksite.

iii. RFID tags installation work shall be planned during the daytime having sufficient daylight (till sunset).

iv. Working on track during the evening with dark light or lamps of the permanent indicators, which are reflective type is not allowed.

v. Working on tracks during **nighttime or when there is poor visibility is not allowed**.

vi. Minimum 3 members staff/workers should be planned to work on the tracks.

vii. Staff should be posted on both sides of the workplace, who can alert the working teams to the trains coming on that track.

viii. Watchmen deployed on both sides are equipped with hooters/whistles to keep a watch on the approaching trains and alert the workers well in time with the use of hooters/whistles.

ix. All staff or contract workers working on Track should wear red colour ***safety jacket, Yellow colour Helmet*** and should carry ***whistle*** tied with neck belt.

5.2.2 Track Crossing Works:

All the works under track crossing, inside a tunnel, deep cutting, on bridges, constricted area, etc. should be carried out under the protection of engineering signals and preferably under block protection. The Inspector concerned / site in charge of a contractor shall be responsible for the safety of

trains and of the men and equipment working under the track.Track crossings work shall be done in the presence of JE/P.Way.The cabling work shall be supervised at the site personally by an official of the S&T department, not below the rank of JE-Sig.

5.3 Loco TCAS:

i. Loco to be grounded by operating earth switch (HOM).

ii. ***Safety red colour jacket, Helmet, and shoes*** should always be used at the time of working in loco.

iii. Ensure use of safety items such as ***safety belts/helmet/hand gloves/slings/ropes*** etc. by a man working on an overhead structure or ***Loco roof***.

iv. Don't place any flammable materials like petrol, grease, cotton vest, etc. around the welding job. Earth wire shouldn't be used as a neutral wire

v. While welding, ensure that loco equipment, cables are isolated.

vi. Ensure that there is no ***cushion/foam/cotton waste*** material lying inside the welding portion, such material may catch fire easily.

vii. While drilling, ensure that there are ***no cables, conductive material*** beneath it, to avoid its damage.

viii. Display the switchgear layout of the power supply. Employees working on the shop floor should be aware of which switch to turn off in an emergency.

6. Electric Shock:

6.1 The risk of electric shock is according to the voltage.

i. The person may be unconscious, the body may be burnt, muscles may Twitch, the heart or brain may stop functioning, the place affected by current could be numb or paralyzed. Due to a fall, a person may be injured and bones can be broken.

ii. Electric shock can be so dangerous that it could also burn internal parts of the body. It can cause fatality.

6.2 In case of electric shock:

iii. If the person is in contact with the current, then with the help of wood or any bad conductor, remove him/her from the contact of electricity and turn off the power/supply

iv. Call ambulance.

v. Give first aid until the ambulance arrives.

vi. If the victim is breathing, then lay down the person in the recovery position.

vii. If the victim is not breathing, so lay it and start CPR by giving breath by mouth immediately by raising the feet and giving repeated pressure on the heart.

Figure 2: Electric Shock Treatment

viii. Tie bandage on the injured area and after applying antiseptic cream on burnt areas cover them with a clean cloth. Do not wrap blanket.

7. SAFETY IN MANUAL METAL ARC WELDING:

During arc welding the welder is exposed to hazards such as an injury due to harmful rays (ultraviolet and infra-red rays) of the arc, burns due to excessive heat from the arc and contact with hot jobs, electric shock, toxic fumes, flying hot spatters and slag particles and objects falling on the feet. The following safety apparel and accessories are used to protect the welder and other persons working near the welding area from the above-mentioned hazards.

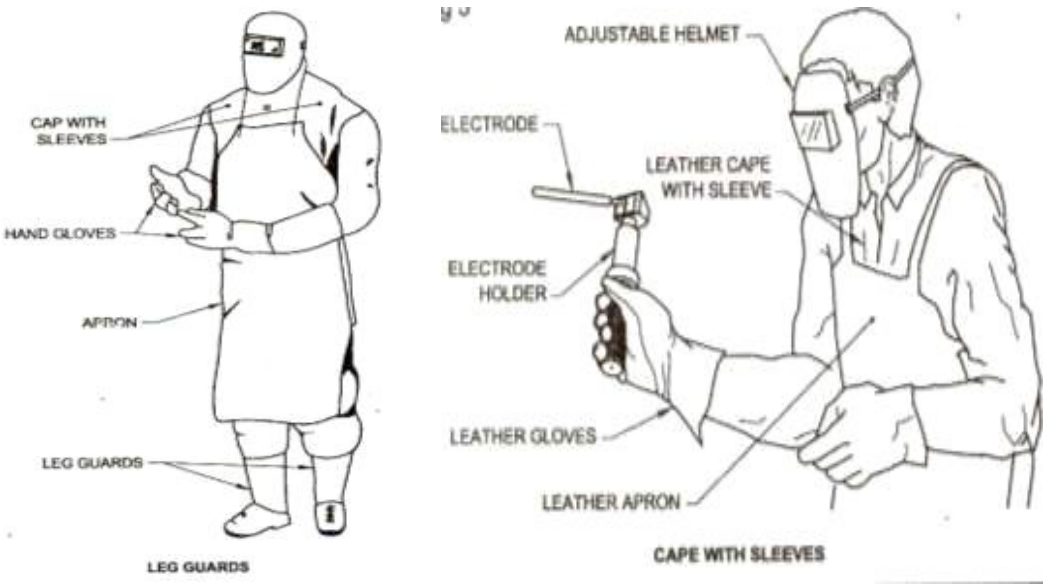


Figure 3: Safety Apparels

7.1 Safety apparels

i. Leather apron

ii. Leather gloves

iii. Leather cape with sleeves

iv. Industrial safety shoes

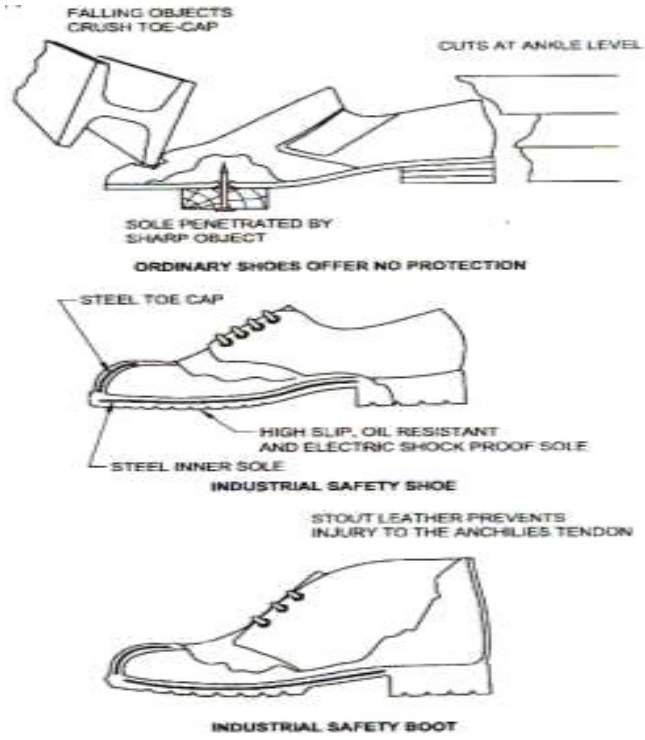


Figure 4: Industrial Safety Shoes

7.2 Hand screen

i. Adjustable helmet

ii. Portable fireproof canvas screens

7.3 Chipping/ grinding goggles

During Chipping/Grinding tasks, it is very important to protect your eyes small projectiles. Wearing these goggles is very uncomfortable in hot and humid conditions, as the lens of goggles tends to get blurred due to sweat. The accident often occurs that metal particles sticks into an eye of the worker who wears sunglasses instead of goggles to prevent blurring due to sweat. Flying of metallic chips in using a disc sander is very dangerous. They may not directly attack the user but may come in the eye of another worker even when he is wearing goggles.

7.4 Respirator and exhaust ducting

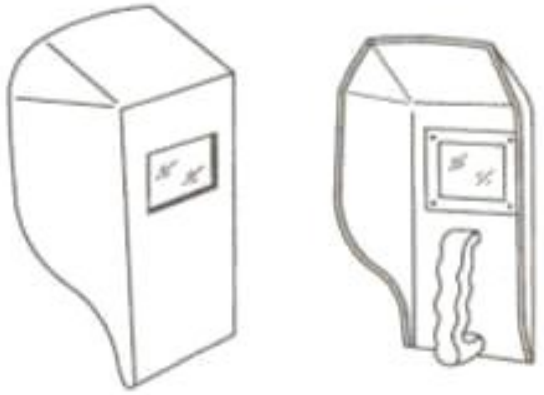
Safety apparels

The leather apron, gloves, cape with sleeves, and leg guard are used to protect the body, hands, arms, neck, and chest of the welder from the heat radiation and hot spatters from the arc and also from the hot slag particles

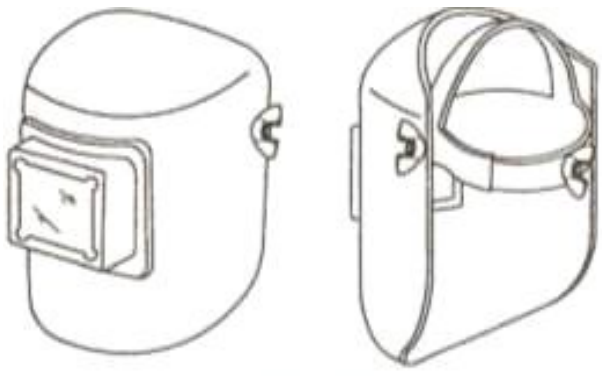
flying from the weld joint during chipping off the solidified slag. All the above safety apparel should not be loose while wearing them and a suitable size has to be selected by the welder. The industrial safety boot is used to avoid slipping, injury to the toes and ankle of the foot. It also protects the welder from electric shock as the sole of the shoe is specially made of shock-resistant material.

Welding hand screens and helmet

These are used to protect the eyes and face of a welder from arc radiation and sparks during arc welding. A hand screen is designed to hold in hand A helmet screen is designed to wear on the head. It provides better protection and allows the welder to use both hands freely. Screens are made of non-reflective, nonflammable, insulated, dull-coloured, light material with coloured (filter) glasses fitted with plain glasses on both sides to see the arc and molten pool while welding. Clear glasses are fitted on each side of the coloured glass to protect it from weld spatters. Coloured (filter) glasses are made in various shades depending on the welding current ranges used as given below:



HAND SCREEN



WELDING HELMET

Figure 5: Safety Helmets

Recommendation of filter glasses for manual metal arc welding

Shade No. of coloured glass	Range of welding current in amperes
8-9	Upto 100
10-11	100 to 300
12-14	Above 300

Portable fireproof canvas screens are used to protect the persons who work near the welding area from arc flashes.

Plain goggles are used to protect the eyes while **chipping** the slag or **grinding** the job. It is made of a Bakelite frame fitted with clear glasses and an elastic band to hold it securely on the operator's head. It is designed for a comfortable fit, proper ventilation, and full protection from all sides.

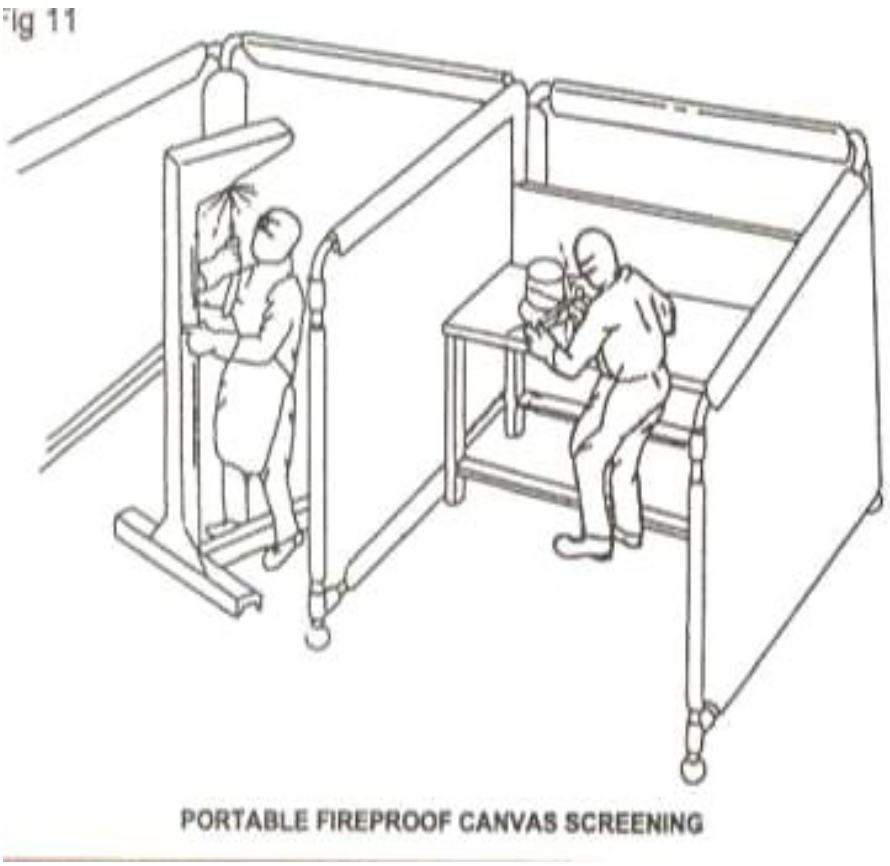


Figure 6: Safety Canvas

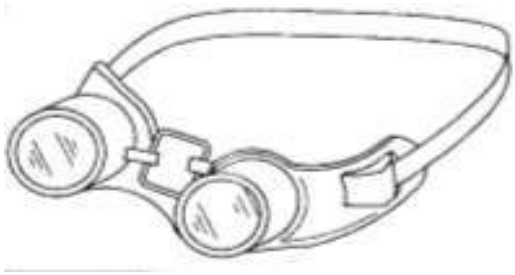


Figure 7: Safety Goggle

ARC WELDING ACCESSORIES

Some very important items used by a welder with an arc welding machine during the welding operation, are called arc welding accessories.

Electrode-holder

It is a clamping device used to grip and manipulate the electrode during arc welding. It is made of copper/ copper alloy for better electrical conductivity. Partially or fully insulated holders are made in various sizes i.e. 200-300-500 amps.The electrode holder is connected to the welding machine by a welding cable.

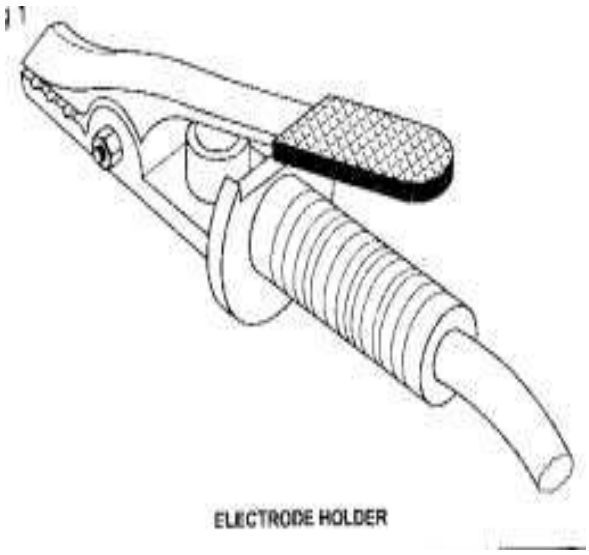


Figure 8: Welding Electrode Holder

Earth Clamp

It is used to connect the earth cables firmly to the job or welding table. It is also made of copper/ copper alloys. Screw or spring-loaded earth clamps are made in various sizes i.e. 200-300-500 amps.

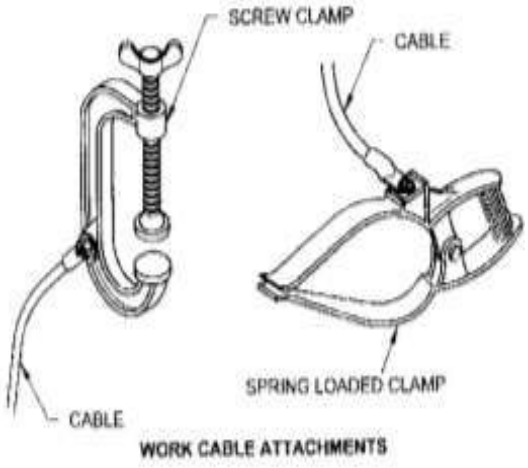


Figure 9: Earth Clamping Holders

Welding cables/ leads

These are used to carry the welding current from the welding machine to the work and back. The lead from the welding machine to the electrode-holder is called electrode cable and the lead from the work or job through the earth clamp to the welding machine is called earth (ground) cable. Cables are made of super flexible rubber insulation, having fine copper wires and woven fabric reinforcing layers. Welding cables are made in various sizes (cross-sections) i.e. 300, 400, 600 amps, etc.

The same size welding cables must be used for the electrode and the job. The cable connection must be made with suitable cable attachments (lugs). Loose joints or bad contacts cause overheating of the cables.

MATERIAL PREPARATION METHOD

Cutting: Cutting and preparing the base metal to the required dimensions from the original material available is necessary before welding them. Different methods used to cut metals are: chiseling, hacksawing, shearing using hand lever shear, using guillotine shear, gas cutting

Tools and equipment used to cut metals:

1. Cold chisel
2. Hacksaw with frame
3. Hand lever shear
4. Guillotine shear
5. Oxy-acetylene gas cutting torch

The cut edges of the sheet or plate are to be filed to remove burrs and to make the edges to be square (at 90° angle) with each other. For ferrous metal plates, which are more than 3mm thick, the edges can be prepared by grinding them on a bench/ pedestal grinding machine.

Cleaning

The base metals before cutting them to size will have impurities like dirt, oil, paint, water, and surface oxides, due to long storage. These impurities will affect the welding and will create some defects in the welded joint. So to get a strong welded joint, it is necessary to clean the surfaces to be joined and remove the dirt, oil, paint, water, surface oxide, etc. from the joining surfaces before welding.

Importance of cleaning

The basic requirement of any welding process is to clean the joining edges before welding. The joining edges or surfaces may have oil, paint, grease, rust, moisture, scales, or any other foreign matter. If these contaminants are not removed the weld will become porous, brittle, and weak. The success of welding depends largely on the conditions of the surface to be joined before welding.

Methods of cleaning

Chemical cleaning includes washing the joining surface with solvents of diluted hydrochloric acid to remove oil, grease, paint, etc. Mechanical cleaning includes wire brushing, grinding, filing, sandblasting, scraping, machining, or rubbing with emery paper. For cleaning ferrous metals, a carbon steel wire brush is used. For cleaning stainless and non-ferrous metals, a stainless-steel wire brush is used.

8. Electrical Safety:

All applicable electrical safeties mentioned in **Indian Railways Pamphlet on Electrical Safety CAMTECH/E/2019-20/EP-04/Electrical Safety/1.0 November 2019** (attached as Annexure) should be adhered to while working.

केवल कार्यालयीन उपयोग हेतु
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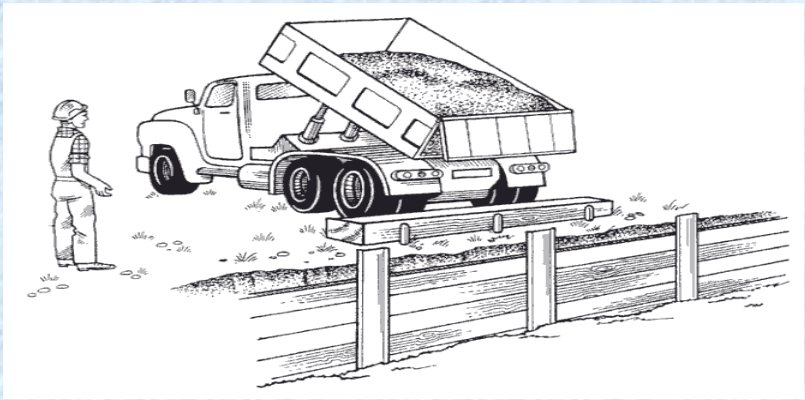
सत्यमेव जयते

भारत सरकार – Government of India

रेल मंत्रालय – Ministry of Railways

कार्य-स्थल पर संरक्षा
Safety at Work-Site



केमटेक/2015/सि/एस ए डब्लू एस/1.0

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कार्य-स्थल पर संरक्षा
Safety at Work-Site

प्राक्कथन

भारतीय रेल देश की प्रगति में बहुत बड़ा योगदान करता है | बडी संख्या में संगठित और असंगठित मजदूरों को रेल्वे में ठेके के माध्यम से रोजगार प्रदान करता है |

यह बहुत आवश्यक है कि ठेकदार के श्रमिकों के साथ साथ रेल्वे के कर्मचारियों और आधिकारियों कि संरक्षा सुरक्षित की जाय, साथ ही साथ संरक्षा नियमों का सख्ती से पालन रेल्वे और रेल्वे में कार्य कर रहे ठेकेदारों द्वारा किया जाय |

केमटेक के सिविल इंजीनियरिंग विभाग द्वारा 'कार्य स्थल पर संरक्षा' पर हस्त पुस्तिका तैयार की गई है जिसके निर्माण के दौरान होने वाली गतिविधियों पर क्या क्या सावधानियां रखनी चाहिए बताया गया है

यह उम्मीद की जाती है कि यह पुस्तक रेलवे के अभियांत्रिकी विभाग के लिये अत्यधिक उपयोगी होगी | जो कि रेलवे के निर्माण और अनुरक्षण गतिविधियों पर कार्यरत है|

केमटेक/ग्वालियर
दिनांक 27 जनवरी 2015

(ए आर तुपे)
कार्यकारी निदेशक

Foreword

Indian railway imparts a major role in the development of our nation. A huge number of employments have been provided for organised or unorganised labour in the railway construction work through contract.

It is very necessary to ensure safety of workmen of contractor as well as railway officials and staff. It is also mandatory to follow the safety rules strictly by the railway and the contractor.

The civil engineering branch of CAMTECH has prepared a hand book on "Safety at work site" It consist of various precautions are to be adopted during different construction activities.

It is expected that the hand book will be quite help full to the civil engineering personnel of Indian Railways engaged in the construction and maintenance activities.

CAMTECH/Gwalior **(A. R. Tupe)**
Date: 27/01/2015 **Executive Director**

प्रस्तावना

भारतीय रेल के पास संरचनात्मक ढ़ाचों के रूप में भवनों की वृहद परिसम्पति मौजूद है। यंत्रिक निर्माण के बावजूद रेल्वे में बडी संख्या मैं श्रमिक नियोजित होते हैं। रैलों मे ठेकेदार द्वारा अपनी जरूरत के अनुसार कुशल, अर्ध कुशल ऐवम अकुशल श्रमिक निर्माण कार्य मे नियोजित करते है और इसमे रेल प्रमुख नियोजक की भूमिका मे होता है|

बीते कुछ समय मे रेल्वे मे कई दुर्घटनाये हुई जिसमे ठेकदार के श्रमिकों, रेल्वे कर्मचारियों की मौत, रेल्वे की संपत्ति को नुकसान एवं कार्य समय में रुकावटें महसूस की गयी|

क्षेत्रीय अनुभव के अनुसार ज्यादातर घटनायें/दुर्घटनायें उत्खनन और ट्रेन्चिंग काम में, मचान की विफलता, सीढ़ी का अनुचित उपयोग करने से, वाहनों के अनुचित परिवहनों से निर्माण सामग्री के परिवहन के दौरान ऐवम व्यक्तिगत सुरक्षा उपकरणों का उपयोग न करने के कारण हुयी है

इस पुस्तिका 'कार्य स्थल पर संरक्षा' तैयार करने का उद्देश्य उन सावधानियों के जानकारी देना है। जो कि रेल निर्माण की विभिन्न गतिविधियों में उठाई जानी चाहिए | इन सावधानियों को अपनाने से हम उन कर्मचारियों की सुरक्षा को बढ़ा सकते हैं जो रेलवे के निर्माण कार्य में लगे हुए हैं|

यह पुस्तिका वैधानिक नहीं है इसमें दी गई जानकारी का उद्देश्य उन कर्मियों के मार्गदर्शन के लिए ही है। जो कि रेल निर्माण की गतिविधियों में संलग्न हैं इस विषय पर अधिकांशतः साहित्य सर्वेक्षण और इंटरनेट खोज पर आधारित हैं। अधिक गहराई से जानकारी के लिए, इस विषय पर प्रासंगिक साहित्य को निर्दिस्ट किया जाये

हम आगे सुधार के लिए हमारे पाठकों से किसी भी सुझाव का स्वागत करते हैं।

केमटेक/ग्वालियर (एस के सक्सेना)

दिनांक 23 जनवरी 2015 उप निदेशक (सिविल)

PREFACE

The Indian Railway having vast infrastructural setup of building and civil assets. Despite of mechanised construction a huge numbers of labourers are engaged in construction and maintenance work. In the railway, contractor engage workmen like skilled, semi skulled or unskilled as per their requirement for execution of work. In this case railways play the role as a principal employer.

In recent past many accidents are noticed in various railways involving loss of life of railway personnel and contractor labour, loss of railway property and working time of railway.

As per field experience, mostly incidents/accidents are occurred during the excavation and trenching work, failure of scaffolding, misuse of ladder, improper movement of vehicle at site, during transportation of material and not using personal safety equipments.

The objective to prepare this handbook on 'safety at work site' is to disseminate the knowledge of various precautions, which are to be adopted during construction and maintenance activities. By adopting such precautions, we improve the safety of staff and workers who are engaged in construction work of railway.

This handbook is not statutory and contents are only for the purpose of guidance to the civil engineering personnel involved in construction activities. Most of the data & information in some form or the other are based on literature survey and internet search. For more in-depth information, the relevant literature on the subject may be referred before final implementation of any information contained in this handbook.

We welcome any suggestions from our readers for further improvement.

CAMTECH/Gwalior ***(S.K. Saxena)***
Date: 23, january 2015 ***Dy.Director/Civil***

विषय–सूची / CONTENT

संशोधन पर्चियों का प्रकाशन
ISSUE OF CORRECTION SLIPS

इस हस्तपुस्तिका के लिये भविष्य में प्रकाशित होने वाली संशोधन पर्चियों को निम्नानुसार संख्यांकित किया जायेगाः

The correction slips to be issued in future for this handbook will be numbered as follows:

केमटेक/2015/सि/एस ए डब्लू एस/1.0/सीऐस # XX दिनांक _____

CAMTECH/2015/SAWS/1.0/CS # XX date _____

जहॉ XX सम्बन्धित संशोधन पर्ची की क्रम संख्या है (01 से प्रारम्भ होकर आगे की ओर)

Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

प्रकाशित संशोधन पर्चियॉ
CORRECTION SLIPS ISSUED

क्र.सं./ **Sr. No.**	प्रकाशन की तारीख/ **Date of issue**	संशोधित पृष्ठ संख्या तथा मद संख्या/ **Page no. and Item No. modified**	टिप्पणी/ **Remarks**

1.0 परिचय / INTRODUCTION

Indian railway has a vast network of buildings and civil assets. Despite of mechanised construction, a huge numbers of labourers are engaged in the construction and maintenance work. Mostly, labourers are seasonal and migrated and not familiar to construction site and construction process, simply says they are untrained workers. In recent past many accidents are noticed in various railway involving loss of working time, loss of life of railway staff and contractor workers, and loss of railway property. Due to the increase of construction works and large scale mechanization, the accidents in railway are more and their rate is high.

Safety at work site can be achieved by adopting proper operating conditions and taking preventions of accidents or mitigations of the consequences of accidents. Numbers of railway workmen, who are engaged in construction work in Railway, get injured every year seriously or fatally. Problems of safety aeries when the safety measures are bypassed or over ruled. The safety must be ensured right from the beginning of construction work i.e. from design stage. The design should be based on safety first and selecting proper and trained workers. The workers should always be motivated for safety by imparting training and ensuring that no one should be over loaded with work.

In the railways, contractors engage workmen (like skilled, semi skilled and unskilled) as their requirement for the executing the work for construction. In construction cases, Railway administration plays the role as a Principal Employer. It is necessary to ensure the safety of workmen of contractor as well as railway officials and staff. Also, the safety rules have to be strictly followed by contractor.

It is necessary that adequate precautions must be taken during construction at site. This hand book is prepared as a ready reference to the civil engineering staff of railways, who are engaged in various construction and maintenance activities. The precautions, which are to be adopted in various construction activities, are being discussed keeping in view the field experience mostly related to incidents/ accidents occurred during excavation and trenching work, failure of scaffolding, misuse of ladders, improper movement of vehicles at site, during transportation of material and not using personal safety equipments.

2.0 खुदाई / EXCAVATION

Most of the construction work involves some form of excavation for foundations, sewers and underground services. Excavation or trenching work can be highly dangerous and even some of the most experienced workers have been caught by the sudden and unexpected collapse of the unsupported sides of a trench.

Excavation work involves the removal of soil or a mixture of soil and rock. Water is nearly always present, even if only as moisture in the soil, and heavy rain may become the cause of soil slip. The possibility of flooding presents an additional hazard which should always be considered. Cracks are caused by pressure release as soil is removed, or from drying out in hot weather.

2.1 CAUSES OF ACCIDENTS DURING EXCAVATION

The main causes of accidents resulting from excavation work are as follows:

- Workers trapped and buried in an excavation owing to the collapse of the sides
- Workers struck and injured by material falling into the excavation
- Workers falling into the excavation
- Unsafe means of access and insufficient means of escape in case of flooding
- Vehicles driven into or too close to the edge of an excavation, particularly while reversing, causing the sides to collapse
- Asphyxiation or poisoning caused by fumes heavier than air entering the excavation, e.g. exhaust fumes from diesel and petrol engines

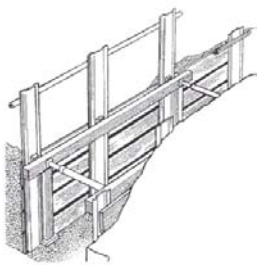
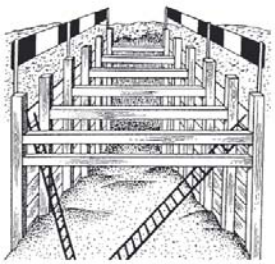
2.2 GENERAL PRECAUTIONS FOR EXCAVATION

- Excavation work to be inspected by a competent person before work begins and at least once a day where work is in progress.
- Wherever possible, an excavation work is not too close and deep as to undermine any adjacent building or structure.
- When the stability of a building or structure may be affected by excavation work, the precautions must be taken by shoring, and so on, to prevent any collapse or fall.
- Never store, or move materials and equipment near the edge of an excavation as the danger may be caused by materials falling on those working below.
- Spoil and waste heaps should similarly be kept well away from the edges of excavations.
- Adequate and well-anchored stop blocks should be provided on the surface to prevent vehicles. The blocks should be placed at a sufficient distance away from the edge of the excavation to avoid the danger of it breaking away under the weight of the vehicles.
- If you are working in an excavation, then make sure that there are safe means of access and egress, such as a properly secured ladder. This is of particular importance when there is a risk of flooding and rapid escape is essential.
- Arrangement of proper lighting at site.
- In case of underground services like electric cable, gas lines, it is necessary to work with more precautions. It should be ensured with local authority to know the layout of cables/ gas pipe lines and marked properly.

- Do not use mechanical excavator near gas pipe lines. If any sign of gas leakage is noticed, then go away from the line and keep away other peoples.

2.3 SAFETY PRECAUTIONS TO PREVENT COLLAPSE OF EXCAVATIONS, AND FALLS

- The sides of the excavation or trench should be sloped or battered back to a safe angle of repose, or to be supported by timbering or other suitable means to prevent a collapse
- Make sure that there are enough materials to support the length of the trench to be cut; support for the trench must be installed without delay as the excavation progresses. Never work ahead of the trench support.
- Shoring should be erected/ altered or dismantled only by a competent worker operating under supervision. Wherever practicable, it should be installed before excavating to the final depth of the trench. The excavation and installation of shoring should then proceed by stages until the full depth is reached.
- Provide full awareness of the procedures to follow to rescue a fellow worker trapped by a fall of earth.
- Workers often fall into excavations. Suitable barriers should be erected high enough (i.e. about 1 m) to prevent falls. Projected trench supports can often be used for this purpose.

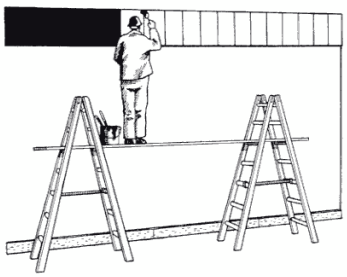



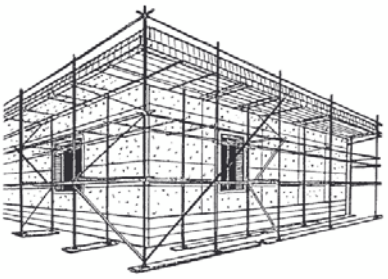

3.0 स्काफ़्फ़ोल्डिंग/SCAFFOLDING

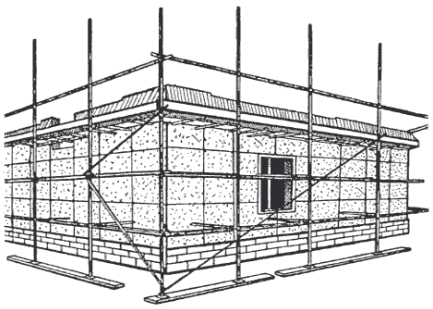
Scaffolding is a temporary structure supporting one or more platforms and used as a workplace or for the storage of materials. Scaffolding may be used in both cases for construction and demolition work where the work cannot safely be done from the ground. Scaffolds should be erected/ altered or dismantled only by competent persons operating under supervision. After erection, scaffolds should be inspected at least once a week and a written report on each inspection should be kept in record.

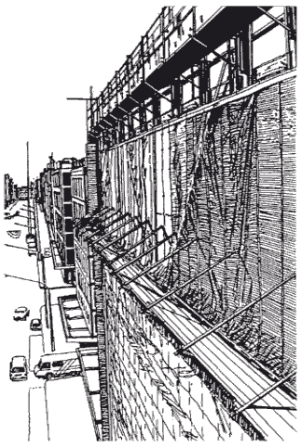
There are many different materials used to construct scaffolding, such as steel, aluminium, wood and bamboo. Whatever the material, the principles of safe scaffolding remain the same that it should be of adequate strength to support the weight of person and materials, and should be securely anchored and stable to prevent the fall of workers and materials. Fall of worker or material over the workers from a height, is the most serious safety risk in the construction at site. High rates of deaths are caused by failure of scaffolding.

Depending upon the need, there are so many types of scaffolds, which are used during construction work like Independent tied scaffolds, Single pole or putlog scaffolds, Tower scaffolds, Trestle scaffolds, Suspended scaffolds etc.





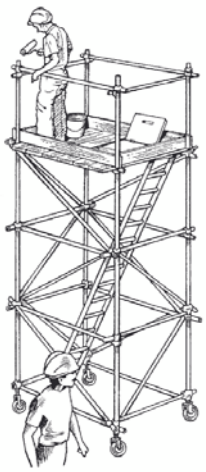




3.1 PRECAUTIONS FOR SCAFFOLDING

- Where you cannot work safely from the ground or from part of the building, it is better to use a suitable scaffold than a ladder.
- Use a scaffold only for the purpose for which it has been provided and makes sure it is securely anchored or tied to the building.
- Do not overload the scaffold. In particular, do not load it with plant and materials unless it has been erected for this purpose. Never keep materials on the scaffold unless they are needed for work within a reasonable time.
- Make sure that timber used in scaffolding is not painted or treated so that defects cannot be seen.
- Do not use bamboo that show signs of rotting or being infested by insects; also examine the ropes for early signs of decay, avoid using material about which there is doubt.

3.1.1 In case of tower scaffold



Accidents can happen when a tower topples over. This is likely to happen in any of the following cases, so work carefully and do not overlook the following points:

- The ratio of the height of the tower to the width of the base is excessive
- The top working platform is overloaded causing the tower to become unstable
- A ladder is placed on the top platform to extend the height of the tower

- Work involving percussion tools produces an outward horizontal or lateral force at the top of the tower
- A mobile tower is moved with persons or materials carried on the top platform
- The tower is used on sloping or uneven ground
- The tower is not tied to the building or structure where this is necessary
- Access to the platform is from outside the tower

The following precautions are to be adopted during use of tower scaffold –

- Tie the tower into the adjacent structure wherever possible.
- Use the locks on the wheels whenever the scaffold is in use.
- Never climb a mobile scaffold unless the wheels are locked and on level ground.
- Keep the material on the platform to a minimum.
- Keep towers away from overhead electrical supply lines and check that mobile towers are free of overhead obstructions before moving them.
- Avoid using a tower in windy or severe weather conditions.

3.1.2 Suspended scaffolds

These are used most frequently for work on tall buildings or structures above busy streets, or in other situations where it is not feasible or economic to build a scaffold from the ground. Suspended scaffolds are of two main types, viz. suspended platforms, hinged or independent and cradles.

All are suspended from the building or structure by means such as outriggers, tracks and parapet hooks. Typical accidents on all types of suspended scaffold occur because of:

- difficulty getting in and out of the suspended cradle
- insufficient or poorly secured counterweights
- failure of suspension ropes
- poor maintenance

4.0 नसैनी / LADDERS

Every year many workers are killed or severely injured while using ladders of all types. Because a ladder is so readily available and inexpensive, its limitations are easily overlooked. If using a ladder, please keep in mind the safety of workers during its proper use.

4.1 SAFE USE OF LADDERS

Ladder can be used safely with the following precautions

- Make sure there are no overhead power lines with which the ladder might make contact;
- Wooden ladders with wire-reinforced stiles should be used with the wired side facing away from you. Wire tie rods should be beneath and not above the rungs;

- The ladder should extend at least 1 m above the landing place, or above the highest rung on which you have to stand, unless there is a suitable handhold to provide you with equivalent support. This is to stop the risk of over-balancing when you step off and on at the top;
- You should be able to step off the ladder at the working place without being required to climb over or under guard-rails or over toe boards. However, keep the gaps in guard-rails and toe boards as small as possible;
- Never use a ladder which is too short, and never stand it on something such as a box, bricks or an oil drum to gain extra height;
- Place the ladder at a safe angle of about 75° to the horizontal, that is about 1 m out at the base for every 4 m in height;
- Face the ladder when climbing or descending;
- Ensure that there is sufficient space behind the rungs to provide a proper footing;
- For extension ladders, make sure you leave an overlap of at least two rungs for sections up to about 5 m in length and at least three rungs for sections of more than 5 m in length
- Always raise and lower extension ladders from the ground and make sure that hooks or locks are properly engaged before you start to climb;
- Make sure that your footwear is free from mud or grease before you begin to climb a ladder;
- If possible carry your tools in your pockets or in a holster or bag when you climb ladders so as to leave both hands free to grip the stiles.
- Try not to carry materials while you are climbing ladders – use a hoist line instead;
- A common cause of accidents is overbalancing or overreaching, so do not be tempted to stretch too far instead move the ladder.
- Make sure that your ladder is long enough for the job.
- Avoid carrying tools or materials in your hand while you are climbing ladders.
- Clean your footwear before climbing.
- Enable only one person to work from it at any one time;
- If not lashed at the top, requires two workers for use – one on the ladder and the other at the bottom;
- Leave only one hand free; carrying tools or loads up a ladder is difficult and dangerous and the weight which can be carried is severely limited. There is also the risk of dropping items on passers-by;
- Restrict movement;
- Has to be safely situated and secured;
- Has a limitation on heights at which it can be used.




4.2 CARE OF LADDERS

Proper care of ladders involves the following measures:

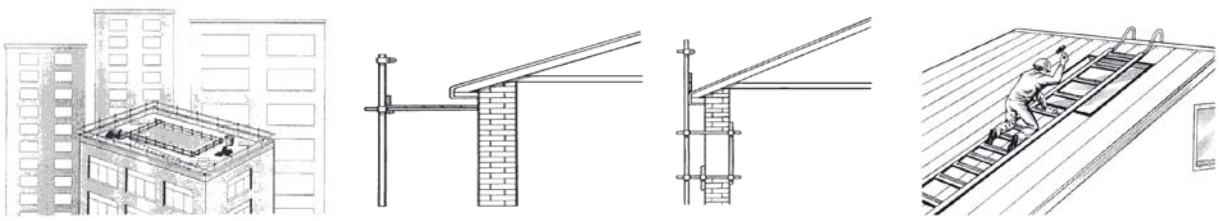
- Ladders need to be inspected regularly by a competent person and damaged ladders should be removed from service. Timber ladders should be checked for splits or cracks, splintering or warping, metal ladders for mechanical damage. Look for missing, loose or worn rungs;
- Ladders should be capable of being individually identified, e.g. by some form of marking;
- Ladders not in use should not be left on the ground so that they are exposed to weather, water and impact damage. They should be properly stored on racks under cover and above ground, and ladders over 6 m in length should have at least three support points to avoid sagging;
- A ladder should not be hung from its rungs or from one stile as this tends to pull out the rungs;
- Timber ladders should be kept in areas with good ventilation which are free from excessive heat or dampness;
- Timber ladders and equipment may be coated with transparent varnish or preservative, but should not be painted as paint conceals defects;
- Aluminium ladders should be given an adequate protective coating when they are likely to be subject to acids, alkalis or other corrosive substances.

5.0 छत कार्य / ROOF WORK

Without proper precautions, roof work is among the most hazardous of construction operations. The most common accidents to workers are due to:

- falls from the edge of roofs;
- falls through openings in roofs;
- falls through fragile roof materials.

Although most accidents happen to specialist roof workers, who are engaged simply in maintaining and cleaning roofs. To undertake roof work safely, one should have knowledge and experience, and special equipment. Before the job begins, a safe system of work must be planned. Precautions must be adopted to reduce the risk of a worker falling or to prevent the fall from the roof. The precautions to be taken will depend on the type of roof and the nature of the work to be undertaken.

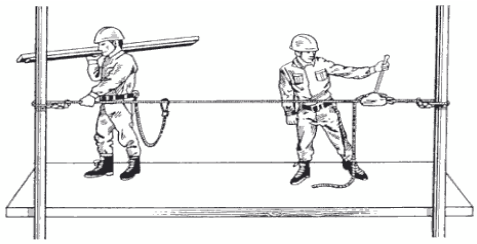
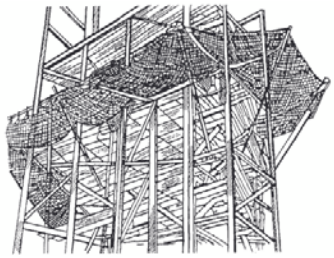


5.1 PRECAUTIONS

- Never work on a roof which is without adequate edge protection.
- Before you work on a roof make sure you know which parts are made of fragile material.
- Never step on to a fragile roof.

6.0 स्टील परिनिर्माण / STEEL ERECTION

The erection of steel structures and building frames involves work at heights and in exposed positions. The incidence rates for injury and death of steel erection workers are much greater than those for workers in the construction industry as a whole.

These are because of a) time spent at individual work points is often relatively short, b) access scaffolding is frequently not used and c) steel erectors perform many tasks in unnecessarily dangerous situations, often from a mistaken belief in their own invulnerability.

6.1 PRECAUTIONS

Following precautions may be adopted:

- If you work in steel erection you should know what safety precautions should always be taken before you begin work on site. It is essential that safety in steel erection begins at the design stage.
- Designers of structural steelwork should have sufficient site experience to understand fully the problems of steel erection, such as joint positions affecting erection sequences, the accessibility of connections, fixings for working platforms, and means of access and weights in relation to crane capacity.
- Because erection of steelwork usually takes place during the early stages of a project before the site has been cleared and prepared, arrangements for the storage and handling of prefabricated steelwork are frequently haphazard, and there is often no proper access and freedom of movement for transport and cranes.
- Steel erection involves a good deal of manual handling and lifting activities resulting in many back injuries and the trapping of hands or feet. You require proper training in safe methods of handling and lifting, and you should always wear suitable personal protective equipment.
- Trying to save crane time by reducing the number of bolts used in connections is a dangerous practice.
- Do not work in high winds or on wet steelwork.

7.0 पानी पर कार्य / WORK OVER WATER

Falling into water and being drowned or carried away by currents is an ever-present danger when working over or adjacent to water. Even though, you may be a good swimmer, the following precautions should always be followed:

7.1 PRECAUTIONS

- Make sure that the working platform is secure and has no tripping hazards such as tools, wire, timber or bricks. Surfaces soon become slippery and should be treated immediately by cleaning, gritting or applying industrial salt or sand.
- Check that access ladders, guard-rails and toe boards are firmly fixed in position.
- Wear a safety helmet at all times – if you are struck on the head and fall into water you are at special risk.
- Wear a life-jacket, and ensure that it is properly fastened.
- Use any safety nets or safety harness provided.
- Check that lifebuoys fitted with lifelines are ready to hand for immediate use.
- Make sure that there is a safety boat and that it is manned while you are working above water – if over tidal water or a fast- flowing river, it must have a motor with a self-starting device.
- Ensure that you know the routine for raising the alarm and for rescue drill.
- Do not work alone when you are working over water.
- Check the number of work regularly to ensure that no one is missing.

8.0 तुड़ाई / DEMOLITION

The causes of accidents during demolition are:

- Due to adopting an incorrect method of demolition;
- An unsafe place at demolition site;
- Due to unintentional collapse of the building being demolished,
- Collapse of adjoining building and structure, due to lack of temporary support.

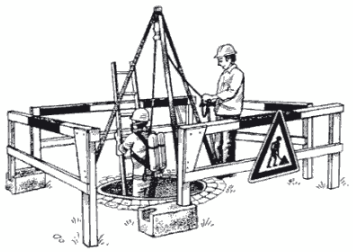
8.1 PRECAUTIONS

- During demolition process everyone on site must wear personal protective equipment (PPE) including helmet, gloves, goggles etc. for safety.
- Provide proper and adequate temporary support to adjoining building if necessary.
- All service lines like electric, water supply etc. must be disconnected before demolition work.
- Demolition site to be protected for the public, wherever feasible, fencing may be erected.
- Do not isolate walls or parts of building which are liable to be collapse by the wind effect.

9.0 पाइलिंग / PILING

There are so many hazards which are common to all types of piling, to minimise them following precautions are to be adopted:

- Piling machine operators should be over 18 years of age and properly trained;
- Prior to piling, all underground services should be located and made safe.
- Ensure that there are no cellars, underground water courses or ground conditions which might cause hazards;
- Ensure that firm level base for the crane, or crane mats should be provided;
- While working on piling operations, workers must wear personnel safety equipments like safety helmet, and ear and eye protection where necessary;
- Ensure that all cranes, lifting appliances and lifting gear works should be appropriate and tested before operation.
- Be careful and take attention to the risk of damage to lifting gear from sharp edges;
- Lowering to be done under power; and workers to be carried in properly constructed cages which cannot spin or tip;
- Provide training and information related to the method statement to the worker and supervisor.



10.0 वाहनों का आवागमन / MOVEMENT OF VEHICLES

Numbers of accidents are noticed at working site due to improper movement of vehicles at site. Common causes are as under;

- Bad driving techniques which include reversing blind;
- Carelessness or ignorance of special hazards, e.g. work near overhead power lines or excavations;
- Carrying unauthorized passengers;
- Poor maintenance of vehicles;
- Overloading or bad loading;
- Site congestion and poor traffic layout;
- Lack of proper roads at site combined with uneven ground and debris.

10.1 SAFETY PRECAUTIONS

- Driver must be trained and hold valid license and should be experienced for up and down sloping at site.
- Route is leveled and marked and to be protected from over head power lines by making varies.

- Whenever feasible, one way system is followed for vehicle movement.
- Special attention to be taken for reversing the vehicle.
- Unattended vehicles must be switched off and suitable protection to be adopted for keeping stable at site.
- Always keep shoes for foot protection during loading and unloading.
- When machine or vehicle is not in working, ensure that tipping bodies are lowered.
- Impose speed limit for movement of vehicles and ensure it.
- Distribute the load evenly within the capacity of vehicle.
- Load should not be projected beyond the plan area of vehicle. If it is unavoidable, it is protected by flag attachment.
- Never travel backward where the driver rear view is obscured.

11.0 सामग्री की ढुलाई / TRANSPORTATION OF MATERIALS

Materials are transported at site by various means like cranes and good hoists. Here, we brief in short what precautions are to be taken.

11.1 CRANES

Before a crane is used on site, we took all the factors that could affect its safe use, such as:

- the weight, size and type of load it will have to lift;
- the maximum reach or radius required; restrictions on use such as overhead power lines, the state of the site and the type of ground;
- the need for trained operators and signallers.

11.1.1 Precautions

- Both the erection and dismantling of cranes to be done by skilled and trained workers, with obeying all the instructions of manufacturers.
- Operator of crane must be over the age of 18 and well trained and experienced.
- Suitable signaling system is required for better communication. If driver cannot see the load, help of a signaller may be taken.
- Never over load the crane. All cranes are specified for safe working loads. Use safe working load indicators in the cranes. It usually indicates by lighting or by hooter for exceeding the safe load.
- Ensure the adequate clearance for the crane jib or boom or counter weight from the traffic and fixed structure.
- Ensure that no part of crane is closer to the live over head power lines.

- Avoid lifting load having large surface area during heavy wind.
- Lift the load vertically.

12.0 गिन या पुल्ली व्हील / GIN OR PULLEY WHEELS

Gin or pulley wheels are a common and inexpensive way of lifting small loads a limited distance. The most common accidents occur when

- pole on which the wheel is mounted relies on a single support – two supports are always required.
- hoisting rope is not fitted with a properly made safety hook – hooks made of bent reinforcing rod are dangerous;
- hoisting rope is worn, chafed and no longer serviceable;
- bucket or load strikes the scaffold or building, tipping out its contents;
- load is too heavy or is not secured;
- an appliance mounted on a roof does not have a secure anchorage to prevent overturning and there should be a safety factor of at least 3.

12.1 PRECAUTIONS

The following precautions are to be taken

- if liquid is transported in a bucket, there should always be a cover;
- when you are hoisting the bucket, always use gloves to protect your hands;
- if the height of the pulley is over 5 m, a ratchet and pawl mechanism should be considered;
- where the pulley is mounted near the edge of a roof or floor, guard-rails and toe boards are required;
- if two or more persons are lifting, one should give instructions to ensure that the team works together.

13.0 मैनुअल हैंडिलिंग / MANUAL HANDLING

The handling of raw materials and building components is an integral part of the construction process. Manual handling of loads and materials is still very common. Many workers carry out heavy lifting and carrying operations during much of the working day. Next to falls, manual handling is the most common cause of construction accidents.

Almost one-quarter of work injuries occurs during manual handling, most of which are strains to the hands, legs, feet and back. Much construction work involves heavy manual labour and workers not in good physical condition, tire easily and are more susceptible to injury.

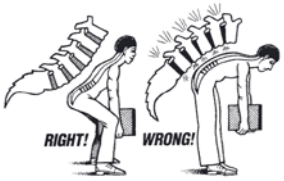
The proper mechanical handling of materials can ensure that work flows smoothly, and helps to avoid delays and damage. It is important, too, to have been adopted right techniques of lifting and carrying. Look after your own welfare by:

- putting the load on wheels if you can instead of carrying it;

- using mechanical handling equipment if you have been trained to use it;
- wearing the right equipment for the job such as safety boots,
- checking the weight of the load before lifting;
- not lifting loads higher than is necessary;
- checking that there are no overhead power lines or obstructions when you are carrying a long load such as scaffold tubes or reinforcing rods;
- removing or securing loose objects on the load;
- getting assistance if the load is too heavy or awkward for you to handle on your own;
- making sure that there is a clear walkway to your destination and a safe stacking place.

13.1 LIFTING TECHNIQUE

The size, shape and structure of the material will largely determine how easy or difficult manual handling will be. Well-designed and well-placed handles are of great help. Whenever you lift a load, follow the following procedure:



- Stand close to the load on a firm footing and with feet about 30 cm apart.
- Bend the knees and keep your back as straight as you can.
- Take a firm grip on the load.
- Breathe in and throw the shoulders backwards.
- Straighten the legs, continuing to keep the back as straight as you can.
- Make sure that your view is not obstructed by the load.
- Keep the load close to the body.
- Lift slowly and smoothly.
- When carrying a load, avoid twisting the spine to turn; move your feet instead.
- If two or more of you are lifting, one should give instructions to ensure that the team works together.

14.0 साइट का वातावरण / ENVIRONMENT AT WORK SITE

By the proper house-keeping at site we can achieve higher productivity, good quality, reduction in cost and more safety at site. The basic need is to control pollution at site. Pollution may be water, air and noise pollution. Always keep good working environment at site by minimising the pollution. Following points are to be remembered for good house-keeping at site:

- Minimize the pollution of any type.
- Not stored un necessary items at site.
- Waste material to be removed from the site regularly.
- Staff and workers get trained for safety by imparting training, showing video films etc.
- Always keep in mind that safety of staff and workers first.

15.0 वैयक्तिक संरक्षा उपकरण / PERSONAL PROTECTIVE EQUIPMENT (PPE)

Despite of all preventive measures at site, some personal safety equipments like helmet, hearing and eye protection, goggles, boots, gloves and safety belts, is needed to protect workers at site. In addition to these, some mask may be useful for reciprocator safety.

Safety helmets protect the head effectively against most of these hazards, and you should wear a helmet whenever you are on site and particularly when you are in an area where overhead work is going on. The same rule applies to managers, supervisors and visitors. Only safety helmets which have been tested to national or international standards should be used. A chin-strap on the helmet prevents it from failing off and should be used when appropriate.

The type of safety shoes or boots to be used will depend on the nature of the work (e.g. the presence of ground water on construction sites), but all safety footwear should have an impenetrable sole and uppers with a steel toe-cap. There are many types of safety footwear now available such as:

- light, low-cut leather safety shoes for climbing jobs;
- normal safety shoes or boots for heavy-duty work;
- rubber or plastic safety wellingtons or gumboots which provide protection against corrosive substances, chemicals and water.

Hands are extremely vulnerable to accidental injury, and in construction more injuries are caused to hands and wrists than to any other part of the body. Open wounds, abrasions, fractures, dislocations, strains, amputations and burns occur. They are largely preventable by better manual handling techniques and equipment, and by wearing suitable hand protection such as protective gloves and gauntlets. Personal eye protection (goggles, safety glasses or shields) is the only practical solution. During construction activities many eye injuries occur as a result of flying material, dust or radiation when the following jobs are being carried out:

- breaking, cutting, drilling, dressing or laying of stone, concrete and brickwork with hand or power tools;
- chipping and dressing painted or corroded surfaces;
- cutting off or cutting out cold rivets and bolts;
- dry grinding of surfaces with power grinders;
- Welding and cutting of metals.

A suitable mask may help a lot in the activities on construction sites, where harmful dust, mist or gas are produced during tasks such as rock crushing and handling; sandblasting; dismantling buildings containing asbestos insulation; welding or cutting materials with coatings containing zinc, lead, nickel or cadmium; paint spraying; blasting.

It is very necessary that every staff and worker has the knowledge of primary first aid. A well equipped first aid kit is provided at site.

***

संदर्भ / REFERANCE

1	Indian railway work manual
2	Indian Railway Bridge manual
3	Indian Railway Permanent manual
4	CE circulars on the subject
5	Text Book on construction Technology by Subir K. sarkar
6	Literature of ILO
7	Various IS codes on the subject

***

टिप्पणी / NOTES

गुणवत्ता नीति

रेलों में यात्री और माल यातायात की बढती माँग को पूरा करने के लिए गुणवत्ता प्रबंध प्रणाली में अनुसंधान, डिजाइनों और मानकों में उत्कृष्टता तथा सतत् सुधारों के माध्यम से सांविधिक और नियामक अपेक्षाओं को पूरा करते हुए सुरक्षित, आधुनिक और किफायती रेल प्रौद्योगिकी का विकास करना।

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

हमारा उद्देश्य

अनुरक्षण प्रौद्यौगिकी और कार्यप्रणाली को उन्नयन करना तथा उत्पादकता और रेल्वे की परिसम्पत्ति एवं जनशक्ति के निष्पादन में सुधार करना जिससे अन्तर्विषयों में विश्वसनीयता, उपयोगिता और दक्षता प्राप्त की जा सके।

यदि आप इस सन्दर्भ में कोई विचार और सुझाव देना चाहते हों तो कृपया हमें इस पते पर लिखें:

सम्पर्क सूत्र	:	उप निदेशक (सिविल)
पत्राचार का पता	:	भारतीय रेल उच्च अनुरक्षण प्रौद्योगिकी केन्द्र, महाराजपुर, ग्वालियर (म.प्र.) पिनकोड - **474005**
टेलीफोन	:	0751–2470869
फैक्स	:	0751–2470841
ई–मेल	:	**dircivilcamtech@gmail.com**

Our Objective

To upgrade Maintenance Technologies and Methodologies and achieve improvement in productivity and performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability, and Utilisation.

If you have any suggestion & comments, please write to us:

Contact person	**:**	**Dy. Director (Civil),**
Postal Address	**:**	**Indian Railway Centre for Advanced Maintenance Technology,** **Maharajpur, Gwalior (M.P.)** **Pin code – 474 005**
Phone	**:**	**(0751) - 2470869**
Fax	**:**	**(0751) – 2470841**
Email	**:**	**dircivilcamtech@gmail.com**

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सत्यमेव जयते

भारत सरकार – Government of India

रेल मंत्रालय – Ministry of Railways

रेलपथ से सटे कार्य स्थल पर सुरक्षा सावधानियाँ

SAFETY PRECAUTIONS AT WORKSITE ADJACENT TO TRACK

केमटेक/2015/सि/एस.पी.डब्लू.एस.ए.टी./1.0

CAMTECH/2015/C/SPWSAT/1.0

सितम्बर/September-2015

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✆ : 0751 - 2470869 & Fax : 0751 – 2470841

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रेलपथ से सटे कार्य स्थल पर सुरक्षा सावधानियाँ

SAFETY PRECAUTIONS AT WORKSITE ADJACENT TO TRACK

प्राक्कथन

भारतीय रेलवे में सुरक्षा मुख्य पहलू है, जिसे नजरअंदाज नहीं किया जा सकता। ट्रैक के आसपास कार्य करते समय चलित आयामों में किसी भी प्रकार का उल्लंघन ट्रेन दुर्घटनाओं को जन्म दे सकता है जो कि मानव जीवन और तैनात मशीनरी के लिए भारी नुकसान का कारण बन सकती हैं। यह अनिवार्य है कि समस्त सुरक्षा सावधानियों जैसा निर्देशों के रूप में निर्दिष्ट और परिचारित हैं, को लागू करने तथा ट्रैक पर या ट्रैक के आसन्न काम करने के दौरान उनका पालन होना चाहिए।

यह उम्मीद की जाती है कि यह हैंडबुक, निर्माण गतिविधियों में लगे भारतीय रेल सिविल इंजीनियरिंग तकनीकी कर्मचारियों के लिए काफी उपयोगी साबित होगी।

केमटेक, ग्वालियर ***(ए.आर. तुपे)***

05 अक्तूबर, 2015 ***कार्यकारी निदेशक***

FOREWORD

'Safety' is the prime concern in Indian Railways and can not be ignored. While working adjacent to track, any infringement to moving dimensions may lead to train accidents and may cause heavy loss to human lives and machineries deployed. It is imperative to apply all safety precautions as specified and circulated in the form of instructions and must be followed during working on track or adjacent to the track.

It is expected that the handbook will be quite helpful to civil engineering technical staff of Indian Railways engaged in construction and maintenance activities.

CAMTECH/Gwalior ***(A.R. Tupe)***
05, October 2015 ***Executive Director***

भूमिका

यह महसूस किया गया है कि ट्रैक के आसपास काम करने के दौरान श्रमशक्ति और मशीनरी की सुरक्षा हेतु, पयोप्त सुरक्षा उपायों को अपनाया जाना चाहिए। ट्रैक के आसपास जो काये की प्रकृति है, उसमें ट्रैक नवीकरण, गेज परिवतेन, दोहरीकरण, पुल पुननिेमोण आदि कार्यों का होना है। ये काये जो कि ज्यादातर ठेकेदारों के श्रमिक और मशीनरी द्वारा कराये जाते हैं, सुरक्षा संबधी होते हैं तथा चालित आयामों में किसी भी प्रकार का उल्लंघन रेल दुघेटनाओं को जन्म दे सकता है।

यह प्रत्येक और हर एक व्यक्ति के लिए अत्यंत आवश्यक है कि यदि वह ट्रैक से किसी भी रूप में जुड़ा है तो उसे सुरक्षा को ध्यान में रखते हुए विभिन्न ट्रैक कार्यों के निष्पादन के दौरान शॉटे कट तरीकों को नहीं अपनाना चाहिए। इस पुस्तिका में एहतियाती उपायों को कम से कम में संक्षेपित किया गया है।

यह पुस्तिका वैधानिक नहीं है और इसमें दी गइ सामग्री, सिविल इंजीनियरिंग तकनीकी कमेचारियों के ज्ञान प्रसार हेतु है। किसी न किसी रूप में अधिकांश डेटा और सूचना या अन्य, साहित्य सर्वेक्षण पर आधारित है। अधिक गहराई से जानकारी के लिए, इस विषय पर उपलब्ध प्रासंगिक साहित्य देखा जा सकता है।

हम इस पुस्तिका के आगे सुधार के लिए हमारे पाठकों से किसी भी सुझाव का स्वागत करते हैं।

केमटेक, ग्वालियर ***(एस.के.सक्सेना)***

30 सितंबर, 2015 ***उप निदेशक/सिविल***

PREFACE

It has been realized that adequate safety measures should be adopted to keep the manpower and machinery safe during working adjacent to the track. Along the track, the nature of work consists of track renewals, gauge conversions, doublings, bridge rebuilding etc. These works, mostly carried out by contractor' men and machineries are safety concerned and any infringement to moving dimensions may lead to train accidents.

It is extremely necessary for each and every person, if he who is in some or the other way connected with the track, has to be safety minded and should not adopt short cut methods during execution of various track works. In this booklet the precautionary measures are briefly summarized.

This handbook is not statutory and contents are only for the purpose of knowledge dissemination to the civil engineering technical staff. Most of the data & information in some form or the other are based on literature survey. For more in-depth information, the relevant literature available on the subject may be referred.

We welcome any suggestions from our readers for further improvement of this handbook.

CAMTECH/Gwalior ***(S.K. Saxena)***
30 September, 2015 ***Dy. Director/Civil***

विषय-सूची / CONTENT

संशोधन पर्चियों का प्रकाशन
ISSUE OF CORRECTION SLIPS

इस हस्तपुस्तिका के लिये भविष्य में प्रकाशित होने वाली संशोधन पर्चियों को निम्नानुसार संख्यांकित किया जायेगाः

The correction slips to be issued in future for this handbook will be numbered as follows:

केमटेक/2015/सि/एस.पी.डब्लू.एस.ए.टी/1.0/सी.ऐस.#XX दिनाक _____

CAMTECH/2015/SPWSAT/1.0/CS # XX date _____

जहॉ XX सम्बन्धित संशोधन पर्ची की क्रम संख्या है (01 से प्रारम्भ होकर आगे की ओर)

Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

प्रकाशित संशोधन पर्चियॉ
CORRECTION SLIPS ISSUED

क्र.सं./ **Sr. No.**	प्रकाशन की तारीख/ **Date of issue**	संशोधित पृष्ठ संख्या तथा मद संख्या/ **Page no. and Item No. modified**	टिप्पणी/ **Remarks**

रेलपथ से सटे कार्य स्थल पर सुरक्षा सावधानियाँ
SAFETY PRECAUTIONS AT WORKSITE ADJACENT TO TRACK

1.0 परिचय / INTRODUCTION

A large number of men and machinery are deployed by the contractors for track renewals, gauge conversions, doublings, bridge rebuilding etc. It is therefore essential that adequate safety measures are to be taken for safety of the trains as well as the work force.

Several incidents have occurred in past wherein contractor's machinery while working very close to the Railway line has infringed the moving dimensions resulting into train accidents. Some accidents also took place due to infringement left at work-site after closure of the work such as repair in tunnels, Complete Track Renewals etc.

It is extremely necessary for each and every person, who are in some or the other way connected with the track to be safety minded and adopt no short cut methods during execution of various track works which may lead to compromise with the safety norms and may eventually lead to an accident. In this booklet the precautionary measures are briefly summarised.

2.0 भारतीय रेल में अपनाये गए निर्देशों के आधार पर कुछ दिशा निर्देश / SOME OF THE GUIDELINES BASED ON INSTRUCTIONS FOLLOWED IN INDIAN RAILWAYS

a. On a double line section where the tracks are close by or for track works on a long bridge, particularly on girder bridges, special care should be taken for labourers staying away from running trains from both directions while passing over the work site. There should be watchmen deployed on both sides with red flags and hooters/whistle to keep a watch on the approaching trains and alert the workers well in time with the use of hooters/whistle.

b. Caution orders speed restriction may be imposed when considered necessary. During the hours of night and at work site where speed restriction has been imposed, the lamps of the permanent indicators, which are not reflective type, should be lit at sunset and kept burning till sunrise, where trains run at night. Reflective type temporary indicators need not be lit. (Para 808,(3) of IRPWM)

c. All permissible or sanctioned infringements should be consolidated for each Division, Section wise. The consolidated list should be in possession of DRM, ADRM, Sr.DSO or DSO, Construction officer in-charge of the Division and relevant extract with each Divisional and other officers. These should be checked once a year at Assistant officer's level and it should be ensured that there is no aggravation of any permitted infringement.

d. All the works inside a tunnel, deep cutting, on bridges, constricted area etc. should be carried out under the protection of engineering signals and preferably under block protection. The Inspector concerned shall be responsible for the safety of trains and of the men and equipments.

3.0 चल लाइनों और तय संरचनाओं के निकट कार्य स्थल पर सुरक्षा / SAFETY AT WORK SITE CLOSE TO THE RUNNING LINES AND FIXED STRUCTURES

All works planned for execution close to the running lines and fixed structures, on bridges, inside tunnels, cutting, constricted area etc. should be carried out only after preparation of detailed plans for the same and getting clearance from Engineering Department of open line and approval of competent authority to ensure that the execution of the work will not in any way infringe the prescribed schedule of dimension or aggravate existing permissible infringement.

3.1 अभियंता प्रभारी द्वारा काम की शुरुआत करने से पहले यह उपाय सुनिश्चित किया जाना है / Measure to be Ensured by Engineer In-charge Prior to Start of Work

Before starting any track work the engineering incharge**,** of the section shall ensure that he has complete knowledge of the following aspects;

i) Detailed planning of the work including protection of track and safety measures proposed to be adopted and precautions to be taken at site for working of trains including materials required for protection after joint survey of site by the supervisors of the contractor and Railway.

ii) Railway supervisor at site will ensure safety precautions against any danger to safety of track and will accordingly educate the contractor’s staff and take their acknowledgement before starting the work.

iii) Before permitting the execution of certain works close vicinity of existing running line like earthwork, supply of ballast for new or existing rail line, gauge conversion or laying of concrete sleepers and rails etc. where it is necessary to use road vehicle/ machinery, Open lines Engineer-in-charge (ADEN/DEN) of the section shall ensure that he receives the prior intimation of the following aspects from Assistant Engineer/ Assistant Officer in charge of the work of the executing agency i.e. construction, electrification, S& T etc.

iv) Name and address of the contractor assigned to execute the work.

v) List of individual vehicle with numbers, name and licence particulars of the drivers, those are proposed to be used by contractor at work site.

vi) Information regarding location, where the vehicles are planned to be plied.

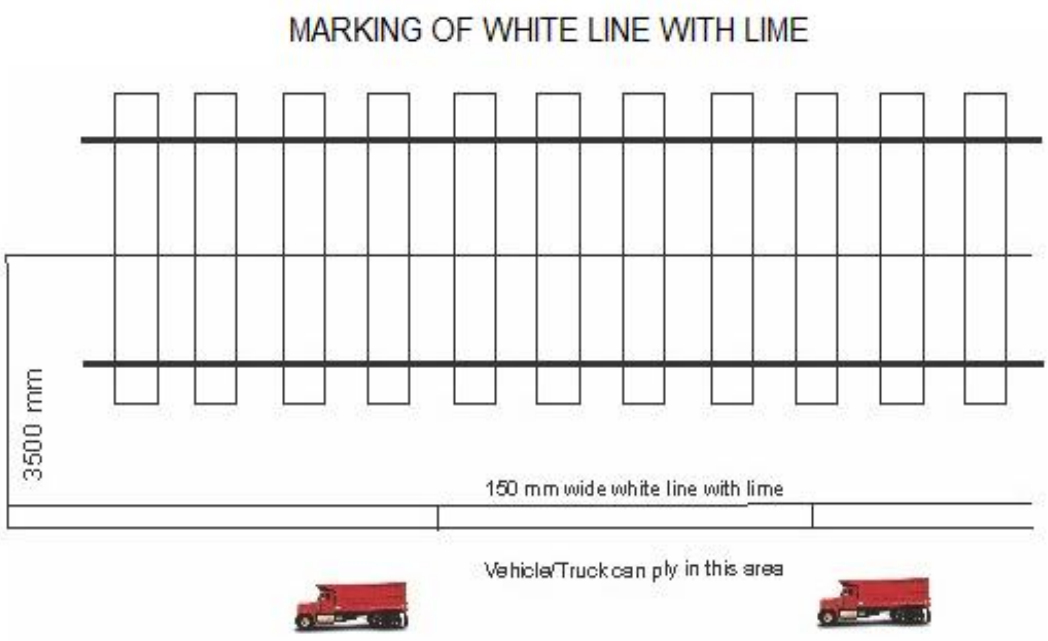
vii) The supervisor/workmen should be counselled about safety measures. The staff of the contractor should be fully trained for the work. List of contractor's supervisors who have been issued competency certificate with location and the nature of works they will supervise. A competency certificate as per proforma given below shall be issued by Assistant Engineer to the supervisor/ staff of the contractor and then only they will be allowed to start the work. Competency certificate will be valid only for the work for which it has been issued.

COMPETENCY CERTIFICATE

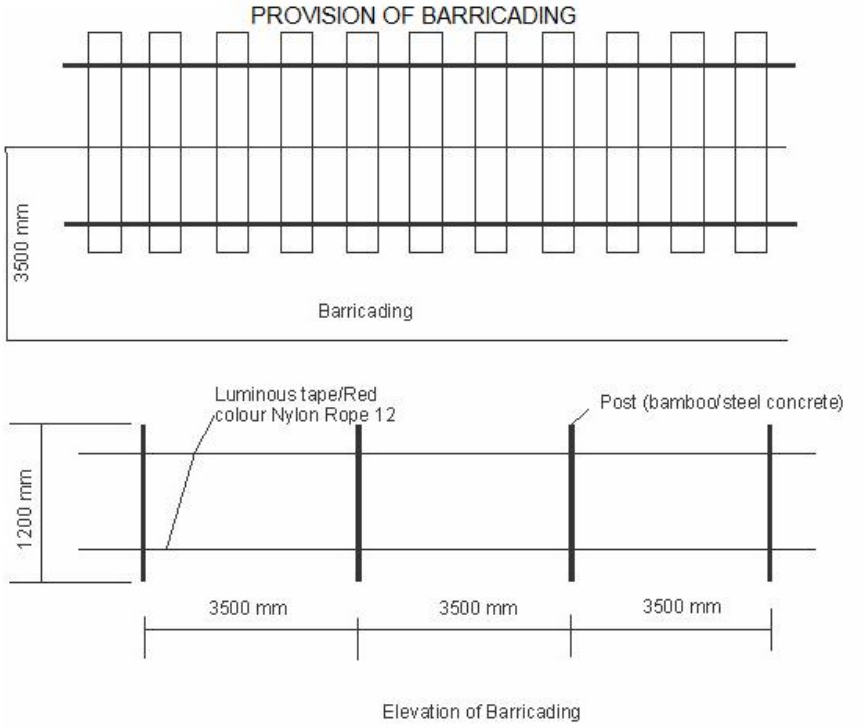
Certified that Shri _____P.Way supervisor of M/s. _____ has been examined regarding P.Way working on _____work. His knowledge has been found satisfactory and he is capable of supervising the work safely.

viii) The other organisations working in the section should submit to ADEN the names of supervisors of construction organisations/other organisations who are going to be site incharge / incharge of work site.

ix) Before the start of work, the land strip adjacent to running track where road vehicle machinery is to ply for the work shall be demarcated with lime in advance at the appropriate distance from the centre of existing track and acknowledged by contractor. Sketches showing the location of marking are as under;



x) Barricading as design given below shall be provided in full length of work area along the track at the specified distance;



xi) The worksite shall be suitably demarcated to keep public and passengers away from work area. Necessary signage boards such as 'Work in progress' etc shall be provided at appropriate locations to warn the public/passengers.

xii) Check list given in Annexure-I shall be used to ensure that all the Requisites measures have been taken before start of the work.

3.2 निष्पादन एजेंसी और अभियंता प्रभारी को कार्य के क्रियान्वित करने के दौरान यह उपाय सुनिश्चित किया जाना है / Measures to be Ensured During The Execution of The Work by Executing Agency and Engineer In-charge

The Engineer in-charge shall approve the methodology proposed to be adopted by the contractor, with a view to ensure safety of trains, passengers and workers and he shall also ensure that the methods and arrangements are actually available at site before start of the work and the contractor's supervisors and the workers have clearly understood the safety aspects and requirements to be adopted/followed while executing the work.

i) There shall be an assurance register kept at each site, which will have to be signed by both, i.e. Railway Supervisor or his representative as well as the contractor's supervisor as a token of their having understood the safety precautions to be observed at site.

ii) The contractor shall not start any work without the presence of railway supervisor or his representative and contractors supervisor at site.

iii) Only trained supervisors have been deputed at work sites duly certified by ADEN/in charge of the work.

iv) Drivers of road vehicles / machinery have been briefed about the safety and precautions to be taken while moving / working close to traffic / track.

v) The contractor shall not allow any road vehicle belonging to him or his suppliers etc. to ply within 6meters from centre of running line without presence of railway trained supervisor.

vi) Contractor shall ply road vehicles only between sunrise and sunset. When vehicle is plied to work during night hours, sufficient lighting shall be ensured in the complete work area for the safety of public and passengers. Engineering indicator will be of luminous material. Also the luminous tapes should be used for demarcation of prohibited area. Additional staff shall be posted as necessary for night working.

vii) The area of work should be demarcated by providing barricades and Sign Boards, which will enable the work-men posted at site and also the lorry drives to have clear guide lines of the movement on vehicles.

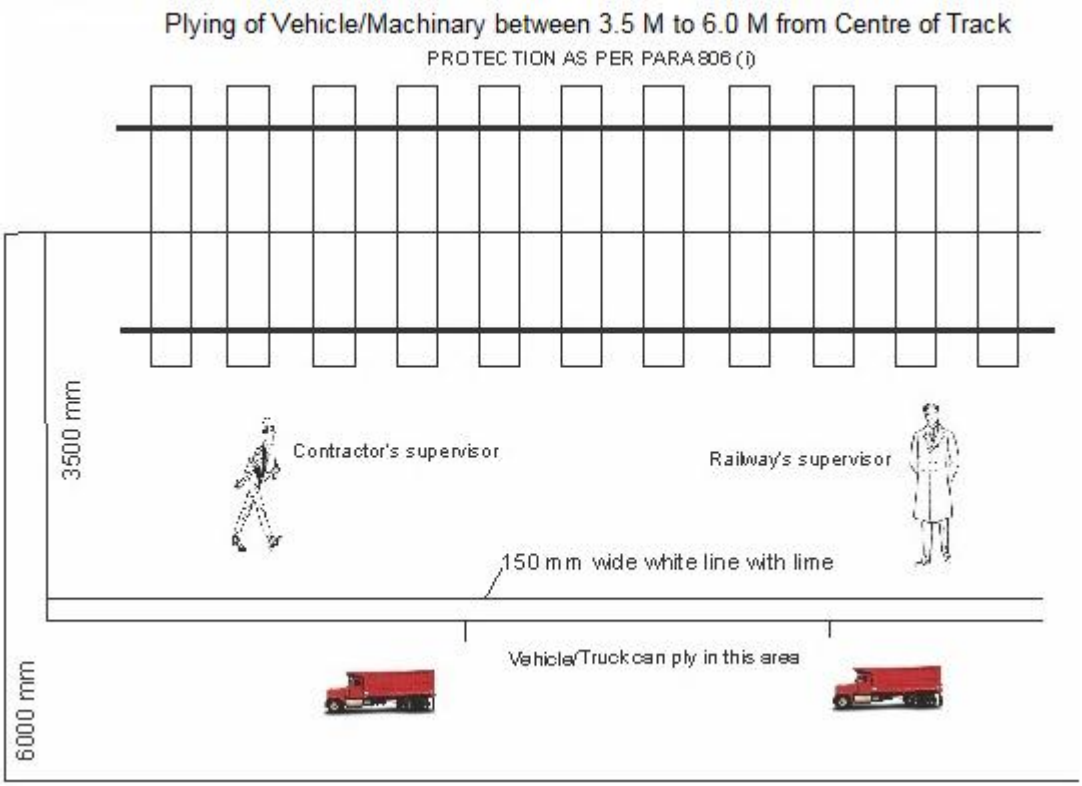
viii) Contractor shall ensure that road vehicle / machinery ply in a way so that these do not infringe the line of demarcation.

ix) The look out and whistle caution orders shall be issued to the trains and speed restrictions imposed where considered necessary. Suitable flagmen/detonators shall be provided where necessary for protection of trains.

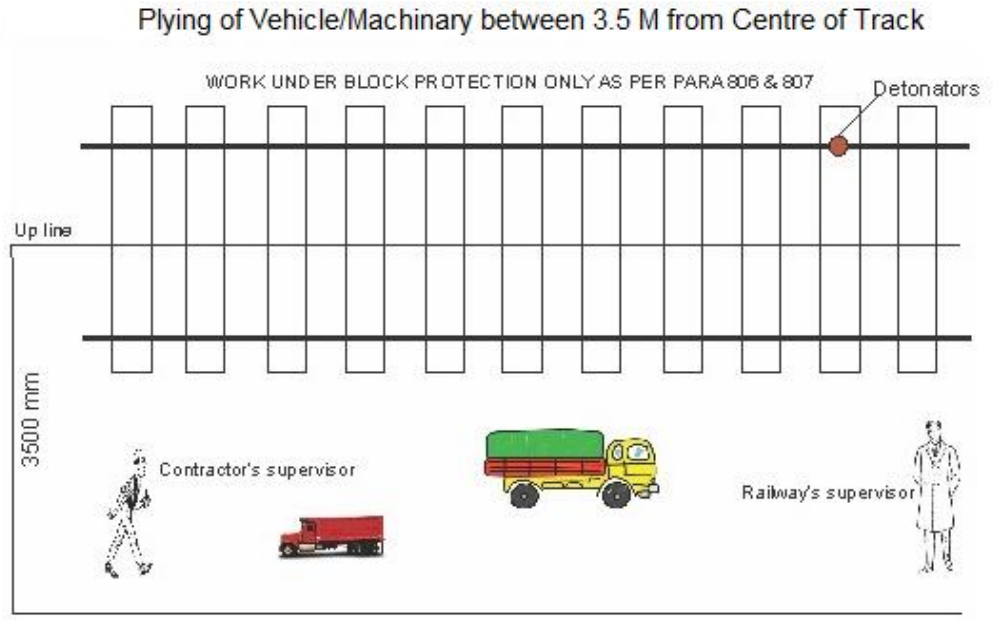
x) In unusual circumstances, where operator apprehends infringement to track while working truck/machinery near running track, following action shall be taken;
   a) The track should be protected as per the provision of IRPWM laid in para 806(i) by the Railway staff.
   b) Any emergency, if occurs, will be protected and attended by the Railway staff, contractor's staff may assist the Railway staff.

xi) All temporary arrangements required to be made during execution of work shall be made in such a manner that moving dimensions are not infringe. Necessary checks shall be exercised by site incharge from time to time.

xii) In case, work has been planned to be done within 6m but beyond 3.5 m of centre of track, it shall be ensured that, necessary precautions for protection of track have been taken as per para 806(i) of IRPWM and look out man has been posted where necessary.



xiii) In case work is planned within 3.5 m of centre line of adjacent track, it shall be ensured that the work is done under block protection only and necessary safety precautions for protection to track as per para no. 806 and 807 of IRPWM are taken.



xiv) Proper communication system shall be available in form of Mobile phones or Walkie-Talkie sets, where necessary at works sites.

xv) In one block section, Lorries should be permitted to work at not more than two locations at a time.

xvi) Where turnings of Lorries are found necessary in course of work, locations for reversing for the purpose of turning should be nominated and should be selected in such a way that there is no danger to the running train. At such locations, a Railway official not below the rank of Works / P-Way supervisor should be available with Hand Signal Flag to ensure that the Lorries do not infringe the Standard Dimension for the running lines. Sufficiently strong stoppers or rail barricades should be installed at such locations wherever required to ensure that even by carelessness or oversight the Lorries do not infringe the fixed dimensions. Wherever Lorries have to take turn, the reversing should be done in such a way the driver invariably faces the running lines at all time.

xvii) The new embankment for doubling should be made extra wide at every 500m or so interval for permitting turning/crossing of vehicles/construction machinery. The extra earthwork involved in such widening of embankment, may be included in the schedule of quantities as a paid item.

xvii) Engineering Supervisors and Contractor's representative should ensure the clearance of total infringements before they leave the work site.

xviii) Supplementary site specific instructions, wherever considered necessary, shall be issued by the Engineer in Charge.

xix) While inspecting the worksite check list given in Annexure -II shall be used to ensure that all the Requisites measures have been taken during the execution of the work.

4.0 ट्रैक के आसपास खुदाई और ट्रेन्चिंग करते समय सुरक्षा उपाय / SAFETY MEASURES WHILE UNDERTAKING EXCAVATION & TRENCHING ADJACENT TO TRACK

i) Before taking up any digging activity on a particular work by any agency Sr. DSTE/DSTE or Sr. DEE/DEE of the section shall be approached in writing by the concerned Eng. or S&T or Electrical officer for permitting to undertake the work.

ii) After getting the permission from S&T or Electrical Deptt. as case may be the, relevant portion of the cable route plan shall be attached to the letter through which permission is issued to the contractor by concerned Eng. official for commencement of work and ensuring that the contractors has fully understood the cable rout plan and precautions to be taken to prevent damage to the underground cables. The contractor shall be asked to study the cable plan and follow it meticulously to ensure that the safety the cable is not endangered. Such a provision including any penalty for default should form part of agreement also. However,

basic responsibility will be of the Department executing the work and the Contractor.

iii) While digging in station area, if any cable is found, digging should be stopped and concerned signalling /electrical staff should be informed immediately.

iv) No new OFC or Quad cable shall be laid close to the existing track. It shall be laid close to the Railway boundary to the extent possible to avoid any interference with the future work (doubling etc.). It shall be ensured in the new work of the cable laying that the cable route is properly identified with electronic or concrete markers.

v) Trenches and foundation pits should be adequately and securely fenced, provided with proper caution signs and marked with red lights at suitable intervals during night to avoid accidents. Adequate protective measures should be taken to see that the excavation operations do not affect or damage adjoining existing buildings.

vi) Position of all underground installations such as sewer, gas pipes, water pipes, electrical cables and other civic facilities that may cause danger during the work should be checked and proper precautions should be taken not to damage them.

vii) Land should be cleared of trees, loose boulders and other obstructions before excavation commences so as to avoid accidents.

viii) Where hard rock is found with and blasting operations are considered necessary, the contractor should obtain the permission of the Engineer-in-Charge in writing for resorting to blasting operation.

ix) Proper precautions should be taken for safety of persons and adjacent track before undertaking any blasting operation. Red flags should be prominently displayed around the area to be blasted. All the people on the work except those who actually light the fuses should be withdrawn to a safe distance of not less than 300 metres from the blasting site.

5.0 रेलवे ट्रैक के साथ उतराई और सामग्री की स्टैकिंग / UNLOADING AND STACKING OF MATERIALS ALONG THE RAILWAY TRACK

i) The sites for material stacking shall be selected in advance ensuring that no part of the stacked material would infringe the standard moving dimensions or inconvenience to any worker or the public. Necessary fencing and lights are to be provided. Later on the material may be stacked to a place from where it may be conveniently disposed off. A plan of proposed stacking locations be made and signed jointly by a competent Railway representative and authorized Contractor's representative, if stacking is done within 6 meters of track centre.

ii) The selected locations within 6 meters shall be marked by lime in advance.

iii) All unloading operations near the track should be undertaken under the supervision of a competent P.Way Supervisor.

iv) The unloaded ballast/rails/sleepers/other P.Way materials after unloading along track should be kept clear off moving dimensions and stacked as per the specified heights and distance from the running track, which will not cause infringement to SOD in case of accidental roll off.

v) After completion of work, the released sleepers and fittings shall be properly stacked away from the track clear of moving dimensions.

vi) While inspecting the worksite, check list given In Annexure-II shall be used to ensure that all the requisite measures have been taken during the execution of work.

6.0 यातायात ब्लॉक के अंतर्गत कार्य के निष्पादन के दौरान अपनाई जाने वाली आवश्यक सावधानियाँ / PRECAUTION REQUIRED TO BE TAKEN DURING EXECUTION OF WORK REQUIRING TRAFFIC BLOCK

i) Any work, which infringes moving dimension, shall be started only after the traffic blocks have been imposed and track protected.

ii) At location where night working is unavoidable, proper lighting arrangement should be made.

iii) Before closing the work, the track shall be left with the proper track geometry so that the trains run safely. After completion of work, the released sleepers and fittings should properly stacked away from the track to be kept clear of moving dimensions.

iv) Block shall be removed only when all the temporary arrangements, machineries, tools, plants, etc. have been kept clear of moving dimensions.

7.0 ओ.एच.ई. क्षेत्र में कार्य करते हुए सुरक्षा पहलुओं का अवलोकन करना / SAFETY ASPECTS TO BE OBSERVED WHILE WORKING IN OHE AREA

i) The risk of direct contact with live OHE is ever present while working in electrified sections such as for painting of steel work of through spans of bridges and platform cover.

ii) The return current in the rails may cause dangerous voltages. During maintenance or renewal of track, continuity of the rails serving electrified tracks shall invariably

be maintained. For bridging gaps which may be caused during removal of fish-plates or rails, temporary metallic jumpers of approved design shall be provided.

iii) No electrical work close to running track shall be carried out without permission of Railway's representative.

iv) No work shall be done within a distance of two meters from the live parts of the OHE without a 'permit-to-work'.

v) While unloading rails from BFRs in an electrified section, it should be ensured that no metallic rod/ stick held by the workmen come in touch with the OHE. A minimum distance of 2 m has to be maintained between live OHE wire and body part of worker or tools or metallic supports etc.

vi) It is important to note that dangerous voltages may be induced in metallic masses such as fencing posts, continuous metallic mass (unloaded rails) of length greater than 300 metres in the vicinity of traction conductors. To avoid possibility of shock due to such voltages, the metallic structures are bonded together and earthed.

vii) No electric connection etc. can be tapped from OHE.

viii) Authorized OHE staff should invariably be present when the relaying work or any major work is carried out.

ix) In the electrified territories, the cutting and day to day trimming of the trees, wherever required shall be done in the presence of authorized engineering and TRD staff to ensure safety and to maintain the 4 m safety clearances from OHE.

x) Power block is correctly taken and 'Permit to work' is issued.

xi) The structure bonds, track bonds, cross bonds, longitudinal rail bonds are not disturbed and if disconnected for the work, they are reconnected properly when the track work is completed.

xii) The track level is not raised beyond the permissible limit during the work.

xiii) The relative alignment of the centre line of the track with respect to the alignment of the contact wire must be maintained within the specified tolerances.

xiv) No fallen wire or wires shall be touched unless the power has been switched off and the wire or wires have been suitably earthed.

xv) In the electrified section, for carrying out repairs/ painting works etc. to bottom of FOB, top chords and bracing of trough type / semi through type girder bridges and other overhead structures over track, power block should be taken before commencing the work in consultation with SSE (Electrical). Staff working on station roofs and signal gantries and similar structures adjacent to Live Overhead

Equipment shall not use any measuring tapes, tools and materials when there is a possibility of their being dropped or carried by wind on to the live overhead equipment.

xvi) In AC traction areas, intimation should be given to the concerned officers of the Electrical General services and also S&T Department, since all the S&T and Electrical lines are cabled on account of Electrical Induction.

xvii) During excavation, if workmen come across tiles or bricks in an arranged manner, they should at once report the matter to the higher officials. Any further excavation should be carried out only in the presence of the authorized staff of Electrical and or S&T department as the case may be.

xvi) No crane shall be worked except on the authorised '**permit-to-work'.**

xvii) For inspection of roofs and sides of a tunnel, the overhead equipment shall be rendered **'dead'**.

8.0 ट्रैक मशीनों के कार्य / WORKING OF TRACK MACHINES

Track machine working is likely to produce a dusty atmosphere and/or heavy noise pollution. Hence extra care is necessary at site to ensure safety of workers. For this, the following steps should be taken.

i) Hooters should be provided on the track machines. These hooters should preferably have remove control operation so that the Lookout man standing around 150 m away from the track machine can operate the hooter to warn the staff working on/around the track machine about approaching train on adjoining track.

ii) Temporary `Whistle Board` should be fixed on the adjoining track, which can be moved along with track machine worksite.

iii) It is necessary that all trains passing on the adjoining track should be issued a caution order "OBSERVE HAND SIGNAL, WHISTLE FREELY AND STOP, IF REQUIRED". Such caution order on the adjoining track is necessary due to high noise level caused by track machine and large concentration of staff working around it.

9.0 चालू पटरी के पास ढांचे के विध्वंस के पूर्व सावधानियाँ / PRECAUTIONS PRIOR TO DEMOLITION OF STRUCTURE NEAR RUNNING TRACK

i) If the structure to be demolished is one which may have got hidden damages, caused by fire, flood or earthquake, measures necessary to prevent accidental collapse by way of bracing, shoring, etc., should be provided.

ii) When demolition by explosives has to be resorted to, this should be done only after the approval of the Authority and after taking necessary precautions.

iii) Prominent danger signs should be posted all round the property and all openings giving access to the structures should be kept barricaded or manned except during the actual passage of workmen or equipment. However, provision should be made for at least two independent exits for escape of workmen during any emergency. During night, warning lights should be placed on or above all barricades.

iv) All gas, water, electricity, steam and other service lines should be shut off outside the property line after notifying the service companies and concerned authorities and obtaining their approval. Any temporary service connections required for the demolition work should be separately taken and arranged in such a manner as to afford safety to the workmen.

v) When work is not in progress, watchmen should be provided to prevent unauthorised entry of the public in the danger zone.

vi) All necessary safety appliances should be issued to the workers prior to starting of work.

vii) Safety distances to ensure safety of the public should be clearly marked and prominent sign boards posted. Every sidewalk or road adjacent to the work should be closed or protected.

10.0 संविदाओं में कार्य स्थल पर सुरक्षा के संबंध में प्रावधान / PROVISIONS REGARDING SAFETY AT WORK SITE IN CONTRACTS

Following items, which are illustrative rather than exhaustive, be provided in the works contract, involving works near track;

i) The Contract Agreement should contain all the provisions of safe working as suitable barricading and signboards to forewarn the road vehicle driver, its type, level of contractor's supervisors who will necessarily be present if work is being done in vicinity of track etc should be specifically provided as an item in tender schedule and paid for as the work progress, rather than mentioning the same in general way in the General conditions or Special conditions. The luminous tape, strung on bamboo poles can be considered for such barricading and provided as separate item in schedule.

ii) Provision for contractor's flagman and supervisors: The engineer- in-charge or his authorized representative will personally counsel, examine & certify the contractor's flagman & supervisor and will give written permission, giving names of such flagman & supervisor to be deployed on the work, location, period and time of the work Contractor shall not normally change such authorized persons. In exceptional circumstances only, contractor should approach Railway for counselling of fresh staff. Photo ID of trained staff and supervisor shall he provided. Staff trained at one site can be used for other site also.

iii) For items such as walkie-talkie sets and mobile phones suitable provision may be incorporated in the tender conditions as per site requirement.

11.0 प्रशिक्षण/ TRAINING

a. Special Training and Counseling should be imparted to all Field staff engaged in maintenance of railway assets regarding the Safety at work site and all of them should be in possession of a Compendium prepared in the same format as Engineering Standing order No.16 (Annexure-VI) issued by the Railway Board in August, 1999.

b. Similar training should be organised for railway's Associates and Contractors working in close proximity of the running track as directed by the Railway Board in their letter No.99/CE-II/PRA/32 of 20.04.2000.

12.0 करो और ना करो / DO'S AND DON'TS

a. Boulders including CST-9 plate, rail pieces etc., should not be left unguarded in the mid-section to facilitate miscreants for their unauthorized placing on the track particularly in areas prone for such miscreant activities.

b. Whenever construction of the double line is undertaken fencing alongside the Railway line in complete length of the block section where doubling is being done should be erected so as to prevent any infringements to the moving dimensions likely to be caused by moving or stationary vehicles used for execution of the works. The fencing should conform to the design approved by CE/Construction.

c. Suitable gates/barriers should be installed across the new embankment, preferably adjoining the manned/unmanned level crossings. The entry for the vehicles should be regulated by an authorized representative of the Engineer-in-charge during the working hours.

d. The design & drawings of FOB other than standard designs/drawings, if adopted, should be adopted "in toto" without any alterations. If any alternation, modification required fresh design should be done.

e. Any unusual noticed at site during fabrication & erection shall be viewed seriously and shall not be neglected. The design section should be consulted immediately. In case it is not possible to attend the same well in time do not keep it in a state affecting the running line till it is attended.

f. Open line Supervisors & Officers should be vigilant about the work being carried out by Construction Organization on & near running lines and promptly bring into the notice of any deficiencies/defects/unusual noticed and prompt remedial action should be taken.

g. During construction it should be ensured that any structure or part of the structure should not be subjected to loads for which it is not designed. Especially in FOBs. Precast slabs to be placed should not be stacked at one place.

***

Annexure-I

CHECK LIST (Before starting the work)

Name of Work.....

Location.....

Duration of Work: From.....To.....

Sr. No.	Description	YES	NO
1.	Contractor's supervisor identified /selected. Who is going to be site-incharge.		
2.	Training imparted to contractor's supervisor and certificate issued.		
3.	Work site inspected by contractor's supervisor/other department's supervisor along with contractor's supervisor.		
4.	Precautions to be taken, identified and listed.		
5.	Plan of work drawn out by contractor's supervisor in consultation with Railway's supervisor.		
6.	Plan of work, brought to the knowledge of open line ADEN/SSE-P.Way & Works.		
7.	Before start of work, proper line marking/barricading done at site of work.		
8.	Men deputed for protection of work along with safety equipments.		
9.	Caution order issued to the train drivers in case work is being done within 6 meter of centre of running track.		
10.	Drivers of vehicle/machinery being used have been identified.		
11.	Drivers of vehicle/machinery briefed about the safe working.		
12.	Sufficient lighting provided at site of work for night working.		
13.	Infringement checked.		
14.	Sectional open line ADEN/SSE-P.Way & works have satisfied themselves regarding safety arrangements.		
15.	Availability of Walkie-Talkies sets for communication.		

Signature of Contractor's/
Other department supervisor

Signature of open Line's
Supervisor

Date:

Annexure-II

CHECK LIST (While inspecting the worksite)

Name of Work.....

Location.....

Duration of Work: From.....To.....

Date of Inspection.....

Sr. No.	Description	YES	NO
1.	Does the contractor's supervisor have the certificate?		
2.	Does the knowledge of contractor's supervisor on safety of track and worksite is up to the mark?		
3.	Is Railway's supervisor of construction organisation/ other department available at site?		
4.	Is knowledge of Railway's supervisor OK?		
5.	Is Lime marking/barricading done?		
6.	Are adequate safety precautions taken?		
7.	Are communication facilities (Walkie-Talkies sets) available at site?		
8.	Are only identified drivers driving the vehicle/machinery?		
9.	Is whole worksite safe for working of men/vehicles and trains?		
10.	Are adequate lighting arrangements done at site?		
11.	Are adequate protection equipments available at site?		
12.	Is caution order to trains being issued?		
13.	Are train drivers following the enforced temporary speed restriction?		
14.	Is work permit been taken for working in electrified territory/station yard (P&C areas)?		

Signature of Inspecting Officer

Designation

संदर्भ / REFERENCE

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टिप्पणी / NOTES

गुणवत्ता नीति

रेलों में यात्री और माल यातायात की बढती माँग को पूरा करने के लिए गुणवत्ता प्रबंध प्रणाली में अनुसंधान, डिजाइनों और मानकों में उत्कृष्टता तथा सतत् सुधारों के माध्यम से सांविधिक और नियामक अपेक्षाओं को पूरा करते हुए सुरक्षित, आधुनिक और किफायती रेल प्रौद्योगिकी का विकास करना।

QUALITY POLICY

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

हमारा उद्देश्य

अनुरक्षण प्रौद्यौगिकी और कार्यप्रणाली को उन्नयन करना तथा उत्पादकता और रेल्वे की परिसम्पत्ति एवं जनशक्ति के निष्पादन में सुधार करना जिससे अन्तर्विषयों में विश्वसनीयता, उपयोगिता और दक्षता प्राप्त की जा सके।

यदि आप इस सन्दर्भ में कोई विचार और सुझाव देना चाहते हों तो कृपया हमें इस पते पर लिखें:

सम्पर्क सूत्र	:	उप निदेशक (सिविल)
पत्राचार का पता	:	भारतीय रेल उच्च अनुरक्षण प्रौद्योगिकी केन्द्र, महाराजपुर, ग्वालियर (म.प्र.) पिनकोड - **474005**
टेलीफोन	:	0751–2470869
फैक्स	:	0751–2470841
ई–मेल	:	**dircivilcamtech@gmail.com**

Our Objective

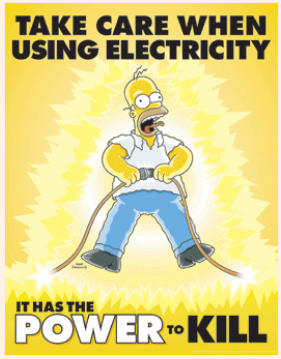
To upgrade Maintenance Technologies and Methodologies and achieve improvement in productivity and performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability, and Utilisation.

If you have any suggestion & comments, please write to us:

Contact person	**:**	**Dy. Director (Civil),**
Postal Address	**:**	**Indian Railway Centre for Advanced Maintenance Technology,** **Maharajpur, Gwalior (M.P.)** **Pin code – 474 005**
Phone	**:**	**(0751) - 2470869**
Fax	**:**	**(0751) – 2470841**
Email	**:**	**dircivilcamtech@gmail.com**

Introduction

- Many accidents occur as a result of exposure to electrical equipment or devices.
- Today almost everything is powered by electricity. Electrical equipment used in an office are potentially dangerous. If they are used improperly, severe accident may take place. If a part of the body comes into contact with an electrical circuit, a shock will occur. The current will enter the body at one point and leave it at another place, and this path of current can cause great pain, burning, and even death.
- When it comes to your health, it is always better to be safe. For the safety of workers, they should be properly educated about electrical safety and hazard.
- It is important to take safety precautions when working with electricity. Safety should not be compromised and safety rules must be followed first. Below are some tips to prevent electrical accidents at the workplace, which will help while working with electricity.



In General

- Use only those devices that are properly grounded or insulated. Check the earthing system periodically and ensure proper earth value.
- Do not overload the outlet; do not plug the multi-outlet bar into another multi-outlet bar.

- Use extension cords causiously. Do not plug two extension cords together and do not cover them with rugs or mats, as this may present potential hazards.
- Unplug or disconnect the machines before servicing or repairing, and check to make sure the machine is actually disconnected. It is also a good idea to place caution signs on the service panel so that no one turns **ON** the main switch.
- Do not ignore the warning signs. If an item feels hot, makes an unusual noise (buzz or hum), smokes, or sparks, immediately turn it out of service and "don't use it“

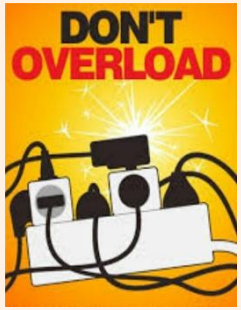
- Never use devices with hot cords, damaged insulation or broken plugs. Inspect cords and equipment regularly, and report any defect immediately

- Do not cover or guard any exposed electrical component or wire, and ensure that employees are aware of any hazards
- Do not pull the cord for exit the outlet. Hold the plug and exit the outlet.

- Avoid water when working with electricity. Do not repair or touch any electrical equipment or circuit with wet hands. This increases the conductivity of electric current.

- Always use insulated tools while working. Always use appropriate rubber gloves when working on any live electrical circuit.
- Never use an aluminum or steel ladder if you are working at a height near live line. An electric shock will land you and the entire current will pass through your body. Use a bamboo or wooden ladder instead and wear helmet and safety belt while working.
- If you have to work near HT - lines, take safety precautions. Discharge the line before working and attach the discharge rod during working. And work on electric line or equipment only after obtaining "Permit to Work" from the authorized person.
- Never try to repair energized/live equipment. Always check using a tester that it has been previously de-energized. When an electric tester touches a live wire, the bulb inside the tester shows that the electric current is flowing into the respective wire. Check all wires, the outer metallic cover of the service panel and any other hanging wire with the electrical tester before proceeding with your work.
- Always use ELCB, RCCB, and use fuse of appropriate current rating. ELCB and RCCB are safety devices that automatically disconnect the live wire when a short circuit or current occurs. Selection of the appropriate fuse or ELCB and RCCB is required. A fuse of 150% of the normal circuit current is usually selected to avoid short circuits.

- Working outdoors with underground cabling can be dangerous. Moist soil around the cable is a good conductor of electricity. Using a hoe to dig on the cable can easily cause damage to the wires, so it is better to dig the cable by hand wearing gloves.
- Take care when removing capacitors from a circuit. That the capacitor stores energy and if it is not discharged properly it can easily cause an electric shock.
- Use 3 pin plug socket in electrical devices. Use phase wire red, neutral wire blue and earth wire black or green.



While Working on OHE

- All metallic items like fencings, platform's metal structures etc that are parallel to the track, cause an inductive effect, so they should be earthed for safety.

- Each task team should be secured by earth at least two different places on the both end on the work site.
- If the distance between two work sites is more than 1000 meter one earthing should be provided at such point that distance between two earthing point should not exceed to 1000 mt.
- No work should be done within a distance of two meters or less from the live OHE without granting 'permit-to-work.
- Staff should be posted on both sides of the work place, who can alert the working teams to the trains coming on that track.

- For OHE earthing at working place earth clamp should be provided at least one span away at OHE mast and it should be ensured that the structure bond is properly connected with mast.

- Always first, tighten the discharge rod clamp on the traction rail or pole and then hang the upper clamp of discharge rod on the OHE. Similarly, when the earthing is to be removed, first remove the clamp from the OHE line, then open the clamp on the rail or pole.

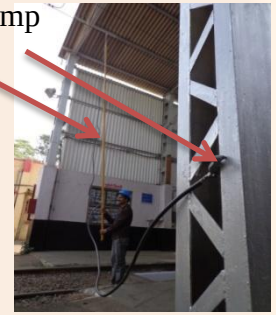
- Do not touch any broken OHE wires. Switch off the supply from both ends of wire or parted wire and it should be earthed at two different places of both parts, this precaution should also be taken while working near sectioning point and cut-in insulator.
- The tools and plant used in OHE maintenance are must check at least once a month in presence of JE/ (OHE).
- Neutral section should be treated like live part and before starting work should have manning at two different places on both sides of the work site. While working on isolator it should be earthed from both ends at two different places.

While Working in Electrical Loco Shed (TRS)

❖ ***Before going on roof of loco***

☞ OHE supply to be switched off by opening isolator and locking.

☞ OHE to be earthed on both ends of loco using discharge rods.



☞ Loco to be grounded by operating earth switch (HOM).

☞ Helmet and shoes should always be used at the time of working.

- While performing the schedule inspection, keep the battery switch HBA on the off position and remove the battery fuse CCBA.
- Whenever the loco is standing, place the appropriate wheel wedge on the wheels on either side of the loco.
- After meggering, always discharge the concerned/ meggered circuit with the help of a flexible insulated wire.
- Operation of the locos should be ensured by the authorized person only. Horn to be blown after taking charge of loco.
- Clearly display the switch gear layout of the power supply. Employees working on the shop floor should be aware of which switch to turn off in an emergency.
- Ensure that condition-monitoring-testing such as ultrasonic testing; RDPT, wheel profile, DGA and temperature test etc. are strictly carried out as per schedule. Periodical load tests and ultrasonic checks of lifting equipment like shackles, safety sling, hook anchors and pins to be done.
- While lifting heavy equipment like transformers etc. from one place to another, first lift only about 1-2 feet and check that the job slip cannot be done, only then lift it completely.
- Do not place any flammable materials like petrol, grease, cotton vest etc. around the welding job. Earth wire should not be used as neutral wire.
- Do not operate the loco until the work inside the loco is complete and checked of the all safety equipment is properly. Ensure availability of fire extinguishers and wooden blocks in the locomotive before operation.

While Working with Electrical Loco (TRO)

- When attaching loco to air-braked train LP to check with the guard, the continuity of the brake pipe by application and release of brake. Ensure the braking & full releasing of brakes of train before running the train and check all safety devices.
- Perform the brake test in the first block section by proper method.
- The Driver and Assistant driver should exchange the signal in a loud voice. Properly exchange the signal with the guard, station staff and other personnel.
- While driving the train, the driver and co-operator to keep their mobile phones switched off or in silent mode.
- Continuously whistle while crossing the level gate. Whenever the train stops in the gradient section, protect the train by applying train break A-9, loco brake SA-9 and hand brake. Put wooden blocks in the loco wheels and if necessary, apply ballast. The driver should use DVR / Regenerative braking to the maximum to protect the train from brake binding.

- Loco log-book to be checked for any loco defect and always do entry in log-book for every unusual and defect.
- Driver should switch "**ON**" the flasher light as per rules in case of abnormalities.

In The Workshop

- Ensure the proper operation of the limit switch/emergency switch of crane daily before starting.
- Do not operate the EOT crane without checking the EOT crane brake.
- Do not operate the traverser without checking the traverser's brake as well as hand brake.
- Ensure use of safety items such as safety belts/helmet/hand gloves/slings/ropes etc. by man working on overhead structure of any EOT cranes or DSL of traverser etc.

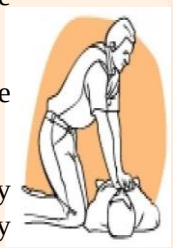
Electric Shock

The risk of electric shock is according to the voltage.

- The person may be unconscious, the body may burn, muscles may Twitch, the heart or brain may stop functioning, the place of effected by current is numb or paralyzed. Due to Falling down person may be injured and bones can be broken.
- Electric shock can be so dangerous that it can also burn internal body. It is completely fatal.

In case of electric shock,

- First of all, if the person is in contact with the current, then with the help of wood, remove it from the contact of electricity and turn off the power / supply.
- If the situation is dangerous, call the ambulance.
- Give first aid until the ambulance arrives.
- If the victim is breathing, then lay down the person in the recovery position.



- If the victim is not breathing, so lay it and start giving breath by mouth immediately by raising the feet and give repeated pressure on the heart.
- Band bandage on the injured area and after apply Burnol Cream on burnt areas cover them with clean cloth. Do not wrapped blanket.

ELECTRIC FIRE PREVENTION MEASURES

- Always use ELCB, RCCB, and use fuse of appropriate current rating.
- Never overload plugs, sockets or extension cords. Use appropriate overload relay for all devices.
- Replace the hot-faceplate light switch.
- Replace all damaged cords.
- Do not attempt electrical repairs without expertise.
- In the interval between three months to one year, regular testing of electrical equipment should be done and the test date should be written.
- Never extinguish electric fire with water. Instead, use a fire extinguisher or baking soda. Water conducts electricity, so the fire can actually ignite further.

- If the equipment be overheating, immediately unplug it or interrupt power from the main switch.
- Isolate combustible objects from heaters and other appliances that heat up quickly

- Use a fire extinguisher.

Protecting employees or controlling hazards should be the same for all employers and employees.

A good first step is to do a safety assessment of your workplace.

Take the first step towards making your workplace safe, and create an action plan to correct those issues.

Disclaimer:

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

If you have any suggestion or comment, please write to:
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Ph.0751-2470890, Fax 0751-2470841
E-mail: direlcamtech@gmail.com

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भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय MINISTRY OF RAILWAYS

PAMPHLET
ELECTRICAL SAFETY AT WORK PLACE

End User : All Electrical Maintenance Staff

CAMTECH/E/2019-20/EP-04/Electrical Safety/1.0
November, 2019

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