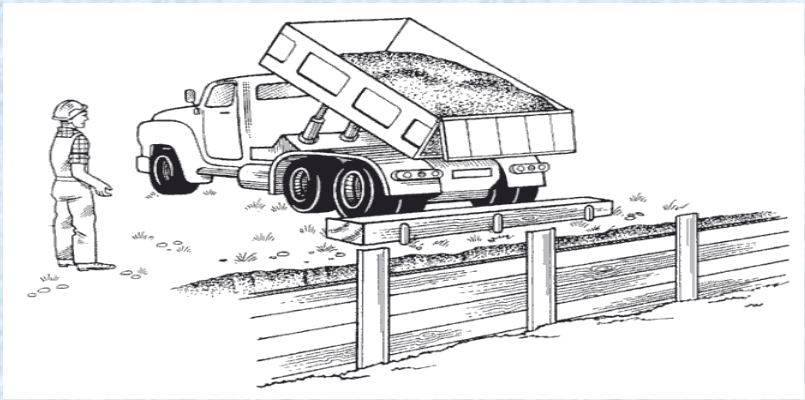
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सत्यमेव जयते

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

CAMTECH/2015/C/SAWS/1.0

जनवरी/January-2015

अअमासं RDSO
रेल अग्रदूत Transforming Railways

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Indian Railways

Centre for Advanced Maintenance Technology

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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

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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

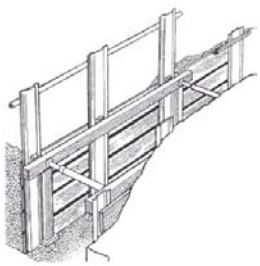
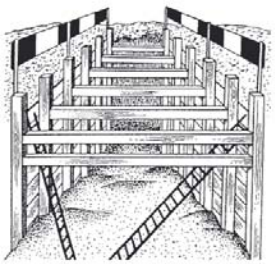
- Excavation work to be inspected by a competent person before work begins and at least once a day where work is in progress.
- Wherever possible, an excavation work is not too close and deep as to undermine any adjacent building or structure.
- When the stability of a building or structure may be affected 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.

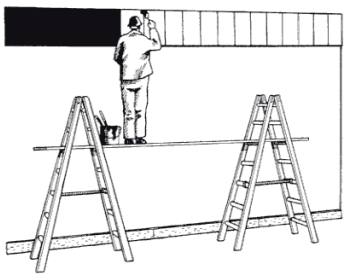



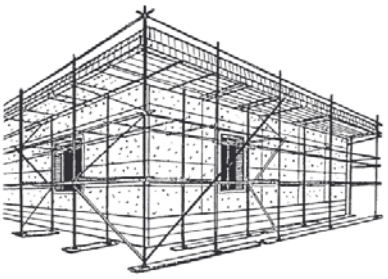

3.0 स्काफ़्फ़ोल्डिंग/SCAFFOLDING

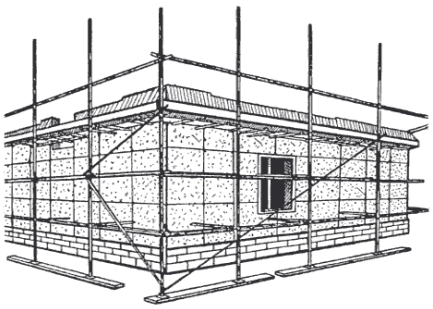
Scaffolding is a temporary structure supporting one or more platforms and used as a workplace or for the storage of materials. Scaffolding may be used in both cases for construction and demolition work where the work cannot safely be done from the ground. Scaffolds should be erected/ altered or dismantled 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.

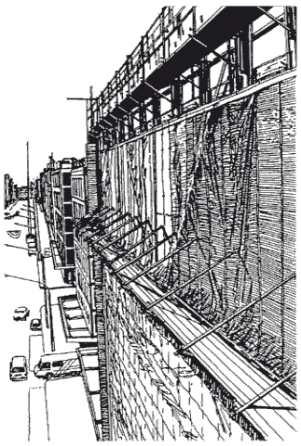
There are many different materials used to construct scaffolding, such as steel, aluminium, wood and bamboo. Whatever the material, the principles of safe scaffolding remain the same that it should be of adequate strength to support the weight of person and materials, and should be securely anchored 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.





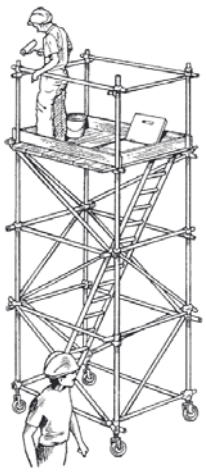




3.1 PRECAUTIONS FOR SCAFFOLDING

- 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:

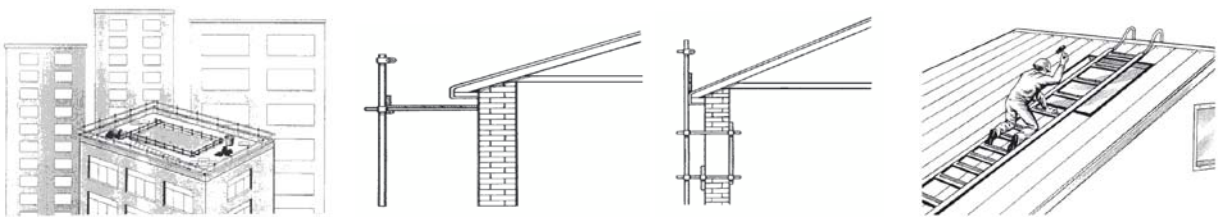
- Ladders need to be inspected regularly by a competent person and damaged ladders should be removed from service. Timber ladders should be checked for splits or cracks, splintering or warping, metal ladders for mechanical damage. Look for missing, loose or worn rungs;
- Ladders should be capable of 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.

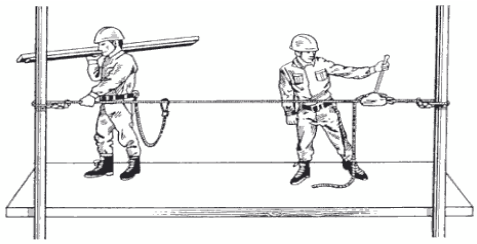
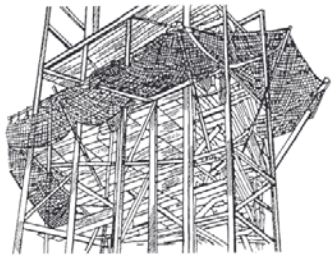


5.1 PRECAUTIONS

- 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.

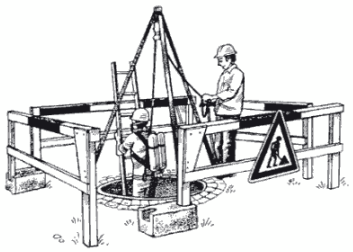
8.1 PRECAUTIONS

- 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.

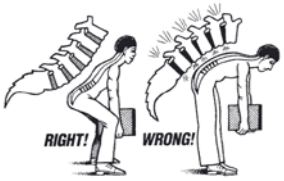
The proper mechanical handling of materials can ensure that work flows smoothly, and helps to avoid delays and damage. It is important, too, to have been adopted right techniques of lifting and carrying. Look after your own welfare by:

- 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

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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.

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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:

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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:

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