



International
Labour
Organization

Occupational Safety and Health (OSH)

Manual for Labour-Based Rural Road
Construction and Maintenance



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Manual for Labour-Based Rural Road
Construction and Maintenance

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First published 2026.



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ISBN: 9789220423332 (print); 9789220426968 (web PDF)

DOI: <https://doi.org/10.54394/SSYE9110>

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Preface

Unemployment and poverty remain urgent challenges worldwide, particularly in underdeveloped and rural areas where infrastructure deficits hinder economic growth and access to essential services. The International Labour Organization (ILO) has championed the use of local resource-based methods in rural infrastructure development which includes the provision of access roads as a strategy to address these challenges. By promoting employment-intensive approaches and the use of local resources, the EIIP contributes to the ILO's commitment to poverty alleviation, sustainable development and economic empowerment.

The construction, maintenance and management of rural road infrastructure, however are accompanied by diverse occupational safety and health (OSH) hazards. The ILO has emphasized the need for robust safety standards and training to safeguard the well-being of workers, while at the same time recognizing that in. However, the ILO also recognizes that in many rural contexts there is often insufficient guidance and a lack of relevant legislation, regulations and guidelines. This manual therefore aims to fill some of these gaps by serving as a vital resource for promoting safe practices, for clients, consultants, contractors, supervisors, technicians, and experts as well as workers and their representatives involved in rural roads construction and maintenance.

With detailed illustrations and practical examples, the manual provides guidance on mitigating hazards, understanding road construction methodologies, tools and equipment and ensuring compliance with labour laws on employment-intensive worksites. Drawing on authoritative sources, including ILO specialists and key publications, the manual bridges the gap between theory and practice to support safer and more efficient rural road construction projects.

Through this OSH Manual, the ILO furthers its commitment to the Decent Work Agenda by creating opportunities for equitable and secure employment, social protection and community development.

Foreword

The Employment-Intensive Investment Programme (EIIP) has been supporting member States and social partners in promoting local resource-based (LRB) approaches for over five decades, operating in more than 70 countries. These approaches prioritize local labour, skills and materials while integrating appropriate technologies to optimize employment opportunities, infrastructure quality and sustainability.

Addressing infrastructure deficits in the Global South requires solutions that not only enhance access to essential services such as water, sanitation, roads and energy but also generate decent and productive employment. LRB approaches, when combined with suitable technologies, can create short-term jobs and long-term employment through skills development, operations and maintenance and related economic activities.

EIIP ensures that appropriate technologies are embedded at every stage of infrastructure development – from planning and design to procurement, implementation and maintenance. These technologies include nature-based solutions, low-cost construction techniques and the utilization of climate-resilient materials which enhance employment generation, reduce costs and minimize dependency on imports. When effectively applied, they strengthen local economies while promoting decent work through inclusive and sustainable development.

The adoption of LRB approaches and appropriate technologies is often constrained by institutional capacity, policy environments, market access and technical expertise. EIIP addresses these challenges by providing policy guidance, technical assistance and training, all of which further strengthens the institutional frameworks and workforce capabilities of governments, local agencies, private sector actors and communities.

This report was developed for policymakers and practitioners as part of EIIP's commitment to knowledge-sharing and innovation. It examines the role of appropriate technologies in employment-intensive infrastructure development by analysing their effectiveness, sustainability and socio-economic impact. Additionally, the consolidated good practices, lessons learned and case studies presented in this report aim to inform decision-making, strengthen policy frameworks and encourage broader adoption of LRB approaches by the national stakeholders.

With sincere appreciation to our EIIP colleagues for their valuable insights, technical experiences and expertise. This ensures that these demonstrated approaches have been promoted through institutional capacity building in national frameworks. Contributions from an extensive literature review have also helped shape this comprehensive resource.

I encourage policymakers, development practitioners and stakeholders to use this report as a guide for designing and implementing sustainable, inclusive and employment-generating infrastructure projects. Integrating appropriate technologies within LRB approaches not only builds essential infrastructures but also fosters long-term economic resilience and community development.

Mito Tsukamoto

Head of the ILO Employment in Investments Branch (EMPINVEST)

Geneva, January 2026

Acknowledgements

This OSH manual serves as a critical resource to address the safety and well-being of workers engaged in rural road construction and maintenance. By employing local resource -based and employment-intensive methods, rural road projects create much-needed employment opportunities while tackling infrastructure deficits in underdeveloped areas. However, these projects also introduce various occupational hazards, underscoring the need for robust safety measures.

Targeted primarily at clients, consultants, contractors, supervisors, technicians, experts as well as workers and their representatives, the manual provides practical guidance on ensuring safe road construction practices. It offers insights into compliance with labour laws, hazard identification, risk mitigation and the effective use of local resources such as labour, materials and tools.

Drawing upon the EIIP approach, the manual aligns with the organization's Decent Work Agenda. This emphasizes fair wages, social protection and community development, while optimizing local resources to promote sustainable infrastructure development.

Through detailed illustrations, step-by-step methodologies, checklists, hazard and risk identification, the manual equips stakeholders with the knowledge to foster safe, efficient and inclusive practices in rural road construction projects. By addressing the dual challenges of unemployment and workplace safety, it contributes to the broader goals of poverty reduction and sustainable economic development.

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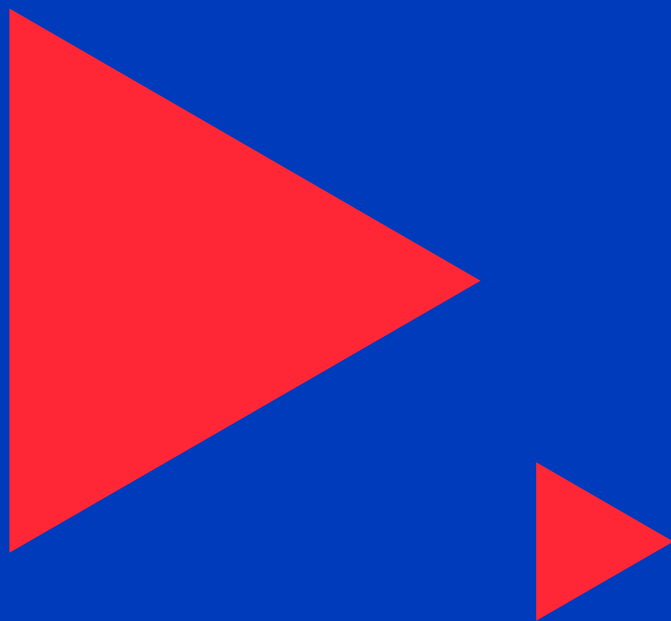
CBRM	Community-based Routine Maintenance
CPR	Cardiopulmonary Resuscitation
EIIP	Employment-Intensive Investment Programme
EI	Employment-intensive
EIC	Employment-intensive Construction
EP	Emergency Preparedness
EU	European Union
HIV	Human Immunodeficiency Virus
ILO	International Labour Organization
ILC	International Labour Conference
LBM	Labour-based Methods
LRB	Local Resource-based
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
PCE	Powered Construction Equipment
RPE	Respiratory Protective Equipment
ROPS	Roll-over Protective Structure
SHP	Safety and Health Plan
WASH	Water, Sanitation and Hygiene

► List of definitions and terminology

Term	Definition
Accident	An unexpected, unplanned or undesired event/exposure that results in injury, death and damage to property.
Benchmarking	The act of measuring the quality of something by comparing it with something else of an accepted standard.
Client	Any private or legal person for whom a project is carried out.
Construction	Building, including excavation, construction, structural alteration, renovation, repair, maintenance (including cleaning and painting) and demolition of all types of buildings or structures. Civil works, including excavation, and construction, structural alteration, repair, maintenance and demolition of airports, docks and harbours. This extends to inland waterways, dams, rivers, avalanches, and sea defence works. Construction also covers roads and highways, railways, bridges, tunnels, viaducts and works related to the provision of related services such as communications, drainage, sewage, water and energy supplies.
Contractor	A person or enterprise providing services to an employer in accordance with national laws and regulations or with agreed specifications, terms and conditions.
Cross-cutting activities	Refers to activities, themes or standards that span and affect multiple areas of focus and are integral to achieving broader organizational goals, such as the Decent Work Agenda.
Competence	Having the necessary skills, knowledge, experience and training to fulfil a given role or task. This applies to both individual and organizational capability.
Conventions	Established rules, standards, or practices that are widely accepted and followed within a particular context or community. Conventions are can also be legally binding international treaties that may be ratified by Member States. In many cases a convention lays down the basic principles to be implemented by ratifying countries.
Continual improvement	The ongoing practice of refining processes, systems and products over time.
Decent Work	Decent Work sums up the aspirations of people in their working lives. It involves establishing opportunities for work that is productive and delivers fair working conditions and wages.
Employer	Any civil or legal person who employs one or more workers at a work place . As the context requires, the employer may be the principal contractor, a contractor or the subcontractor.
Epidemic	A widespread occurrence of an infectious disease in a community at during a particular period.
Ergonomics	The scientific study of people and their working conditions, especially focused with the aim to improve health and effectiveness.
Exposure	Being in contact with a hazard in relation to duration, frequency, health status or protection level, etc.
Falsework (road construction specific)	Falsework is any temporary structure or framework used to support a permanent structure (such as concrete, steel, or masonry) until it is strong enough to support itself.
Formwork (road construction specific)	Mold used to form concrete into structural shapes (beams, columns, slabs, shells) for building. Formwork can be of timber, steel, plastic, or fiberglass.
Hazard	A source or situation with potential to cause injury or ill health.
Health	In relation to work, health indicates not merely the absence of disease or infirmity. It also includes the physical and mental elements affecting health which are directly related to safety and hygiene at work.

Term	Definition
Hoarding (road construction specific)	Construction hoarding is built around a perimeter of a construction worksite in order to conceal it from view and prevent unauthorized access.
International Labour Organization	A specialized agency of the United Nations that brings together governments, employers and workers to promote decent work, social justice and internationally recognized labour rights.
Incident	An unplanned event that has the potential to cause, or actually results in, injury, illness, damage, or loss. This includes near-misses — events where no harm occurred but had the potential to do so.
Infectious disease	Illnesses caused by pathogens such as bacteria, viruses, fungi, or parasites which can be transmitted in workplace environments.
Labour-based	A structured approach and set of work methods in which the use of manual labour (preferably local) is optimized where technically feasible in a cost-effective and timely manner to produce quality results. Appropriate equipment is used to supplement work activities for reasons of cost or quality, for example, for haulage, rock crushing or soil compaction.
Local resource-based	Use of labour force, materials, knowledge and services from local sources, etc.
Metrics	Quantifiable measurements used to evaluate, track and assess the performance, progress, or success of a process, project, organization or system.
Member of the public	Any individual who is not an employee, contractor or official representative of an organization, but may be affected by or interact with its operations, services, or premises.
Occupational injury	Any personal injury, disease or death resulting from a work accident or an occupational disease.
OSH Management System	A set of interrelated and interacting elements that establishes OSH policy and objectives to achieve the system objectives.
Pandemic	A widespread occurrence of an infectious disease over a whole country or the world at a particular time.
Risk	A combination of the likelihood of an occurrence of a hazardous event and the severity of injury or damage to the health of people caused by this event.
Risk assessment	The process of evaluating risks to safety and health arising from hazards at work.
Temporary works (road construction specific)	Parts of the road construction work that allows or enables the construction of protecting, supporting or providing access to the permanent works. Temporary works might or might not remain in place at the completion of road construction, e.g. hoarding, signs, scaffolding, formwork and falsework.
Toolbox Talk (specific to this manual)	A Toolbox Talk is a brief, informal safety meeting to present and discuss specific safety topics or issues within a workplace and is usually held before the start of a work shift. These short, topical meetings facilitate two-way communication between employers and employees, helping to ensure awareness of safety issues and promote safe work practices before work begins.
Vulnerable persons	People who may be unable to take care of themselves or are unable to protect themselves against harm or exploitation.

Part A – Context and premise



1. Introduction

Unemployment and underemployment are a persistent global challenge. The ILO uses employment-intensive investment (EII) and local resource-based (LRB) approaches to tackle unemployment and poverty while improving access to basic infrastructure, i.e., roads, water, sanitation and hygiene (WASH), agricultural and social infrastructure, etc. However, infrastructure construction and maintenance operations, including road works, expose a large labour workforce to many and diverse occupational safety and health hazards and risks.

1.1 Current state of affairs

In 2024, 8.5 per cent of the global population (700 million people) lived in extreme poverty, earning less than USD2.15 per day. Global unemployment reached 4.96 per cent (205 million), with youth unemployment at 15.7 per cent (74.8 million). Decent work deficits persist globally, highlighting the urgency to create over 400 million new jobs in the next decade to reduce unemployment and ensure equitable opportunities for all.

Infrastructure deficits in rural or underdeveloped areas, such as roads, bridges and drainage systems, hinder economic development and limit access to essential services. These challenges are compounded by gender disparities, with women disproportionately carrying out unpaid work or engaging in low-paid and unprotected jobs. Current estimates show that each year an estimated 2.78 million workers die from occupational accidents and work-related diseases while an additional 374 million workers suffer from non-fatal occupational accidents. This means almost 2 million people die from work-related causes each year. Workplace-related

deaths exceed the average annual deaths from road accidents (999,000), war (502,000), violence (563,000) and HIV/AIDS (312,000) (ILO 2023). While specific annual death figures solely on occupational health hazards on rural road construction and maintenance are difficult to pinpoint, it is known that road construction is a high-risk industry with a significant number of fatalities. Globally, nearly 3 million workers die annually from work-related accidents and diseases. Within the construction sector, which includes road work, at least 108,000 workers are killed on-site each year, representing 30 per cent of all fatal injuries.

The ILO addresses these challenges through its Decent Work Agenda which implements a number of global initiatives for employment creation. These initiatives promote opportunities for decent, productive work under conditions of freedom, equity, security and human dignity. Key priorities include job creation, ensuring workers' rights, extending social protection and fostering social dialogue, particularly in rural areas. One of these ILO initiatives is the Employment-Intensive Investment Programme (EIIP).

The EIIP stands out by addressing unemployment, poverty and infrastructure deficits simultaneously. By utilizing locally available resources such as labour, materials and tools, this approach supports sustainable practices, encourages community participation and stimulates social and economic development. Additionally, the ILO promotes investments in infrastructure through public funding to improve community access to essential services while promoting decent work through fair wages, safety and social protection. This integrated approach makes EIIP distinct from the conventional infrastructure methods as it prioritizes both development and worker well-being.

1.2 Challenges to be addressed

Construction work, more specifically rural road construction and maintenance, is prone to higher risk of hazards mainly resulting from the use of inappropriate tools, old or unsafe equipment, operating in crowded workspaces,

working in steep terrain or at height. The high turnover of casual labour results in inadequate safety orientation of workers.

Rural road construction is often associated with a high risk of non-compliance with labour law due to the general lack of awareness on safe, extensive contracting chains, the temporary nature of worksites, remote locations, diversity of the workforce, lack of regulations and guidance and the changing nature of operations at construction sites.

Employment-intensive work places often fall short of adhering to strict safety standards, increasing risks for inexperienced workers. Safety training, especially for first-time employees, is vital to prevent accidents.

The ILO recognizes the magnitude of the risks related to rural road construction and maintenance. It is therefore emphasizing the need for robust safety measures to reduce injuries, deaths and economic losses while safeguarding workers' lives, well-being and livelihoods.

2. About the Manual

This manual is intended to provide OSH guidelines for clients, consultants, contractors, supervisors, technicians, experts as well as workers and their representatives involved in rural roads construction and maintenance.

2.1 Objectives

- ▶ Provide clear and comprehensive OSH guidance on practices for local resource-based rural road construction and maintenance, including easy to use templates and checklists.
- ▶ Set out the alignment of safety standards with national, regional and international OSH requirements for the road sector.
- ▶ Detail identified hazards, risks and corresponding control measures to ensure worker safety and mitigate accidents, injuries and illnesses.
- ▶ Define actionable safety protocols and preventive measures to support safe and sustainable rural road operations.

2.2 Scope and applicability

2.2.1 Scope

This manual covers the use of labour-based methods during the life cycle of road construction, maintenance and repair of rural roads. The scope of the manual includes OSH planning

and management and detailed OSH guidance for common tasks on employment-intensive worksites such as site preparation, earthworks, laying of road materials, installation of drainage systems, concrete works and other associated activities.

2.2.2 Applicability

These OSH guidelines are applicable to local resource-based rural road construction and maintenance across the globe, including:

1. Rural areas addressing the unique challenges of remote, less developed regions.
2. All rural road projects, including construction, rehabilitation, improvement and/or maintenance.
3. All personnel, such as labourers, machine operators, engineers, supervisors and visitors.
4. Every stage of the project, from planning to completion and handover.
5. Activities complying with local, regional and international OSH standards for workforce safety.

3. Global and regional OSH provisions related to the road sector

OSH provisions in the road sector aim to ensure the safety and well-being of workers involved in road construction and maintenance. These provisions are guided by international standards, such as those set by the ILO and regional regulations that address specific hazards and working conditions. The overarching policy and goal of the ILO is to minimize occupational accidents, injuries and diseases by promoting safe working practices, providing adequate training and ensuring proper use of personal protective equipment (PPE).

3.1 International labour standards

International labour standards are guidelines and regulations set by the ILO to establish minimum standards for human rights, workers' rights, working conditions and workplace safety and health globally. These standards cover various aspects of labour, including wages, working hours, health and safety and rights to organize and collectively bargain.

► **Box 1. The five core labour Conventions and one Recommendation**

► **1. Freedom of association and the right to collective bargaining**

Freedom of Association and Protection of the Right to Organize Convention (No. 87), 1948

Right to Organise and Collective Bargaining Convention (No. 98) 1949

► **2. Forced Labour**

Forced Labour Convention (No. 29), 1930

Abolition of Forced Labour Convention (No. 105), 1957

► **3. Child Labour**

Minimum Age Convention (No. 138), 1973

Worst Forms of Child Labour Convention (No. 182), 1999

► **4. Discrimination in Respect of Employment and Occupation**

Equal Remuneration Convention (No. 100), 1951

Discrimination (Employment and Occupation) Convention (No. 111), 1958

► **5. Occupational Safety and Health**

Occupational Safety and Health Convention (No. 155, 1981)

This defines the responsibilities of governments and employers and the rights of workers.

Promotional framework for Occupational Safety and Health Convention (No. 187), 2005 provides concrete measures to develop a national OSH programme.

The Safety and Health in Construction Convention (No. 167), 1988 and its accompanying **Recommendation (No. 175), 1988** provide the global framework OSH in the construction sector aimed at reducing the incidence of accidents, injuries and work-related diseases.

In June 2022, ILO constituents adopted a new resolution to include Occupational Safety and Health (OSH) as one of their Fundamental Principles and Rights at Work during the 110th International Labour Conference (ILC). Thereby, the right to a safe and healthy working environment becomes universal and applies to all workers in all Member States, regardless of the level of economic development. The goal is to ensure fair and humane working conditions worldwide. They are the foundation for developing national labour laws and policies.

3.2 Global safety provisions

Global safety provisions are guided by the ILO. These are practices, frameworks and measures aimed specifically at ensuring workplace safety and health, often based on ILO guidelines and international best practice. Unlike international labour standards, global safety provisions are more focused on practical and technical aspects of workplace safety, such as risk assessments, use of PPE, emergency preparedness and temporary works.

3.3 Regional safety provisions

Safety requirements in construction and specifically for employment-intensive operations vary by region. These differences often stem from local labour laws, cultural practices and economic conditions of a region. For example:

- South Africa is governed by the Occupational Health and Safety Act (OSH Act) of 1993 and the Construction Regulations of 2014.
- In the European Union, the EU Directive on Safety and Health at Work provides a framework for Member States to implement safety measures.
- In Asia, countries like Japan and Singapore have stringent safety regulations, often influenced by ILO standards.
- In Iraq, workplace safety is governed by the Iraqi Labor Law No. 37 of 2015, which includes provisions for accident prevention, disease control and worker training.
- Afghanistan's safety regulations are influenced by its Labour Law, which mandates safe working conditions and the provision of safety equipment.
- In Bangladesh, the Labour Act of 2006 and its subsequent amendments provide the legal framework for occupational safety and health.

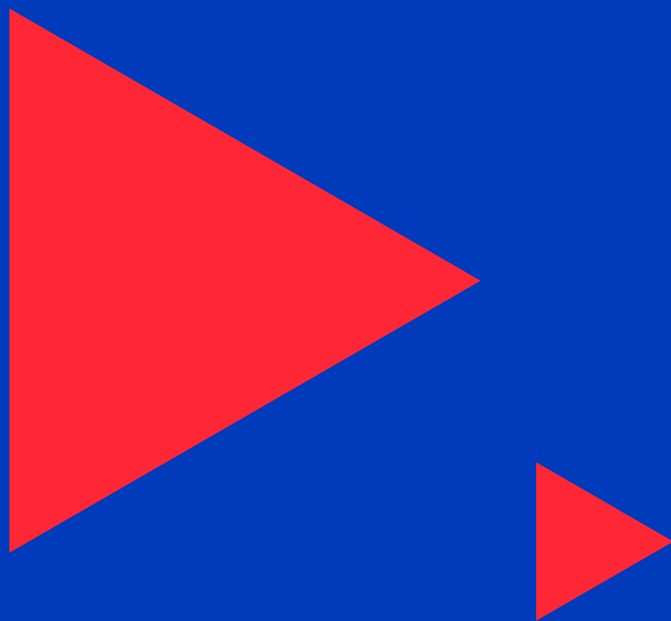
3.4 Best practice in the absence of local laws and regulations

In some countries without specific safety regulations, employers are encouraged to adopt international standards, like those from the ILO, to serve as benchmarks for ensuring worker safety (ILO 2022).¹

1

See also ILO's [On-line resource kit on construction](#).

Part B – OSH management

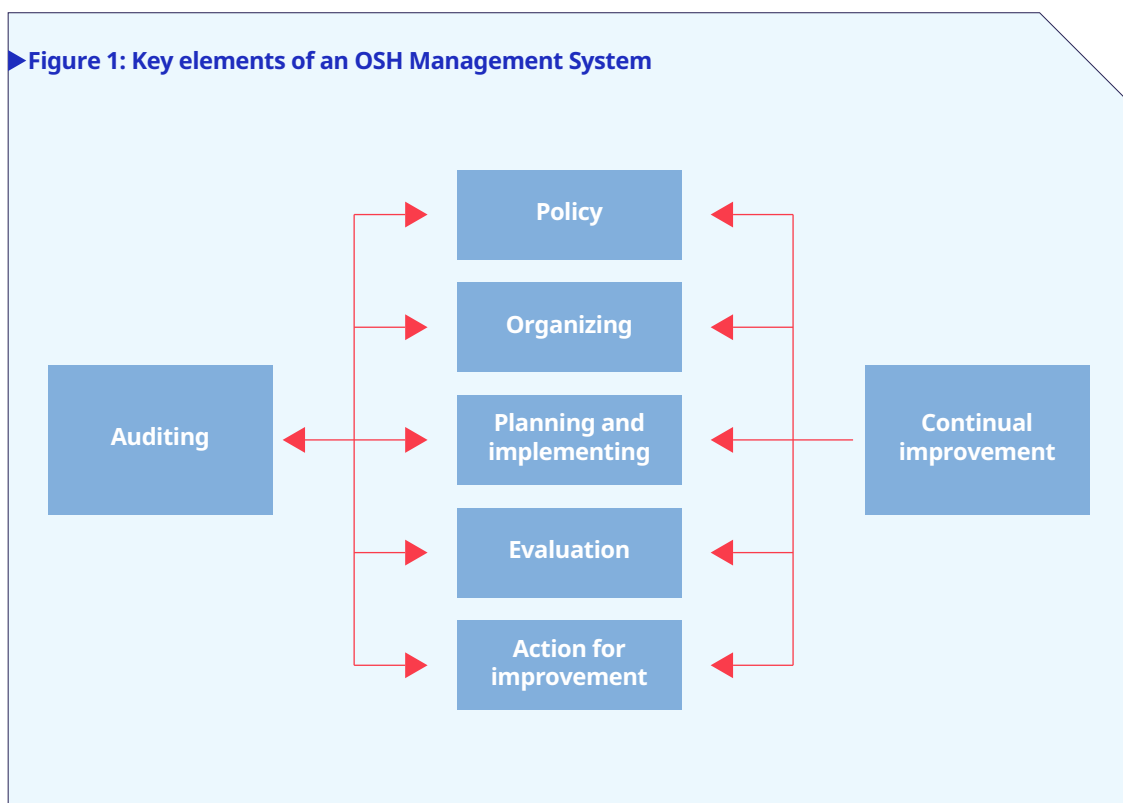


4. OSH management

OSH management is the practice of safeguarding worker well-being by identifying, evaluating and controlling workplace hazards. Effective OSH management ensures compliance with safety regulations and promotes healthy work and employee satisfaction.

The process of improving working conditions on a construction project should be approached in an inclusive and systematic way. This should be done through the implementation of OSH management

systems and whose key elements are presented in figure 1. The systems should be specific to the construction project and appropriate to its size and nature of the activities involved.



4.1 OSH policy

An OSH policy outlines the commitment of an organization to ensure the safety, health and well-being of its employees.

When creating the policy:

- ▶ Involve workers and their representatives in writing the OSH policy.
- ▶ Make sure the policy covers the target sectors in full, in this case the construction project, fitting its size and activities.
- ▶ Write clearly, date it and have it signed by the employer or the top responsible person.
- ▶ Make the policy easily accessible to everyone at their workplace.
- ▶ Regularly review the policy to ensure it remains relevant.
- ▶ Share the policy with relevant external parties when necessary.

Strategic principles and objectives of an OSH policy:

- ▶ Protect the safety and health of all workers by preventing injuries, diseases and incidents.
- ▶ Comply with relevant national laws, voluntary programmes, collective agreements and other requirements related to OSH.
- ▶ Identify common risks, mitigation measures and other OSH provisions. Ensure these measures and provisions are accompanied with a budget.
- ▶ Ensure workers and their representatives are consulted and actively involved in the OSH management system and are aware and committed to the safety policies therein.
- ▶ Continuously monitor and improve the OSH management system's performance.
- ▶ Ensure financial protection and support for workers in the case of workplace injury or illness by incorporating provisions for insurance policies (e.g. Workmen's Compensation).



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A template for an OSH Policy is provided in Annex 1.

4.2 Organizational set up for OSH

Leaders must demonstrate their commitment to safety and health and clearly define who is responsible for safety tasks at all levels.

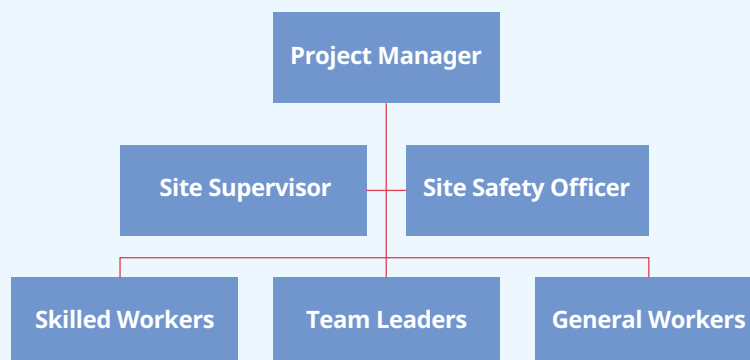
The use of an organigram could be helpful in illustrating the hierarchy and roles on the worksite, such as project managers, supervisors, safety officers, skilled labourers, team leaders and general workers. Establishing OSH committees also helps to ensure safety responsibilities are shared and maintained across all levels of workers and management.

On employment-intensive projects, for example, the organigram can help to organize workers into functional or task-specific groups, such as excavation, material handling or masonry.



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► **Figure 2: Example of an organizational organigram**



4.2.1 Roles and responsibilities

Table 1 presents a list of the key responsibilities of known roles in road construction projects.

►Table 1: Roles and Responsibilities	
Roles	Responsibilities
Government Agency	• <i>National Government:</i> Establishes health and safety regulations and standards for road construction and maintenance and provides oversight to ensure compliance. • <i>Local Government:</i> Implements health and safety policies and bylaws at the local level, conducts inspections and enforces regulations.
Client	• Initiation of the project, that is, defining the project scope, objectives and budget. • Design of the road project and integrating the OSH measures into the design and planning process. • Secure and allocate funds for the project and approve budgets for necessary safety introducing measures like PPE, training and medical support. • Select and manage the contractors and consultants. • Provide all preconstruction information like site specific risks and specify OSH requirements (safety specifications) in the project's scope of work to all contractors who will be bidding for the project. • Ensure that project staff and qualified safety personnel, such as safety officers or consultants, are involved in drafting and reviewing safety specifications. • During the tender process, the client ensures that contractors include comprehensive safety plans in their submissions and evaluates these plans thoroughly. • Ensure the project and all related parties align and comply with local laws, regulations and international standards, such as ILO Conventions, through audits or regular reviews. • Monitor compliance with contractual health and safety provisions and principles of decent work. • Build stakeholder engagement that includes liaising with local communities and other stakeholders.
Contractor	• Develop and implement site-specific health and safety plans. • Execute the construction work as per the project plan. • Manage labour, materials and equipment. • Provide adequate and competent supervision of work while ensuring adherence to principles of decent work. • Ensure safety, health and welfare at work of all its employees and anyone who is affected by its activities. • Conduct a risk assessment for all construction activities. • Provide and maintain safe workplaces, tools and machinery. • Provide first aid, training and welfare facilities for workers. • Organize construction work to minimize accident or injury risks. • Ensure the safety of workers and nearby individuals. • Ensures all workers are trained in safety procedures and that all personnel (including managers, supervisors and workers) are competent to conduct their allocated tasks (or fulfil their duties). • Provide and enforce the use of personal protective equipment (PPE). • Conduct regular safety inspections and audits. • Investigate occupational accidents, near misses, illnesses and incidents.
Project Managers	• Oversee the implementation of health and safety plans. • Ensure that safety measures are in place and that workers are following protocols.
Engineers and technicians	• Provide expertise in the planning and design of the road project and integrate the safety and health measures. • Aim to prevent risks before, during and after construction. • If risks can't be eliminated, take steps to reduce or control them by choosing safer options, and organize work to minimize hazard exposure. • Ensure those responsible for planning and managing work are provided with appropriate information they need to manage the risks.

Roles	Responsibilities
Health and Safety Officers	• Monitor daily operations to ensure compliance with safety regulations. • Conduct safety briefings and training sessions. • Supervise and monitor the implementation of OSH guidelines, policy and plans. • Inspect the site to ensure it is a hazard free environment. • Ensure that sub-contractors and all persons working on the site are aware of the safety and health policy and plans set in the contract. • Along with the engineer carry out weekly inspections and complete the inspection checklists. • Prepare detailed report of the accidents, incidents and near misses submit to management or concerned authorities if requested or mandated by the law. • Coordinate with the sub-contractors and engineers on the preparation of risk assessments. • Conduct Toolbox Talks, training programmes arrange and conduct trainings and keep records. • Attend site safety committee meeting and act as liaison between the committee and the workers.
Workers	• Follow safety rules and policies. • Take care of their own and other's safety. • Report potential risks and incidents immediately. • Properly use and care for provided PPE; and not misuse or destroy anything provided to them for their safety. • Attend regular safety and health meetings. • Workers have the right to refuse dangerous work without fear of reprisal.

4.2.2 Appointments and role clarification

The ILO emphasizes the importance of appointing competent personnel to ensure safety and health on construction sites. While specific appointments may vary by national regulation, the ILO's Safety and Health in Construction Convention, 1988 (No. 167) and the Revised Code of Practice on Safety and Health in Construction (ILO 2022a) highlight key roles and responsibilities:

- **Safety Officers:** Appoint qualified individuals to oversee OSH measures, conduct risk assessments and ensure compliance with safety protocols.
- **Supervisors:** Assign supervisors to monitor daily activities, enforce safety standards and provide guidance to workers.
- **Health personnel, e.g. first aiders:** Ensure access to medical personnel or first aid providers to address health emergencies on-site.
- **Workers' representatives:** Facilitate the appointment of workers' representatives to collaborate with employers on safety and health matters.
- **Training coordinators:** Designate individuals responsible for organizing safety training and awareness programmes for workers.

These appointments aim to foster a preventative safety culture and ensure accountability in managing risks. Officers appointed to coordinate OSH measures onsite, irrespective of position, seniority should have wide ranging powers to enforce OSH compliance.

Where clients or authorities do not enforce safety measures, contractors can adopt proactive steps to maintain safety on construction sites:

- Implement OSH measures based on international standards such as the ILO's Safety and Health in Construction Convention (No. 167) and Revised Code of Practice (2022).
- Develop an internal safety and health plan that includes risk assessments, PPE requirements and training programmes.
- Assign competent personnel, such as Safety Officers and Supervisors, to oversee and enforce safety protocols.
- Train workers on safety practices and involve workers' representatives in identifying risks.
- Establish reporting systems for incidents and regular audits, adopt best practices from international guidelines.

4.3 OSH planning

4.3.1 Feasibility, design and tender stage

During the feasibility and design stages of the project cycle, OSH requirements focus on proactively integrating safety measures into every phase to ensure a safe and efficient working environment:

Initiation Phase:

The client or project owner identifies potential hazards early in the project by conducting risk assessments and establishing clear safety goals. This includes addressing hazards, control measures, emergency plans, PPE needs and developing training and safety protocols.

Planning/Design Phase: The Design Team/Engineer considers the methods and materials which may be used for construction specifically considering safety. While labour enhancement during rural works is important, the designer will consider the risks to such employees when conducting such activities. The designer will consider the necessary measures to limit risk including but not limited to PPE.

Tender Phase:

The project designer prepares detailed OSH specifications for tender documents, ensuring compliance with local laws and standards as well as international standards and best practices.

The client or project owner allocates a safety and health budget covering training, equipment, workers welfare, compliance audits, insurance for injury or death and unforeseen safety-related adjustments. They would also integrate safety costs into the bill of quantities to prioritize a safe work environment from the beginning.

Local authorities and community leaders are mobilized and consulted to secure local participation during planning to address land issues, religious grounds and community concerns.

The procurement team evaluates tender submissions for compliance with OSH requirements and the inclusion of Safety and Health Plans. Contractors must demonstrate regulatory compliance. Prioritize contractors with a strong safety record to ensure alignment with project safety goals. Specific OSH provisions may be discussed during the pre-tender meeting and site visit.

Execution Phase:

The Contractor or Site Manager mobilizes adequate safety personnel, briefs all workers on OSH requirements and implements and monitors the safety measures designed in earlier phases and during the project execution to ensure adherence to OSH standards. The Client monitors overall compliance with contractual and legal provisions.

4.3.2 Risk assessment

A risk assessment is a process that evaluates the risks to a person's safety and health arising from hazards at work.

A risk assessment for construction work should be carried out at different points during the construction project such as:

- ▶ At the start of any construction project, no matter the size - a risk assessment must be carried out even if the project under consideration is relatively small.
- ▶ When new tools or equipment are added to a construction site.
- ▶ The first point before the project begins or during the design.
- ▶ The second point being any time a new process or method is introduced.
- ▶ The third point being if a new hazard is identified that may have been missed in the initial assessment.
- ▶ If there are any high-risk activities such as working at height or working with hazardous substances.

► **Figure 3: Steps of a risk assessment**

The risk assessment typically involves five steps:

Step 1: Identify hazards and why these are present



Step 2: Identify who might be harmed and how



Step 3: Evaluate risks: Identify and decide on the safety and health risk control measures



Step 4: Record who is responsible for implementing which control measures and the timeframe



Step 5: Monitor and review the risk assessment and update when necessary



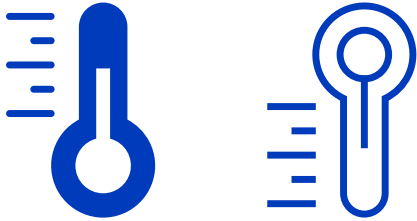
A **hazard** is a source or situation with a potential to cause injury or ill health.

4.3.2.1 Hazard identification

Identifying hazards is the first step in the risk management process. Hazards can be broadly categorized into the following types, summarised from the HIRA matrix attached in Annex 10.

These are further summarized from the HIRA matrix attached in Annex 10.

►Table 2: Types of hazards and risks

Physical hazards: are environmental factors that can cause harm to workers.	
Noise: Prolonged exposure to high levels of noise can lead to hearing loss and stress.	 ©Marcus MoonWater/Flickr
Vibration: Vibration from tools or machinery can cause injuries such as Hand-Arm Vibration Syndrome (HAVS).	 ©zstern/Flickr
Radiation: Exposure to excessive ionizing radiation (e.g. X-rays) or non-ion light) can lead to serious health issues, including cancer.	 ©computerligator/Flickr
Temperature extremes: Working in very hot or cold conditions can result in heat stress, hypothermia, or other temperature-related illnesses.	 ©Jen/Flickr

Physical hazards: are environmental factors that can cause harm to workers.

Slip, trip and fall hazards – same level: Uneven or slippery surfaces and poor housekeeping on a site can lead to slipping, tripping and falling resulting in injuries.



©haberlea/Flickr

Fall from height: When working at height, injuries can occur on scaffolds, ladders roofs, working in very steep terrain or even ground.



©Claire Gibbs/Flickr

Electrical hazards: Electrical hazards are dangerous conditions that can cause electric shock, burns, fires and explosions.



©Leonel Richard/Flickr

Dangerous wildlife and insects: Wildlife (venomous snakes or aggressive mammals) and insects (e.g. mosquitoes, ticks and spiders) pose a significant hazard as encounters can lead to animal attacks, injuries allergic reactions, or transmission of diseases.



©SippakornYamkasikorn/Pexels

Physical hazards: are environmental factors that can cause harm to workers.

Unexploded ordnance (UXO) and landmines: Can be found in areas with past military activity or conflicts, or serious regions where explosive devices were used but not fully cleared. They pose a risk of injury or fatality.



©David Birozy /Unplash

Community unrest or local conflict: Caused by disputes and conflicts, improper communication, historical tensions, posing risks to personnel safety, equipment and project timelines.



©Isaac Billy/Flickr

Landslides/Falling rocks: Can be caused by heavy rainfall, seismic activity, soil erosion, excavation or deforestation near slopes, pose risks of injury, equipment damage and project disruptions.



©control.cancel/Flickr

Traffic hazards: Vehicle collisions resulting in injury or fatality.



©Accident & Injury Chiropractic Pleasant Grove/Flickr

Physical hazards: are environmental factors that can cause harm to workers.

Contact with machinery/moving parts: Contact can potentially cause injuries such as cuts, entanglement, or crushing.



©Michael Neal/Flickr

Chemical Hazards: Chemical hazards arise from exposure to hazardous substances that can cause acute or chronic health effects. These include:

Toxic substances: Chemicals that can cause poisoning, respiratory issues, skin irritation, or other health effects upon exposure (e.g. asbestos, lead, benzene).



©Gary/Flickr

Flammable substances: Chemicals that can ignite easily and cause fires or explosions (e.g. gasoline, acetylene or hydrogen).



©Rie Louise/Flickr

Corrosive substances: Chemicals that can cause burns or destroy tissue upon contact (e.g. sulfuric acid, sodium hydroxide).



©Graciela Blaum/Flickr

Chemical Hazards: Chemical hazards arise from exposure to hazardous substances that can cause acute or chronic health effects. These include:

Reactive substances: Chemicals that can undergo dangerous reactions, such as violent explosions or toxic gas release, when exposed to certain conditions (e.g. reactive metals, peroxides).



©torino271/Flickr

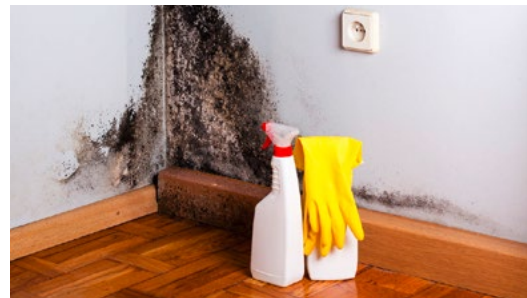
Biological Hazards: Biological hazards are related to exposure to harmful biological agents that can cause infections allergic reactions, or diseases. These include:

Bacteria and viruses: Pathogens that can cause illnesses such as tuberculosis, influenza, or COVID-19.



©Monstera Production/Pexels

Fungi and molds: Microorganisms that can cause respiratory issues, allergic reactions, or skin infections.



©Clean First/Flickr

Bloodborne pathogens: Infectious agents that can be transmitted through contact with blood or bodily fluids (e.g. HIV, Hepatitis B and C).



©ecko380/Flickr

Ergonomic Hazards: Ergonomic hazards arise from poor workplace design, repetitive motions, or improper work practices. They can lead to musculoskeletal disorders (MSDs) and other injuries. Examples include:

Repetitive motion: Tasks that require repeated movements, such as digging can lead to conditions like muscle strain and back pain.



©Michael Tolich/Flickr

Poor posture: Working in awkward positions for extended periods can cause back pain, neck strain and other ergonomic issues.



©roxskulet/Flickr

Work in close proximity: Working in close proximity can lead to awkward postures or injury due to restricted spaces.



©LAFD/Flickr

Manual handling: Heavy lifting, pushing, or carrying heavy objects can lead to injuries such as strains, sprains and hernias.



©mackinconsultancy/Flickr

Psychosocial hazards: Psychosocial hazards are related to the psychological and social aspects of the workplace. These hazards can affect workers' mental health and well-being. Examples include:

Workplace stress: High job demands, long working hours and lack of control over work can contribute to stress anxiety and burnout.



©Amanda Hittle/Flickr

Harassment and bullying: Negative behaviours such as harassment, bullying, or discrimination can lead to psychological harm and reduced job satisfaction.



©Terra Nova/Flickr

Workplace violence: Acts of physical or verbal aggression in the workplace can result in injury, trauma or fear among workers.



©Andrea Piacquadio/Pexels

4.3.2.2 Risk analysis and matrix

Risk assessment is the process of evaluating the potential risks associated with identified hazards and determining appropriate control measures.

Organizations often use a risk matrix to categorize risks as low, medium, or high. It is a simple tool used to categorize risks based on their likelihood and severity and helps prioritize risks for action, with high-likelihood, high-severity risks requiring immediate attention.

► Box 2: Risk, severity and likelihood

Risk = severity X likelihood

Likelihood: The extent of how likely it is for the risk to occur. The 5 risk rating levels under this component are as follows:

1. Very unlikely – Rare / not expected but remotely possible
2. Unlikely – Improbable but could happen / not expected
3. Possible – Could happen or plausible
4. Likely – Will probably happen / is likely to happen
5. Certain – 100% likely / almost 100% likely

Severity: The potential impact or consequences of the hazard, should it occur.

1. Negligible– Minimal injuries / no injuries
2. Minor – can cause injuries or illnesses, only to a mild extent
3. Significant – moderate injuries or illnesses that may require medical attention

► **Table 3: Risk Matrix**

Consequences					
Likelihood	Negligible (1) Minimal injuries / no injuries	Minor (2) Minor injuries / first aid	Significant (3) Moderate injuries / medical treatment	Severe (4) Sers injuries / hospitalization	Catastrophic (5) Death / permanent impairment
Certain (5) 100% likely / almost 100% likely	Moderate (5)	High (10)	High (15)	Catastrophic (20)	Catastrophic (25)
Likely (4) Will probably happen / is likely to happen	Moderate (4)	Moderate (8)	High (12)	Catastrophic (16)	Catastrophic (20)
Possible (3) Could happen or plausible	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
Unlikely (2) Improbable but could happen / not expected	Low (2)	Moderate (4)	Moderate (6)	Moderate (8)	High (10)
Very Unlikely (1) Rare / not expected but remotely possible	Low (1)	Low (2)	Low (3)	Moderate (4)	Moderate (5)
Score	Priority	Action			
1 to 3	Low	Low risk identified - control measures to be adopted and monitored			
4 to 9	Moderate	Medium risk identified – further controls may be required			
10 to 15	High	High risk identified – develop or determine further controls			
16 to 25	Catastrophic	Catastrophic risk identified – stop work / or develop/determine further controls			

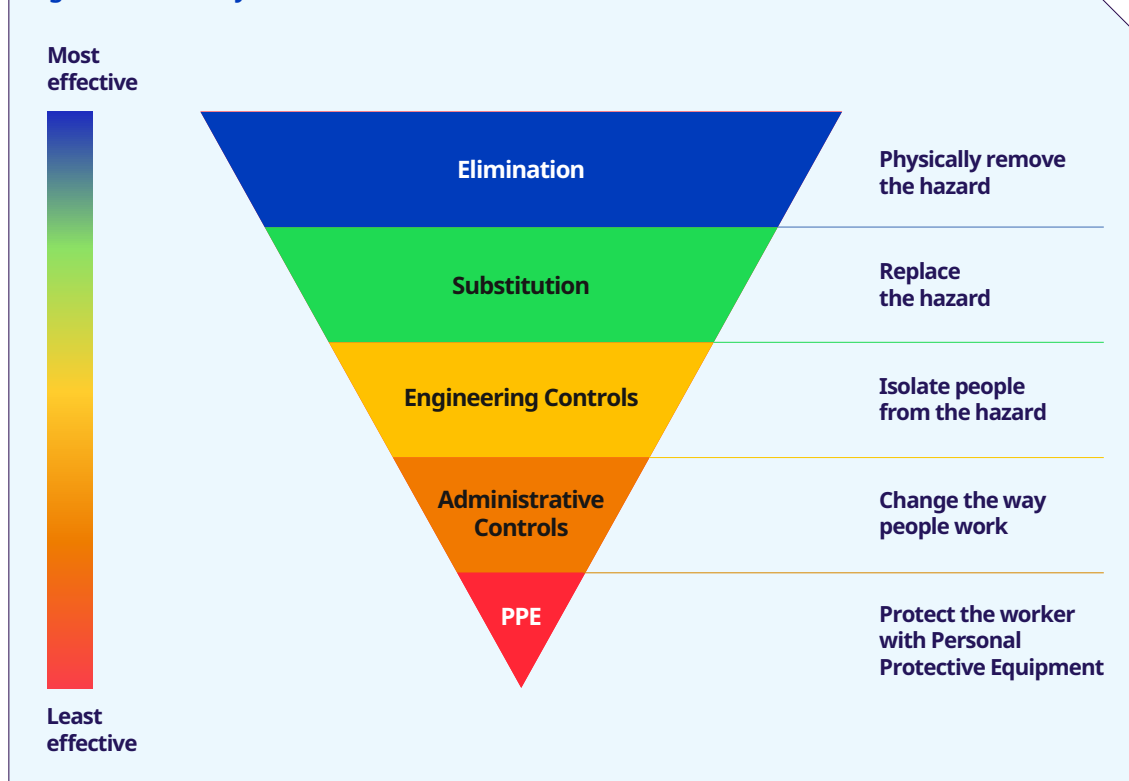
4.3.2.3 Risk Control

After assessing the risks, the next step is to determine appropriate control measures to mitigate or eliminate the risks. Risk assessments need to take account of gender issues, differences and inequalities by involving all workers, both men and women at all stages of the assessment. For example, women and men suffer different types of accidents at different rates in the workplace and are strongly related to job and task segregation.

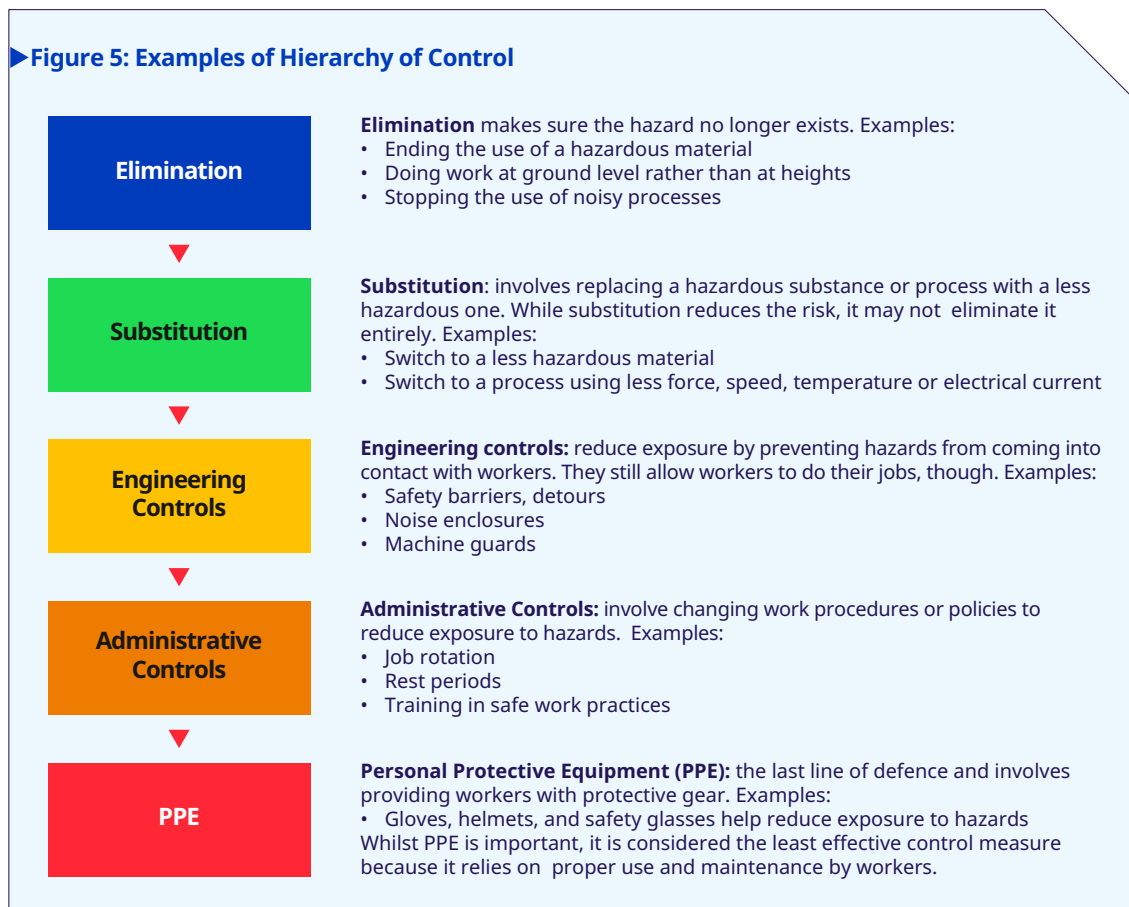
Any risk control measure should also include individual elements such as gender and worker's ability (e.g. workers with disabilities or vulnerable workers). Further guidance on these issues can be found in the ILO working paper *Guidelines for Gender Mainstreaming in Occupational Safety and Health* (ILO 2013a).

The hierarchy of controls should be used to prioritize control measures, starting with the most effective (elimination) and working down to the least.

► **Figure 4: Hierarchy of controls**



► **Figure 5: Examples of Hierarchy of Control**



4.3.2.4 Monitoring, recording of findings and review

A risk assessment is not a one-time activity; it requires ongoing monitoring and review. After control measures are implemented, their effectiveness should be monitored and the risk assessment should be reviewed regularly or

whenever there are changes introduced into the workplace (e.g. new equipment, new processes). It is also important to record and display the findings, writing down what assessors have identified and decided. This record should be made available to workers, supervisors and labour inspectors.

A template for conducting task-based risk assessments (as needed) is provided in Annex 7.

A baseline risk assessment for labour-based rural road operations can be found in Annex 10. However, this risk assessment should be adapted to local conditions.

4.4 OSH implementation

4.4.1 Safety and Health Plan (SHP)

In rural road construction a comprehensive site safety and health plan (SHP) is crucial to ensure the well-being of all personnel. This plan should include risk assessments specific to the challenges of remote locations, protocols for managing emergencies such as equipment accidents or health incidents and access to first-aid kits, trained personnel and emergency evacuation procedures. Provisions for health and welfare, regular health check-ups for workers and strict adherence to hygiene standards must also be emphasized. Additionally, clear communication channels should be established to promptly address safety concerns and implement corrective actions. The plan is normally prepared by the Contractor or the Project manager.

4.4.2 Safety training and awareness

Safety training for employment-intensive rural road workers is essential to prevent injuries and ensure smooth project execution. Workers must understand site rules and safety procedures before starting.

Training should be free, provided during work hours if possible and prioritize worker well-being.

4.4.2.1 Site-specific induction training

Contractors must ensure that all workers are given proper site-specific induction in OSH prior to starting work. The initial site-specific induction should be followed by ongoing refreshers and safety Toolbox Talks.

Induction training should be relevant and practical for the unique needs of the organization and any new employees. It should include topics like company policies and safety protocols. Training would need to be tailored for each specific situation.

4.4.2.2 Toolbox Talks: Talking about safety

Toolbox talks are an excellent way to keep safety at the forefront of everyone's minds. These short, focused safety meetings are usually held at the job site before work begins.

Toolbox talks should be given by the safety officer or site supervisor. They should take no more than 10 to 15 minutes and can be used to introduce a new activity or to discuss generic health and safety issues. Toolbox Talks must be conducted daily, prior to beginning work and should encourage worker participation and teamwork.

An example of a simple toolbox talk is provided in Annex 6.

► **Box 3: How to conduct effective toolbox talks:**

- **Frequency and timing:** Hold toolbox talks regularly, ideally at the start of each workday or shift.
- **Relevant topics:** Choose topics that are relevant to the tasks at hand or current safety concerns. Examples include: **Safe use of machinery** and hand tools; Proper lifting techniques; Trenching; Personal protective equipment (PPE) usage; Hazard identification and reporting; Ladder safety; Extreme weather conditions e.g. heat stress and cold stress; Working with bitumen; Working at heights
- **Preparation:** Prepare in advance, ensuring you have all the necessary materials and information to discuss the topic thoroughly.
- **Engagement:** Encourage participation from all team members. Ask questions, solicit feedback, and share personal experiences to make the talk more engaging.
- **Clarity:** Keep the talk clear and concise. Use simple language and avoid jargon to ensure everyone understands the message.
- **Visual aids:** Use visual aids such as posters, diagrams, or even demonstrations to reinforce the topic.
- **Follow-up:** After the talk, follow up to ensure that the key points are being implemented on the worksite. Address any concerns or questions that arise.

4.4.2.3 Specialized safety training

Specialized safety training is essential for tasks that require specific skills and knowledge. This training helps ensure that employees are well-prepared to handle unique risks and challenges associated with their work. Box 4 presents some areas where specialized training might be necessary.

► **Box 4: Some areas where specialized safety training might be necessary**

- Training on the use of machinery like pedestrian rollers, concrete mixers, chainsaws and lifting equipment.
- Guidance on handling, storing and disposing of hazardous materials safely (e.g. chemicals, cement, fuels), including spill response and cleanup.
- Specialized training for working at height, focusing on fall protection and rescue techniques.
- First aid and CPR to prepare employees for responding to medical emergencies.
- Ergonomic training to prevent injuries caused by heavy lifting or repetitive tasks.
- Traffic management around roadworks, involving proper use of signs, cones and barriers.

►Figure 6: Image showing specialized training



©COMSEVENTHFLT/Flickr

Any form of training carried out should be recorded with signed attendance records. Site specific training shall be conducted by worksite management and/or an authorized representative or training provider.

4.4.2.4 Gender inclusivity in training

Incorporating gender inclusivity into training fosters equity and support in the workplace. Programmes should enhance women's skills in construction while promoting equality

and emphasising zero tolerance for sexual harassment. Key strategies include:

- Ensuring accessible sessions with equal participation opportunities for all.
- Using inclusive materials addressing gender-specific challenges and avoiding stereotypes.
- Featuring female trainers and role models to inspire diversity and leadership.
- Providing bias and gender-stereotype training to encourage equality.

►Figure 7: Image showing gender inclusive training



©Addressing RMNCH issues in Sierra Leone/Flickr

4.4.2.5 Competency assessments

Competency assessments check if workers have the skills and knowledge to do their jobs safely and well. Key point for conducting competency assessments are below.

Set clear parameters for what skills are needed for each job.

- ▶ Watch workers do tasks to assess their skills and knowledge of safety practices during induction and after training.
- ▶ Use scenarios to see how workers solve problems and handle emergencies.
- ▶ Ask structured questions to understand their knowledge of the job.
- ▶ Get feedback from supervisors and co-workers on their performance.

Keep records of results to track progress and plan training if needed. Keep results confidential and use them to enhance safety and performance.

Note: If young people are employed on a worksite, it is important to note that they will need clear and sufficient instruction, training and supervision in order that they understand the importance of health and safety and can work without putting themselves and other people at risk. Understandably, they may need more supervision than more experienced workers.

4.4.2.6 Continuous professional development

Continuous Professional Development (CPD) helps employees keep their skills and knowledge up to date for safe and effective work. Ways to promote CPD are listed below.

- ▶ Offer regular training on new tools, safety and best practices.
- ▶ Encourage employees to earn relevant certifications.
- ▶ Set up mentorship programmes for guidance and support.
- ▶ Promote learning different roles through cross-training.
- ▶ Create a culture that values growth and learning.

4.5 Operational planning and control

Operational planning and control in employment-intensive activities focuses on managing and responding to the unique challenges and dynamics of labour-intensive projects. These activities often require a large workforce and involve manual unskilled labour in activities such as construction and road maintenance.

4.5.1 Health, welfare and worksite camp provisions

Health, welfare and site camp provisions for rural road operations typically focus on ensuring the safety and well-being of workers involved in the construction and maintenance of rural roads. Before construction commences, a site camp may need to be set up to accommodate the supervisors, workers, materials, tools and equipment. Where required, the site camp needs careful planning to provide basic comfort adequate storage, sanitation and waste management and security for equipment and materials.

The decision to establish a site camp would, however, depend on the specific needs of the project, the location and the available resources, e.g. remote locations, long-term projects a large workforce or emergency situations. The size of the site camp would depend on the kind of work to be undertaken and on how many people need to be housed onsite. The site camp may also need to move along with the road construction as it progresses, depending on the distance or activity. It is important to ensure minimal environmental impact of the site camp. In employment-intensive projects, the provision of welfare and site camp facilities should be based on factors as discussed below:

► **Box 5: Provision of welfare and site facilities for employment-intensive projects**

A. Project duration:

- Short-term Projects (a few days to a couple of weeks): Provide basic amenities like potable water, sanitation and first aid.
- Medium-term projects (several weeks to a few months): Include facilities such as temporary shelters, dining areas and shaded rest zones to the basic amenities.
- Long-term projects (several months or years): Include full welfare facilities, housing, healthcare, recreation and training.

B. Project location:

- Remote Areas: There may be limited access to basic amenities, so it is essential to establish full facilities (housing, food, healthcare, communication) early.
- Rural Areas: In locations closer to rural communities, use available local amenities but ensure all essential needs are met.

C. Workforce composition:

- Larger migrant/temporary workforces need more extensive facilities, including gender-specific ones if necessary.

D. Local regulations:

- Follow local labour laws that often sets minimum welfare standards based on the nature and scale of the project.

E. Environmental conditions:

- Provide extra facilities like cooling/heating, shelters and protective gear in extreme weather.

By considering these factors, one can ensure that facilities are provided appropriately.

Table 4 below provides further guidance on the requirements that need to be considered.

►Table 4: Guidance on health , welfare and camp provisions

Health, welfare and camp provisions to consider	Requirements
1. Example of a camp for workers  ©watermelon watermelon/Flickr	• Choose a location away from the roadside to minimize the risk of accidents. • Campsites should be within walking distance of the worksite, where possible. If not, free transport must be provided to ensure workers can travel conveniently to and from the worksite. • Site is to be large enough to contain stores, site office and if necessary, staff accommodation including sanitation facilities. • Camps for major structural works (drifts, bridges) should be next to the site to avoid hauling construction materials. • Camps should preferably be located away from villages and market centres but not so far as to cause unnecessary problems with the purchase of food, etc. • The camps should be accessible to project vehicles. • Camps must be constructed with resistant materials to ensure protection against ensures resistance from earthquakes, tropical cyclones, floods and other natural hazards. • The camp must be established on a stable foundation above potential flood level 5, well drained and should not pollute public water supply and waterbodies. • The site should be located at a safe distance from rivers, lakes, or other water bodies to prevent contamination of the water source and to protect against flooding risks during heavy rains. • The camp must be levelled, the courtyard and pathways paved, well-lit and accessible by road and maintained in a clean and sanitary condition free from waste. • The camp must be fenced and secured with a boundary wall or barbed wire and guarded. • The camp area should be restored to its original state after the work is completed.
2. Camp management  ©Mikael Blomkvist/pexels	• A camp supervisor must be appointed to monitor all activities within the camp and be responsible for maintaining the hygiene, safety and fire standards within the camp. • The camp supervisor is responsible for immediately reporting any outbreak of illnesses such as but not limited to food poisoning or an unusual prevalence of any illness such as fever, diarrhoea, vomiting, jaundice, typhoid or any other communicable disease. • Oil and fuel contaminated soil must be removed, transported and buried in preapproved waste disposal areas; soak pits and septic tanks must be covered and effectively sealed off. • The Contractor shall execute all works to restore the site and clear the land of any debris or waste or hand over the land back to the community/owner without any nuisance.

Health, welfare and camp provisions to consider	Requirements
3. Safe drinking water - Provide safe, easily accessible drinking water for all workers, especially in hot environments, to prevent dehydration and illness from contaminated water. Locate water facilities conveniently to save time. - Alcohol is prohibited during onsite working hours.  ©Ice Family/Unsplash	- Place drinking water facilities in convenient accessible locations. - Where water is supplied to the site, ensure the vendor is suitable and the water provided is regularly tested, properly stored and transported to maintain quality. - Ensure that the drinking water is clean and hygienic. Boil water from public water supply systems and filter rainwater and underground water. Drinking water should be boiled for at least one (1) minute, kept in a clean, closed bottle or container and in a cool or shaded place. - Provide hot drinks for workers working in a cold environment. - Keep the water containers in cool, safe and hygienic places. The water in the container must be changed frequently. - Keep drinking water away from animals, rodents and pests as well as from chemical sources at the construction site to prevent contamination. - Use clean, separate cups for workers. Wash them regularly and store in a clean place. - Clean containers or filters frequently.
4. Toilets and washing facilities - Provide clean, separate male and female toilets and washing facilities near the work area, ensuring special attention to the needs of female workers and people with Disabilities. - Washing facilities are crucial for hygiene, especially after handling chemicals, to prevent skin issues and contamination while eating.  ©Bruno Cervera/pexels	- Build toilet facilities or use moveable temporary facilities easily accessible to all workers on different parts of the site. - It is recommended that provision is made for at least one toilet per 15 workers, including separate facilities for men, women and people with disabilities. - Ensure sanitary disposal bins are available and emptied regularly. - Keep toilets clean and equipped with a water container, soap, toilet paper and a bin with a lid. Clean daily. - Promote handwashing with water and soap especially after using the toilets. Use visual instructions where necessary. - Ensure that training venues or facilities also take into consideration separate male and female toilets. - Contractors must ensure that the waterbodies and or the vicinity around the camp does not get polluted. - Implement proper wastewater treatment to maintain hygiene.
5. Provide eating and resting areas for workers Worksites should provide ample time and space for workers to eat, drink and rest safely. Clean eating areas away from work zones help avoid exposure to dirt, dust and hazardous substances, ensuring comfort and productivity.  ©ILO/Flickr	- Provide meal areas separate from the workstations that include a space where workers can prepare drinks or heat their food. - Plan for a rest area near the working areas with water facilities, shade as well as a table and chairs, for workers to sit and relax. - Identify any need for other welfare facilities such as lockers with keys, parking areas for bicycles and motorcycles, or simple recreational facilities. - Rest areas should incorporate shade for hot and sunny conditions, warm areas for working under cold conditions and drying facilities for wet clothing.

Health, welfare and camp provisions to consider	Requirements
6. Provide comfortable accommodation facilities for workers It is important to provide appropriate and comfortable accommodation facilities for those workers who need to stay overnight on the road construction site. They must be able to rest and recuperate in comfort to after the end of each workday. As a result, they will be more likely to work safely and increase their productivity on the following day. As a general rule workers on an employment-intensive worksite should be stay at their homes and adequate transport (to and from the worksite) should be provided for them.  ©Jackson Wilson/Unsplash	• Accommodation facilities should be offered to workers who have to travel far from the site. • Provide separate accommodations for different groups, considering social security. • Ensure separate locations for men and women. Separate arrangements must be provided for female workers and workers with spouses and or families. Hygienic and well-equipped sanitary facilities, including showers, should be integrated into the accommodation facilities. • Accommodation facilities should be located in an area within or close to the construction site, thus allowing the workers to rest. They should also be near to — and have covered access to — the sanitary facilities. • Design these accommodation facilities to ensure good hygienic conditions and sufficient space for each worker. • Provide adequate natural ventilation and a good source of illumination from the windows. • Artificial illumination, preferably electric, should also be provided. • Contractors must ensure that the structure built to accommodate workers has considered the number of workers adequately and provided appropriate minimum space for each worker. • Providing comfortable meal areas for eating, separate from the workplace, helps to refresh workers.
7. Ensure that first aid facilities are available Injuries on construction sites are inevitable; therefore, it is crucial for construction sites to be prepared for such eventualities. Providing easily accessible first-aid kits is essential, along with ensuring at least one worker on-site is trained in first aid. The purpose of first-aid facilities is to save lives during critical moments after an accident, prevent further harm and support recovery.  ©Mathurin NAPOLY / matnapo/Unsplash	• Prepare a written first-aid procedure, detailing the arrangements to ensure that workers are assisted quickly in the event of an accident or illness. • Provide first-aid kits/boxes with clear instructions. • Portable first-aid kits should also be available. • Train first-aid personnel (rescuers). The number of personnel trained should be based on the premise that any worker on the site should be able to receive help without delay. • Post a list of emergency telephone numbers in a place that is accessible and visible to all workers (posting this list in different places is recommended).

Health, welfare and camp provisions to consider	Requirements
8. Actively promote good hygiene practices Workers on small construction sites must be safeguarded against pandemics, epidemic, seasonal flu and other infectious diseases. Without proper precautions, these illnesses can spread rapidly, leading to severe symptoms like cough, fever and sore throat. Such outbreaks can significantly disrupt construction progress, highlighting the importance of proactive health measures.  ©Sean Horsburgh/Unsplash	• Promote regular hand washing for all workers, especially before starting work, eating, or after breaks. Emphasize using soap to clean palms, fingers, wrists and the backs of hands. • Increase the number of accessible hand washing stations with soap near the workplace. • Provide hygiene essentials, such as handwashing supplies and masks and ensure workers use them correctly. • During a pandemic or an epidemic outbreak, supply masks and encourage workers to wear them at work and in public, especially in close-contact settings. • Maintain a recommended 2-meter distance between workers where possible.
9. Waste management  ©Jan van der Wolf/pexels	• Dispose of surplus materials and recycle where possible. • Ensure proper waste disposal to maintain a clean and safe environment.
10. Fuel and cooking  ©Tima Miroshnichenko/pexels	• Arrange for fuel for cooking, lighting and heating without affecting local supply. • Avoid using firewood from unauthorized sources for environmental reasons. • Tools should not be allowed to be used as cooking utensils.

Health, welfare and camp provisions to consider	Requirements
11. Health and safety regulations  ©Elliott Brown/Flickr	• Comply with relevant health, safety and environmental regulations. • Implement safe working practices and emergency procedures. • Portable fire extinguishers or fire buckets clearly marked must be made available at readily accessible locations. • An emergency evacuation plan must be in place and all workers residing within the camp must be made aware of it. There must also be an emergency alarm, e.g. airhorn that can be used to alert workers of an emergency. • Provide each camp with a first aid box, clearly marked with phone numbers, access to the nearest medical centre and provisions as mentioned in the section on first aid above in the guidelines. A trained first aider should also be available. • Provide health awareness training on communicable and sexually transmitted diseases to workers. • Workers must be made aware of policies on prohibition of consuming alcohol, smoking, drugs and or other illegal substances in the camps. • Place posters at strategic places to remind workers on the importance of wearing PPEs.
12. Zero tolerance for harassment  ©Alpha PhotoFlickr	• Provide a work environment that promotes women's and men's efficiency and one that does not sustain gender-based violence and stereotypes. • Train staff to recognize signs of violence against women and understand laws and existing policies on gender-based violence, sexual harassment and sexual exploitation.
13. Childcare facilities  ©Rosario Fernandes/Unplash	• Establish safe and secure childcare areas within or near worksites. • Employ trained personnel for supervising and caring for children. These personnel are part of the project workforce employed by either the client, clients representative or the enterprise. • Maintain clean, child-friendly environments equipped with essential safety measures. • Provide food, water, resting spaces and first-aid resources for children. • Ensure facilities are available to all workers, without discrimination. • Conduct regular health check-ups and vaccinations. • Incorporate activities that support both entertainment and developmental needs.

4.5.2 Traffic management

Effective traffic control is a cornerstone of road construction safety. Strategically placed signage alerts drivers well in advance of the work area allowing them to slow down and navigate safely. Barriers serve as a physical line of defence, delineating the work zone and protecting workers from incoming traffic. Moreover, flaggers play a pivotal role in directing the flow of vehicles, providing a dynamic response to changing conditions on the ground. In placing signage, it is crucial to understand the road working areas that commonly are divided into five sections: 1) advanced warning area, 2) transition area, 3) buffer area, 4) work area, and 5) termination area.

Navigating inaccessible roads and tracks, particularly where vehicles or equipment may risk falling off or becoming stuck, requires a proactive management approach. Establishing clear protocols for assessing these risks beforehand and equipping operators and workers with the necessary tools and training to handle emergencies can help mitigate such risks. Furthermore, creating contingency plans ensures operations continue smoothly even in unforeseen scenarios.

The transportation of workers using trucks or motorbikes presents significant accident risks. Implementing strict guidelines such as regular vehicle maintenance, vehicle checks and driver training can enhance the safety of transportation.

When carrying out surface works on rural roads, external traffic must be carefully controlled to ensure smooth passage. This involves implementing measures such as diversions or timed intervals for alternating traffic flow to a single lane, using clear signage for directions and deploying flaggers to assist with real-time traffic regulation. Stress can be minimized by maintaining steady communication with drivers, ensuring they are informed of delays or diversions beforehand.

When carrying out carriageway work and maintenance on trafficked roads barriers or cones must be placed along the entire work zone to protect workers and signage with reduced speed warnings placed at the beginning of the work zone to alert drivers.

Construction equipment, on the other hand, requires dedicated supervision to prevent accidents on-site. This includes allocating specific areas for organizing or arranging equipment and operations, scheduling movements to avoid congestion, safety features such as reversing alarm and training operators to work within confined spaces. Specific and clearly defined rules or guidelines need to be put in place for machinery which is operated, transported and maintained on-site. These guidelines would be aimed at training operators, enforcing proper maintenance schedules, restricting access to machinery to authorized workers and establishing safe zones for operation.

► Figure 8: Traffic management controls





©Julian Gentile/Unsplash



©Tim Mossholder/Unsplash

The most common method of regulating traffic on rural roads is to employ “flagmen” with STOP/GO signs at both ends of the diversion. On narrow roads, traffic may need to be halted for an extended period when major pavement works take place. In such cases, the road users need to be alerted at the start of the road also providing information on when the road will be reopened. The signs and barriers in figure 9 are useful for this purpose:

► **Figure 9: Traffic management signs**



- Reversible 'Stop/Go' signs
- Speed limit signs (30 km/hr)
- 'Work in Progress' signs
- 'No Overtaking' signs
- 'Road Narrows' signs
- 'End of Restriction' signs
- Lane closure barriers
- Traffic cones (as many as required)

Temporary signs should be placed well ahead of the site from both directions to warn traffic and reduce speed, both for work off-carriageway and on the carriageway. It is important to install sufficient measures to ensure that the speed of traffic is reduced before it arrives at the worksite.

At the worksite all damages to the road which pose a danger to traffic should be properly marked so that the traffic is guided away at a safe distance. Equally, the traffic should be properly separated from where works take place.

The worksite needs to be protected so that the traffic does not pose any danger to the workers, materials or equipment.

Simple safety equipment such as traffic cones can improve safety for the road users as well as the maintenance workers. Cones are useful for alerting the traffic of road works ahead, guiding the traffic into diversions and keeping traffic at a safe distance from the worksite. Cones are easy to place and can be quickly moved when the works progress to another location.

► Figure 10: Traffic management set up



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4.6 Personal protective equipment (PPE)

It is the employer's responsibility to protect workers from health and safety risks. This means they must provide PPE free of charge if a risk assessment shows it is needed. To stay safe, workers may have to wear PPE such as safety helmets, gloves, eye or hearing protection, high-visibility clothing, safety footwear and harnesses. PPE also includes respiratory protective equipment (RPE) to prevent workers breathing in dust, mist, gas or fume. The use of PPE is identified in the risk assessment and would also be linked to the activities or tasks workers are to perform.

The requirements for PPE should be outlined in the Safety and Health Plan (SHP) and reflected in the contracts. PPE should be the last resort to protect against risk. Appropriate PPE should always be available and used by the workers, however, remember that PPE is only one aspect of the safety management.

►Table 5: When to use PPE

Hard hats should be worn when there is a risk of falling objects	
 Good practice  ©ILO/Flickr	 Inappropriate  ©danzel dangleben/Unsplash
Sunhats help protect workers from harmful UV rays and reduce heat-related stress during outdoor activities	
 Good practice  ©Kindel Media/pexels	 Inappropriate  ©Daniele La Rosa Messina/Unsplash

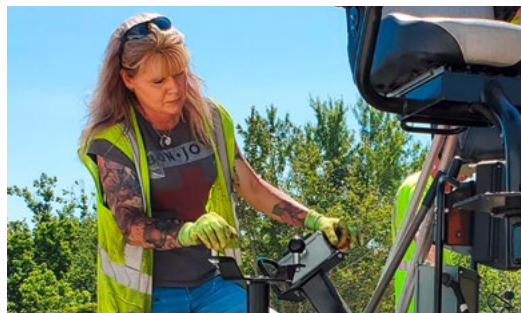
Hearing protection should be worn to avoid hearing loss

Good practice



©Kindel Media/pexels

Inappropriate



©Vicki White/Pixabay

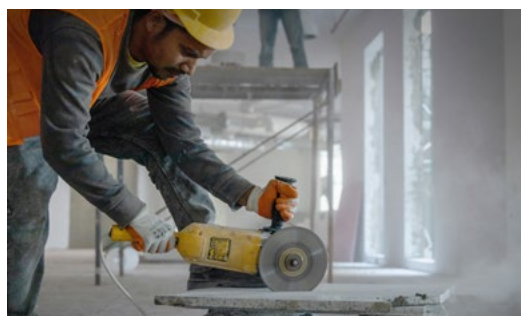
Safety goggles should be worn when breaking rocks to protect eyes

Good practice



©Kindel Media/pexels

Inappropriate



©Glenov Brankovic/Unsplash

Dust masks should be worn when pouring dry cement or on very dusty roads This will reduce the risk of damaging workers' lungs or developing respiratory problems

Good practice



©Kindel Media/pexels

Inappropriate



"ILO photo e3548" by International Labour Organization ILO,
CC BY-NC-ND 2.0

Gloves should be worn when handling hazardous substances to prevent hands injury



Good practice



"ILO photo e20292" by International Labour Organization ILO, CC BY-NC-ND 2.0



Inappropriate



"Kuwait" by International Labour Organization ILO, CC BY-NC-ND 2.0

Safety boots protect the feet from falling objects or stepping on sharp objects



Good practice



"Lebanon" by International Labour Organization ILO, CC BY-NC-ND 2.0



Inappropriate



©Muaia Elameen/pexels

High-visibility vests are worn when working on the edge of the road, e.g. cutting grass or during night work. This will allow drivers to see them and avoid hitting the workers



Good practice



"Qatar 209" by International Labour Organization ILO, CC BY-NC-ND 2.0



Inappropriate



Kabiur Rahman Riyad/Unsplash

A suitable risk assessment should be undertaken of the work activity to ensure that suitable PPE is provided to workers. This assessment should consider all relevant factors including the nature of hazard workers may be exposed to and individual factors to ensure the PPE fits properly.

Before PPE is selected, consider:

- Who is exposed?
- What are they exposed to?
- How long are they exposed for?
- How much are they exposed to?

Instruct and train workers how to use PPE, for example train workers to fit dust masks properly so that they do not leak and therefore allow direct exposure to hazardous dusts (e.g. cement).

If more than one item of PPE is worn at the same time, make sure they can be used together. For example, wearing safety glasses may disturb the seal of a respirator, causing air leaks. Choose hard hats and ear defenders carefully to make sure they can be worn together and are both effective.

Explain to workers why PPE is needed, when to use it and what its limitations are.

How to improve the use of PPE

- Ensure workers are provided with PPE which fits their body size taking into consideration different sizes for females.
- Masks must be well-fitted to the face shape of each worker.
- Incentivize the appropriate use of PPE.
- Use short training sessions (Toolbox Talks) to emphasize the need for the PPE.
- Monitor supervision to ensure PPE is used when it is needed.
- Continually review the provision and use of PPE as the project progresses.

4.7 Tools and powered construction equipment

Tools and powered construction equipment (PCE) are essential components in the construction industry, facilitating efficiency, precision and safety in various tasks. These tools range from hand tools like shovels and pickaxes to advanced powered equipment such as pedestrian rollers and concrete mixers.

4.7.1 Hand tools

Hand tools are essential in labour-based road construction, and must be available in sufficient numbers, be of good quality and well maintained. Workers must know how to select the right tool for the job and how to maintain them to ensure efficiency and safety, e.g. how to replace broken handles or sharpen cutting edges.

Tools should not be bought based on lowest price. With unrestricted imports, it is easy to buy poor quality hand tools when basing it on price only. It is important that tools be made from appropriate material and are properly tempered. The quality of tools is of prime importance as they can influence productivity and safety positively or negatively. Tools handles must also be of good quality: steel, wood or reinforced rubber can all be acceptable if made to appropriate standards.

Guidance in this regard can be obtained from publications such as the ILO's guide to tools and equipment for labour-based road construction" (ILO 1981). Unskilled labour with previous knowledge of construction, need to be taught how to handle unfamiliar tools correctly, e.g. people who only know how to use a hoe will probably not know how to swing a pick.

Description and design of hand tools

It is also essential that the tools used on the road works project are properly designed to stand the heavy wear and tear of a construction site. Hand tools should be of good quality and well designed. The tools should be robust enough for the intended work use. For most tools this means that the metal head should be made from carbon steel, heat-treated to give the correct strength and wear characteristics.

A more detailed description on when and why different types of PPE should be used can be found in Annex 8.

► **Table 6: Recommended tools to be used for respective tasks**

Operation	Activity	Typical hand tools
Clearing	Bush clearing	Bush knife axe, bow saw
	Grass cutting	Grass cutter/slasher, rake
	Tree and stump removal	Axe, bow saw, ropes, pickaxe, mattock, crowbar
	Grubbing	Hoe, shovel, spade, rake basket, wheelbarrow
	Boulder removal	Crowbar, sledgehammer, chisel and wedges
Earthworks	Excavation	Hoe, mattock, pickaxe, spade
	Hauling	Baskets, head pans, wheelbarrow, shovel
	Spreading	Spreader, hoe, rake, shovel
	Compaction	Hand rammer, watering can
	Gabion works	Pliers, knives, hammers, crowbars
Gravelling	Excavation	Mattock, pick axe, spade
	Spreading	Spreader, hoe, rake, shovel
Setting out	Roadworks	Line level and fish line, ranging rods and profile boards, boning rods, measuring tapes axe, hammer, chisel, string, pegs

4.7.2 Ladders

Ladders are often used on small construction sites and it is extremely important to ensure their safe use. Wobbly ladders that are the wrong height and inadequately secured may cause serious accidents at the workplace. There are many ways to use ladders safely and to secure them at low cost by using locally available materials. It is important that both managers and workers check the condition of the ladders and exchange practical ideas for improvements. Well-secured ladders are a prerequisite for workers' safety and efficient construction work.

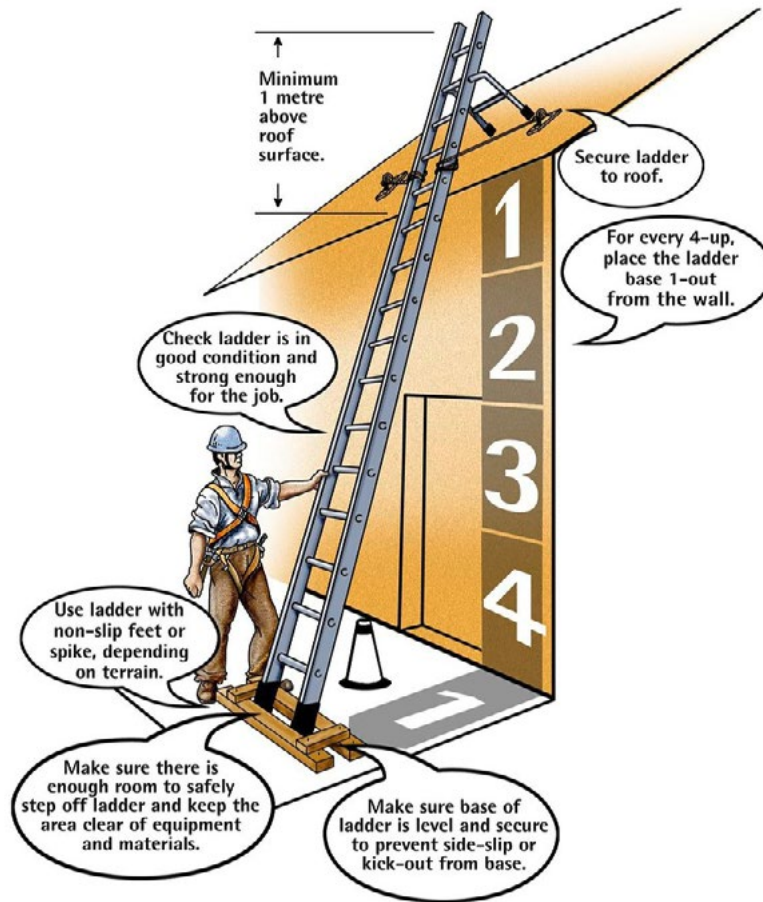
How to improve safety when working with ladders

- Walk around the construction site and identify which work areas use ladders. Check that the ladders are safe and securely fixed.
- Ensure that the ladders are placed at an angle of about 75° and that the top of the ladder extends at least 75 cm above the landing platform.

- Check that all the steps/rungs of the ladders are strong enough and that they are not damaged or cracked. Make sure that they are all wide enough for the workers to use safely.
- To secure all ladders they must be fixed at the top and at the bottom. After securing them, check that they have no weaknesses or wobbling parts.
- Where appropriate attach strong handrails to the stairs to ensure safe use.
- If workers need to carry heavy materials up ladders, ensure that the Duty Rating of the ladder in question is adequate.
- Only one worker should be allowed to climb or descend a ladder at any one time. The next worker should wait until the first worker has finished using it.

Secure ladders tightly at the top and bottom and ensure that the top of the ladder extends 1m above the landing point. Ladders should be positioned at an angle of "one out for every four up."

► Figure 11: Safe use of ladders



©worksafe_bc/Flickr

4.7.3 Powered construction equipment (PCE)

The term employment-intensive does not mean that only labour should be used in the construction process but implies the use of a range of machine/labour combinations, based on considerations of quality, cost and time constraints.

Rural road construction requires PCE and well-maintained equipment enhances productivity, quality and worker safety. While reducing manual effort, unguarded or poorly maintained machinery may pose injury risks.

Material haulage depends on distance and can involve baskets, stretchers, wheelbarrows,

tractors, or dump trucks, which minimize physical strain. For low-traffic rural roads, haulage mainly involves delivering gravel. Earthworks are often manual, with soils sourced near the road alignment.

When using powered equipment, precautions like employing a banksman for reversing addressing risks of overturning and ensuring worker training are essential. Contracts should have clauses mandating proper maintenance of their equipment.

Proper training, maintenance regimes and guarding of machinery are critical to minimizing risks, especially where pedestrian workers are present.

The table below shows some of the powered equipment that can be used for rural road operations together with a summary of the safe operational controls.

► **Table 7: Guidance on health , welfare and camp provisions**

PCE and its associated hazards	Safe Operational Control Description
Chainsaws	
Used for tree felling Using a chainsaw for tree felling involves several hazards: • Contact with the moving chain • Kickbacks • Exposure to noise, vibration and exhaust fumes  ©Bram van Egmond/pexels	• Ensure all operators are adequately trained and competent in using a chainsaw for tree felling. • Provide and enforce the use of appropriate PPE, including safety helmets, eye protection, hearing protection, gloves, leg protection (cut resistant trousers) and safety boots. • Provide anti-vibration gloves and limit the duration of chainsaw use to reduce the risk of hand-arm vibration syndrome. • Regularly maintain and inspect chainsaws to ensure they are in good working condition. • Follow safe work practices, such as maintaining a safe distance from the tree being felled and using proper felling techniques. • Follow safe operating procedures from the manufacturer's guide. • The chainsaw should be held correctly and securely. • Maintain good balance and secure footing when using the chainsaw. • Avoid cutting above shoulder height. • Ensure that the chain is clear of obstructions before starting. • Engage the chain brake before starting the chainsaw. • Use chainsaws with kickback protection features and ensure operators are trained to handle kickback situations. • Workers should take breaks to avoid prolonged exposure to exhaust fumes. • Establish and communicate emergency procedures, including first aid and evacuation plans.
Tipper/dump trucks	
Advisable to use for hauling distances of more than 10kms (6.2 miles) Hazards associated: • Overturning • Mechanical failure • Collisions • Falling materials • Noise and vibration • Dust • Operator errors  ©Andre/pexels	• Conduct thorough inspections of the trucks before use to identify defects or maintenance needs. Inspect the dumper truck/dump truck, including the head and taillights, horn, rear view mirrors, tires air brakes and fluid levels. • Ensure all safety features such as alarms and emergency shut-off systems are functional. • Check tire pressures daily. Tyre pressures should be equal on each side of the vehicle according to manufacturers' recommendations. • Provide proper training for operators on the safe and efficient use of the vehicle. • Have a banksman available to direct the trucks. • Vehicles should be fitted with amber lights and reverse alarms. • Address any repairs promptly to avoid breakdowns and accidents. • If any dump truck equipment fails the pre-use inspection, the equipment has to be returned back to the owner to make necessary repairs. • Keep tires properly inflated and ensure they are not worn. • Ensure the load is evenly distributed. Never overload the upper portion of the truck bed. • Keep your truck and trailer in a straight line when backing up and never move faster than walking speed. • Operators should stay in the cab with their seat belt on during the entire dumping process. • Never attempt to exit or jump from an overturning truck. Remaining in the truck is the single best thing drivers can do to protect themselves. • Dump only on level surfaces and never dump when surfaces are uneven, loose, or not properly compacted. • Operators should have the required PPE e.g. hearing protection, dust masks, high visibility vests and anti-vibration gloves where required.

PCE and its associated hazards	Safe Operational Control Description
Tractor – trailer combination Transporting of labour and materials to and from site and transporting of gravel from gravel pit to construction front with hauling less than 10km Hazards associated: • Overturning of tractor • Collisions • Coupling/uncoupling(Caught between) • Mechanical failure • Noise and vibration • Operator error  ©Hugh Trainer/Flickr	• Conduct thorough inspections of the tractor and trailer before use to identify defects or maintenance needs. • Operators must be trained/experienced enough to do the job. • Always wear a seatbelt if the tractor has a roll-overprotective structure (ROPS). • Do not carry passengers on tractors that do not have instructor seats, ROPS and safety belts. • Do not carry passengers on tractor-mounted implements or trailers that are not designed to carry people. • When climbing on and off a tractor always keep three points of contact (e.g. two hands and one foot) with the tractor or ground. • Get off facing towards the tractor, the same as you do when getting on. • Never jump on or off a moving tractor. • Clean the steps regularly. You are more likely to slip and fall if the tractor steps are dirty or wet. • Drivers should also wear suitable footwear with a good grip and clothes, like overalls, which will not snag on machinery. • Before getting off always put the tractor in neutral apply the brakes and disengage the power take-off, even just to open a gate. If you are leaving the tractor to do something else, shut off the engine. • Ensure operators are trained in proper coupling and uncoupling procedures. • Workers are to be aware of pinch points and avoid placing hands near moving parts. • Tractor engines cause high noise levels. If the tractor does not have a sound-proof cab always wear hearing protection. • Operators and workers should also have the required PPE e.g. dust masks, high visibility vests and gloves where required.
Compaction equipment Pedestrian Rollers Used on labour-based road construction and maintenance works to compact the formation, sub-base and base layers as well as pothole patching works Hazards associated: • Roller tipping over/overturning. • Rolling downwards in steep terrains • Uncontrolled or improper operation of rollers • Slips and trips – uneven or wet ground. • Exposure to noise and vibration • Mechanical failure • Dust exposure • Manual handling (push and pull)  © ILO/Flickr	• Provide proper training for operators and establish safety plans to follow best practices. • Ensure safe workspace between workers. • Use appropriate PPE such as helmets, high visibility vests, safety boots, hearing protection, dust masks and anti-vibration gloves. • Conduct thorough checks of the roller and the work area before starting the job. • Ensure inexperienced operators are supervised and not allowed to operate the machine unsupervised. • Follow safe operating procedures as per the manufacturer's manual. • Keep the work area free of obstacles, steep gradients and foreign objects. • Practice job rotation or rest periods to reduce fatigue and minimize exposure to dust, noise and vibration. • Have emergency plans in place for any incidents.

PCE and its associated hazards	Safe Operational Control Description
Compaction equipment Plate compactors (wacker plates) Vibrating plate compactors, often called wacker plates are used to compact soil, gravel asphalt and other materials by using a heavy plate that vibrates rapidly Hazards associated: • Contact with moving parts • Overturning • Loss of control • Vibration • High noise levels • Exposure to dust and fumes • Mechanical failure • Manual handling  ©Rodolfo Gaion/pexels	• Wear required personal protective equipment (PPE), including steel cap boots, hearing protection, eye protection, dust mask, safety helmets, high visibility vests. • Provide anti-vibration gloves and limit the duration of the plate compactor use to reduce the risk of hand-arm vibration syndrome. • Vibrations should be maintained by having a firm grip on the handles and keeping a stable stance. • Start the machine according to the manufacturer's instructions, typically on a flat, stable surface. • Ensure that the fuel and oil are topped up. • Ensure all guards are in place before operating the machine. • Ensure that the area to be compacted does not contain any 'live' electrical cables, gas, water or communications services which may be damaged by the action of the machine. • Never stand on the unit while it is operating. • Do not wear loose clothing, gloves, neckties, rings, bracelets or other jewellery which may get caught in the moving parts. • Do not overreach. Ensure proper footing and balance when working with the tool. • Always keep the work area well lit. • Never permit children, other people or animals to loiter near the work area. • Never leave a machine running while unattended. • Check the condition of the machine at the end of each day and report any damage or defects.
Jackhammer Used for breaking rocks, concrete, etc. Hazards associated: • Flying debris • Vibration hazards • Noise exposure • Respiratory risks • Musculoskeletal strain • Electrocution • Fatigue and overexertion • Dust inhalation  ©Thomas Fuhrmann/pexels	• Wear the required PPE such as safety goggles, face shields, hearing protection, respirators or dust masks, gloves to reduce vibration impact and improve grip and steel-toed boots for foot protection. • Ensure operators are trained in safe handling and maintenance. • Supervise operations to ensure adherence to safety protocols. • Use proper lifting techniques to handle the jackhammer. • Rotate tasks among workers to minimize prolonged exposure. • Use wet methods or vacuum dust collection systems to reduce airborne particles. • Limit exposure time and maintain a safe distance for non-operators. • Regularly inspect and maintain jackhammers to ensure they are in good working condition. • Secure air hose couplings and check for leaks. • Use insulating gloves and ensure cords are intact and positioned safely. • Mark and secure the work area to prevent unauthorized access. • Ensure proper lighting and stable footing.

PCE and its associated hazards	Safe Operational Control Description
Concrete mixers Used for mixing of concrete Hazards associated: • Contact with moving parts, e.g. the drum and auger • Slips, trips and falls • Cement dust exposure • Noise and vibration exposure • Contact with wet cement • Untrained operator  ©Jvalenciazz Jhon/pexels	• Follow the manufacturer's instructions for safe operation. This includes reading and understanding the operator's manual and adhering to any warning labels or cautionary notes. • Wear appropriate personal protective equipment (PPE), such as safety glasses, earplugs and protective clothing. • Keep the work area clean and organized. Clutter and debris can create tripping hazards and make it more difficult to move around safely. • Use caution when working near the drum. The drum can be heavy and can cause serious injuries if it falls or rolls. • Keep your hands and feet clear of moving parts. This includes the drum auger and any other moving components. Workers should avoid using loose clothing or having long loose hair untied. • Use only approved attachments and accessories. Using non-approved attachments or accessories can compromise the safety of the machinery and increase the risk of injury. • Place appropriate guards and shields over dangerous parts, ensuring that they are made from sufficiently strong materials. • Place barricades around cement mixers, to prevent other workers from entering the area. • Inspect the concrete mixer regularly for wear and tear. If you notice any problems, such as damaged guards or worn-out parts address them immediately to prevent accidents. • Rinse eyes and skin with water if they come into contact with wet cement and seek medical attention.
Water bowser Watering of fill material may be required to have optimum moisture content for effective compaction Water supply for other site activities Hazards associated: • Wet surfaces – spills and leaks • Mechanical failure • Collision with workers, members of public or other construction vehicles • Untrained operator  ©Rory C/pexels	• Conduct daily pre-use inspections to check for leaks, damaged hoses and issues with the tow hitch and braking system. • Ensure the bowser meets all relevant safety standards and regulations, including proper certification and compliance with machinery directives. • Use high-visibility markings and legible safety decals on the bowser to enhance visibility and safety. • Make sure that there are safe distances between the worker and the bowser. • Ensure the bowser is securely coupled to the towing vehicle with functional safety chains or brakes. • Check that the bowser has flashing beacons and operational lights. • Check that there are reversing alarms on the towing vehicle to alert nearby personnel when the bowser is reversing. • Provide proper training for operators and ensure inexperienced operators are supervised.

4.8 Employment -intensive road construction and maintenance activities

Employment -Intensive activities in road construction and maintenance involve the use of innovative methods in executing projects to maximize employment and transfer of skills to the target communities and individuals without compromising the final asset or product quality. In infrastructure projects, these are achieved by using employment -Intensive work methods. Other reference materials may refer to this as labour-based (LB) or labour-intensive (LI) construction. In this document these terms may be used interchangeably.

Local resource-based activities in rural road operations involve the use of local resources and an appropriate mix of local labour and equipment in construction of infrastructure and assets, with a preference for labour where technically and economically feasible, without compromising the quality of the assets. International experiences have shown that, with well-trained supervisory staff and an appropriate employment framework, local resource-based methods can be employed successfully for most rural infrastructure projects without compromising quality.

Operational controls for safety in local resource-based rural road operations are crucial to ensure the well-being of workers and the public. These are discussed below:

► **Table 8: Operational controls for employment-intensive activities**

Sub-activities	Safe operational controls/checkpoints
Clearing: Consists of the removal and disposal of bush, trees, roots, boulders, grass and topsoil	
Site and bush clearing Description: Removing vegetation (e.g. grass, shrubs and small plants) and debris from the worksite to prepare for construction or roadworks. Steps Involved: • Surveying and marking areas for clearing. • Cutting vegetation using tools like machetes, bow saws axes and bush knives. • Collecting and disposing of vegetation/debris. Potential Hazards: • Injuries from tools or equipment. • Slips or trips on uneven ground. • Contact with harmful plants, insects, snakes or wildlife. • Working in extreme heat or extreme cold conditions. • Landmines and UXOs • Motor vehicle collisions.	Worksite assessment: • Conduct a site assessment to identify hazards like uneven terrain, wildlife, overhead power lines, underground utilities, unstable trees, boulders, or unexploded ordinance (UXOs) where relevant. • Check the risk with competent authorities for UXO's. If any suspicious objects are found, maintain and enforce a safe distance from potential UXOs until it is cleared. Resurvey the area for other UXOs before restarting works. • Avoid working in adverse weather conditions, such as heavy rain or strong winds, which can increase the risk of accidents. • Identify potential hazards, such as loose soil, nearby structures, or steep slopes. • Space out workers at safe distance into teams or groups and assign clear tasks and an amount/area/volume of work to be completed before the end of the workday. • Establish and follow clear communication protocols, especially when coordinating hazardous tasks like boulder movement and tree cutting. • Ensure workers are trained and there are plans in place to handle wildlife (carnivores, snakes, insects, hazardous plants, etc.). • Evaluate the size, stability and risks of boulders, trees and soil before removal. • Set up exclusion zones for high-risk activities (e.g. tree felling) to protect workers and the public. • Provide experienced supervision for these tasks to maintain safety standards. • Secure participation from local villages when realigning or expanding roads to obtain early awareness of land issues, religious grounds, etc.



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Sub-activities	Safe operational controls/checkpoints
Clearing: Consists of the removal and disposal of bush, trees, roots, boulders, grass and topsoil	
Tree and stump removal Description: Cutting and removing trees and stumps that obstruct construction or road alignment. Steps Involved: • Cutting trees using chainsaws or hand tools such as axes, saws and mattocks. • Excavating or grinding stumps. • Transporting and disposing of tree materials. Potential Hazards: • Falling trees or branches. • Equipment malfunction. • Injuries from heavy lifting. • Noise exposure from chainsaws. • Injuries from equipment (chainsaws, etc.) • Working in extreme heat or extreme cold conditions.  ©Jason Bardales/Unsplash	Hand tools and equipment: • Use tools with comfortable grips, sized appropriately for cutting dense bushes, clearing undergrowth, or handling heavy boulders. • Check tools before use for damage, particularly for chainsaws (blade sharpness, motor function) and manual tools (e.g. machetes axes). • Ensure workers know how to properly maintain the tools they use including sharpening machetes for bush clearing or inspecting chainsaw handles for cracks. • Mechanical aids may need to be considered for boulder removal. • Only trained workers should handle chainsaws during tree and stump removal, following manufacturer instructions. • Prohibit cutting branches above shoulder height unless specialized equipment or techniques are used. • Use ladders rated for outdoor use; secure them firmly, with one worker holding the base and another working from the ladder. • Use ropes longer than the tree height to keep workers pulling the rope at a safe distance from falling branches. Ergonomics: • Ensure you have a stable footing when working around tree stumps so as not to fall over. • Use the correct techniques for cutting and lifting to avoid strain and injury. Bend your knees and lift with your legs, not your back. • Practice job rotation amongst workers to minimise fatigue and body strain. • Schedule regular rest breaks to prevent fatigue and reduce the risk of accidents. • For larger boulders, consider mechanical aids like winches, pulleys, or hydraulic splitters. • Consider burying rocks where possible rather than moving them. PPE: • Ensure appropriate PPE is provided and worn, i.e. gloves, safety glasses, safety boots, helmets, dust masks and high visibility vests. • Hearing protection must be worn when using the chainsaw. • Specific trousers (chainsaw chaps) made of cut resistant material is required for chainsaw use. • Discuss the type of PPE with workers. • Ensure workers are consulted on the type of PPE.
Grubbing Description: Removal of roots and underground obstructions to prepare the ground for construction. Steps Involved: • Identifying root systems and underground obstacles. • Digging out or cutting roots using tools or machinery such as mattocks axes, hoes, hovels. • Levelling the ground after root removal. Potential Hazards: • Injuries from digging tools. • Uneven ground causing trips. • Damage to underground utilities. • Working in extreme heat or extreme cold conditions.  © ILO/Flickr	Training: • Toolbox talks should form part of the awareness training for activities/tasks being performed on the day. • Ensure all workers are aware of the correct tools and equipment to be used and how to use it safely. • Always ensure specialist/more skilled workers are properly trained for significant hazard activities such as tree-felling and machinery use e.g. chainsaws. • Provide training and awareness on safe lifting techniques, proper use of tools and emergency procedures. • Ensure workers are trained in safe boulder removal techniques. Inspections: • Regularly inspect all hand tools and equipment, including emergency equipment (first aid kits, fire equipment) to ensure they are in good working condition. • Chainsaw must be inspected before use. Check for any visible damage or wear on the chainsaw body, chain and guide bar. • Ensure all screws and bolts are tightened securely. • Check the throttle lock and stop switch for proper functioning.

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Sub-activities	Safe operational controls/checkpoints
Clearing: Consists of the removal and disposal of bush, trees, roots, boulders, grass and topsoil Boulder removal Description: Removing large rocks or boulders obstructing work areas. Steps Involved: • Assessing the size and location of boulders. • Breaking or lifting boulders using tools or machinery such as crowbars, wedges and sledgehammers. • Where equipment is unavailable, fire and water (heating and cooling) and splitting rock using feather and wedges have been used with some degree of success. • Transporting, burying and disposing of removed materials. Potential Hazards: • Crushing injuries from heavy boulders • Injuries from hand tools • Slips on unstable surfaces • Manual handling injuries • Flying debris • Falling or rolling rocks • Working in extreme heat or extreme cold conditions  ©ILO/Flickr	

Sub-activities	Safe operational controls/checkpoints
Earthworks: This is the most common labour-based activity and can be applied to many items in a construction. This usually involves digging, loading/offloading, filling, spreading and compacting soil.	
Rock and trench excavation Description: Breaking and removing rocks, digging trenches to create space for road alignment and drainage. Steps Involved: • Surveying and marking the areas. • Breaking rocks manually using hammers, chisels, or controlled techniques (e.g. wedging or splitting). • Excavating using hand tools (e.g. pickaxes, shovels). • Collecting and transporting material. Potential Hazards: • Flying rock fragments causing injuries. • Cave-ins or soil collapses. • Unstable slopes from slope excavations causing landslides and falling rocks. • Falls into unprotected trenches. • Strains or injuries from lifting heavy materials and manual digging. • Injuries when working in close proximity to others. • Collapse of stockpiled areas. • Working in extreme heat or extreme cold conditions. 	Worksite assessment: • Conduct geotechnical investigations for excavations deeper than 1.5m to evaluate soil conditions and stability. • Plan for adverse weather conditions (e.g. floods, earthquakes) that may affect trench safety. • Allocate sufficient space to prevent overcrowding and ensure workers can operate safely. Hand tools and equipment: • Use tools suited to the material to prevent injury (e.g. shovels or mattocks for soil; chisels and hammers for fractured rock; drilling or blasting for hard rock). • Keep tools clean and well-maintained to ensure their effectiveness and safety. • Ensure workers know how to properly maintain the tools they use such as sharpening and checking handles etc for looseness or cracking. Ergonomics: • Train workers on safe lifting techniques, such as lifting with the legs and avoiding twisting whilst lifting to reduce the risk of musculoskeletal injuries. • Train workers to work at minimum safe distances when working with picks and shovels. • Provide regular breaks and rotate tasks to reduce fatigue and prevent repetitive strain injuries. PPE: • Ensure appropriate PPE is provided and worn, i.e. gloves, safety glasses, safety boots, helmets, dust masks, high visibility vests and hearing protection. Training and awareness: • Hold daily Toolbox Talks to discuss excavation risks (e.g. cave-ins, falling objects) and emergency procedures, including evacuation and first aid. • Train workers on recognizing hazards and using protective systems like shoring, shielding, or sloping. • Ensure specialized training for skilled tasks like excavation inspections.
	Excavation checks: • Regularly inspect trenches to ensure stability and implement proper risk controls especially after adverse weather. • Prohibit workers from entering unsupported trenches; ensure trenches are supported or sloped to prevent collapse. • Do not stockpile excavated material close to excavated edges. • Installing temporary retaining structures or slope stabilization systems, such as retaining walls or rock netting to provide immediate support to prevent landslides and falling rocks, protecting both workers and equipment in the area. • Implement proper sloping, benching, or terracing techniques during quarry or slope excavation to prevent collapses and landslides, ensuring stable and safe excavation practices. • Store materials and park equipment away from excavation edges to avoid instability. • Provide safe access and egress (e.g. ladders or stepped sides) for deep excavations. • Protect open excavations with barriers, covers and adequate lighting at night to prevent accidents, e.g. third parties falling into excavations. • Suitable traffic signs should be in place to warn road users of the potential hazards. • Monitor site conditions as the project progresses to plan segregation distances and adapt safety measures.

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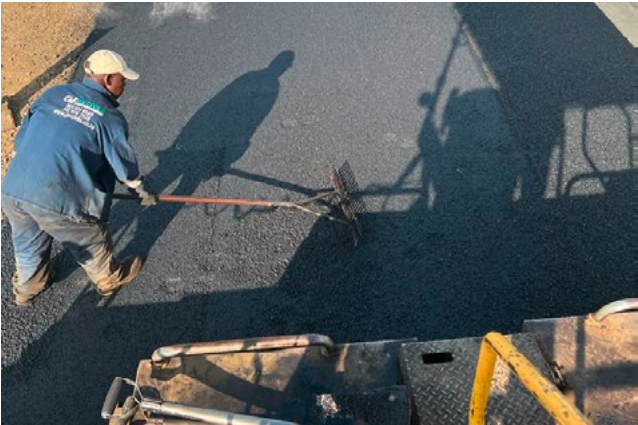
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Sub-activities	Safe operational controls/checkpoints
Earthworks: This is the most common labour-based activity and can be applied to many items in a construction. This usually involves digging, loading/offloading, filling, spreading and compacting soil.	
Trench backfilling Description: Trench backfilling involves filling an excavated trench with appropriate material to stabilize the ground and prepare it for further construction or usage. Steps Involved: • Steps Involved • Preparing the trench for backfilling. • Selecting and transporting suitable backfill material (e.g. soil, gravel, or other aggregates). • Layering backfill material evenly within the trench. • Compacting each layer of material. • Conducting a final inspection to confirm proper backfilling. Potential Hazards: • Trench wall instability during the backfilling process. • Strains or injuries from manual handling of materials. • Risks associated with the use of compaction equipment. • Poor compaction leading to future ground collapse. • Working in extreme heat or extreme cold conditions.  ©ILO/Flickr	Worksite assessment: • Conduct a site inspection to ensure trench walls are stable and safe for backfilling. • Mark the trench area and restrict access to non-essential personnel. • Confirm the suitability of the backfill material and ensure it is free from hazardous debris. • Maintain safe egress points like ladders or ramps within the trench to allow workers to exit quickly in case of an emergency. • Be aware of weather conditions that could affect soil stability and take necessary precautions. Hand tools and equipment: • Use appropriate tools for spreading and compacting materials, such as shovels, rakes and compactors. • Use hand tools like tampers or rammers to compact each layer thoroughly, ensuring stability and preventing settling. • Use compaction machinery appropriate to the trench size and depth. Ergonomics: • Encourage the use of proper lifting techniques to minimize strain during manual handling of materials. • Provide tools or mechanical aids to reduce the physical effort required. • Rotate tasks among workers to prevent repetitive motion injuries and fatigue. PPE: • Provide workers with safety boots, gloves, helmets and dust masks. • Ensure high-visibility vests are worn in areas with vehicle or machinery activity. • Require ear protection when using noisy compaction equipment. Training: • Train workers in proper backfilling techniques, including safe compaction methods. • Provide equipment-specific training for operators of compactors. • Educate workers on hazard identification and emergency response procedures. Inspections: • Inspect trench walls for stability before backfilling starts. • Inspect tools and equipment before use. • Inspect the compaction level of each layer to avoid future settlement issues.

Sub-activities	Safe operational controls/checkpoints
Gravelling: Gravelling involves the transportation and distribution of gravel to construct or maintain road surfaces Hauling Description: Transporting construction materials like soil, gravel, or stones from one location to another using trucks or wheelbarrows. Typical haulage equipment found on rural road construction sites differ from country to country and could consist of head baskets, wheelbarrows animal carts, tractor-trailer combination or tipper trucks depending on the hauling distance. Steps Involved: • Loading materials into vehicles, wheelbarrows or other means. • Transporting materials along designated paths. • Unloading materials at the intended location. Potential Hazards: • Overloading equipment, causing tipping or loss of control. • Collisions with workers or other vehicles. • Uneven terrain leading to vehicle or wheelbarrow instability. • Manual handling injuries • Working in extreme heat or extreme cold conditions.  ©ILO/Flickr  ©ILO/Flickr	
	Worksite assessment: • Supervisors and workers are to identify the safest route and safest method for hauling, taking the load and distance into consideration. Hand tools and equipment: • Ensure that the appropriate tools and equipment are used for hauling materials e.g. shovels, wheelbarrows, baskets, sack stretchers animal carts, tractor trailers or tipper trucks. These must be inspected and checked for any defects. • Ensure there is effective communication between the workers performing the tasks. Ergonomics: • Take care not to overload the wheelbarrows or baskets. • Workers are to practice proper lifting techniques e.g. bending their knees and keeping their back straight when lifting, using leg muscles rather than their back to lift heavy objects avoid twisting the body while carrying heavy loads. • For heavy or bulky items, work with a partner to distribute the load and reduce strain, form human chains to pass buckets from one area to the other taking care not to injure the next person. PPE: • Use appropriate PPE e.g. gloves to protect hands from sharp edges and rough surfaces, safety glasses or goggles to protect eyes from debris, steel-toed boots to protect feet from heavy objects. Training and awareness: • Provide regular training and awareness on ergonomic principles and safe work practices. • Ensure workers are aware of the hazards and risks and how to identify it in their daily tasks. • Operators of the trucks or tractors must be trained on how to safely operate the vehicle.

Sub-activities	Safe operational controls/checkpoints
Gravelling: Gravelling involves the transportation and distribution of gravel to construct or maintain road surfaces	
Loading, unloading and spreading of material Description: Gravelling includes loading gravel onto transport vehicles, unloading it at the worksite and spreading the material evenly. Steps Involved: • Loading gravel onto transport vehicles using manual or mechanical means. • Transporting gravel to the designated worksite. • Unloading gravel from vehicles. • Spreading the gravel evenly across the road surface using tools such as shovels and rakes. Potential Hazards: • Injuries from handling heavy materials during loading and unloading. • Strains or fatigue from improper posture during spreading. • Risks from operating or working near vehicles and machinery. • Dust exposure. • Working in extreme heat or extreme cold conditions.  ©ILO/Flickr  ©SHOX art/pexels	Worksite assessment: • Conduct a risk assessment to identify potential hazards such as uneven ground or vehicle movement. • Ensure adequate spacing of workers for loading, unloading and spreading activities as this is quite a labour-intensive activity. • Mark and cordon off areas to separate workers from vehicles or machinery. • Also account for the needs of the potential negative effects on local communities from issues such as dust or noise from road construction works. • Watering to damp down dust generated from road works which may be affecting local communities. Hand tools and equipment: • Inspect tools (e.g. shovels, rakes) for damage or defects before use. • Use appropriate tools that are ergonomically designed and suited for the task. • Ensure vehicles and machinery used for loading/unloading are maintained regularly. Ergonomics: • Encourage workers to use correct lifting techniques to avoid back injuries (e.g. bending at the knees, not the waist). • Limit manual handling of heavy gravel by using tools or small equipment where feasible. • Schedule regular breaks to prevent fatigue and overexertion during physically demanding tasks. PPE: • Provide workers with safety boots, gloves, reflective vests and dust masks. • Require helmets to protect against falling gravel or other materials. • Ensure workers wear high-visibility clothing, especially in areas with vehicle movement. Training: • Train workers on proper loading, unloading and spreading techniques. • Educate workers on the use and maintenance of tools and machinery. • Provide specific training on hazard awareness and emergency procedures. • Use regular Toolbox Talks to inform workers of the potential risk issues. Inspections: • Inspect vehicles, hand tools and equipment daily before operation to ensure they are functional. • Ensure workers know how to properly check the equipment they use such as checking handles etc. for looseness or cracking. • Check worksite conditions periodically to identify and mitigate hazards.

Sub-activities	Safe operational controls/checkpoints
Pavement construction (excluding asphalt) Description: Pavement construction involves creating a durable and even road surface using materials such as gravel, sand, cement, or concrete. This activity includes subgrade preparation, laying base layers and applying and compacting the pavement surface. Steps Involved: • Conducting a site survey and marking the area. • Clearing and levelling the subgrade. • Laying and compacting base materials (e.g. gravel or crushed stones). • Preparing and mixing pavement material (e.g. concrete, cement-stabilized soil). • Placing and spreading the pavement material evenly. • Compacting the pavement surface using manual or mechanical methods. • Curing or finishing the pavement for durability. Potential Hazards: • Uneven or loose surfaces. • Improper handling of materials or tools. • Exposure to dust, cement, or fumes. • Heat stress due to outdoor work conditions. • Use of compactor, equipment or tools. • Working in extreme heat or extreme cold conditions.  ©ILO/Flickr  ©ILO/Flickr	Workplace assessment: • Conduct a site inspection to identify uneven or unstable areas. • Assess weather conditions to mitigate risks like heat stress or sudden rains. • Ensure proper drainage to prevent water stagnation. • Mark and barricade the worksite to keep unauthorized personnel away. • Traffic management should include traffic diversions and/or temporary road closure. Hand tools and equipment: • Hand tools and equipment must be selected as per the task requirements e.g. shovels, rakes and trowels. • Wheelbarrows to be used for transporting materials. • Hand tampers or plate compactors to be used for surface compaction. Ergonomics: • Train workers on correct lifting and handling techniques. • Train workers on working in close proximity to others. • Rotate tasks to minimize repetitive strain or overexertion. • Provide shade or rest areas to reduce heat stress. • Use tools with ergonomic designs to limit physical strain. PPE: • Safety helmets and gloves. • Steel-toed safety boots with non-slip soles. • Dust masks or respirators. • High-visibility vests. • Eye protection (goggles). • Ensure that PPE is in good condition and used appropriately. Training: • Provide training on proper handling and laying of pavement materials. • Educate workers on hazard identification and safety protocols. • Demonstrate safe use of hand tools and compaction equipment. • Train workers on emergency response and first aid procedures. Inspections: • Regularly inspect tools, equipment and materials for defects or contamination. • Monitor the stability and compaction of the subgrade and base layers. • Check the evenness and compaction of the pavement surface.

Sub-activities	Safe operational controls/checkpoints
Asphalt paving Description: Asphalt paving involves the preparation, laying and compaction of asphalt material to create a durable and smooth road surface. Steps Involved: • Clearing and levelling the subgrade. • Lay and compact the base layer (e.g. gravel or crushed stone). • Apply a prime coat of bitumen to seal the base layer. • Prepare the asphalt mix (aggregate and bitumen) at the required temperature. • Spread and level the asphalt. • Compact the asphalt layer using rollers. • Inspect surface for evenness / quality. • Allow the asphalt to cool and cure. Potential Hazards: • Handling hot asphalt or equipment. • Slips, trips and falls on uneven or slippery surfaces. • Exposure to fumes, dust and high heat. • Heavy machinery or tools. • Repetitive tasks or improper lifting. • Fires  ©ILO/Flickr  ©gv tar paving/Flickr	Workplace assessment: • Assess weather conditions to avoid risks like rain or extreme heat. • Establish designated work zones with proper barriers to prevent unauthorized access. • Plan work schedules to avoid exposure to the hottest periods of the day. • Plan the bitumen works to ensure worker segregation. Hand tools and equipment: • Use long-handled tools, equipment and PPE to minimize direct contact with hot asphalt. • Conduct regular maintenance of equipment and tools involved in asphalt-related tasks to ensure proper functioning and minimize the chances of accidental contact with hot asphalt. • Implement proper training on handling hot asphalt and emergency response procedures. Ergonomics: • Train workers on proper lifting, handling, spreading and compaction techniques. • Rotate tasks to minimize repetitive strain or overexertion. • Provide rest breaks to reduce fatigue. • Use tools with ergonomic designs to limit physical strain. PPE: • Ensure heat-resistant gloves and safety helmets are provided and worn. • Steel-toed boots with non-slip soles. • Dust masks or respirators. • High-visibility vests and eye protection. • Ensure that PPE is in good condition and used appropriately. Training: • Train workers on safe handling of hot asphalt and equipment. • Demonstrate proper spreading, levelling and compaction techniques. Inspections: • Regularly inspect tools, equipment and materials for defects or contamination. • Monitor the temperature and consistency of the asphalt mix. • Check the evenness and compaction of the asphalt surface.

Sub-activities	Safe operational controls/checkpoints
Compaction Description: The process of increasing the density of soil or other materials by reducing air voids through the application of mechanical force. This is achieved by compressing the material to create a stable, firm and uniform surface that can better support structures or resist environmental stresses. Steps Involved: • Clear the area. • Level the surface to ensure an even foundation for compaction. • Assess moisture content of soil. • Spreading soil or material in uniform layers. • Use appropriate tools or equipment for compaction, such as hand tampers, rammers, or pedestrian rollers. • Compact each layer thoroughly before adding the next. • Inspect and test and then do a final compaction. Potential Hazards: • Slips, trips, or falls due to uneven or cluttered terrain. • Repetitive motion • Vibrations • Noise exposure • Improper use of or malfunctioning compactor. • Radiation exposure during density testing • Working in extreme heat or extreme cold conditions.  ©ILO/Flickr  ©wayang gambar/pexels	Worksite assessment: • Conduct a site inspection to identify hazards such as uneven terrain, loose materials, or nearby traffic. • Demarcate the work area using cones, tape, or signage to restrict access to authorized personnel only. • Assess weather conditions and modify operations accordingly (e.g. delay work during heavy rain, strong winds or extreme heat). Hand tools and equipment: • Use appropriate tools such as rammers, rollers, plate compactors or tampers designed for compaction. • Regularly inspect tools and equipment for wear and tear, ensuring they are in good working condition. • Provide clear instructions on the correct use of tools to prevent misuse or accidents. Ergonomics: • Train workers to use proper body mechanics when lifting or operating tools. • Rotate tasks among workers to minimize repetitive strain on specific muscle groups. • Schedule regular breaks to allow workers to rest and recover. PPE: • Equip workers with safety gear, including helmets, gloves, steel-toed boots, ear protection, high-visibility vests and dust masks. • Ensure PPE is properly fitted and maintained to provide maximum protection. • Replace damaged or worn-out PPE immediately. Training: • Train workers on the safe operation of compaction tools and equipment, emphasizing proper techniques to avoid injuries. • Provide education on hazard identification and emergency response procedures. • Conduct regular refresher courses to reinforce safety practices and update workers on new protocols. Inspections: • Perform routine inspections of tools, equipment and the worksite to ensure compliance with safety standards. • Document inspection findings and address any identified issues promptly. • Involve workers in safety checks to promote a culture of accountability and awareness. • Supervisors should monitor activities to ensure compliance with standards.

Sub-activities	Safe operational controls/checkpoints
Concrete works Description: Concrete works involve the preparation, mixing, placement, and curing of concrete for rural road construction. This includes tasks such as forming, pouring, and finishing concrete structures like culverts, drains, or road slabs. Steps Involved: • Site preparation and layout. • Setting up formwork and reinforcement. • Mixing concrete (manual or mechanical). • Transporting and placing concrete. • Compacting and levelling. • Curing and finishing. Potential Hazards: • Contact with wet concrete. • Entrapment with concrete mixers. • Noise exposure from concrete mixer. • Fire through fuel usage. • Slips, trips and falls due to uneven surfaces or wet concrete. • Manual handling of cement bags and heavy materials. • Exposure to cement dust and chemicals. • Exposed reinforcement bars and cutting and bending of reinforcement bars • Collapsing formwork. • Working in extreme heat or extreme cold conditions.  ©ritesh_arya/pexels  ©Rodolfo Gaion/pexels	Workplace assessment: • Conduct a site inspection to identify hazards. • Ensure proper drainage to avoid water accumulation. • Verify the stability of formwork and scaffolding. • Assess weather conditions to prevent heat stress or rain-related risks. Hand tools and equipment: • Use appropriate tools like shovels, trowels and floats. • Wheelbarrows for transporting concrete. • Hand tampers, hand rammers or pedestrian rollers for compaction. • Measuring tools (tape, levels). • Concrete mixers (if available). • Store tools in designated areas to prevent tripping hazards and damage. Ergonomics: • Working with cement and concrete usually involves manual labour and lifting heavy loads. Train workers on proper lifting techniques. • Rotate tasks to minimize repetitive strain. • Provide rest breaks to reduce fatigue. • Use tools with ergonomic handles to reduce strain. PPE: • Respiratory protection (dust masks or respirators) required for protection against dust inhalation. • Wear impermeable gauntlet type rubber gloves and high length rubber boots to prevent direct contact with skin. Trousers should overlap the boots rather than be tucked into them. • Safety helmets, high-visibility vests and eye protection is also required to be worn. • Encourage workers to regularly wash (at least daily) protective clothing and keep it clean and free of concrete. Training: • Training on safe handling of cement and tools. • Educate workers on hazard identification and risk mitigation. • Conduct demonstrations on proper mixing and pouring techniques. • Training on good hygiene measures when handling concrete e.g. washing any areas that have been accidentally splashed with wet concrete as soon as possible with large quantities of clean water. Care should be taken to ensure that normal and protective clothing do not become soaked with wet concrete or concrete fluids. This could result in exposure over an extended period, resulting in tissue damage. • Training on working with combustible materials such as fuel. Inspections: • Daily inspection of tools and equipment including the concrete mixer. • Regular checks on formwork and scaffolding stability. • Monitor curing conditions to ensure quality. • Inspect PPE for wear and tear.

Sub-activities	Safe operational controls/checkpoints
Drainage and trenching works - Installing and maintaining drainage systems to prevent waterlogging and erosion Description: Drainage works involve creating channels, culverts, or other systems to manage water flow and prevent erosion or flooding on roads. Steps Involved: • Site survey and preparation to determine water flow patterns • Clearing the area. • Digging trenches or channels using hand tools like spades and shovels. • Remove excavated material and deposit it in designated areas. • Compacting the foundation for culverts. • Installation of structures like culverts, stone pitching, or gabions. • Backfilling of excavated areas and compaction. • Alignment and finishing. • Final inspection. Potential Hazards: • Manual handling. • Uneven terrain, loose soil, or waterlogged areas. • Trench collapse/cave-ins. • Improper tool handling. • Exposure to extreme weather or proximity to flowing water during construction. • Exposure to wildlife like snakes, crocodiles animals and insects. • Exposure to contaminated water. • Fall from height. • Motor vehicle collisions.  "Orange uniform workers" by International Labour Organization ILO, CC BY-NC-ND 4.0  ©Pascal Saur/pexels	Workplace assessment: • Assess the area to determine water flow patterns and identify the best locations for drainage structures. • Conduct a site inspection to identify potential hazards such as unstable slopes, waterlogged areas, or nearby traffic. • Mark out the work area with barriers or signage to restrict access to authorized personnel only. • Assess weather conditions as heavy rain can increase risks of flooding or soil erosion. • Supervisors are to conduct thorough risk assessments before starting drainage works to identify potential hazards and implement control measures. • Use clear signage and barricades to warn motorists and pedestrians of the work area. • Assess areas where guardrails are required whereby workers are expected to work close to edges and are at risk of falling over e.g. on bridges. Hand tools and equipment: • Use appropriate tools such as shovels, picks, wheelbarrows and spirit levels for excavation and alignment. • Inspect tools before use to ensure they are in good working condition and free from defects. • Store tools in designated areas to prevent tripping hazards and damage. Ergonomics: • Rotate tasks among workers to prevent repetitive strain injuries. • Provide adequate rest breaks to reduce fatigue during physically demanding tasks. • Provide mechanical aids such as cranes or hoists where the pipes may be too large or heavy to lift manually. PPE: • Equip workers with gloves, helmets, safety boots and high-visibility vests. • Provide dust masks if there is a risk of exposure to fine particles during excavation. • Ensure PPE is properly fitted and replaced if damaged. • Flotation devices and waterproof clothing, gloves and footwear may be needed when working on or near water sources. Training: • Conduct training sessions on safe manual handling techniques, hazard identification and emergency response procedures. • Train workers to use proper techniques for digging and lifting to minimize strain on the back and muscles. • Train workers on the proper use of tools and equipment to prevent misuse. • Workers should be made aware of the dangers that could be lurking in drainage systems e.g. snakes, crocodiles animals and insects. Inspections: • Perform daily inspections of the worksite to identify and address hazards such as loose soil or water accumulation. • Check tools and equipment regularly for wear and tear. • Inspect completed drainage structures to ensure they meet design specifications and are stable.

Sub-activities	Safe operational controls/checkpoints
Culverts and structures Description: Culvert construction involves creating drainage structures to allow water to flow beneath roads, trails, or similar obstructions. This activity includes excavation, formwork setup, reinforcement placement, concrete pouring, and backfilling. While culvert construction primarily involves ground-level tasks, elevated work may be necessary for associated structures like retaining walls, bridges, or complex culvert designs. In such cases, scaffolding plays a crucial role in ensuring safe access and support during tasks such as formwork setup, reinforcement placement, and concrete pouring at height. Structures include all elements related to structures on rural roads including: • Bridges • Drifts • Culverts, • Retaining walls, • Related infrastructure Steps Involved: • Site survey. • Excavation of the trench to required dimensions. • Preparation and placement of bedding material. • Planning and design of formwork and scaffolding. • Installation of scaffolding for elevated work areas. • Installation of formwork and support work. • Installation of steel reinforcement. • Mixing and pouring concrete for the structure. • Curing of concrete. • Removal of formwork and scaffolding, followed by backfilling. Potential Hazards: • Cave-ins during trench excavation. • Manual handling. • Exposure to cement, dust or fumes. • Slippery surfaces. • Equipment or machinery-related incidents. • Working on or near water sources. • Structural instability resulting in collapse. • Working at height. • Inclement weather (heat, winds, rain, snow). • Improper handling of tools, materials and equipment. • Falling objects. • Motor vehicle collisions.  ©Oscar Sánchez/pexels	Workplace assessment: • Before starting the excavation of the culvert trench, traffic needs to be diverted away from the worksite. • Ensure the stability of excavation walls (use trench supports if necessary). • Mark and barricade the worksite to prevent unauthorized access. • To keep the worksite dry and free from water, it may be necessary to build temporary waterways, i.e. river trainings or river diversions. • Evaluate weather conditions to avoid risks of flooding or heat stress. • Assess ground conditions to ensure a stable and level base for scaffolding and formwork. Hand tools and equipment: • Ensure the appropriate tools are selected for the type of work being performed. • Concrete mixers, hand tampers, hand rammers or pedestrian rollers must be checked prior to use for any defects. • Inspect tools like hammers, wrenches, and levels for damage before use. • Use tools designed for scaffolding and formwork assembly, avoiding makeshift solutions. • Store tools securely to prevent them from falling or causing tripping hazards. • If ladders are used for safe access, ensure that the ladder is secured and is safe for use. Ergonomics: • Train workers on safe lifting techniques to handle materials and tools and carrying scaffolding components and formwork panels safely to avoid strain. • Rotate tasks regularly to minimize repetitive strain. • Provide rest breaks to reduce fatigue. • Use long-handled tools to reduce bending and strain. • The culvert pipes should be gently lowered into the trench using a rope. • Ensure workers have stable platforms and avoid awkward postures during assembly or dismantling formwork or scaffolding. PPE: • Ensure PPE provided is appropriate for the tasks being performed e.g. safety helmets, gloves, steel-toed boots with anti-slip soles, safety harnesses and high-visibility vests. • Use eye protection and dust masks when cutting or handling materials that generate dust or debris • Flotation devices will be required when working on or near water sources. • Provide fall protection equipment such as harnesses and lanyards for workers operating at height. • Whenever appropriate, install safety nets to complement other systems used to protect against falls.

► Continues on the next page

Sub-activities	Safe operational controls/checkpoints
Culverts and structures  ©Jametlene Reskp/Unsplash  ©Marina/Flickr	Training: • Train workers on safe trench excavation and formwork setup. • Provide guidelines for handling concrete and reinforcement materials. • Demonstrate the safe use of tools and equipment. • Train workers on the proper assembly, use and dismantling of scaffolding and formwork. • Train all workers on how to check the basic safety conditions on the scaffolding and to report any defects. • Workers are to be trained on working at height, scaffold use and how to use safety harnesses properly. • Specialised training or best practices should be in place for those required to erect and inspect scaffolds. Inspections: • Conduct daily inspections to check the stability of excavation walls, formwork and scaffolding. • Inspect tools and equipment for any damage or defects. • Monitor curing conditions for the concrete to ensure proper strength development. • Conduct regular inspections to identify weaknesses or damage of formwork or scaffolding. • Inspect scaffolding and formwork for defects or damage before each use. • Have the scaffold checked by another person once it has been erected and record all the controls carried out. Ask the site manager to conduct a final check before using the scaffold. A safe to use tag should be placed on the scaffold. • Examine the scaffolding under various conditions e.g. after placing heavy materials on it, when many workers are working on it and after heavy rain or a storm. Form work and scaffolding: • Ensure that formwork and scaffolding are designed by qualified engineers to handle the expected loads. • Use proper bracing, tiebacks, and shoring to enhance stability. • Follow manufacturer guidelines for assembly and dismantling. • Avoid overloading by adhering to weight limits specified by engineers. • Distribute loads evenly to prevent structural failure. • Install guardrails, toe boards, and safety nets where necessary. • Secure scaffolding against wind or other environmental factors. • Avoid working on scaffolding during adverse weather conditions e.g. excessive rains, heavy winds, snow or icy conditions. • Restrict access to the area underneath the scaffold that has to be erected or dismantled so that no worker can access the area, apart from those directly involved.

Sub-activities	Safe operational controls/checkpoints
Gabion construction - Gabions are wire mesh boxes filled with stones and tied together to form basic structures. They are used principally for retaining walls, drifts and erosion protection. Description: Gabions are wire mesh cages filled with materials like rocks, concrete, or sand. They are commonly used for erosion control, retaining walls, and landscaping due to their durability, flexibility, and permeability. In retaining wall applications, gabion structures must be designed to resist collapse and minimize risks of landslides. Proper site preparation, stable foundations and effective drainage systems are critical to maintaining their structural integrity. Steps Involved: • Site preparation. • Setting up the foundation. • Unfold the units from compressed bundles. • Assembling and lacing of gabion baskets. • Placement of empty gabion baskets on the prepared foundation. • Filling the baskets with stones or other materials. • Installing braces. • Securing and closing the baskets with wire or fasteners. • Checking alignment and stability. • Backfilling and compaction. Potential Hazards: • Handling sharp wire edges. • Manual Handling due to lifting heavy stones or baskets. • Falling Objects or tools. • Structural Instability. • Throwing rock into the basket whilst someone is working in it. • Working on near water sources. • Fall from height. • Landslides or ground erosion impacting gabion wall stability. • Working in extreme heat or extreme cold conditions.  ©Angela Bax/Flickr	
	Workplace assessment: • Maintain a clean and well-organized work area. • Use stable and level ground for basket assembly and installation. • Plan the work area with clear boundaries using barriers, signage, or cones to restrict access to authorized personnel. • Plan the installation progression to allow teamwork passing rocks into the basket for packing. • Assess environmental conditions (e.g. weather, ground stability) before beginning work and adjust plans accordingly. • Evaluate ground stability and implement measures such as compacting soil and designing drainage systems to minimize risks of landslides or retaining wall collapse. • Conduct a thorough site inspection to identify potential hazards such as uneven terrain, unstable slopes, or proximity to water bodies. Hand tools and equipment: • Use only appropriate tools such as wire cutters, pliers, spades, crow bars, closing tools and measuring tools for gabion works. • Check all tools before use for wear, defects, or damages, and ensure they are fit for purpose. • Follow manufacturer guidelines when operating equipment like compactors or cutters. • Store tools in designated areas to prevent them from becoming tripping hazards or getting damaged. • Ensure proper storage and stacking of materials to prevent them from falling. Ergonomics: • Plan work to prevent workers from working next to each other with the baskets. • Provide manual handling training to all workers. • Use mechanical aids, such as cranes or forklifts, to lift and move heavy gabion rock. • Provide adequate rest breaks to prevent overexertion and fatigue. • Execute the works using teams of 5 to 10 people. • Implement a buddy system or team lifting approach for heavier gabion baskets. • Ensure tasks are rotated regularly among workers to prevent repetitive strain injuries. • Provide platforms or scaffolding for workers to maintain ergonomic positions while assembling gabions. PPE: • Equip workers with gloves to prevent cuts and punctures from sharp gabion wires. • Provide helmets to protect against head injuries caused by falling objects or debris. • Ensure steel-toed boots are worn to shield feet from heavy falling rocks or tools. • Issue reflective vests to enhance visibility and dust masks if dust exposure is high. • Implement overhead protection (e.g. scaffolding, netting) to catch or deflect falling objects.

► Continues on the next page

Sub-activities	Safe operational controls/checkpoints
GABION CONSTRUCTION - Gabions are wire mesh boxes filled with stones and tied together to form basic structures. They are used principally for retaining walls, drifts and erosion protection.	
 ©George Redgrave/Flickr	Training: • Conduct initial training sessions focused on gabion construction techniques, hazard identification, and safe tool usage. • Provide adequate and ongoing training to workers on the risks associated with falling objects and how to properly mitigate them. • Train workers to use proper lifting techniques when carrying heavy rocks or gabion baskets (e.g. bend at the knees, not the waist). Inspections: • Perform daily inspections of the worksite to identify and address hazards like loose rocks or unstable gabion baskets. • Check tools and equipment regularly for defects or wear and ensure they are maintained in good condition. • Inspect completed gabion structures to confirm they are stable and properly secured. • Keep records of inspections and promptly implement corrective actions for any issues identified.

4.9 Planning for emergencies

4.9.1 Emergency Preparedness and Response Plan (EPRP)

All worksites need a plan for emergencies. Emergencies should include consideration of crises, such as war, civil unrest, natural disasters, medical emergencies and general contingency planning (see table 9).

On rural road worksites this will include planning for medical incidents and accidents and ensuring there are suitable numbers of people trained in first aid measures, on-site first-aid provision, e.g. suitable first aid kits in appropriate locations and the location of local emergency medical facilities. Plans will also have to include transport planning for emergency medical evacuations considering existing road conditions and distance to the nearest suitable clinic.

Every worksite, where applicable, should have clearly labelled exit routes for emergency evacuation. This should consider local road conditions. Designate an open area at the worksite - or in the vicinity - as the meeting (assembly) point and instruct everyone to

proceed to this area during an evacuation. This will need to change as the project progresses. An overview of a typical EPRP and response plan is presented in table 9.



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► **Table 9: Emergency Plan and Preparedness report (EPPR)**

Emergency preparedness (EP)
1. Identify potential emergencies: • Road accidents • Fire • Severe weather (e.g. storms, sandstorms, floods, snow, excessive heat) • Medical emergencies • Equipment failure • Infectious diseases (pandemic or epidemics) • Fall from height incidents
2. Emergency contact information: • Have a list of emergency contact numbers (e.g. local fire department, medical services, police, supervisors) • Make this list accessible to all workers
3. Emergency supplies: 3.1 First aid kits: • Make sure that there are clear signs to indicate the locations of first-aid kits. • Kits must be easily accessible and close to points of works, checked regularly and fully stocked. 3.2 Fire extinguishers: • Provide a suitable number of fire extinguishers in each worksite either foam or dry chemical for the type of works. • Check the expiry date of fire extinguishers regularly. • Expired extinguishers should be replaced immediately. • All the instructions on how to use fire extinguishers and the signs for evacuation routes should be written in the local language and, if relevant, in the languages of migrant workers who do not understand the local language. 3.3 Emergency shelters (tents or safe structures): To provide immediate protection and aid to individuals affected by unforeseen events, ensuring safety and well-being until further assistance arrives. 3.4 Communication devices (e.g. mobile phones, radios): These devices provide a lifeline for reporting incidents, requesting assistance and disseminating crucial information. 3.5 Emergency sirens or alarms: Must be available onsite and personnel must be trained on the proper use. 3.7 Emergency transport vehicles: Must be available onsite and arrangements made with nearest clinic for initial care.
4. Training and Drills: • Regularly train all workers on emergency procedures, evacuation routes assembly points and the sound of the alarm. All workers should have training on how to evacuate the work area and where to evacuate to, who to contact and what to do in an emergency. Evacuation drills should be planned and implemented. • There should be trained first aiders, emergency coordinators and fire fighters onsite/projects. Ensure that all workers know who their trained first aiders are. • Conduct periodic emergency drills to practice the response plan.
5. Post-Emergency Procedures: 5.1 Reporting: • Fill out an evacuation drill report form. (Refer to Annex 2) • Provide details of the emergency and response actions taken. • It may also be necessary to fill out an incident report form (Annex 4). 5.2 Review and Improve: • Review the incident and response to identify any gaps. • Update emergency preparedness and response plan as needed. • Conduct follow-up training if necessary.

Emergency response

1. Road accidents:

- Step 1: Ensure safety of workers, move to a safe location or emergency assembly point if needed.
- Step 2: Call emergency services.
- Step 3: Provide first aid to the injured, if trained to do so.
- Step 4: Report the accident to the supervisor.

2. Fire:

- Step 1: Raise the alarm and evacuate the area.
- Step 2: Use fire extinguishers to control small fires if trained. Use foam or dry chemical extinguishers especially for asphalt paving.
- Step 3: Turn off nearby machinery and ignition sources.
- Step 4: Smother small fires with sand or soil if needed. Prevent fire spread with non-flammable barriers.
- Step 5: Call the fire department for uncontrollable fires.
- Step 6: Assemble at the designated emergency assembly point.

3. Medical emergencies:

- Step 1: Assess the situation and call medical services.
- Step 2: Provide first aid if trained.
- Step 3: Ensure the patient is in a safe position.
- Step 4: Report the incident to the supervisor.

4. Infectious diseases (pandemic or epidemic):

- Step 1: Immediately isolate anyone showing signs of infection and report cases to health authorities.
- Step 2: Enforce physical distancing, provide handwashing stations and distribute PPE like masks and gloves. Limit site access to essential personnel only.
- Step 3: Provide access to health services and ensure infected or quarantined employees have support e.g. paid leave and accommodation where applicable.
- Step 4: Educate workers about symptoms, prevention and hygiene practices. Share clear communication about protocols.

5. Measures to treat heat stress:

- Step 1: Move the person to a cooler place.
- Step 2: Lay them down with legs slightly elevated.
- Step 3: Loosen or remove heavy clothing.
- Step 4: Offer cool, non-caffeinated drinks.
- Step 5: Cool the body with water or a fan.
- Step 6: Monitor their condition and get medical help if needed. If symptoms of heatstroke appear (like confusion or high fever), call for emergency services immediately.

6. Measures for hypothermia:

- Step 1: Move the person to a warm, sheltered area.
- Step 2: Remove wet clothing and replace with dry layers.
- Step 3: Warm the person gradually using blankets or body heat.
- Step 4: Focus on warming the torso first, not extremities.
- Step 5: Offer warm, non-caffeinated drinks if they are conscious.
- Step 6: Monitor their breathing and pulse and seek medical help if needed.

7. Fall from height incident:

- Step 1: Have a rescue plan tailored to the site and ensure all workers are trained in it.
- Step 2: Call emergency services immediately after a fall.
- Step 3: Communicate with the fallen individual to assess and reassure them.
- Step 4: If suspended in a harness, initiate rescue quickly to prevent suspension trauma.
- Step 5: Use proper rescue equipment like ladders aerial lifts, or rope systems.
- Step 6: Provide first aid and ensure medical attention for the individual.
- Step 7: Record and report the incident for investigation and prevention.
- Step 8: Conduct regular training and equipment inspections to prevent future incidents.

4.10 OSH evaluation and monitoring

4.10.1 Emergency preparedness and evacuation drill

All sites should have a mock emergency drill or simulation carried out at least quarterly or as the project site changes, to test the effectiveness of their emergency plan and response.

Table 10 gives further detailed steps for conducting an emergency drill.

A template for an EP drill can be found in Annex 2.

► Table 10: Steps to follow for an emergency drill	
Step	Details
Scenario Start	Announce the start of the drill and outline the scenario details.
Activation of Alarm	Test the alarm system or notify workers through the chosen communication method.
Response Actions	Workers follow emergency procedures (e.g. evacuate apply first aid, report hazards).
Evacuation Process	Direct participants to designated assembly points or safe areas.
Communication Check	Test communication channels between workers, supervisors and emergency responders.
Observer Evaluation	Observers monitor actions, noting strengths and areas for improvement.

Monitoring of an OSH programme for labour-based rural road operations involves systematic processes to ensure compliance, safety and continuous improvement.

4.10.2 Safety audits and inspections

Safety audits and inspections are an important way of determining whether established controls, safe work practices, safety rules, etc. that were developed as part of the hazard assessment and control process are in place, being followed and are effective. Table 11 lays out some key points for conducting safety audits and inspections.

What are safety audits and inspections?

Safety audits are systematic evaluations of how well safety practices and procedures are being implemented.

Safety inspections are typically more focused and seek to identify potential hazards. Both processes work hand-in-hand to create a safe working environment.

Why conduct safety audits?

- Identify potential hazards and mitigate risks.
- Ensure compliance with safety regulations.
- Enhance the efficiency of operations.
- Improve the safety culture of the organization.

► **Table 11: Key Points for conducting safety audits and inspections**

Step	Details
1. Preparation	Before conducting an audit or inspection, gather all necessary documentation, define scope, and prepare checklists. Form an audit team with members who have expertise in safety, engineering, and operations.
2. Execution	- During the audit or inspection, observe work conditions, interview employees, and document findings. This should include regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used. - Use checklists to ensure all critical areas are covered, including equipment, materials, and work processes. - Observe workers' adherence to safety protocols and use of personal protective equipment (PPE). The inspection should verify that PPE continues to provide adequate protection and is being worn as required. - All instruments installed or used for monitoring and recording of working environment parameters should be regularly tested and calibrated, and the respective records maintained.
3. Reporting	After the inspection, compile a report detailing findings, recommendations, and action plans to address any issues identified.
4. Follow up	Ensure that the recommended actions have been implemented and validate their effectiveness through follow-up inspections.

Safety audits and inspections should be conducted regularly and whenever there are changes in work procedures, introduction of new machinery, or after an incident occurs. Typically, audits are scheduled quarterly or bi-annually and inspections can be done weekly.

A checklist for safety inspections is provided in Annex 5.

4.10.3 Performance indicators and metrics

OSH performance indicators and metrics in labour-based rural road operations are essential for ensuring the safety and well-being of workers. Box 5 presents more details on indicators and metrics.

► **Box 5. Performance indicators & metrics**

Performance indicators

- **Definition:** These are the specific qualitative or quantitative measures used to assess the progress toward achieving a goal or objective.
- **Purpose:** They focus on what you want to measure and track.

Performance Metrics

- **Definition:** These are the actual values or calculations derived from data to track and quantify performance.
- **Purpose:** They focus on how you measure and calculate the performance indicators.

Procedures to monitor, measure and record OSH performance on a regular basis should be developed, established and periodically reviewed. Responsibility, accountability and authority for monitoring at different levels in the management structure should be allocated. The selection of

performance indicators should be according to the size and nature of activity of the organization and the OSH objectives. Examples of OSH performance indicators and metrics that can be used in labour-based rural road operations are presented in table 12.

► **Table 12: Examples of OSH performance indicators and metrics**

Performance Indicator	Associated Metric
Incident rate	- Number of recorded incidents per 1,000 work hours. - Percentage of total workers involved in accidents in a given month or year.
PPE compliance	- Percentage of workers observed wearing required PPE during inspections. - Number of PPE violations logged during site audits.
Worker engagement in safety initiatives	- Number of safety meetings or Toolbox Talks conducted per month. - Percentage of workers providing safety-related feedback or suggestions.
Emergency response readiness	- Time taken to complete emergency evacuation drills. - Percentage of workers aware of emergency procedures (based on surveys or tests).
Health monitoring and well-being	- Number of health check-ups provided for workers. - Percentage of workers reporting health issues related to work activities.

4.11 OSH improvement

4.11.1 Reporting of accidents, incidents and occupational diseases

The ILO provides guidelines for measuring and recording incidents through its conventions and recommendations, such as the Occupational Safety and Health Convention, 1981 (No. 155) and related Codes of Practice. National safety regulations often align with ILO guidelines, so each Member State should consult local laws for specific reporting requirements.

4.11.2 Types of incidents

► **Table 13: Types of incidents and their description**

Types of Incidents	Description
Occupational Accidents	Any occurrence arising out of or in the course of work that results in injury or fatality.
Occupational Diseases	Illnesses contracted as a result of exposure to risk factors at work.
Dangerous Occurrences	Events with the potential to cause injury or disease, even if no harm occurs (e.g., equipment failure, near-misses).
Commuting Accidents	Accidents occurring on the direct route between the workplace and the worker's residence or other designated locations.

4.11.3 Guidelines for reporting and recording minor and serious injuries

Employers must report occupational accidents and diseases to the relevant authority within a specified timeframe, as outlined by national laws. This ensures that affected workers can access compensation promptly.

► **Table 14: Guidelines for reporting and recording minor and serious injuries**

A. Classification of injuries
Minor Injuries: • Include small cuts, bruises, minor burns, or injuries that do not require hospitalization or time off work. • Treatment will include the provision of first aid onsite, e.g. cleaning wounds or applying bandages. No follow-up treatment would be required unless the condition worsens. • Example: A worker sustains a small cut while using hand tools but continues working after basic first aid is provided. Serious Injuries: • Include incidents such as fractures, amputations, head injuries, or injuries that require hospitalization and lead to lost workdays or result in permanent disability. • Immediate medical attention would be required which may involve emergency services, surgery or prolonged treatment. • Example: A trench collapse causes a worker to sustain a fractured leg, requiring medical attention and time off work.
B. Recordkeeping requirements
Create an injury logbook or register (template provided in Annex 3) to systematically record all workplace injuries. • Log minor injuries for internal records and trend analysis. • Log serious injuries and submit them to the relevant authority, as per national requirements. Include the following in your log: • Date and time of injury. • Detailed description of the incident. • Worker details (name, role, etc.). • Treatment provided (first aid, hospitalization, etc.). • Lost workdays (if applicable).
C. Reporting process
Minor injuries: • Maintain a detailed internal record. This must be used for monitoring and trend analysis. This is typically not reported to external authorities. • Use the data to identify recurring minor hazards, such as tool misuse or insufficient PPE. Serious injuries: • Notify the competent authority immediately (e.g. within 24–48 hours). • Submit a formal report (template provided in Annex 4) detailing the nature and cause of the injury, along with preventive measures. Include supporting evidence like photographs, witness statements, and medical records. • Reporting process.
D. Follow-up
Minor injuries: • Monitor the worker to ensure recovery. • Investigate recurring minor injuries to identify potential hazards. Serious injuries: • Conduct thorough investigations to determine the root causes. • Ensure workers receive the necessary rehabilitation or compensation.

E. Key metrics for monitoring injuries

Incident Frequency Rate (calculated for everyone million man-hours worked):

- Formula: $(\text{Number of incidents} \times 1,000,000) \div \text{Total hours worked}$.
- Tracks how often incidents occur relative to the total work hours.

Lost-Time Injury Rate (LTIR) (calculated for everyone million man-hours worked):

- Formula: $(\text{Number of lost-time injuries} \times 1,000,000) \div \text{Total hours worked}$.
- Measures the rate of serious injuries that result in lost workdays.

Severity Rate (calculated for everyone million man-hours worked):

- Formula: $(\text{Total lost workdays} \times 1,000,000) \div \text{Total hours worked}$.
- Indicates the overall impact of injuries in terms of lost productivity.

F. Preventive Measures

Use injury records to identify trends (e.g. recurring tool injuries or slips).

Implement specific safety measures based on the data:

- Conduct targeted training for high-risk activities.
- Improve safety equipment or procedures e.g. reinforce the use of appropriate PPE for tasks such as gloves for manual handling.
- Strengthen hazard identification processes – implement formal risk assessments for high hazard tasks.

The ILO encourages member states to establish national systems for recording and notification of occupational accidents and diseases. These systems should:

- ▶ Be accessible to all workers and employers.
- ▶ Include clear procedures for reporting and processing compensation claims.
- ▶ Provide data for national and international statistics to inform preventive measures.

4.11.4 Workman's compensation

To protect workers and comply with international standards, including the International Labour Organization (ILO) conventions, provisions for workmen's compensation must be integrated into the project/programme. This ensures injured workers receive necessary medical care, rehabilitation and financial support, fostering a culture of safety and accountability.

Examples from other projects show how these provisions are effectively implemented: Employers collaborated with insurers to provide comprehensive coverage, facilitating the timely resolution of compensation claims and minimizing disruptions to affected workers.

Embedding insurance as a contractual requirement not only reinforces compliance with ILO standards but also prioritizes the welfare of workers, ensuring they are supported throughout recovery.

4.11.5 Reporting of grievances

A grievance mechanism is a formal process that allows workers, community members, or stakeholders to raise concerns, complaints, or issues related to workplace practices, safety, or project operations. It provides a structured way for these grievances to be reported, addressed, and resolved fairly and transparently.

A typical grievance mechanism involves:

- ▶ **Raising a grievance:** Concerns can be submitted through a designated channel (e.g., suggestion boxes, a hotline, email, or in-person meeting). Ensure anonymity and confidentiality to protect workers from retaliation.
- ▶ **Recording and acknowledging:** The project team or assigned person should record the grievance and acknowledge receipt.
- ▶ **Awareness and training:** Educate workers on how to use the grievance mechanism during safety training or induction sessions. Display procedures in visible areas using posters or leaflets.

- Investigation and resolution: The grievance is then investigated, and appropriate actions are taken to address the issue. Assign a team or individual for investigation.
- Feedback and follow-up: The affected party is informed about the outcome of the investigation and any actions taken.

4.12 Continual improvement

Continual improvement is a core principle in OSH management systems. This concept is designed to ensure that workplace safety and health practices are consistently enhanced over time.

A. Regular safety audits and inspections

- Conduct frequent on-site safety inspections and audits to identify hazards and areas for improvement.
- Use findings to make incremental updates to processes, equipment, and training.

B. Worker participation and feedback

- Engage workers in discussions about workplace risks and ways to improve safety.
- Provide a platform, such as suggestion boxes or safety meetings, where workers can contribute ideas.
- Acknowledge and reward workers or teams who consistently follow OSH protocols. This could involve giving incentives, praise, or recognition to encourage a culture of safety and compliance.

C. Informal goal setting

- Set short-term, achievable safety goals (e.g. reducing near-misses or improving PPE compliance).
- Review progress regularly and adjust targets as necessary.

D. Use of incident data

- Track incidents, near-misses, and unsafe conditions through a logbook or simple spreadsheet.

- Analyse this data periodically to identify trends and recurring hazards.
- Document the steps taken to address and resolve any incidents or accidents that occur. It includes investigating the cause, implementing corrective actions to prevent recurrence and ensuring accountability.

E. Ongoing training and skill development

- Offer workshops, toolbox talks, or refresher training sessions tailored to specific risks or tasks.
- Keep workers updated on new safety practices and technologies.

F. Benchmarking and best practices

- Learn from peers or similar organizations by benchmarking performance against industry standards.
- Adopt best practices that can enhance safety and efficiency on-site.

G. Incremental improvements

- Focus on small, manageable changes, such as upgrading tools, revising procedures, or redesigning workflows.

H. Leadership commitment

- Foster a culture where supervisors and management consistently demonstrate a commitment to safety.
- Lead by example by following safety protocols and encouraging others to do the same.

I. Use of visual tools

- Display safety boards, posters, or charts showing key metrics like incident rates or compliance levels.
- Use these tools to communicate progress and keep safety top of mind.

5. Cross-cutting social and environmental issues

The ILO identifies several cross-cutting social and environmental issues that are integral to its work and policies. Recognizing diversity, including gender differences, is essential for ensuring the safety and health of workers. A gender-sensitive approach acknowledges that societal roles and job types expose men and women to different risks, requiring tailored control measures. It also highlights how biological differences, employment patterns, and social roles shape gender-specific occupational hazards.

Additionally, workers with disabilities may participate in road construction. Employers must assess accessibility, job demands, and workers' potential beforehand to ensure the work system is safe and inclusive.

5.1 Gender inequalities

The construction industry has long been a male-dominated field, focusing predominantly on safety measures tailored to men. However, as the sector evolves and welcomes an increasing number of women, it is no longer sufficient to have a one-size-fits-all approach to safety.

Challenges:

- ▶ **Gender inequalities:** Women often face unique risks, such as harassment, absence of gender-friendly facilities or lack of appropriate PPE designed for their body types, e.g. a helmet that's too large can obstruct vision, while a loose harness can lead to dangerous slips or falls.
- ▶ **Workers with disabilities:** Workers with disabilities may encounter barriers in accessing safe work environments or equipment.

- ▶ **Vulnerable groups:** Vulnerable groups, such as migrants, youth, or older workers, may lack awareness of safety protocols or face exploitation.

Special considerations to ensure the safety, well-being and empowerment of women workers:

- ▶ Provide gender-sensitive PPE.
- ▶ Implement strict anti-harassment policies, training and measures to prevent harassment and violence, e.g. well-lit work areas, secure accommodation, and clear reporting mechanisms for any incidents.
- ▶ Provide separate and adequate sanitation facilities for women, including clean toilets and washing areas.
- ▶ Ensure access to healthcare services and make provisions for sanitary products.
- ▶ Promote equal opportunities for women. Encourage women to take on leadership roles within the project.
- ▶ Create a supportive work environment that respects women's needs, such as flexible working hours and provisions for maternity leave.
- ▶ Offer training programmes tailored to women to enhance their skills and knowledge in construction and related fields.
- ▶ Conduct awareness programmes to sensitize all workers about gender equality and the importance of creating an inclusive work environment.



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"Lebanon" by International Labour Organization ILO, CC BY-NC-ND 2.0



"Nepal earthquake 2015" by ILO Asia-Pacific, CC BY-NC-ND 2.0



"HIMO Route/OIT/DEFIS project in Madagascar" by International Labour Organization ILO, CC BY-NC-ND 2.0



©Mike van Schoonderwalt/pexels



©Ron Lach/pexels

5.2 People with disabilities

There are many tasks in road construction that people with disability can perform. People with disability should be consulted about what kinds of works they are able to do and what types of works they might have difficulty with.



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Special considerations for workers with disabilities:

- ▶ Adapt tools, equipment, and workspaces to accommodate disabilities (e.g. ramps, ergonomic tools).
- ▶ Provide tailored safety training and emergency evacuation plans.
- ▶ Encourage an inclusive culture where workers with disabilities feel supported.
- ▶ Workers with disabilities can work closer to the villages with suitable facilities.
- ▶ Workers with disability should be consulted with about what accommodations they may need.
- ▶ Reasonable accommodation should be made for people with disability as to resting breaks and modified tools or safety gear (ILO 2002).

5.3 Vulnerable groups

The commitment to social inclusion relates to addressing the situation of the poor and vulnerable including those most marginalized, discriminated against, excluded and affected by conflicts and disasters and to empower them to become active agents of the development process. This commitment translates to the principle of non-discrimination.

Prohibited grounds of discrimination include race, colour, caste, ethnicity, gender, age, language, disability, sexual orientation, gender identity, religion, political or other opinion, national, social or geographic origin, property, birth or other status.

Special considerations for vulnerable workers:

- ▶ Offer multilingual safety training and materials for diverse workers.
- ▶ Ensure fair treatment and protection from exploitation or unsafe practices.
- ▶ Monitor working conditions closely to address specific risks faced by these groups.

5.4 Environmental issues

Road construction and maintenance activities have several adverse effects on the environment such as deforestation, destabilizing of slopes, causing erosion of riverbanks, noise pollution, air pollution etc. It is the responsibility of all the road construction and maintenance agencies to keep these adverse impacts to the minimum.

► Table 15: Roles and Responsibilities

Environmental issue	Description	Mitigation
Soil erosion  ©Harrison Haines/pexels	Construction and maintenance activities can lead to soil erosion, especially in areas with loose or unstable soil. This can result in the loss of fertile topsoil and negatively impact agricultural productivity.	Cover exposed soil with geotextiles or mulch to stabilize it and reduce erosion risk. Establish vegetation like grasses or shrubs on exposed soil as quickly as possible to hold soil in place. Minimize works during heavy rains to minimize erosion risks.
Water pollution  ©Çağrı KANMAZ/pexels	Runoff from construction sites can carry sediments, oils, and other pollutants into nearby water bodies, leading to water pollution. This can harm aquatic ecosystems and affect the quality of water for local communities.	Use silt fences or sediment traps to filter runoff before it reaches water bodies. Store oils and chemicals in secure, designated areas to prevent leaks or spills. Implement drainage systems to direct runoff away from water sources safely.
Deforestation and habitat loss  ©Merih Tasli/Unsplash	Clearing vegetation for road construction can lead to deforestation and the loss of natural habitats for wildlife. This can disrupt local ecosystems and threaten biodiversity.	Tree cutting to be permitted only under extremely necessary conditions. Only fallen twigs to be used as firewood. Construction sites should strive to use a mixture of available energies other than fuel wood. Follow compensatory planting plan if trees have to be removed.
Air and noise pollution to habitats  ©Maël BALLAND/pexel	Dust and emissions from construction equipment and vehicles can contribute to air pollution. This can have adverse effects on the health of workers and nearby residents. Construction activities can generate significant noise, which can disturb local communities and wildlife. Prolonged exposure to high noise levels can also have health implications for workers.	Restrict works to daylight hours within 500m of protected areas, residential settlements and hospitals. Monitor and investigate complaints, proposing alternative mitigation measures. Tightly cover trucks transporting construction materials (sand, soil, cement, gravel, etc.) to avoid or minimize spills and dust emission. Mixing and crushing plants operations will be equipped with dust suppression devices such as water sprays, when within 500m of any sensitive receptors.

Environmental issue	Description	Mitigation
Inappropriate stone and/or sand quarry sites  ©marcin studio/pexel	The selection of inappropriate stone or sand quarry sites can lead to environmental degradation, habitat destruction, and disruption of local communities, while also increasing transportation costs and reducing project efficiency.	Stone quarry sites should be so chosen as not to cause landslides/ avalanches. No stone/sand quarrying on the upstream side of riverbed of a habitat / on the banks that are vulnerable to flooding. No stone/sand quarrying on the upstream side of bridges/causeways. Do not use quarries in areas of natural woodland or near rivers, which provide food and shelters for birds and other animals. Do not use borrow/quarry sites located in productive land and forested areas.
Waste management  ©Mathias Reding/Unsplash	Improper disposal of construction waste, such as debris, packaging materials, and hazardous substances, can lead to environmental contamination. Effective waste management practices are essential to minimize this impact.	Separate recyclable, hazardous, and general waste on-site for proper disposal. Reuse materials like metal, wood, and concrete whenever possible. Ensure hazardous waste is disposed of at licensed facilities. There shall be no burning of construction and domestic wastes. Provide labelled bins for different types of waste to prevent mixing. Train workers on waste management practices to minimize improper disposal.
Hydrological changes  ©Jacob Antony/Unsplash	Road construction can alter natural drainage patterns and affect the hydrology of the area. This can lead to changes in water flow, increased flooding, and disruption of local water resources.	Use culverts and channels to manage water flow and avoid flooding. Maintain or plant vegetation along roadsides to reduce water runoff and soil erosion. Inspect drainage systems periodically to ensure they function effectively. Rocks and stones must be disposed not to block rivers and streams.

Environmental issue	Description	Mitigation
Impact on wildlife  ©Annie Spratt/Unsplash	Roads can create barriers for wildlife movement, leading to habitat fragmentation and increased risk of roadkill. This can have long-term effects on local wildlife populations.	Construct underpasses or overpasses to allow safe wildlife movement across roads. Install fences along roads to guide animals toward safe crossing points and reduce roadkill. Replant native vegetation along roadsides to maintain connectivity between habitats.
Cultural heritage and other sensitive issues  ©TORSTEN JACOBI/Unsplash	Construction of roads can cause destruction or alteration of historically or culturally significant landmarks, artifacts, and landscapes. This can result in the loss of irreplaceable cultural assets, community unrest, and violations of heritage protection laws.	Site agents must keep a watch out for archaeological artefacts and relics. If any potential items are located, and determined of a potential significance, work must be temporarily stopped in that area and the relevant persons contacted.

6. Conclusion

The safety, health, and well-being of workers is paramount in the successful execution of rural road operations. This manual is intended to serve as a dynamic reference document, continually evolving in response to advancements in safety practices and the specific needs of rural road operations. By implementing the OSH practices outlined in this manual, we can create a safer, more productive and sustainable work environment that benefits not only workers but also the communities they serve.

Through a proactive approach to hazard identification, risk management and worker participation, we can prevent accidents, protect the environment and promote inclusivity for all, including vulnerable groups. By fostering a culture of continual improvement, rural road operations can align with international standards, such as those set by the ILO, ensuring the highest standards of safety, equity and quality.

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ILO related Conventions and Recommendations

Conventions

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1947. Labour Inspection Convention (No. 81)

1948. Freedom of Association and Protection of the Right to Organise Convention (No. 87)

1949. Labour Clauses (Public Contracts) Convention (No. 94)

1967. Recommendation Concerning the Maximum Permissible Weight to Be Carried by One Worker (No. 128)

1977. Working Environment (Air Pollution, Noise and Vibration) Convention (No. 148)

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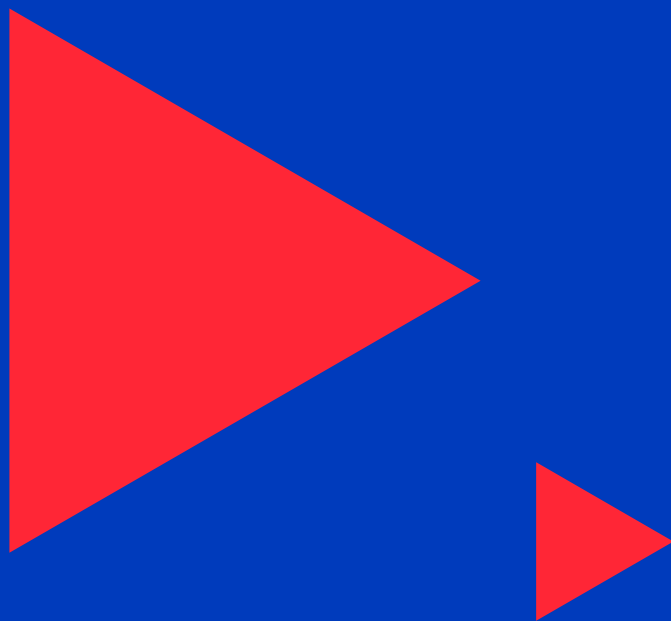
Recommendations

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1981. Occupational Safety and Health Recommendation (No. 164)

2023. Safe and Healthy Working Environment (Consequential Amendments) Recommendation (No. 207)

Part C – Annexes



Annex 1: OSH Policy Template [amend as appropriate]

Occupational Safety and Health (OSH) Policy for Rural Road Operations [Organization Name]

1. Purpose

To ensure the health, safety and well-being of all workers, contractors, members of public and stakeholders involved in rural road operations, while minimizing risks to the environment and surrounding communities.

2. Scope

This policy applies to all activities related to the construction, maintenance and repairs of rural road operations conducted by [Organization Name].

3. Objectives

- ▶ Prevent workplace injuries, illnesses and accidents.
- ▶ Promote a culture of safety and health at all levels.
- ▶ Comply with applicable legal and regulatory safety standards.

4. Key Principles

- ▶ **Risk Identification and Mitigation:** Conduct regular risk assessments to identify hazards and implement appropriate control measures.
- ▶ **Training and Awareness:** Provide regular safety training to ensure workers understand their OSH responsibilities.
- ▶ **PPE Usage:** Mandate the use of Personal Protective Equipment (PPE) such as helmets, gloves, reflective vests and safety boots.
- ▶ **Emergency Preparedness:** Develop and communicate emergency response plans, ensuring all workers are trained to act effectively during incidents.
- ▶ **Site Safety:** Maintain clear signage, barriers and traffic controls to safeguard workers and the public.
- ▶ **Health Monitoring:** Implement regular health screenings for workers exposed to hazardous conditions.

5. Responsibilities

- **Management:** Ensure implementation, monitoring and continuous improvement of OSH measures.
- **Supervisors:** Enforce compliance with safety guidelines on-site and ensure proper use of equipment.
- **Workers:** Follow OSH protocols, report hazards and participate in training programs.

6. Monitoring and review

Regularly evaluate the effectiveness of this policy and safety practices. Update procedures to address emerging risks and regulatory changes.

7. Communication

This policy must be accessible to all workers and shared with contractors, suppliers and stakeholders (upon request).

8. Commitment

[Organization Name] is committed to ensuring a safe and healthy working environment for all participants in rural road operations.

Signed by:

[Authorized Signatory Name]

[Designation]

[Date]

Annex 2: Evacuation Drill Report

Site: _____

The 3 Ps of Prevention: **Plan • Practice • Participate**

Emergency controller (EC) name:		Date of evacuation:	
Time evacuation commenced	Time evacuation completed		Time taken to evacuation
No. Of workers:		Emergency team leader name:	
Roll call taken? ☐ Yes ☐ No ☐ NA		All workers present ☐ Yes ☐ No	
Electrical power isolated? ☐ Yes ☐ No ☐ NA		Person responsible for this function?	
Power tools stopped? ☐ Yes ☐ No ☐ NA		Person responsible for this function?	

Type of emergency e.g. Fire, excavation collapse, annual mock drill, medical emergency:		
Item	Compliance	Comment
Did the workers respond actively to the alarm?		
Did they evacuate the worksite in a calm and brisk manner?		
Was the evacuation roll call register filled in?		
Have all workers been accounted for?		
Did workers assemble at the appropriate assembly points?		
Comments (any problems encountered must be indicated here)		

Annex 3: Incident Register Template

Inc No	Date and time of Incident	Location of incident	Name of injured or affected person/s	Type of incident	Injury Details	Root cause	Action taken and comments
eg 001	e.g. [dd/mm/year]	e.g. clearing site	e.g. Joe Soap (Labourer)	e.g. minor injury	e.g. small cut on hand	e.g. sharp tool misuse	e.g. Provided first aid. Reviewed safe tool use procedures

This template is used to maintain an ongoing log of all incidents (minor, serious and near-misses) for tracking and analysis purposes

Annex 4: Incident Reporting and Investigation Form

Incident details				
Name of person involved in the incident:			Date of incident:	
Location of incident:				
Incident investigation team				
What task was being performed at the time of the incident?				
What happened? (e.g. 'worker tripped over tools' or 'worker fell into excavation ')				
What factors contributed to the incident?				
Environment:		Equipment/materials:		
☐ Noise	☐ Layout / design	☐ Wrong equipment for the job	☐ Equipment failure	
☐ Lighting	☐ Dust / fume	☐ Inadequate maintenance	☐ Material / equipment too heavy / awkward	
☐ Vibration	☐ Slip / trip hazard	☐ Inadequate guarding	☐ Inadequate training provided	
☐ Damaged / unstable floor	☐ Other	☐ Other	☐ Other	
Work systems:		People:		
☐ Hazard not identified	☐ No / inadequate risk assessment conducted	☐ Procedure not followed / no procedure exists	☐ Drugs / alcohol	
☐ No / inadequate safe work procedure	☐ No / inadequate controls implemented	☐ Fatigue	☐ Time / production pressures	
☐ Hazard not reported	☐ Inadequate training / supervision	☐ Change of routine	☐ Distraction / personal issues / stress	
☐ Other	☐ Other	☐ Lack of communication	☐ Other	
Corrective actions				
Contributing factor (from above list)	What are we going to do to fix the problem?	Who	When	Completion date
Issue fixed?				
Name	Signature	Date		
Person involved in incident:				
Manager/Supervisor:				

Incident investigation process guide

1. Establish the facts of the incident, including:

- What happened?
- When and where did it happen?
- What task was being done?
- Who was involved?
- Were there any witnesses?

2. Gather all necessary background information, for example:

- maintenance records
- safe work procedures
- instructions manuals
- training records.

3. Consider all the potential contributing factors:

- Environment: *Did environmental conditions (e.g. light, noise, floor surfaces) contribute to the incident?*
- Equipment /materials: *Did anything about the equipment, materials, tools etc (e.g. equipment failures, missing guards) contribute to the incident?*

- Work systems: *Was there something about the system that contributed (e.g. hazard not identified, known hazard not addressed)?*

- People: *Was there something the workers, supervisors or contractors did that contributed to the incident (e.g. poor communication, being tired or rushing to finish on time)?*

4. Determine the primary cause/s of the incident, that is, those which if they hadn't occurred then the incident wouldn't have occurred. Ask yourself "Would the incident have happened if....?"

5. Identify the root cause / system failures that underlie the primary cause/s and contributing factors. One simple technique for identifying the root cause is the 'Five Whys'. This technique involves asking yourself 'Why did this happen?' and continuing to ask 'Why' for each response until you reach a conclusion that does not generate another 'why' and the underlying cause becomes apparent.

6. The final and most important step in any investigation is to take action to fix all the factors that contributed to the incident, starting with the primary cause/s and working through each of the contributing and underlying causes.

Annex 5: Site Inspection Checklist

Date _____

Inspected by _____

Please tick the appropriate box.

Section	Pictorial description	OK	Not OK	N/A	Action taken
1. Planning of the site					
Is there an updated Safety and Health Plan	 ©NCPDS/Flickr	☐	☐	☐	
Is the site layout mapped to ensure efficient and safe work		☐	☐	☐	
1a. Planning for emergencies					
Is there a plan for emergencies and are workers aware of this	 ©SHOX art/pexels	☐	☐	☐	
Is there a trained first aider/s on site and do all workers know who they are		☐	☐	☐	
Are first aid kits provided and fully stocked		☐	☐	☐	
Are there clear signs indicating the location of first aid kits		☐	☐	☐	
Are there sufficient fire extinguishers provided on site	 ©mike demers/Flickr	☐	☐	☐	
Are fire extinguishers within their expiry date		☐	☐	☐	
Have workers been trained on the use of fire extinguishers		☐	☐	☐	
Is there an emergency assembly/ muster point and are workers aware of the location		☐	☐	☐	
Are there clearly labelled exit routes for emergency evacuation		☐	☐	☐	

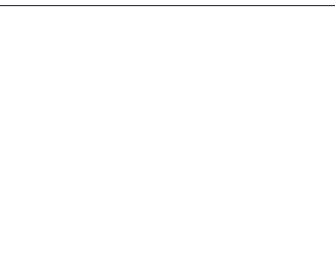
Section	Pictorial description	OK	Not OK	N/A	Action taken
2. Site layout					
Are working areas segregated from road traffic		☐	☐	☐	
Is construction site traffic well managed and equipment fitted with necessary safety features		☐	☐	☐	
Are pedestrian walkways provided using barriers or cones	©Sergei Starostin/pexels 	☐	☐	☐	
Are there appropriate signs, cones, barriers and lighting available.		☐	☐	☐	
Are banksman or flagman available to assist in directing traffic	©Laurel and Michael Evans/Unsplash 	☐	☐	☐	
Are excavations or similar hazard features left in a safe condition with barriers and lighting in place at night		☐	☐	☐	
Are workers provided with and wearing high visibility vests	©David Brown/pexels 	☐	☐	☐	
3. Tools and powered construction equipment					
Have tools that are robust, familiar to workers and safe for intended work use been selected?		☐	☐	☐	
Do workers have the right tools for the job	©Lucio Patone/Unsplash 	☐	☐	☐	
Do workers know how to properly check and maintain their tools		☐	☐	☐	
Are handles secured tightly to the tool	©Samuel Ramos/Unsplash 	☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
3. Tools and powered construction equipment					
Are the handles free from cracks, breaks, splinters, bends, sharp edges and makeshift repairs (like taped cracks)		☐	☐	☐	
Are the handles free of oil, grease, lubricant and/or any other material that could cause the user's hand to slip / lose their grip on the tool	©Alexander Mass/Unsplash	☐	☐	☐	
Are the handles used near electricity made of the proper material for the job being performed (such as rubber or other insulating material)		☐	☐	☐	
Are the tips of all impact tools such as chisels or centre-punches relatively sharp and their heads free from burrs and/or a "mushroomed" head?	©Ivan S/pexels	☐	☐	☐	
Are tools stored correctly when not in use		☐	☐	☐	
Have powered construction equipment that is suitable for the work been selected? (all construction equipment including vehicles)	©Erik Mclean/pexels	☐	☐	☐	
Are project equipment parked securely?		☐	☐	☐	
Are equipment and guards inspected regularly	©frmrby69/Flickr	☐	☐	☐	
Are inspections recorded on a register		☐	☐	☐	
Are defective equipment stored securely or removed from site?	©Andrew Scott/Flickr	☐	☐	☐	
Are workers trained on safe use of equipment e.g. chainsaws, rollers, compactors, tractors, trucks, concrete mixers		☐	☐	☐	
Are workers provided with the relevant PPE for the use of specific machinery	©ILO/Flickr	☐	☐	☐	
Where equipment has cords are the casing ends and connections checked		☐	☐	☐	
Are there signs and instructions attached to critically important areas of machinery in languages workers can understand?		☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
4. Personal Protective Equipment (PPE)					
Is appropriate PPE provided and worn	 ©Kindel Media/pexels	☐	☐	☐	
Is the PPE correct for the task		☐	☐	☐	
Hard hats worn and available	 ©Kindel Media/pexels	☐	☐	☐	
Protective footwear worn and available		☐	☐	☐	
Fall protection worn and available	 ©Asasupplies.com/Flickr	☐	☐	☐	
Gloves worn and available		☐	☐	☐	
High Visibility vests worn and available	 ©Kindel Media/pexels	☐	☐	☐	
Eye & face protection worn and available		☐	☐	☐	
Hearing protection worn and available	 ©rasenicks/Flickr	☐	☐	☐	
Respiratory protection worn and available		☐	☐	☐	
Is PPE provided free of charge	 ©Kindel Media/pexels	☐	☐	☐	
Do workers share PPE		☐	☐	☐	
Are workers trained on how to use the PPE and understand their limitations	 ©Kindel Media/pexels	☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
5. Welfare provisions					
Is safe drinking water provided and easily accessible to all workers?		☐	☐	☐	
Are water containers kept in a cool, safe and hygienic place		☐	☐	☐	
Do workers have separate cups and are they washed and changed frequently		☐	☐	☐	
Is drinking water kept away from animal and chemical sources	©Ice Family/Unsplash	☐	☐	☐	
Are there separate male and female toilets and washing facilities		☐	☐	☐	
Are there sufficient toilets – at least one toilet for every 15 workers		☐	☐	☐	
Are toilets provided close to the work site for easy access		☐	☐	☐	
Are toilets cleaned on a regular basis		☐	☐	☐	
Are washing facilities provided with soap and water		☐	☐	☐	
Do the toilets have a water container, toilet paper, garbage bin with lid and a cleaning brush		☐	☐	☐	
Are eating and rest areas provided for the workers		☐	☐	☐	
Are the eating and rest areas separate from the work areas and in shaded areas		☐	☐	☐	
Are facilities available for workers to have midday siestas e.g. mat or bed for lying down		☐	☐	☐	
Have accommodation facilities been provided for the workers		☐	☐	☐	
Are these facilities located close to the work site		☐	☐	☐	
Is there sufficient space for each worker		☐	☐	☐	
Are there separate facilities for male and female	©Jackson Wilson/Unsplash	☐	☐	☐	
Are good hygienic practices promoted and followed		☐	☐	☐	
In a pandemic situation are there masks provided		☐	☐	☐	
Is safe distancing practiced in a pandemic or seasonal flu situation		☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
6. Initial site work					
Has a risk assessment been performed before carrying out site clearance	 ©ILO/Flickr	☐	☐	☐	
Are workers adequately spaced out		☐	☐	☐	
Has the area been assessed for wild-life e.g. snakes, insects animals		☐	☐	☐	
Has the site been assessed for any cultural or heritage sites		☐	☐	☐	
Have UXO's been taken into consideration especially in areas of conflict	 ©Ka Ho Ng/Unsplash	☐	☐	☐	
Is traffic management in place e.g. diversions, road closures to ensure safe works on or near carriageways and to keep the area during tree felling and other site clearing activities		☐	☐	☐	
Is sufficient signage and lighting provided to improve visibility for motorists and pedestrians at night if work is unfinished		☐	☐	☐	
Are flags man or banksman available to direct traffic	 ©Jimmy Nilsson Masth/Unsplash	☐	☐	☐	
Are tree felling activities carried out under supervision		☐	☐	☐	
Are workers trained on tree felling techniques and use of powered equipment e.g. chainsaws		☐	☐	☐	
Are exclusion zones in place		☐	☐	☐	
Is the appropriate PPE worn for the task, e.g. helmets, safety boots, eye protection, hearing protection, cut resistant trousers (chainsaw use), high visibility vests, dust masks		☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
7. Earthworks and excavations					
Has a geotechnical or sub surface investigation for trenches over 1.5m deep been carried out		☐	☐	☐	
Are there safe access and egress points or is the excavation terraced or benched	©ILO/Flickr 	☐	☐	☐	
Are excavations inspected regularly and after adverse weather conditions e.g. floods, earthquakes, landslides	©ILO/Flickr 	☐	☐	☐	
Are trenches where workers need to enter properly supported or angled back	©CONSTRUCCIÓN TOTAL/pexels 	☐	☐	☐	
Are materials, equipment and vehicles stored or parked adjacent to the excavation	©ILO/Flickr 	☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
8. Surfacing works					
Are there safe methods of transporting and unloading materials	 ©UNDP.LHSP/Flickr	☐	☐	☐	
Are workers overloading equipment e.g. wheelbarrows		☐	☐	☐	
Are workers aware of risks associated with manual handling		☐	☐	☐	
Are tractor/trailers inspected before use		☐	☐	☐	
Are there trained operators for the tractor/trailer		☐	☐	☐	
Are quarry's benched or terraced	 ©Marius Le/Unsplash	☐	☐	☐	
Are safe methods followed for the spreading of gravelling materials		☐	☐	☐	
Is there sufficient spacing between workers		☐	☐	☐	
Is appropriate PPE provided and worn (e.g. hi-visibility clothing in the vicinity of reversing vehicles)		☐	☐	☐	
Is watering used to dampen down dust		☐	☐	☐	
8a. Bitumen works					
Have risks of working with hot bitumen been assessed	 ©Juan Manuel Montejano Lopez/pexels	☐	☐	☐	
Is the work area barricaded to prevent accidental access by pedestrians		☐	☐	☐	
IS PPE provided - gloves, long sleeved overalls, high visibility vests, boots for bitumen works, dust masks, eye protection, helmets		☐	☐	☐	
Is first aid and fire extinguishers readily available at the point of works	 ©Gen Pol/Unsplash	☐	☐	☐	
Is there a container of water or an eye wash unit provided for flushing eyes and rinsing wounds		☐	☐	☐	
Have watering activities been planned to avoid risks to pedestrians		☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
8b. Compacting					
Have compacting activities been planned to avoid risks to pedestrians	 ©ILO/Flickr	☐	☐	☐	
Are operators trained on the safe use of the compactors		☐	☐	☐	
Is the work area barricaded to prevent pedestrians accessing the site		☐	☐	☐	
Is job rotation practised to minimise fatigue and effects of vibration		☐	☐	☐	
Are frequent rest breaks taken		☐	☐	☐	
Are anti- vibration gloves provided to reduce vibration effects		☐	☐	☐	
9. Working on structures and gabion works					
Are suitable tools used for the task e.g. pliers	 ©Angela Bax/Flickr	☐	☐	☐	
Is suitable PPE provided and worn for the task e.g. durable gloves and flotation devices when working over or near water sources		☐	☐	☐	
Are mechanical aids used for lifting gabion baskets inspected e.g. mobile cranes		☐	☐	☐	
Is the area assessed for contaminated water or wildlife hazards		☐	☐	☐	
Is working at height being performed safely	 ©Paul Becker/Unsplash	☐	☐	☐	
Is the scaffold erector and inspector trained		☐	☐	☐	
Are scaffolds inspected and tagged safe for use		☐	☐	☐	
Are guardrails provided as edge protection		☐	☐	☐	
Are there toe boards to prevent tools falling	 ©Jef KoeleWijn/pexels	☐	☐	☐	
Is there safe scaffolding access e.g. ladders		☐	☐	☐	
Are ladders safe for use, that is levelled, stable and secure, fixed at the top and bottom		☐	☐	☐	
Are ladders inspected regularly		☐	☐	☐	
Is watering used to dampen down dust		☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
9a. Formwork and falsework					
Has the formwork/falsework design been reviewed and approved by a competent engineer	 ©chris robert/Unsplash	☐	☐	☐	
Is the formwork properly aligned and securely fixed to prevent movement during concrete pouring		☐	☐	☐	
Is there an exclusion zone established during construction and dismantling		☐	☐	☐	
Has the formwork been inspected for stability before allowing workers to access it		☐	☐	☐	
Are proper measures in place to prevent falls or accidents, such as guardrails or safety nets		☐	☐	☐	
9b. Concrete work					
Have risks relating to concrete works been assessed and measures put in place	 ©ritesh arya/pexels	☐	☐	☐	
Have workers been made aware of the risks from dust exposure and contact with wet cement		☐	☐	☐	
Are long sleeves, gloves, eye protection, dust masks and leg coverings provided when working with wet concrete and cement	 ©Rodolfo Gaion/pexels	☐	☐	☐	
Are workers trained on how to use the concrete mixer		☐	☐	☐	
Are moving parts of the concrete mixer guarded	 ©ILO/Flickr	☐	☐	☐	
Is the area around the mixer barricaded or segregated to prevent unauthorised access		☐	☐	☐	
Have risks relating to concrete reinforcing activities been assessed and measures put in place	 ©Azamat Hatypov/pexels	☐	☐	☐	
Are reinforcing bars (rebars) inspected for rust, damage, or defects		☐	☐	☐	

Section	Pictorial description	OK	Not OK	N/A	Action taken
9b. Concrete work					
Are tools and equipment, such as cutting and bending machines, in safe working condition	 ©Jametlene Reskp/Unsplash  ©Marina/Flickr	☐	☐	☐	
Are rebars securely tied and adequately supported to prevent movement during concrete placement		☐	☐	☐	
Are sharp edges or protruding rebars capped or flagged to avoid injuries		☐	☐	☐	
Have risks from working over or near water been assessed and measures put in place?		☐	☐	☐	
Are flotation devices or buoyancy aids available for working over or on near water surfaces		☐	☐	☐	
10. Work organisation					
Are workers provided with enough rest time to manage fatigue	 ©ILO/Flickr	☐	☐	☐	
Have all workers received trained on how to prevent occupational accidents and diseases?	 ©ILO/Flickr	☐	☐	☐	
Does your site have gender and diversity inclusion?	 ©ILO/Flickr	☐	☐	☐	

Annex 6: Example of a Toolbox Talk

► Toolbox Talk: Proper Lifting Techniques

► Introduction:

- Briefly explain the importance of proper lifting techniques to prevent injuries.

► Key Points:

- Assess the load: Check the weight and stability of the object before lifting.
- Plan the lift: Identify the destination and clear any obstacles.
- Use proper posture: Keep your back straight, bend your knees and use your leg muscles to lift.
- Avoid twisting: Turn your entire body instead of twisting at the waist.
- Ask for help: If the load is too heavy or awkward ask a coworker for assistance or use mechanical lifting aids.

► Demonstration:

- Show the correct lifting technique using a lightweight object.
- Questions and Discussion:
- Ask the team if they have any questions or experiences to share related to lifting techniques.

► Conclusion:

- Reinforce the importance of using proper lifting techniques and remind the team to stay vigilant.

Annex 7: Daily Pre -Task Risk Assessment Template

Project			
Task			
Date			
Conducted by			
Potential hazards			
☐ Flying debris	☐ Heat / cold	☐ Electricity	
☐ Cuts / laceration	☐ Dust	☐ Manual Handling	
☐ Pinch / crush	☐ Noise / vibration	☐ Working at height	
☐ Fire / explosion	☐ Unsafe tools / equipment	☐ Falling objects	
☐ Slope collapse	☐ Wet cement	☐ Other:	
PPE required (Tick the box)			
 ©Kindel Media/pexels	 ©Kindel Media/pexels	 ©Asasupplies.com/Flickr	 ©Kindel Media/pexels
 ©rasenicks/Flickr	 ©Kindel Media/pexels	 ©Kindel Media/pexels	 ©IOSH images/Flickr

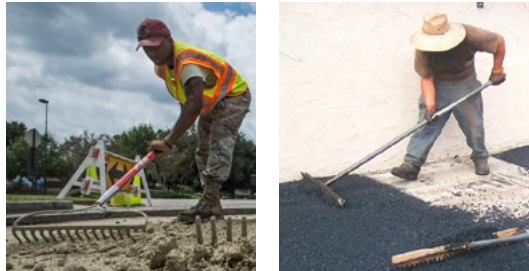
Annex 8: Examples of Mandatory PPE

The use of pictorial images showing the types of PPE to be worn can be helpful. The following table provides examples of mandatory PPE depending on the activity:

Type of Task / activity	Required PPE	Hazard Comment
Use of hand tools such as digging, carrying, levelling, etc; Working with hazardous chemicals such as cement, concrete, bitumen or similar materials; working with metals.	Gloves  ©Kindel Media/pexels	Work without gloves can cause abrasions and other minor injuries to the hands that could lead to infections or diseases such as dermatitis. The type of glove must be suitable for the hazard – e.g. abrasion, chemical, impact, puncture, etc.
Working with sharp tools (e.g. pick axes); carrying heavy loads; working with cement, concrete, bitumen or similar materials. Activities where there is a risk of impact to the feet, or sharp objects penetrating the sole. Proper footwear should be worn at all times.	Boots with toe protection and sole protection  ©rasenicks/Flickr	Good robust boots will provide worker protection from anything that could fall on the foot, but also with the sole protection anything sharp penetrating from beneath. They can also provide foot stability when working on uneven ground.
Activities that may cause flying debris e.g. Breaking rocks, cutting stone, etc	Eye protection  ©Kindel Media/pexels	Flying debris impacting a worker's eye can cause severe trauma, including blindness. Appropriate eye protection will help minimize this risk.
Works under structures or parts of steep slopes where rocks may fall.	Head protection  ©Kindel Media/pexels	If a heavy item falls on a worker and the worker is not wearing head protection, this could cause serious injury, even death.

Type of Task / activity	Required PPE	Hazard Comment
All workers should be provided visibility clothing, in particular for work in or on a road that has traffic also for site traffic.	Hi-visibility tabard  ©Asasupplies.com/Flickr	Hi-visibility vests will help drivers see workers at a distance and prevent collision.
Work that produces dust which the worker can potentially inhale.	Respiratory protection – dust masks and similar  ©Kindel Media/pexels	Dust can cause respiratory problems, which is especially serious for persons with asthma allergies and other similar health issues.
Any work that involves exposure to noise where the worker must raise their voice to be heard.	Hearing protection – e.g. “ earmuffs”, “ear plugs”, or similar  ©Kindel Media/pexels	Hearing protection helps to protect the workers hearing from loud noise either continuously at a high level (e.g. working with powered machinery) or high impact noise from specialist impact fixings (e.g. “Hilti-gun”. In dirty and dusty environments, over-ear “muffs” may be more suitable than “in-ear” protection.
Work involving decanting of hazardous liquids, or exposure to similar liquids where splashing to the face is a potential issue, eyes in particular.	Face protection  ©eedgar ivann/Unsplash	Splashes onto the face and eyes in particular must be avoided. Face shields are effective in this regard allowing good visibility for the activity without the issues of fogging which may come with more direct eye protection.

Annex 9: Hand Tools

Description	Hand tools
Hoe A hoe is used for excavation of soil, spreading gravel, mixing concrete or mortar. It consists of a blade and a handle. Hoes should be sharpened daily with a file on site. Chipped and broken cutting edges should be ground out and resharpened.	 ©Frank/Flickr
Pickaxes and mattocks These are used for excavating stony, hard soils which are difficult to penetrate with hoes. The handle should be provided with a raised safety grip which prevents the handle slipping out of worker's hands.	 ©Samer Daboul/pexels
Shovel and spades These are normally used for scooping up material and throwing it onto a truck, wheelbarrow or directly to where the material is needed and used for mixing concrete and mortar. The handle for the shovel should be long enough to allow the worker to throw the soil with little effort. Shovels should not have sharp joints which damage the hands of the user. The handles should be checked for tightness and replaced as necessary. Avoid replacement handles cut from bush materials on site. A good shovel or spade will wear out with the edges still remaining sharp and once it gets very worn-out it must be replaced.	 ©Dr Photographer/pexels
Spreader and rake A Rake is used in road works for raking out cut grass or collecting vegetation from loose soil when grubbing but can also be used for spreading if the soil is not stony. A Spreader is used for spreading out fill material such as to construct a camber or gravel for the surface-course on the road. A spreader can be a heavy-duty rake. Maintenance is limited to checking the security of the handle and braces.	 "Raking gravel" by US Air Force, United States Government Work ©varbelmark/Flickr

Description	Hand tools
Saws Saws are used to cut trees, branches of tree, bush and wood. There are different type of saws which are used for cutting different size of trees, bush or wood. The big saw is used to cut big trees or wood and operates with two persons while the small saw (steel frame bow saw) can be used by a single person. Small saw (steel framed bow saw) is used for cutting small trees, tree branches and bush. A narrow blade is held in tension by the frame.	  ©John Nelo/Flickr ©Keep Austin Beautiful/Flickr
Bush knives A Bush knife is used for clearing the bush and cutting tree branches along the road alignment. It is also used for cutting and sharpening pegs. The bush knife is made of a steel shape blade and a wooden round handle.	 ©Taylor Daugherty/Unsplash
Axe Axes are used to cut bushes, trees, branches and stripping branches of felled trees. The axe can be shaped as cutting edge (blade) while the head of the axe can be used instead of hammer. Smaller axes also referred to as hatchets are often used for cutting small trees and branches instead of a bush knife. They are also used for producing setting out pegs.	  ©Canyon Swartz/Unsplash ©Tyler Lastovich/Unsplash
Grass cutter or slasher This is a simple and inexpensive tool used for trimming light grass. Routine maintenance workers commonly use a grass cutter for clearing the vegetation on road shoulders and inside drains. It is also used when initially clearing the road reserve. It is an efficient tool for light and moderately dense grass or bush. Thicker and denser grass or bush would normally require a stronger cutting tool such as a bush knife. Maintenance is limited to sharpening the blade and securing the handle.	 ©Pascal Küffer/pexels
Wheelbarrow The wheelbarrow can be a useful piece of transportation equipment over short distances (up to 200 metres). Wheelbarrows are used at sites in earthworks and construction for transporting the construction material such as soil, sand aggregate, stone, concrete etc. All bolts should be regularly checked and tightened and axles greased. Wheels should also be checked regularly and replaced when worn.	 ©hans middendorp/pexels

Description	Hand tools
Basket This is used for carrying soil or gravel for a short distance. Baskets can be made from local basket making materials (bamboo) or used tyres or manufactured in plastic. Baskets are suitable for dry soil. Plastic and Rubber Tyre baskets are most suitable for wet soils. Baskets can be carried individually or by two persons. They can be balanced on a shoulder pole at the end of ropes (like a scale) depending upon the workers strength and preference.	"Lebanon" by International Labour Organization ILO, CC BY-NC-ND 2.0 "Lebanon" by International Labour Organization ILO, CC BY-NC-ND 2.0
Crowbar Is used mostly for digging stony, very hard soils or moving the boulders or heavy items when used as a lever. The crowbar looks like a simple tool, but it must be manufactured with very strong material that does not bend easily and be well designed to function properly.	"Crowbar" by HomeSpot HQ, CC BY 2.0
Hand rammer Is used for compacting soil and gravel and consists of a weight with a long handle. It is usually used in small and confined areas such as around culverts, potholes and other places where it is difficult to access with rollers. Maintenance is limited to replacement of the wooden handle as required. Wooden handles can be secured by fitting a wedge loosely into the base of the handle and then driving the handle into the socket on the rammer, so driving the wedge into and expanding the handle.	©Ian Jacobs/Flickr
Sack Stretcher A Sack Stretcher is a locally made for carrying soil and gravel. An empty rice sack is cut open. Two thick straight bamboo poles about 1.5 meters long are sewn along the length of either side of the cloth, to make a stretcher. The Soil to be carried is placed on the sack carry by two persons.	©Gemini/Google

Annex 10a: Baseline Risk Assessments

Consequences					
Likelihood	Negligible (1) Minimal injuries / no injuries	Minor (2) Minor injuries / first aid	Significant (3) Moderate injuries / medical treatment	Severe (4) Sers injuries / hospitalization	Catastrophic (5) Death / permanent impairment
Certain (5) 100% likely / almost 100% likely	Moderate (5)	High (10)	High (15)	Catastrophic (20)	Catastrophic (25)
Likely (4) Will probably happen / is likely to happen	Moderate (4)	Moderate (8)	High (12)	Catastrophic (16)	Catastrophic (20)
Possible (3) Could happen or plausible	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
Unlikely (2) Improbable but could happen / not expected	Low (2)	Moderate (4)	Moderate (6)	Moderate (8)	High (10)
Very Unlikely (1) Rare / not expected but remotely possible	Low (1)	Low (2)	Low (3)	Moderate (4)	Moderate (5)

Score	Priority	Action
1 to 3	Low	Low risk identified - control measures to be adopted and monitored
4 to 9	Moderate	Medium risk identified – further controls may be required
10 to 15	High	High risk identified – develop or determine further controls
16 to 25	Catastrophic	Catastrophic risk identified – stop work / or develop/determine further controls

Annex 10b: Risk Matrix - Common overarching hazards

Note: this table represented a baseline rating only. All users (project managers) should go through these matrices at the start of project and assign applicable risk rating and define the necessary control measures.

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Common overarching hazards across activities - clearing, earthworks, gravelling, pavements, concrete, drainage and trenching, culverts, gabions , compaction											
Adverse weather conditions	Extreme heat conditions	Workers, surveyors, engineers	Dehydration, heat exhaustion	3	4	12	Ensure drinking water is readily available. Encourage workers to drink water frequently to prevent dehydration. Schedule frequent breaks in shaded or cool areas. Plan heavy tasks during cooler parts of the day or start work earlier at sunrise. Use lightweight, breathable and light-coloured clothing. Consider providing sunhats or hats with brims. Conduct toolbox talks for heat stress awareness. Depending on country and where reasonably practicable, consider offering midday siestas as a rest break.	2	4	8	
	Extreme cold or snow/icy conditions		Slips and falls on icy, wet surfaces causing injuries, hypothermia, frostbite	3	4	12	Apply anti-slip coatings or mats on walkways and stairs to improve traction. Install effective drainage to reduce water pooling and ice formation. Remove snow and ice promptly from pathways using salt, sand, or chemical de-icers. Place clear warning signs near slippery areas to alert individuals to the risk. Ensure thermal protective clothing is worn, i.e. jackets, gloves, head warmers etc. Provide rest breaks in a warmer environment. Provide temporary shelters or enclosures to protect workers from cold winds and rain. Train supervisors and workers on the signs and symptoms of hypothermia and the appropriate actions to take in case of a cold-related emergency. Work may be halted during extreme cold or heavy snow fall.	2	4	8	
	Tropical storms, excessive rainfall and flooding, landslides		Slippery surfaces, water accumulation can cause cave-ins, collapse of structures, damage to tools and materials, drownings	4	5	20	Work should be halted in stormy and flooding conditions. Reinforce slopes to prevent soil movement. Install proper drainage to reduce water accumulation and soil saturation, which can trigger landslides. Use benching or terracing techniques. Monitor slope stability and provide early warnings for potential landslides. Check tools for damages if affected by storms/landslides/flooding.	3	5	15	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Adverse weather conditions	Heavy winds, sandstorms	Workers, surveyors, engineers	Falling/flying objects and poor visibility leading to injury of workers	3	4	12	Suspend work if wind is too heavy and visibility is affected due to sandstorms. Avoid any work at heights. Secure loose and light materials at risk of being carried away. Workers should not work close to edges where this is a risk of falling over.	1	4	4	
Site access	Wildlife hazards (dependant and specific to member states)		Animal/insect attacks causing injury or fatality	3	5	15	Conduct wildlife surveys. Train workers on safe interactions with wildlife. Provide PPE and ensure first aid is available.	2	5	10	
	Traffic management	Workers, public, engineers	Collisions or accidents during traffic redirection, or due to open excavations/pits/trenches	4	5	20	Follow traffic management plans. Wear high visibility vests. Use warning signs and proper lighting. Where necessary, traffic should be stopped during the placement or removal of temporary signs. Have flagmen warning of the road construction ahead. Add diversions, barriers, narrowing of carriageway and speed humps to reduce speed.	2	5	10	
	Transportation of workers at the back of vehicle and with unsecured equipment	Workers, public	Overcrowding men and women can lead to sexual harassment. Reckless driving can lead to injury or fatality.	4	5	20	Limit passengers to safe capacity. Ensure vehicles are well maintained. Train drivers on safe driving. Provide safe transportation where workers are not required to stand in vehicles or sit on the edges of open vehicles. Where practicable, male and females should be separated or provided adequate spacing between them. Equipment should be stored in a trailer, bolted toolbox or separate vehicle.	2	5	10	
General working on site	Lack of sanitation facilities on work sites	Workers	Workers expected to relieve themselves in the bushes - unhygienic and not suitable to female needs - resulting in urinary tract infections. Exposed to wildlife and parasites lurking in bushes leading to attacks and injury Improper disposal of human waste can impact the environment by polluting water sources and attracting pests.	4	4	16	Supervisors are to understand the need of female workers and install portable toilets at the worksite to ensure proper sanitation and privacy. Mark safe and private areas for temporary use away from work zones and water sources. Supply workers with hand sanitizers, soap and water for proper hygiene. Use biodegradable waste bags or pits for temporary waste disposal, ensuring minimal environmental impact.	2	4	8	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Working alone	Lone working	Workers	Harassment, medical emergencies	2	4	8	Avoid lone work; assign teams. Ensure regular check-ins and communication systems. Train workers on emergency protocols.	1	4	4	
Working with tools, material and equipment	Substandard tools		Tools breaking, causing injuries	3	4	12	Inspect and maintain tools and tool handles regularly. Check that blades are kept sharp. Replace damaged tools. Provide training and proper PPE. Ensure good quality tools with good handles are purchased. Tools must be suitable for the type of task carried out. E.g. long handled tools for rakes, shovels, etc.	2	4	8	
	Noise exposure	Workers, public	Hearing loss or distractions	3	5	15	Provide hearing protection (e.g. earplugs). Limit exposure to noisy activities. Conduct periodic noise assessments and medical screening.	2	5	10	
	Dust exposure	Workers, engineers, public	Inhalation of dust causing respiratory illness	4	3	12	Use dust reduction methods (e.g. dampen soil with water). Encourage the use of dust masks	2	3	6	
	Vibration risks	Workers	Hand arm vibration syndrome, repetitive strain	3	4	12	Provide antivibration tools and gloves. Limit duration of exposure. Conduct regular tool maintenance.	2	4	8	
	Unskilled use of hand tools		Injuries from improper tool use	4	4	16	Train workers on correct tool use and maintenance. Provide suitable tools with good handles and grip for tasks. Handles should be long enough for the type of task being carried out.	2	4	8	
	Lack of PPE		Injuries from inadequate protection	4	4	16	Provide task specific PPE. Train workers in proper use and storage of PPE.	2	4	8	
	Fire hazards	Workers, public	Fires causing injury asphyxiation, or property damage	3	5	15	Keep flammable substances away from heat sources. Store minimal quantities of flammables. Maintain tidy workspaces. Provide fire extinguishers and train workers in fire response and correct type of fire extinguishers to be used e.g. foam or dry powder.	1	5	5	
	Environmental impacts		Pollution from spills or dust	4	3	12	Implement spill response protocols. Use dust suppression systems (e.g. water spraying). Dispose of materials responsibly.	2	3	6	
	Ergonomic considerations	Workers	Musculoskeletal disorders from awkward postures	3	4	12	Provide adjustable tools. Rotate tasks to avoid repetitive strain. Educate workers on ergonomic practices.	2	4	8	
	Manual handling	Workers, contractors	Musculoskeletal injuries from lifting heavy items	4	5	20	Provide manual handling awareness training on proper lifting techniques. Use team lifts or mechanical aids (e.g. wheelbarrows or tools mentioned in the hand tools section of the OSH manual). Provide frequent rest periods and practice job rotation.	2	5	10	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Team-work in close proximity with other workers	Ergonomic issues	Workers	Limited space can lead to musculoskeletal injuries from repetitive motions or improper lifting techniques	4	4	16	Maintain proper spacing, enforce safety protocols and ensure that workers are trained on hazard awareness and prevention strategies. Regular safety inspections and clear communication can also help create a safer work environment.	2	4	8	
	Crowded workspaces		Workers bumping into each other, tripping over tools, materials or other workers leading to bruises, cuts, injuries. Stressful work environment affecting mental health	4	4	16	Provide safe working distance to avoid overcrowding. Monitor mental health, Teams and groups of workers can be split up at safe distance from each other by organising task work in which each worker is allocated an individual amount/area/volume of work to be completed before the end of the workday. Encourage workers to practice good housekeeping measures.	2	4	8	
	Infectious diseases e.g. COVID 19	Workers, surveyors, engineers, public	Spreading of infections and diseases when working too closely.	4	5	20	Maintain clean and sanitized work environments, including tools, equipment and common areas. Implement social distancing measures to reduce close contact between workers. Establish protocols for isolating and quarantining infected or exposed workers. Provide PPE (masks) and hygiene stations. Implement regular health screenings e.g. temperature checks. Train workers on prevention measures.	2	5	10	
	Working with different cultures and genders	Workers	Gender and culture-based violence/ harassment can result in injury and fatality	4	4	16	Conduct cultural and gender sensitivity training. Promote an inclusive work environment. Enforce anti-harassment policies. Provide separate facilities for male and female.	2	4	8	
Storing and using Chemicals	Inadequate storage, spillage	Workers, public	Slips, falls and injuries	3	4	12	Store chemicals in ventilated, banded areas or drip trays. Clean up spills promptly using a spill kit or sawdust. Maintain good housekeeping practices.	1	4	4	
	Fire hazard (near flames/ smoking)		Fires causing injury asphyxiation, fatality or property damage	3	5	15	Prohibit smoking or heat sources near storage. Store the minimum volume of flammable substances. Ensure fire extinguishers are present. Have emergency plans and fire equipment available. Refer to the EP section of the OSH Manual for further guidance.	2	5	10	

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Storing and using Chemicals	Exposure to solvents and solvent vapours	Workers, public	Irritation to skin, eyes, lungs, or central nervous system	3	3	9	Use water-based alternatives. Keep container lids closed and dispose of solvent-soaked rags properly. Make workers aware of the hazards, risks and controls as per the Safety data sheet. Provide PPE (gloves, eye protection, respiratory protection). Remove any contaminated clothing. Rinse skin or eyes with water for 15 minutes if exposed. Do not induce vomiting if ingested. Seek medical attention immediately.	1	3	3	
	Cement and wet concrete		Inhalation of dust causing respiratory illness, splashes of wet concrete causing eye irritation alkali burns.	3	4	12	Make workers of the dangers of contact with wet cement and dust. Immediate treatment by flushing out materials from eyes. First aid measures e.g. eye wash units or bottles of water should be available at the point of use of cement and wet concrete. PPE is to be worn - eye protection, dust masks, gloves, long rubber boots.	2	4	8	
Stacking and Storage	Improper stacking, poor pallets	Workers	Falling materials causing injuries	3	4	12	Ensure adequate storage space. Secure materials during movement. Stack materials safely and properly. Illuminate storage areas and use proper signage. PPE to be worn, e.g. safety boots and hard hats.	2	4	8	
	Employees climbing unstable stacks		Falls or injuries from unstable stacks	3	4	12	Provide stable ladders and safe climbing training. Limit stack height to three times the base width. Ensure materials are easy to access.	2	4	8	
Working over or near water sources	Drowning, flooding or sudden water changes	Workers	Risk of falling into water or being swept away by fastmoving water	3	5	15	Avoid tasks near water during heavy rain or adverse weather conditions when surfaces are likely more hazardous. Provide life jackets and fall prevention systems. Prohibit lone working near water; ensure team coordination. Design stable access points near water. Monitor upstream water levels and weather conditions. Use barriers or diversions to control water flow. Train workers in emergency water rescue.	2	5	10	
	Exposure to contaminated water		Infections, skin irritation, or diseases	3	4	12	Test water for contamination before exposure. Provide PPE (waterproof gloves, boots, protective clothing). Ensure washing and sanitation facilities onsite.	2	4	8	
	Wildlife encounters		Bites/stings from aquatic animals/ reptiles/ insects, resulting in injury or fatality	3	5	15	Survey the area for wildlife before starting work. Train workers to safely avoid and handle wildlife encounters. If possible, drain the area prior to working. Keep emergency first aid kits for bites and stings.	2	5	10	

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Working over or near water sources	Slips, trips and falls	Workers	Injuries from wet, muddy, or uneven ground	4	4	16	Use temporary ground reinforcement systems, like mats or planks, to create safer walking paths over muddy or uneven areas. Install physical barriers to mark hazardous zones near water sources. Install temporary handrails or ropes for support in challenging terrain. Wear sturdy, nonslip footwear with good ankle support. Assess and stabilize the work area before starting tasks. Avoid rushing and ensure tools don't obstruct visibility.	2	4	8	
	Machinery risks		Struck by machinery slipping into water/Electric shocks	3	4	12	Use machinery with appropriate insulation or protection near water. Inspect and maintain equipment to ensure safety. Establish clear work zones with restricted access near water.	2	4	8	
Clearing bombs and mines (UXOs)	Live bombs or unexploded ordnance	Workers, engineers, public	Explosion or fire causing fatalities	3	5	15	Work must be conducted by trained and certified professionals in UXO removal. Establish clear exclusion zones to keep untrained personnel and the public away. Use specialized detection and disposal equipment. Develop and follow strict protocols for identifying and neutralizing UXOs. Coordinate with local authorities and emergency services before beginning work.	2	5	10	

Annex 10c: Risk Matrix – Site establishment

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Site establishment											
Setting out and survey work	Unfamiliarity of the area	Workers surveyors, engineers	Slips, trips and falls resulting in injury	3	4	12	Ensure proper area drawing, location information and maps are available at start of survey. PPE to be worn e.g. safety boots, high visibility vests and safety helmets.	2	4	8	
	Road hazards reckless driving, speeding	Workers, public, engineers surveyors	Motor vehicle collision causing injury	4	5	20	Workers to wear high visibility vests, be observant and vigilant and ensure a traffic management is in place.	3	5	15	
	Community unrest; disturbance of heritage or cultural sites		Physical violence resulting in injury	3	4	12	Ensure there is a Community Liaison Officer/spokesperson to engage community leaders. Encourage workers not to speak directly to community members. Have an emergency preparedness plan and contact numbers available. Secure participation from local villages when realigning or expanding roads to obtain early awareness of land issues, religious grounds, etc.	2	4	8	
	Live bombs or unexploded ordnance		Explosion or fire causing fatalities	3	5	15	Work must be conducted by trained and certified professionals in UXO removal. Establish clear exclusion zones to keep untrained personnel and the public away. Use specialized detection and disposal equipment. Develop and follow strict protocols for identifying and neutralizing UXOs. Coordinate with local authorities and emergency services before beginning work.	2	5	10	
Welfare and Camp Site Setup	Uneven or unstable ground	Workers, contractors	Slips, trips, or falls during setup	3	4	12	Conduct a site survey prior to work. Level and prepare the ground. Ensure proper footwear is worn.	2	4	8	
	Tools and equipment		Injuries from broken or misused tools	3	4	12	Inspect and maintain tools, blades for sharpness and handles for cracks regularly. Ensure tools are not of cheap quality. Provide training on proper tool use. Supply adequate PPE. Tools should not be used as cooking utensils.	2	4	8	
	Manual handling		Musculo- skeletal injuries from lifting heavy items	4	5	20	Provide manual handling awareness training on proper lifting techniques. Use team lifts or mechanical aids (e.g. wheelbarrows or tools mentioned in the hand tools section of the OSH manual). Provide frequent rest periods and practice job rotation.	2	5	10	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Welfare and Camp Site Setup	Fire hazards	Workers, contractors	Fires due to cooking, heating, or electrical equipment resulting in injury or fatality.	3	5	15	Ensure fire extinguishers are present. Train workers on fire safety and emergency procedures. Inspect electrical and cooking facilities. Ensure workers do not bring their own electrical items from home e.g. heaters or extension cords that could be defective.	2	5	10	
	Poor sanitation and hygiene		Spread of diseases from inadequate waste disposal or lack of clean water	4	4	16	Provide clean handwashing facilities and potable water. Ensure proper waste disposal systems. Provide separate male and female toilets.	3	4	12	
	Electrical hazards		Shock or electrocution from electrical equipment	3	5	15	Use certified electricians for installations. Inspect and maintain electrical wiring. Ensure proper grounding of equipment.	2	5	10	
	Inadequate lighting and visibility	Workers	Slips, trips and falls causing injuries	3	4	12	Suitable lighting must be provided to allow workers to work and move around safely.	1	4	4	
	No adequate rest facilities or rest periods		Increased fatigue resulting in injuries or stress related incidents	3	4	12	Provide workers with frequent rest breaks especially for hot weather and strenuous work. Suitable areas should be provided for rest areas e.g. shaded areas with tables, chairs, mats or beds. Some workers may do midday siestas.	2	4	8	
	Inadequate emergency preparedness measures	Workers, public	Inability to treat workers timeously or respond to emergencies	3	5	15	First aid kits should be provided to treat minor injuries. A trained first aider should be available on site. Fire equipment should be provided for fires. Emergency procedures should be in place and workers should be trained on the procedures. Emergency transport should be readily available.	2	5	10	
Traffic management	Road hazards	Workers, public, engineers	Collisions or accidents during traffic redirection, or due to open excavations/pits/trenches	3	5	15	Follow traffic management plans. Wear high visibility vests. Use warning signs and proper lighting. Where necessary, traffic should be stopped during the placement or removal of temporary signs. Have flagmen warning of the road construction ahead. Add diversions, barriers, narrowing of carriageway and speed humps to reduce speed.	2	5	10	
Access to site	Transport of workers at the back of vehicle and with unsecured equipment	Workers, public	Overcrowding reckless driving, unroadworthy vehicles, equipment failing	4	5	20	Limit passengers to safe capacity. Ensure vehicles are well maintained. Train drivers on safe driving. Provide safe transportation where workers are not required to stand in vehicles or sit on the edges of open vehicles. Equipment should be stored in a trailer, bolted toolbox or separate vehicle.	2	5	10	

Annex 10d: Risk Matrix – Clearing

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Clearing											
Site and Bush Clearing, Grubbing	Uneven ground and slippery surfaces	Workers, surveyors, engineers, supervisor	Slips, trips and falls resulting in injury	4	4	16	Provide safety induction and toolbox talks before work. Stabilize work surfaces and ensure proper footwear. Workers to be aware of their surroundings.	3	4	12	
	Use of substandard inappropriate sized or broken tools	Workers,	Cuts and injuries caused by tool failure	3	4	12	Regularly inspect and maintain tools and handles. Check that tools are sharpened. Purchase tools of good quality. Provide training and proper PPE for tool use. Tools selected must be appropriate for the task e.g. choosing long handled tools for grubbing.	2	4	8	
	Dust exposure	Workers, public	Dust inhalation causing respiratory illness	4	3	12	Spray water to reduce dust. Provide dust masks.	2	3	6	
	Exposure to toxins from plants	Workers, surveyors, engineers	Allergic reactions or skin irritation	3	4	12	Use gloves, eye protection, safety boots and overalls. Educate workers on identifying and handling poisonous plants.	2	4	8	
	Extreme heat		Dehydration heat exhaustion	3	4	12	Ensure drinking water is readily available. Encourage workers to drink water frequently to prevent dehydration. Schedule frequent breaks in shaded or cool areas. Plan heavy tasks during cooler parts of the day or start work earlier at sunrise. Use lightweight, breathable and light-coloured clothing. Consider providing sunhats or hats with brims. Conduct toolbox talks for heat stress awareness. Depending on country and where reasonably practicable, consider offering midday siestas as a rest break.	2	4	8	
	Extreme cold or snowy/icy conditions		Slips and falls on icy, wet surfaces causing injuries, hypothermia, frostbite	3	4	12	Apply anti-slip coatings or mats on walkways and stairs to improve traction. Install effective drainage to reduce water pooling and ice formation. Remove snow and ice promptly from pathways using salt, sand, or chemical de-icers. Place clear warning signs near slippery areas to alert individuals to the risk. Ensure thermal protective clothing is worn, i.e. jackets, gloves, head warmers etc. Provide rest breaks in a warmer environment. Provide temporary shelters or enclosures to protect workers from cold winds and rain. Train supervisors and workers on the signs and symptoms of hypothermia and the appropriate actions to take in case of a cold-related emergency.	2	4	8	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Site and Bush Clearing, Grubbing	Wildlife hazards	Workers, surveyors, engineers	Animal/insect attacks causing injury or fatality	3	5	15	Conduct wildlife surveys. Train workers on safe interactions with wildlife. Provide PPE and ensure first aid is available.	2	5	10	
	Striking underground services	Workers, public	Damage, fire, or injury from unmarked services	3	5	15	Identify and mark underground services before work. Contact the local councils to identify possible utilities. Follow drawings and safe digging practices. Use experienced staff.	2	5	10	
Clearing bombs and mines (UXOs)	Live bombs or unexploded ordnance	Workers, engineers, public	Explosion or fire causing fatalities	3	5	15	Work must be conducted by trained and certified professionals in UXO removal. Establish clear exclusion zones to keep untrained personnel and the public away. Use specialized detection and disposal equipment. Develop and follow strict protocols for identifying and neutralizing UXOs. Coordinate with local authorities and emergency services before beginning work.	2	5	10	
Tree felling Stump Removal	Falling tree branches	Workers, public	Severe injuries or fatalities	4	5	20	Use proper tree felling techniques. Schedule work during low-risk conditions avoiding periods of strong wind or storms. Erect physical barriers or exclusion zones to keep workers and the public out of hazardous areas during tree cutting or maintenance. Wear helmets, gloves and eye protection.	2	5	10	
	Working at height	Workers	Falls resulting in injuries or fatalities	4	5	20	Use fall protection gear (harnesses, ropes). Do not work at height during adverse weather conditions. Have a site-specific rescue plan in place. Alert emergency personnel immediately. Check the worker and responsiveness. Refer to EP in Section 4 of the OSH Manual for further guidance.	3	5	15	
	Flying wood chips/dust	Workers, public	Eye and respiratory irritation	3	3	9	Provide PPE (e.g. eye protection, dust masks). Have water available to flush out eyes. Encourage good hygiene practices (e.g. washing hands).	2	3	6	
	Electricity	Workers, engineers, public	Shock or electrocution from power lines	3	5	15	Mark clearance zones. Train workers to identify and avoid power line hazards. Use nonconductive ladders. Ensure Supervision at all times when working close to power lines.	2	5	10	
	Use of Shearer	Workers	Risk of injury from faulty or poorly maintained tools	3	4	12	Regular maintenance and pre-use inspections of the shearer. Ensure workers are shown how to use the equipment safely.	2	4	8	
Chainsaw operations	Moving chain and kickback	Workers	Deep lacerations amputations, or fatalities	3	4	12	Ensure operators are trained and competent. Inspect and maintain chainsaws regularly. Use chainsaws with kickback protection. Provide and enforce PPE (helmets, gloves, leg protection, safety boots). Communicate emergency procedures (first aid, evacuation).	2	4	8	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Chainsaw operations	Noise	Workers, public	Hearing loss from prolonged exposure	4	5	20	Provide hearing protection. Limit exposure time to chainsaw noise. Conduct periodic noise assessments and medical screening.	2	5	10	
	Vibration	Workers	Musculo-skeletal disorders (e.g. hand arm vibration syndrome)	4	4	16	Use antivibration gloves. Limit chainsaw usage duration.	3	4	12	
	Exhaust fumes	Workers, public	Respiratory issues from inhalation	3	3	9	Ensure proper ventilation. Schedule breaks to reduce exposure. Provide respiratory protection suitable for fumes. Workers to stay away from the plume of the fume.	2	3	6	
Boulder Removal	Boulders in elevated positions, slopes	Workers, engineers, public	Struck or crushed by falling rocks	4	5	20	Use protective barriers to contain falling rocks. Use rock bolt anchors or retaining walls to stabilize loose boulders and slopes. Conduct regular inspections of rock stability. Clearly demarcate high-risk areas, restricting access during periods of heightened instability (e.g. after heavy rain). Wear PPE (helmets, boots).	3	5	15	
	Breaking of rock	Workers, public	Flying debris and tool related injuries	4	4	16	Inspect tools regularly and ensure they are appropriate for the task. Use protective barriers/screens. Clearly mark and restrict access to areas where rock breaking is taking place. Perform high-risk activities like rock breaking during times when fewer people are present in nearby areas. Provide PPE (e.g. impact resistant eye protection or face shields, helmets, gloves).	2	4	8	
	Use of inappropriate hand tools	Workers	Injuries from tools breaking	3	4	15	Use high quality, task appropriate tools with good handles and grip (e.g. sledgehammers, crowbars). Inspect tools frequently and discard defective ones. Standard PPE for tasks.	2	4	8	
	Loading, moving and offloading boulders	Workers	Musculo-skeletal injuries, crushing injuries	3	5	15	Use mechanical aids to handle boulders, reducing manual effort where possible. Equip trailers or wheelbarrows with stabilizers to prevent tipping during transport. Conduct toolbox talks on proper lifting techniques. Use teams for heavy loads where needed. If possible and practicable, consider burying rocks to minimise manual handling. Schedule regular breaks.	2	5	10	
	Use of tractor/trailer to move boulders	Workers	Overloading, load instability, uneven terrain, mechanical failures resulting in injury or being crushed by	3	5	15	Equip trailers with stabilizers to prevent tipping during loading/unloading. Use chains, straps, or nets to secure boulders firmly during transport. Perform regular checks on tractors and trailers to ensure brakes, tires and other components are in good working condition. Enforce strict adherence to the weight and capacity limits of the tractor and trailer. Select stable, even paths for transportation to minimize risks of rollovers or instability.	2	5	10	

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Boulder Removal	Unstable ground	Workers, engineers, public	Landslides and cave-ins	3	5	15	Conduct site inspections to identify hazards. Use signage, barriers and traffic control. Prepare emergency plans (e.g. evacuation, first aid). Reinforce slopes to prevent soil movement. Install proper drainage to reduce water accumulation and soil saturation, which can trigger cave ins and landslides. Use benching or terracing techniques. Monitor slope stability and provide early warnings for potential landslides.	2	5	10	
	Fire hazard during rock burning	Workers, public	Fires causing property damage, injuries, or fatalities	3	5	15	Conduct burning only under safe weather conditions (no wind). Maintain a safe distance from structures. Assign trained personnel to supervise the fire. Keep fire extinguishing equipment (e.g. extinguishers, water tanks) onsite. Establish emergency procedures for uncontrolled fire scenarios.	2	5	10	

Annex 10e: Risk Matrix – Earthworks

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Earthworks											
Rock and Trench Excavation	Inadequate shoring and bracing	Workers	Cave ins or falling rocks burying workers	3	5	15	Support loose soil using shoring or trench boxes. Provide safe access/ egress (e.g. ladders). Conduct regular inspections of excavations. Store materials at least 1m from the trench edge. Limit hand trenching to a maximum depth of 1.5m.	2	5	10	
	Unsafe access/ egress into trenches	Workers, engineers	Falls into trenches causing injuries	3	4	12	Provide ladders for access/egress. Use stepped excavation to improve accessibility.	2	4	8	
	Open excavations	Workers, engineers public	Falls into trenches, vehicles driving into trenches	3	5	15	Build guard rails or install kerb stones around excavation boundaries. Use warning signs to highlight excavations. Ensure sufficient lighting is provided especially at night for motorists and pedestrians.	2	5	10	
	Wet conditions and flooding	Workers, engineer public	Slipping, drowning, or injury in waterlogged trenches	4	5	20	Use a bucket or pump to remove water. Design trenches with proper slopes or benching to prevent water accumulation and allow safe entry and exit. Use shoring or trench boxes to stabilize walls and prevent collapses in waterlogged conditions. Equip workers with high rubber boots. Avoid entering trenches after heavy rainfall. Inspect trenches after rainfall.	2	5	10	
Use of step and extension ladders	Poor condition of ladders, unsuitable ladders	Workers	Falls, equipment failure causing serious injury or fatality	3	5	15	Use ladders appropriate for the task. Inspect ladders for defects (e.g. cracks, loose parts) before use. Ensure ladders are stable and secure. Maintain three points of contact while using the ladder. Train workers on safe ladder use.	2	5	10	
Compaction using pedestrian rollers	Uneven, wet, or steep ground	Workers, public	Tipping or slipping causing serious injuries or fatalities	3	5	15	Train operators thoroughly and implement safety plans. Conduct area inspections before starting work. Equip workers with PPE such as helmets, gloves and safety boots. Supervise inexperienced operators. Restrict roller use to suitable terrain.	2	5	10	
	Struck by hazards		Workers being hit by rollers or losing control of equipment resulting in crushing injury or fatality	3	5	15	Train and certify all operators on safe roller use. Use PPE like high visibility clothing and steel toed boots. Establish work zones with barriers and signage. Use spotters with two-way radios for guidance. Regularly inspect and maintain rollers. Maintain safe speeds and avoid sudden movements. Keep emergency procedures in place.	2	5	10	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Compaction using pedestrian rollers	Vibration	Workers, public	Hand arm vibration syndrome (HAVS)	4	5	20	Use vibration dampening gloves and equipment. Rotate jobs and schedule rest breaks to limit exposure. Use rollers designed to reduce vibrations.	2	5	10	
Compaction using hand tampers or rammers	Ergonomic hazards (repetitive motion and forceful impact)	Workers	Muscle or joint strain from repetitive impacts	4	4	16	Limit tampers/rammers to confined or small areas. Train workers on proper techniques. Use vibration dampening gloves and protective boots. Employ rammers designed to reduce vibration and strain.	3	4	12	
	Tool handling		Injuries from improper handling or equipment slips	3	4	12	Train workers in proper equipment use. Use gloves and sturdy footwear for safety. Avoid uneven or slippery surfaces.	2	4	8	
Use of water bowser	Wet surfaces	Workers, public	Slips, trips, or falls	3	4	12	Use temporary ground reinforcement systems, like mats or planks, to create safer walking paths over muddy or uneven areas. Provide sturdy footwear to workers. Inspect the bowser and work area regularly.	2	4	8	
	Poor visibility of the bowser		Workers struck by moving bowser	3	5	15	Equip the towing vehicle with reversing alarms. Workers must wear high visibility vests. Operators should remain vigilant of surroundings.	2	5	10	
Embankment construction, side borrows side drains and slope stabilization	Uneven surfaces adverse weather affecting ground conditions	Workers, engineers, public	Slips, trips, falls, or sliding ground causing injuries or fatalities	4	4	16	Conduct regular work area inspections. Shore and stabilize embankments before starting work. Employ correct sloping techniques for stabilization.	3	4	12	
Ditching manual digging of hard surfaces	Overexertion	Workers	Fatigue and muscle strain	4	4	16	Wet the work area to soften the ground in dry conditions. Assign appropriate work/rest cycles to avoid overexertion. Practice job rotation to minimise fatigue	2	4	8	
	Tools breaking		Injuries from broken or unsuitable tools	3	4	12	Use tools that are appropriate for the task and not lightweight. Inspect tools to ensure they are in good condition.	2	4	8	
Camber Construction Working on sloped surfaces	Slips, trips and falls	Workers, engineers, public	Injuries from slipping	3	4	12	Train workers on safe practices for sloped surfaces. Conduct regular inspections for hazards. Provide PPE like nonslip footwear.	2	4	8	
	Road hazards		Motor vehicle incidents resulting in injuries or fatalities	3	5	15	Develop a traffic management plan. Use signs, barriers and cones and diversions/road closures to control traffic and pedestrian flow.	2	5	10	

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Excavation for bridge foundations	Cave-ins or trench collapse	Workers	Suffocation, crushing injuries	3	5	15	Use proper shoring or benching techniques. Reinforce slopes to prevent soil movement. Install proper drainage to reduce water accumulation and soil saturation, which can trigger cave ins and landslides. Use benching or terracing techniques. Conduct regular inspections of trench stability, especially after rain. Restrict access to unsupported excavations.	2	5	10	
Slope preparation for embankments	Unstable terrain or soil collapse	Workers	Falls, suffocations, crushing injuries from collapse/ cave-ins or landslides	3	5	15	Conduct site inspections to identify hazards. Use signage, barriers and traffic control. Prepare emergency plans (e.g. evacuation, first aid). Reinforce slopes to prevent soil movement. Install proper drainage to reduce water accumulation and soil saturation, which can trigger cave ins and landslides. Use benching or terracing techniques. Monitor slope stability and provide early warnings for potential landslides.	2	5	10	

Annex 10f: Risk Matrix – Gravelling

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Gravelling											
Spreading soil or gravel	Inappropriate hand tools	Workers	Tools slipping or breaking, causing injuries	3	4	12	Use tools (e.g. shovels, hoes, rakes) that are suitable and defect free. Ensure handles are of proper length with good grip. Workers must wear safety boots. Maintain safe working distances between workers. Inspect tools and repair or replace broken tools.	2	4	8	
	Dust exposure	Workers, public, engineers	Inhalation of dust or eye irritation	4	3	12	Use dust suppression methods (e.g. water spraying). Provide PPE such as dust masks and eye protection.	2	3	6	
Loading materials	Repetitive motion of loading into wheelbarrows or tractor/trailer	Workers	Bending and twisting causing muscle strain and fatigue	4	3	12	Implement job rotation among workers. Schedule frequent rest periods to reduce strain. Train workers on proper lifting and body mechanics to reduce the strain caused by bending and twisting motions.	3	3	9	
Carrying and/or pushing heavy loads	Overexertion	Workers	Fatigue, collapse or injuries	4	4	12	Balance loads to avoid strain. Use pushcarts/wheelbarrows for heavier loads. Consider forming human chains for quick material transport. Encourage reuse of excavated materials to reduce haulage distances.	3	4	12	
Haulage of gravel	Overloaded equipment or unstable loads	Workers, public	Accidents due to load shifting or equipment tipping	4	3	12	Ensure wheelbarrows and buckets are in good condition without cracks or defects. Avoid overfilling equipment to maintain balance. Workers must wear sturdy footwear for stability.	2	3	6	
	Traffic hazards		Vehicle collisions or accidents	3	4	12	Use proper traffic control measures such as signage and barriers. Establish clear pedestrian and vehicle zones. Ensure operator of tractor is competent. Install reverse alarms on tractors.	2	4	8	
	Use of tractor/trailer		Passengers riding on tractors implements or trailers are at a high risk of injury or being crushed.	4	5	20	Do not carry passengers on tractors without instructor seats, roll-over protective structures (ROPS) and safety belts. When climbing on and off a tractor always keep three points of contact (e.g. two hands and one foot) with the tractor or ground. Get off facing towards the tractor, the same as you do when getting on. Never jump on or off a moving tractor. A banksman should be available to guide the operator of the machinery. Reverse alarms/sirens are to be fitted onto equipment.	3	5	15	

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Offloading gravel	Workers standing on uneven loads or edge of trailer	Workers	Falls causing injuries	4	4	16	Prohibit workers from standing on unstable or unbalanced loads and edge of trailers. Use stable platforms for safe offloading.	3	4	12	
Coupling and un-coupling of tractor/ trailer	Vehicle movement during the operation	Workers, operators	Crush injuries or being pinned between the tractor and trailer	3	5	15	Park on a flat, stable surface. Switch off vehicle during the process. Engage parking brakes on both the tractor and trailer. Use wheel chocks to prevent unintended movement. Have a spotter guide the process, ensuring communication between the driver and workers.	1	5	5	
	Faulty or misaligned coupling mechanisms		Equipment damage or trailer detaching during use	3	4	12	Conduct preparation inspections of coupling mechanisms. Align the tractor and trailer correctly before coupling. Use semiautomatic or automatic coupling systems, if available, to minimize risks.	2	4	8	
Quarry Works	Slope collapse and falling debris	Workers, engineers, surveyors public	Injury or fatality	3	5	15	Design and implement benches or terraces at specified intervals to stabilize slopes. Train workers in benching techniques and safety procedures. Provide PPE (helmets, safety boots). Regularly inspect and maintain benches. Perform continuous maintenance (e.g. remove loose debris). Establish emergency communication procedures.	2	5	15	
	Uneven surfaces, wet or muddy terrain		Slips, trips and falls	3	4	12	Use temporary ground reinforcement systems, like mats or planks, to create safer walking paths over muddy or uneven areas. Provide sturdy footwear. Encourage the use of designated pedestrian routes.	2	4	8	
	Moving machinery		Injury or fatality from contact with machinery	3	5	15	Provide high visibility clothing. Equip machinery with audible reverse alarms. Separate pedestrians and vehicles using safe work zones and designated routes.	2	5	10	
	Working on or near water		Drowning or serious injury from falling	3	5	15	Install guardrails or protective devices around water edges. Provide flotation devices and ensure they are worn. Keep rescue equipment on site and train workers in emergency response.	2	5	10	
Securing the quarry after completion of work	Unauthorised entry or trespassing	Workers, engineers, surveyors public	Injury due to uncontrolled hazards	3	4	12	Install robust fencing, gates and warning signage.	2	4	8	
	Wall collapse or falling debris		Fatal injury	3	5	15	Conduct geological surveys and apply stabilising measures.	1	5	5	
	Formation of hazardous water bodies		Drowning or contamination	3	5	15	Drain excess water and implement secure covers and barriers.	2	5	10	

Annex 10g: Risk Matrix – Pavements

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Pavements											
Traffic Management	Motor vehicle accidents	Workers, public, engineers	Collisions or accidents during traffic redirection.	4	5	20	Follow traffic management plans. Wear high visibility vests. Use warning signs and proper lighting. Where necessary, traffic should be stopped during the placement or removal of temporary signs. Have flagmen warning of the road construction ahead. Add traffic diversions, barriers, narrowing of carriageway and speed humps to reduce speed.	2	5	10	
Breaking of existing pavement layer	Flying debris	Workers, public	Eye injuries, cuts and abrasions	4	4	16	Use PPE (safety glasses, face shields gloves). Restrict access to work zones. Regularly clear debris to reduce risks.	2	4	8	
Asphalt paving	Flying debris (e.g. stone crushing)	Workers, public	Eye injuries, cuts and abrasions	3	3	9	Use appropriate PPE (safety glasses, face shields, gloves). Establish exclusion zones. Clear debris regularly.	2	3	6	
	Hot asphalt		Burns or scalds from direct contact	4	5	20	Use long handled tools and minimize manual handling. Regularly maintain equipment. Provide proper training on handling and emergency response.	3	5	15	
	Hazardous substances		Skin burns, respiratory issues, eye irritation	3	3	9	Train workers on handling hazardous substances. Provide handwashing stations and PPE (gloves, eye protection, overalls) Restrict eating/drinking in work areas. Remove any contaminated clothing. Rinse skin or eyes with water for 15 minutes if exposed. Do not induce vomiting if ingested. Seek medical attention immediately.	2	3	6	
	Asphalt fumes		Respiratory irritation or long-term health effects	4	3	12	Opt for alternatives like warm mix asphalt (lower emissions). Plan work during low occupancy hours. Provide PPE and signage around high fume areas.	2	3	6	
	Use of heavy equipment		Crushing or striking incidents	3	5	15	Use smaller, manoeuvrable equipment where possible. Train operators. Establish clear communication protocols with spotters.	2	5	10	
	Fire Band explosion		Ignition of flammable vapours or materials causing fires or explosions in the work area.	3	5	15	Minimize the use of open flames or spark-producing equipment near asphalt materials. Ensure that heating equipment and storage tanks are properly maintained. Provide fire extinguishers in areas where flammable materials are present. Evacuate the area to ensure everyone's safety. Use foam or dry chemical extinguishers. Turn off nearby machinery and ignition sources. Smother small fires with sand or soil if needed. Call emergency services for uncontrollable fires. Prevent fire spread with non-flammable barriers.	2	5	10	

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Surface finishing	Manual handling	Workers	Muscle strain, backache	3	3	9	Use ergonomic tools and equipment. Rotate workers between tasks. Provide training on proper lifting techniques.	2	3	6	
Painting of roads (road surface marking)	Use of hazardous chemicals	Workers	Health issues from solvent exposure	3	3	9	Provide SDS for all paint materials. Ensure breaks to reduce exposure. Provide PPE (gloves, eye protection and masks).	2	3	6	
	Ergonomic hazards		Backaches, muscle strain	4	3	12	Rotate workers between tasks. Schedule frequent rest breaks. Provide knee pads or ergonomic tools.	2	3	6	
	Road hazards	Workers, public	Motor vehicle collisions	4	5	20	Implement a traffic management plan. Use barriers, cones for traffic diversions and reflective signs. Provide workers with high visibility clothing.	2	5	10	

Annex 10h: Risk Matrix – Concrete works

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Concrete works											
Preparation of formwork	Work at height	Workers	Falls causing serious injuries or fatalities	3	5	15	Use fall protection systems (e.g. harnesses, guardrails). Ensure proper training in working at heights. Inspect all fall protection equipment regularly. Secure tools and materials to prevent falling objects.	2	5	10	
	Use of scaffolds		Collapse or instability of scaffolding causing injuries or fatalities	3	5	15	Ensure scaffolds are erected and inspected by qualified personnel. Follow load limits specified for scaffolding. Provide stable access (e.g. ladders) and proper working platforms with guardrails and toe boards. Regularly inspect scaffolds for damage or hazards.	2	5	10	
	Unsecured shutters		Collapse of formwork causing injuries	3	5	15	Ensure all workers are trained and competent for the task. Maintain adequate supervision and follow the formwork design. Conduct regular inspections of the formwork during construction.	2	5	10	
	Protruding edges		Cuts and abrasions	3	3	9	Cover or blunt all sharp and dangerous edges.	1	3	3	
	Unsafe access/egress		fall from height	3	5	15	Construct proper and stable access/egress points before work begins.	2	3	6	
	Nails protruding from shutters		Puncture wounds or cuts	3	3	9	Hammer down or remove all protruding nails.	1	3	3	
	Manual handling of formwork		Muscle strain or back injuries	4	3	12	Conduct toolbox talks or provide training on manual handling techniques. Determine the weight of the load before lifting. Use mechanical aids or share the load among workers when possible. Rotate tasks and allow rest breaks to reduce physical fatigue.	2	3	6	
Mixing concrete	Exposure to cement dust	Workers	Respiratory irritation, lung disease (e.g. silicosis)	4	5	20	Provide dust masks, safety glasses, gloves and overalls. Eat and drink only in dust-free areas to avoid ingesting cement. Rinse eyes with water if they come into contact with cement dust and seek medical attention.	3	5	15	
	Ergonomic hazards		Muscle strain and back pain from repetitive motions	4	3	12	Rotate workers between tasks and allow rest breaks. Where practicable, use concrete mixers to limit manual mixing.	2	3	8	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Mixing concrete	Wet concrete	Workers	Eye irritation, dermatitis alkali burns	3	4	12	Provide PPE such as eye protection, dust masks and safety boots. Wear impermeable gauntlet type rubber gloves and high length rubber boots to prevent direct contact with skin. Also consider the provision of disposable gloves rather than reusable gloves. Trousers should overlap the boots rather than be tucked into them. Train workers on safe handling practices for cement. Rinse eyes and skin with water if they come into contact with wet cement and seek medical attention.	2	4	8	
Use of concrete mixer	Noise	Workers, public	Noise induced hearing loss	3	5	15	Provide hearing protection (e.g. earplugs, earmuffs). Locate the mixer away from high traffic areas to reduce noise exposure.	2	5	10	
	Dust		Respiratory irritation, silicosis in long term, skin irritation	3	5	15	Provide dust masks and ensure adequate ventilation around the mixer.	2	5	10	
	Rotating/ moving parts		Crushing or disabling injuries	3	5	15	Fit the mixer with a guard to prevent contact with moving parts. Ensure workers do not wear loose clothing and tie back long hair. Provide training on safe operation of mixers.	2	5	10	
	Electrical hazards		Plugs or cords in contact with water resulting in electric shock or electrocution	3	5	15	Any electrical cords to the mixer need to be protected from the wet environment where the mixing takes place. Check insulation of cords. Ensure the cord is raised off the wet ground.	2	5	10	
Placing and pouring of concrete	Manual handling	Workers	Muscle strain or fatigue	3	3	9	Use wheelbarrows or other aids to transport concrete where possible. Train workers on safe lifting techniques. Rotate tasks and allow rest periods to prevent overexertion.	2	3	6	
Compaction and finishing concrete	Vibrating equipment	Workers	Hand arm vibration syndrome (HAVS)	3	5	15	Use vibration dampening gloves and equipment. Rotate tasks and schedule rest periods. Maintain and inspect equipment regularly.	2	5	10	
Curing of concrete	Water hazards	Workers	Slips or falls from wet surfaces	3	4	12	Ensure proper drainage in curing areas. Use warning signs to mark wet surfaces.	2	4	8	
	Heat exposure		Heat related illnesses during curing	3	3	9	Provide shaded areas for workers. Ensure access to cool drinking water and schedule rest breaks.	2	3	6	
Casting and curing bridge decks or piers	Cement splashes, falling concrete	Workers	Burns, injuries from falling debris	3	4	12	Provide gloves, eye protection and protective clothing. Use equipment to handle large pours to minimize manual handling. Restrict access beneath active casting zones.	2	4	8	
Pouring and finishing elevated sections	Working at heights	Workers	Falls leading to serious injuries or fatalities	3	5	15	Use fall protection systems (e.g. harnesses and guardrails). Train workers on height safety protocols. Inspect elevated work platforms regularly.	2	5	10	

Annex 10i: Risk Matrix – Drainage & trenching

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Drainage & trenching											
Site preparation for drainage	Striking underground utilities	Workers, public	Explosion, electrocution, flooding	3	5	15	Conduct utility scans (e.g. ground penetrating radar) before excavation. Use utility maps and coordinate with service providers. Mark the location of underground utilities.	2	5	10	
	Contact with wildlife (e.g. snakes)	Workers	Bites, stings, or injuries caused by wildlife	4	5	20	Survey the site for wildlife before starting work. Train workers on handling or avoiding wildlife. Provide first aid kits with antivenom, if necessary.	3	5	15	
Excavation and trenches	Cave-ins or trench collapse	Workers, public	Crushing, suffocation, fatalities	3	5	15	Use trench shoring, shielding, or benching in unstable soil. Inspect trenches regularly, especially after rainfall. Prohibit entry into unsupported trenches.	2	5	10	
	Falling objects		Injuries from falling tools or debris	3	4	12	Keep tools secured and remove loose materials from trench edges. Provide hard hats for workers.	2	4	8	
	Water hazards		Flooding or drowning risks	3	5	15	Assess water table levels before excavation. Use pumps to control water ingress into trenches. Avoid working during heavy rains.	2	5	10	
	Contami-nated water		Exposure to infectious diseases or chemical hazards	3	4	12	Test water for contamination before exposure. Provide PPE (e.g. gloves, waterproof boots). Train workers on handling contaminated water and ensure washing facilities are available.	2	4	8	
	Open trenches		Falling into trenches, poor visibility due to insufficient lighting	3	4	12	Ensure adequate lighting is provided at night or traffic management e.g. barriers are in place to avoid vehicles or pedestrians falling into trenches.	2	4	8	
	Machinery risks (e.g. excavators, backhoes)		Struck by or crushing injuries	3	5	15	Train operators and use spotters. Maintain clear communication (e.g. two-way radios). Establish exclusion zones for machinery.	2	5	10	
River training and diversions	Alteration of water flow	Workers, public, environment	Flooding or damage to nearby structures	3	4	12	Conduct hydrological studies to assess the impact of diversions. Design diversions with adequate capacity. Monitor water flow regularly to detect blockages or overflow.	2	4	8	
	Working near water bodies	Workers	Slips, falls, or drowning	3	5	15	Use fall protection systems (e.g. harnesses) and life jackets. Ensure work platforms are stable. Prohibit lone working near water bodies.	2	5	10	

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Cleaning and repairs to existing drainage systems	Blockages or debris	Workers	Physical injuries from sharp or heavy debris	3	3	9	Use appropriate tools (e.g. long handled tools) to remove debris. Wear protective gloves and safety boots.	2	3	10	
	Confined space risks		Oxygen deficiency, toxic gases	3	5	15	Test for gases before entering the drainage system. Use gas detectors and ventilators. Develop and train workers on confined space rescue plans.	2	5	10	
	Contami-nated water		Exposure to infectious diseases or harmful chemicals	3	4	12	Provide PPE such as gloves, eye protection and waterproof clothing. Train workers on handling contaminated water and ensure washing facilities are available.	2	5	10	
Backfilling and compacting	Machinery risks (e.g. compactors)	Workers, public	Crushing or vibration injuries	3	5	15	Ensure operators are trained and machinery is inspected. Establish work zones and restrict access for unauthorized personnel.	2	5	10	
	Tipping over of compac-tion equipment		Equipment tipping on slopes or unstable ground, leading to crush injuries or fatalities	3	5	15	Ensure the compaction equipment is operated on stable, level ground. Avoid using heavy rollers on excessively steep slopes. Train operators on safe operation of compactors, including speed control and load balancing. Conduct soil stability tests before operating equipment. Establish exclusion zones around the compaction equipment during operation.	2	5	10	
Installing drainage systems near bridges	Water hazards or trench collapse	Workers	Drowning, entrapment	3	5	15	Use proper drainage shoring techniques. Test water flow management systems. Ensure workers wear waterproof PPE.	2	5	10	

Annex 10j: Risk Matrix – Culverts

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Culverts and retaining walls/ structures/bridge spans											
Traffic Management	Motor vehicle collisions	Workers, public	Injuries or fatalities	4	5	20	Develop a traffic management plan. Use warning signs, cones and barriers to guide vehicles. Ensure workers wear reflective vests and high visibility clothing. Assign a trained flag person or traffic controller.	2	5	10	
Excavation works including around retaining walls	Cave ins or trench collapse	Workers, public	Asphyxiation, crushing injuries	3	5	15	Use proper trench shoring, shielding, or benching techniques. Inspect trench stability regularly, especially after rain. Prohibit entry into unsupported trenches.	2	5	10	
Beddings and Foundation compaction	Use of compaction equipment (pedestrian roller)	Workers, public	Noise and vibration exposure	3	5	15	Provide hearing protection (e.g. earmuffs). Rotate workers to limit prolonged exposure to vibration. Use vibration dampening gloves where feasible.	2	5	10	
	Use of hand tamper	Workers	Repetitive motion injuries	3	4	2	Schedule rest breaks to reduce fatigue. Rotate tasks among workers.	2	4	8	
Placing and connecting culvert pipes	Manual handling of pipes	Workers	Back injuries, dropped loads	3	4	12	Use ropes or lifting aids to gently lower pipes. Provide training on manual handling techniques. Rotate workers to avoid fatigue.	2	4	8	
	Use of hand tools (e.g. crowbars)		Injuries from improper use of tools	3	3	9	Train workers on safe tool use. Inspect tools regularly and remove defective ones.	2	3	6	
	Sealing joints with cement mortar		Skin irritation or chemical burns	3	3	9	Provide gloves and safety glasses. Train workers on handling cement safely.	2	3	6	
Backfilling	Trench collapse	Workers, public	Asphyxiation, crushing injuries	3	5	15	Ensure proper trench shoring during backfilling and shielding or benching in unstable soil. Inspect trenches regularly, especially after rainfall. Prohibit entry into unsupported trenches. Do not allow workers to stand in the trench during backfilling.	2	5	10	
	Uneven surfaces		Slips and falls	3	3	9	Level surfaces before allowing access. Provide appropriate footwear with good grip.	2	3	6	
Construction of headwalls and wings	Stone and brick masonry work	Workers	Injuries from falling materials	3	4	12	Ensure workers are skilled and experienced in masonry. Store bricks, stones and other materials securely to prevent accidental falls. Wear PPE, including gloves, helmets and safety boots. Inspect masonry tools and equipment regularly.	2	4	8	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Construction of headwalls and wings	Cement mortar	Workers	Skin irritation or chemical burns	3	3	9	Provide gloves and eye protection. Also consider the provision of disposable gloves rather than reusable gloves. Train workers on proper handling of cement. Rinse eyes and skin with water if they come into contact with wet cement and seek medical attention.	2	3	6	
Concrete pipe manufacture	Working with steel reinforcement cages		Cuts or abrasions	3	3	9	Provide gloves and other protective clothing. Use appropriate tools to handle steel materials.	2	3	6	
Maintenance of culverts	Cleaning sediment and debris from inlets and outlets	Workers	Exposure to reptiles, insects, bacteria causing bites, stings, or diseases	4	4	16	Wear protective overalls, boots and gloves. Stay alert for wildlife such as snakes or aquatic animals. Conduct cleaning with tools rather than hands whenever possible. Provide first aid kits equipped for bites and stings.	2	4	8	
	Uneven or slippery surfaces and slopes		Slips, trips and falls	3	4	12	Wear sturdy footwear with nonslip soles and ankle support. Assess site conditions and remove slipping hazards before starting work. Cut footing areas if the culvert is located at the base of batters. Avoid rushing and ensure loads carried do not obscure visibility.	2	4	8	
	Working near water sources		Drowning or water hazards	3	5	15	Provide life jackets and fall protection systems. Prohibit lone working near water and ensure workers operate in teams. Design stable access points near water.	2	5	10	
	Sudden water flows or flooding		Drowning or being swept away	2	5	10	Check upstream water levels and weather forecasts before starting work. Use diversion techniques or temporary barriers to control water flow. Ensure workers are trained in emergency water rescue procedures.	1	5	5	
	Contact with contaminated water		Skin irritation, infections, or diseases	3	3	9	Test water for contamination before work. Provide waterproof gloves, boots and protective clothing. Ensure washing and sanitation facilities are available near the site.	2	3	6	
	Confined space risks		Oxygen deficiency, toxic gases, restricted movement	3	5	15	Conduct confined space hazard assessments and gas monitoring. Provide ventilation and have an emergency rescue plan. Train workers on confined space safety protocols.	2	5	10	
	Structural instability		Collapse of old or damaged culverts resulting in crushing injuries	3	5	15	Inspect culverts for signs of damage before entering. Use temporary supports or bracing for weak structures. Restrict access to unstable areas until repairs are completed.	2	5	10	
	Wildlife encounters		Bites or stings from aquatic or terrestrial animals	4	4	16	Survey the area for wildlife before starting work. Train workers to avoid or respond to encounters safely. Keep emergency contact numbers for wildlife removal services.	2	4	8	
	Machinery risks		Struck by or entanglement injuries. Electrocutation	3	5	15	Ensure all machinery is inspected and operators are trained. Maintain a safe distance between workers and machinery. Prohibit use of electrical equipment near water unless it is appropriately insulated.	2	5	10	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Construction of retaining walls	Falling debris or stones	Workers, public, engineers	Head injuries, fractures	3	5	15	Wear hard hats and safety boots. Ensure secure stacking of stones and materials. Use barriers or safety nets to protect nearby workers.	2	5	10	
	Adverse weather		Increase water pressure behind stone walls can trigger a collapse	2	5	10	Install drainage pipes and weep holes to reduce water pressure. Apply waterproof membranes to prevent water infiltration. Inspect and maintain drainage systems regularly. Grade the area to direct water away from the wall. Prepare emergency measures like pumps for unexpected water buildup.	1	5	5	
	Stone and masonry work	Workers	Injuries from falling materials	3	4	12	Ensure workers are skilled and experienced in masonry. Wear PPE, including gloves, hard hats and safety boots. Inspect masonry tools and equipment regularly.	2	4	8	
	Cement mortar		Skin irritation or chemical burns	3	3	9	Provide gloves and eye protection. Train workers on proper handling of cement.	2	3	6	
	Collapsed slopes or trenches		Injuries or fatalities from soil collapse	3	5	15	Inspect and shore up unstable slopes or trenches. Communicate emergency procedures clearly to workers. Avoid working on unsupported embankments.	2	5	10	
	Work at height		Falls resulting in injury or fatalities	3	5	15	Use guardrails or temporary barriers on elevated areas. Conduct inspections to ensure safety measures are in place.	2	5	10	
Formwork on bridge spans	Collapse of formwork	Workers, public, engineers	Injury or fatality due to collapse	3	5	15	Conduct detailed design reviews, use high-strength formwork materials and implement robust bracing and anchoring systems specifically for bridge spans.	2	5	10	
	Falling tools or materials		Injury or damage to property	3	4	12	Secure tools and materials during work on elevated spans; use tool lanyards and install protective debris nets underneath bridge spans. Wear hard hats and safety boots. Use barriers to protect nearby workers.	2	4	8	
	Unsafe load bearing		Structural collapse, load shifting and falling, resulting in crush injuries	3	5	15	Conduct load testing prior to work, ensure adherence to load-bearing specifications and monitor structural stress throughout construction.	2	5	10	
Working on bridge spans	Fall from height	Workers	Injury or fatality	3	5	15	Use fall arrest systems like harnesses, lifelines and guardrails; install temporary walkways and access platforms with secure handrails.	2	5	10	
Bridge span construction	Instability due to wind or vibration	Workers, public	Injury or fatality if structure collapses or workers fall from height	3	5	15	Suspend operations during adverse weather conditions; ensure proper anchoring and add wind barriers if necessary.	2	5	10	

Annex 10k: Risk Matrix – Gabion installation

Initial Risk							Residual Risk				
Activity	Hazard	Who is at Risk	Risk	Likelihood	Consequence	Risk Rating	Control Measures	Likelihood	Consequence	Risk Rating	Actioned by and date
Gabon installation											
Site preparation for gabion installation	Uneven terrain/ surfaces	Workers, public	Slips, trips and falls	3	3	9	Assess and stabilize the site before starting work. Mark uneven areas and provide sturdy footwear with good grip. Remove obstructions and level the work area where possible.	2	3	6	
	Presence of moss or algae		Slippery surfaces causing falls	3	4	12	Inspect the site and clean surfaces where practicable. Provide workers with nonslip footwear.	2	4	8	
Assembly, filling and placement of gabion structures and retaining walls	Handling wire mesh/ baskets	Workers	Cuts, puncture wounds from sharp edges	3	3	9	Dispose of offcuts safely or store them neatly. Turn or trim free ends of mesh to prevent protrusion. Provide gloves, safety glasses and overalls for workers. Keep first aid kits readily available.	2	3	6	
	Manual handling of stones and building materials		Musculoskeletal injuries, backaches, crushed fingers	3	3	9	Train workers on safe lifting and handling techniques. Use mechanical aids (e.g. wheelbarrows, trolleys) for heavy loads. Rotate tasks and allow rest breaks to reduce fatigue. Use gloves and pack materials carefully to avoid crushing fingers.	2	3	6	
	Falling objects		Injuries from falling stones or tools	3	4	12	Use barriers or nets to catch falling objects. Stack and store materials securely. Require workers to wear hard hats.	2	4	8	
	Use of hand tools, e.g. pliers for gabions and masonry tools for retaining walls		Nips, pinches and cuts	3	3	9	Provide appropriate tools with safety features. Conduct regular tool inspections and maintenance. Train workers on safe tool use.	2	3	6	
Construction of retaining walls/taller stone walls	Stone and masonry work	Workers	Injuries from falling materials	3	4	12	Ensure workers are skilled and experienced in masonry. Wear PPE, including gloves, hard hats and safety boots. Inspect masonry tools and equipment regularly.	2	4	8	
	Cement mortar		Skin irritation or chemical burns	3	3	9	Provide gloves and eye protection. Train workers on proper handling of cement.	2	3	6	
	Collapsed slopes or trenches		Injuries or fatalities from soil collapse	3	5	15	Inspect and shore up unstable slopes or trenches. Communicate emergency procedures clearly to workers. Avoid working on unsupported embankments.	2	5	10	
	Work at height		Falls resulting in injury or fatalities	3	5	15	Use guardrails or temporary barriers on elevated areas. Conduct inspections to ensure safety measures are in place.	2	5	10	

Activity	Hazard	Who is at Risk	Risk	Initial Risk			Control Measures	Residual Risk			Actioned by and date
				Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating	
Construction of retaining walls/taller stone walls	Constructing taller stone walls	Workers	Collapse of structure	3	5	15	The design of taller stone walls should be verified by technical staff and supervised by competent staff.	2	5	10	
Securing, linking and finishing work	Collapsed slopes or trenches	Workers	Injuries or fatalities from soil collapse	3	5	15	Inspect and shore up unstable slopes or trenches. Communicate emergency procedures clearly to workers. Avoid working on unsupported embankments.	2	5	10	
	Working near deep trenches/elevated areas	Workers, public	Falls from heights	3	5	15	Install guardrails on unprotected edges. Regularly inspect work areas for hazards.	2	5	10	
	Improper structural alignment		Structural instability or collapse	3	5	15	Conduct regular inspections during and after construction. Follow engineering designs and standards for wall and gabion installation. Use appropriate anchoring systems where required.	2	5	10	
Working near or over water sources	Drowning or currents	Workers	Risk of falling into water or being swept away	3	5	15	Provide safety harnesses, fencing and safety nets. Keep lifebuoys, personal flotation devices and boats available. Train workers on water safety and communication protocols.	2	5	10	
	Wildlife encounters		Bites, stings, or injuries from aquatic animals	4	4	16	Make workers aware of potential wildlife hazards (e.g. reptiles). Carry first aid kits with antivenom, if necessary.	2	4	8	
	Contaminated water or hidden debris		Infections, entanglement risks	3	3	9	Provide PPE, such as waterproof gloves and boots. Conduct area inspections and remove underwater debris before starting work.	2	3	6	
Lifting of prefilled units using mobile cranes	Unstable ground	Workers, public	Crane tipping over, property damage, injuries	3	4	12	Perform soil tests and ground preparation. Set up the crane on stable, level ground and use outriggers for stabilization.	1	4	4	
	Mechanical failure or swinging loads		Injuries, fatalities from falling loads	3	5	15		2	5	10	
	High winds		Loads swinging and causing injuries	3	5	15	Monitor weather conditions; stop work during high winds. Assess wind speeds before lifting operations.	2	5	10	
	Overhead power lines		Electrocution or crane contact with lines	3	5	15	Identify and mark power lines prior to work. Maintain a safe distance from overhead lines.	1	5	5	
Stabilizing bridge embankments with gabions	Handling sharp wire, structural instability	Workers	Cuts, injuries from shifting structures	3	3	9	Use gloves and protective clothing to handle wire mesh. Inspect gabions for alignment and stability after placement. Secure units together to prevent shifting.	2	3	6	

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