IMPLEMENTING SAFETY IN CONSTRUCTION SITE DURING INTEGRATED STORM WATER DRAIN WORK USING RADIO FREQUENCY IDENTIFICATION(RFID)

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Abstract
The purpose of this r e s e a r c h w o r k is to provide a consolidated summary of all the Environmental and Social (E&S) commitments relevant for the construction phase of the Research. Environmental and Social Management Plan (ESMP) also gives an overview about the E&S Management System that is being implemented to ensure systematic and effective execution of these commitments, including roles and responsibilities between the PIA/Implementation Consultant \and the Contractor. The ESMP is updated as the research proceeds to reflect the results of discussions with stakeholders and to include details of any other E&S developments. The research coordination is set up to update the research progress to all the stakeholders (mainly to all residents' welfare association) under the Zonal officer who has direct contact with public for all kinds of civic body activities. This research Coordination will act as a grievance cell in order to ensure all kind mitigation measures related to this research.
Keywords: ESMP, PIA, STAKE HOLDERS

Introduction

The purpose of this Construction Environmental and Social Management Plan (ESMP) is to provide a consolidated summary of all the Environmental and Social (E&S) commitments relevant for the construction phase of the Research. The measures focus on environmental (such as Air emissions, biodiversity, and environmental contamination) and social aspects (such as the protection of human rights, communication with local stakeholders, safety of workers and communities). This ESMP also gives an overview about the E&S Management System that is being implemented to ensure systematic and effective execution of these commitments, including roles and responsibilities between the PIA/Implementation Consultant and the Contractor. The ESMP is updated as the Research proceeds to reflect the results of discussions with stakeholders and to include details of any other E&S developments. As the Chennai City Population is increasing rapidly so is the consumption of ground water. Because of this, the ground water level is going down and Sea water is infiltrating the ground water which will make it difficult for the future generations to utilize it beneficially. Further, as the Coastal City has mostly flat terrain, it is prone to flooding during rainy season and needs effective Storm Water Drain System to prevent water stagnation in roads.

THE AIM OF THE RESEARCH

The aim of this research is to strengthen the resilience of storm water management to flooding in the research area M3Kovalam Basin by collecting the rain water and recharging the ground water with the help of various rain water harvesting techniques and the excess will be discharged into sea. The Research has a drain length of 52.47 km covering 318 roads. It is proposed to have a total of 26 Eco Storage Tanks with a capacity of 24,442 m3 approximately, 168 Sunken wells and over 1932 Rainwater Harvesting Structures. Any excess rainwater after Harvesting by above mentioned 3 ways will be discharged into sea by 27 individual Outfalls.

ESMP

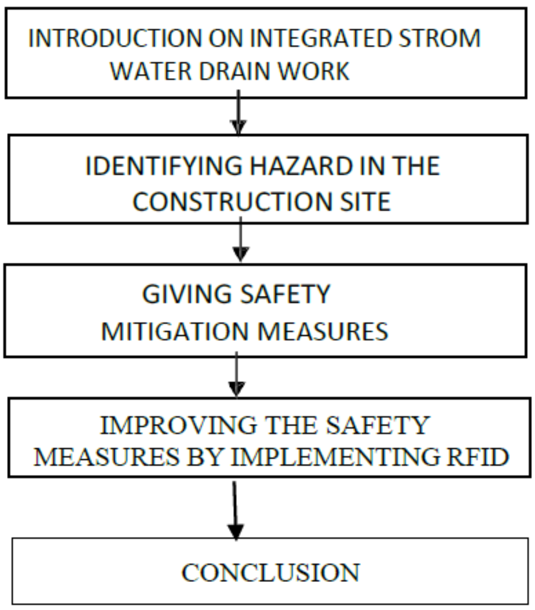
This is Environmental and Social Management Plan (ESMP) is for the Lao PDR Emissions Reduction Programme through Improved Governance and Sustainable Forest Landscape Management. The programmes main objective, an ambitious one that entails paradigm shifts in a number of interrelated sectors, is as follows: To support the Government and people of Laos in changing the present-day use of forests and landscapes and to ensure a transition to sustainable management at scale.

THE PURPOSE OF IMPLEMENTING ESMP IN RESEARCH

The purpose of this Construction Environmental and Social Management Plan (ESMP) is to provide a consolidated summary of all the Environmental and Social (E&S) commitments relevant for the construction phase of the Project. This ESMP also gives an overview about the E&S Management System that is being implemented to ensure systematic and effective execution of these commitments, including roles and responsibilities between the PIA/Implementation Consultant and the Contractor. The ESMP is updated as the Research proceeds to reflect the results of discussions with stakeholders and to include details of any other E&S developments.

METHEDOLOGY

The following flow chart will explain the to be followed in the research work



IDENTIFYING HAZARD IN THE CONSTRUCTION ACTIVITIES EXCAVATION

Excavation is among the most hazardous construction operations. Excavations are needed for the foundation of structures, installation and repair of utility lines, replacement of water and sewer lines etc. An excavation may be defined as any manmade cut, trench, or depression in the earth's surface formed by earth removal Safety requirements

stipulated by AERB during excavation work are as follows:

i) Means for rapid access and egress should be provided. All trenches 120 cm or more in depth should at all times be supplied with at least one ladder for every 30 m along the trench. Ladder should be extended from bottom of the trench to at least 1 m above the surface of the ground.

ii) Workers should not be exposed to dangers of being buried by excavated material or collapse of shoring. Measures to prevent dislodgment of loose or unstable earth,

iii) Measures should be taken to prevent persons who are not engaged in excavation work, from approaching excavation areas by placing warning signals, barricades etc. near the site of the excavation.

TRENCH

The hazards associated with trench work are collapsing of the sides / caving in and `

12 burying/ partially burying those in the trench. Trench provides confined space to work & collapse occurs quickly without warning. The probability of locating & rescuing a person in time is very low which increases the severity of the hazard. Main hazards associated with trench work Important Control measures required to prevent the above hazards are:

i) Underground utilities (such as water pipelines, sewers, gas mains, electrical conduit system) should be located and protected, wherever necessary, before the start of excavation.

ii) Material should not be kept near the trench.

iii) Shoring (supporting the sides of the trench) and/or proper slopes to the trench walls should be provided.

SHAFT

Hazards mentioned for trench work are also applicable to the work related to shafts along with one additional & potential hazard called

"Dangerous Working Atmosphere". Dangerous atmosphere may result from lack of oxygen, increase in carbon dioxide level (number of persons working for a long time), Carbon Monoxide level (use of Petrol/Diesel/Kerosene operated machines) which can lead to serious accidents

Important control measures to prevent the hazard are:

i) Test for oxygen level inside the shaft before start of work every day.

ii) In case of fuel operated machines, frequent monitoring of the air along with a proper ventilation system for the shaft should be ensured to provide a healthy working atmosphere.

iii) Effective communication system between the ground staff & the persons working in the shaft should always be there to ensure safe working environment.

DISPOSAL OF SOIL

The disposal of soil involves the removal and transportation of excavated material with use of heavy equipment and vehicles from current location to a permitted off-site location or disposal facility. The main hazards to be considered include crushing and striking hazards posed by mechanized equipment and dumpers, tripping of materials etc. Managing traffic with the heavy vehicle movement is another aspect that needs to be looked into.

Important safety precautions to be followed for disposal of soil are:

i) The excavated material should be dumped sufficiently away from the edge of the ` 14 excavated pit to avoid the excavated material slipping and falling into the pit.

ii) As far as practical, earth should be removed mechanically from an earth mound/excavated heap. Wherever manual removal of earth is involved, earth should be removed from the top by maintaining a slope equal to the angle of repose of the earth.

iii) When excavated rocks, soil etc. are being filled into tippers, trucks etc., the drivers of such vehicles should come out of the driver's cabin and stay away at a safe distance.

Erection of Structures

The most serious accidents that occur during erection work of structures are due to fall of workers from the structures, fall of materials from structures on persons working below and collapse of the structure or a part of the structure.

Important measures to be taken to prevent the above hazards are:

i) Safe access should be provided to the structures under erection.

ii) Properly inclined ladders secured at the top and bottom should be used for vertical movements.

iii) A suitable working platform with guard rails & toe guards should be provided.

CASE STUDIES OF ACCIDENTS IN CONSTRUCTION SITE

CASE STUDY-1:

Accident due to caught between objects brief description:

In the below given fig 7.1.During the cleaning of the belt at the tail pulley area of conveyor of sand screening section of batching plant, one worker was trapped between the tail end pulley belt roller and ground. The trapped person sustained multiple injuries. Probable Cause of the Accident: There was no arrangement to prevent unauthorized access to the tail end pulley of the belt conveyor. The space available for working in that area was congested. The deceased person tried to clean the belt at the tail pulley end while it was in motion. In this process, his right hand got trapped/caught in between the belt and the ground. He was dragged under the roller and the belt end where he got entangled.

Lessons learnt to prevent such accident: -

Belt guard with locking arrangement should be provided to prevent unauthorized access.

- Loose cloths should not be worn during working in conveyor.

Fig 7.1 CASE STUDY-2:

ACCIDENT DUE TO ELECTROCUTION

Brief Description:

In the fig 7.2 Workers were working in the cable tunnel for job related to lighting system of the tunnel. One of the workers was assigned the work of termination of lighting cable in the emergency lighting junction box, which was in charged condition. As the junction box was located at a higher elevation from the floor and due to non-availability of safe access, the worker over-reached the JB by stepping on the lower cable tray. He lost the balance and got in touch with live core of cable leading to electrocution. Probable Cause of the accident: Contractor had mobilized the manpower without following the standard work procedure for working on an electrical system viz. isolating an energized circuit and obtaining work permit. Worker had been given authorization as an Assistant Electrician by the contractor based upon oral examination and no on-job training and field check list was undergone by him for carrying out jobs on electrical systems. Significant time was lost in shifting the worker from the tunnel as the layout of the tunnel was very congested and no communication system was available inside the tunnel.

Lessons learnt to prevent such accident:

- Work Permit system for working on charged electrical system.
- Authorized/licensed electricians to work on charged systems.
- - Communication system to be always available near the working areas.

Fig 7.2

Radio Frequency Identification (RFID) Overview

INTRODUCTION

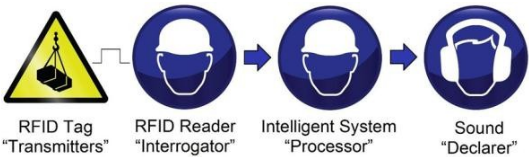
Radio Frequency Identification (RFID) is among the most important technologies developed in the last century. Among RFID's main features, the non- contact automatic identification and the ability to access and track multiples of RFID tagged objects. In addition, the RFID system could work in many different environments and conditions. For instance, RFID system could operate without having a direct line of sight and can even transmit through several materials, and RFID can operate effectively in wide temperature range.

The wireless use of radio frequency electromagnetic fields is the main technology used to transfer data from tags to readers. The data transferred is the electronically defined and stored data in the RFID tags. RFID tags act as transmitters; they are powered by RFID readers when at connection ranges through electromagnetic induction of magnetic fields. When RFID reader is in the connection range of RFID tags, the RFID tag transponder is excited to emit ultra- high frequency (UHF) radio waves. RFID tags are mainly found in two types, passive RFID tags and active RFID tags. The main difference between the passiveand active tags is the reading range of the tag; active tags are generally readable at longer ranges than passive tags. Passive RFID tags have short read range from1cm to 5m. On the other hand, active RFID tags, using power source, such as battery, could transmit its data at long ranges up to hundreds of meters

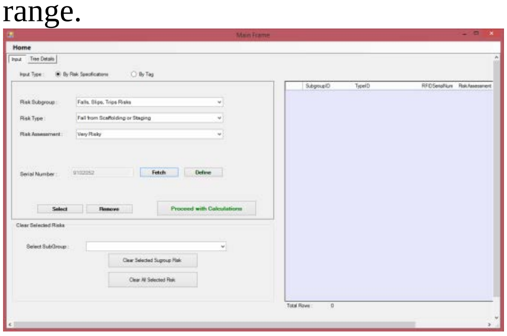
RFID tags comprise of small microchip and antenna. Each RFID tag has a unique product identifier stored in the tag's limited memory; the unique product identifier can be hyperlinked to several related additional information through a database. The unique product identifier could be used as a key into the database. Although the tags can be found as read-only or read-write, the tag data is stored in the tag's non-volatile memory. The RFID tag's circuit basically collects the Direct Current (DC) power from the incident reader signal in range, then, the RFID tag processes the received radio-frequency signal and transmits its memory data through the tag's antenna. Ultimately, the RFID reader sends an encoded radio signal to interrogate the RFID tag within the reading range, then the RFID tag broadcast radio signals with its unique product identifier which could be received by the interrogator RFID reader. The reader could be connected to computer intelligence system having the unique product identifiers database information for further data processing.

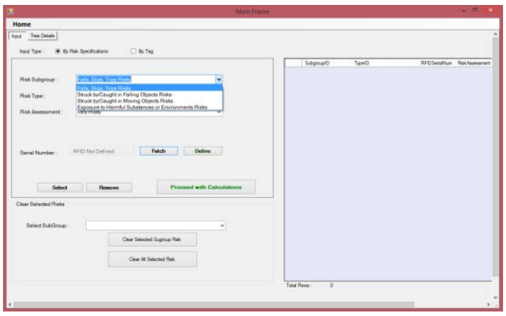
Considering that an RFID system, i.e., tags and readers, may be active or passive, fixed or mobile, and short range or long range; RFID technology is applied in many disciplines. Tags could be produced as flexible small printed circuits even with adhesive backing; this could increase their practical use and reliability for many applications. The RFID system is being used to track inventory, products, assets, baggage, cargo, etc., by fixing an RFID tag on the object to be tracked. Moreover, the RFID is used in many other application, such as access control, travel control, contactless payment, toll collection, transportation control, infrastructure locating and identification, etc. Several industries, e.g., manufacturing, transportation, agriculture, as well as the construction industry proposes that the use of RFID technology in mobile supply chain management could reduce tracking time and control cost RFID technology has been widely applied in many areas in the construction industry; several applications have utilized the RFID systems to provide the construction management with information to empower operation . The tracking of equipment and material is improved with tagging objects with RFID tags and using proper frequencies to track them. For instance, underground utilities locating and tracking was examined using proper RFID systems.

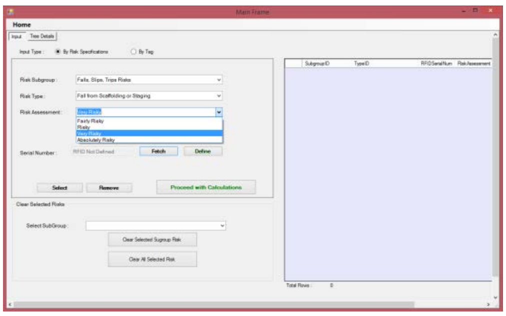
SIMULATION PROGRAM ALGORITHM

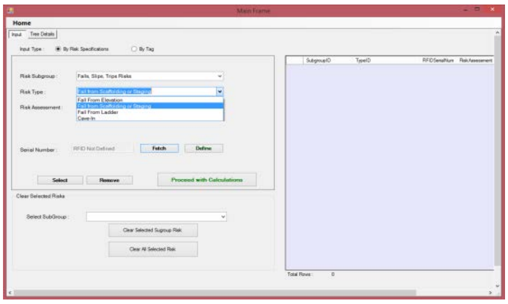


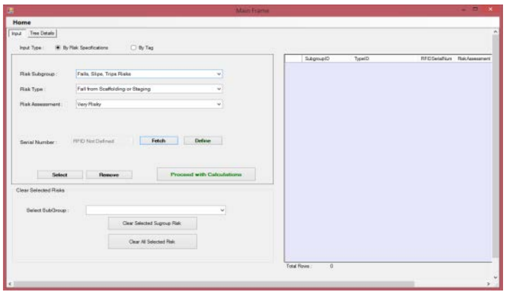
This section presents a flow chart shown in Figure 4.2 demonstrating thereal-time risk detection programed method algorithm. The flow chart includes three phases divided by role. Site setup by safety inspectors, real-time detection by worker, and real-time evaluation by intelligent system are the three algorithmphases referred to as phase one, phase two, and phase three respectively. Shapesof each junction box shown in Figure 4.2 represents either process, decision, ordata junction. Rectangular shape represents process junctions, diamond shape represents decision junction, and the parallelogram represents data item junction. The algorithm of this program starts with process of inspector at site, as shown in Figure 4.2, implying the inspector intention for risk prioritization as shownin Figure 4.1 illustrating the method’s process. If all the risk is prioritized then the algorithm decision junction leads to the second phase of the program which is real- time detection by worker, otherwise, the inspector would go through the followingsteps until all the predictable risk is prioritized: search RFID tag values, fetch RFID tag from database, and define RFID tag. Define RFID tag includes printing theRFID tag with the fetched RFID tag values and placing it at the risk location. Phasetwo starts with the process of the worker being at site. Select risk processrepresents risk detection, it is triggered when the decision of risk in range isactivated considering the RFID reading range.











CONCLUSION

Summary and Conclusion

Considering the damages caused by construction accidents, there is need for advancing safety measure and evaluation systems towards safety risks control to protect health and safety of on-foot workers. It is more effective to proactively combat safety risks at source rather than dealing with accident problems after theyoccur. The lack of real-time visibility, indication, and information about the site risks types and levels may put construction workers in dangerous situations.This study has achieved the concept of real-time safety risk detection by proposing an integrated structured method for evaluating risk events at building construction site for on- foot worker. The achievements of RFID applications promote it to be applicable for construction risk management. The detection method adopted the RFID technology for being proven to be consistent, uniform, and reliable identification solution due to RFID unique features and performanceat construction site environment, such as: the non-contact automatic identification, the ability to access and track multiples of RFID tagged objects, and the ability to operate without having a direct line of sight. This solution design goes beyond the state-of-the-art by systemizing the identification, prioritization, detection, evaluation, and control of safety risks. It adds to the state-of-the-art by developing an intelligent system that communicates in real-time risk identities, types, and levels at different stages and phases of construction. This study exceeds the current detection solution which can only detect the proximity of objects which excludes providing individual risk-specific information. The use of fuzzy logic is complementary with the triggering basic risk structure for enhancing the consistency and comprehensiveness of risk evaluation subjective values delivered in real-time. Furthermore, the use of subjective evaluation values could bridge the risk management gap constituted from misinterpreting qualitative risk values, safety regulations and measures.The simulation of the real-time detection system was implemented in a model with the intelligent system being the brain of the system that receives, interprets, and delivers the risk evaluation and control information in real time. This could make safety risks more recognizable and measureable at the time of risk exposure which can assist in establishing proactive decisions for risk control, accident prevention, and health protection. Real-time prognostic risk detection is among the strategies that could be adopted to effectively mitigate safety risks at early time or even before exposure.As shown in the detection method simulation chapter, the detection Intelligent System keeps a record of all risks detected by worker during the day. Thus, the system could have diagnostic uses along with its prognostic primary use. The system could be utilized to track and monitor the risk types and levels affecting workers to employ, manage, and calibrate health and safety programs at construction sites. Moreover, monitoring the risk detection record could give indication about progress and effectiveness of risk control programs by detecting risks at different instances of time and points in space. Furthermore, risk record might be helpful for accident and near miss incident investigations. Detection system record could help to identify weak zones or less protected areas at site. Thus, having a reliable risk detection tool will support decision makers to take suitable and proactive provisions to control risks and prevent accidents.The elaborated detection system can indicate that the system design was based upon some guidelines: validity, significance, simplicity, representation, reliability and consistency, and feasibility. The system design shows that it couldbe reasonable to use such system at the construction site environment while accommodating on- foot building construction worker activities and mobility. At least, the system could not constitute a hazard to any of the workers or restrain their movement. The simulation of the detection method indicates that the system could be representative by allowing engineers to add and modify input information in order to assure accurate representation of the site risks. Furthermore, the simulation indicates reliability and consistency for the system's intelligent system accuracy in processing inputs and delivering risk values at proper events; consistency of the system is maintained, when the exact same steps are repeated the system gives the same results.

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