

# Risk Reorganization and Hazard Assessment in the Development of Ocean Harbour Construction Using Qualitative Method

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**Abstract:** *The construction industry of India is passing through a very challenging phase. Heavy infra structuring like Ports, Roads & Highway for logistics and transportation, Dam construction for water reserving and irrigation, Airports extension, Urban transportation like Metros, Bus Transport system Flyover poised to grow exponentially within last 15 years. This situation leads to excellent opportunities for the construction industry in terms of business opportunity. In today's dynamic business landscape, technology and innovation projects play a key role in creating competitive advantages for the Construction companies like TATA Projects Ltd, Italian Thailand Development Cementation India Ltd, HCC Ltd, Larsen & Turbo India Ltd, Afcons Infrastructures Ltd etc. Port & Harbors are the basic infra for the logistics and transportation of goods for international trade. India peninsular the sixteenth largest maritime country of the world surrounded by Bay of Bengal and Indian Ocean.*

*The largest number of injuries occurs in the construction industry has compared to other industries. Many projects are often hampered by underperformance. This indicates the lack of risk management we manage the projects. Thus, reducing the accidents and determining the risks are extremely important. On the other hand, it is impossible to have any projects without risks. Thus, it is much more essential to have an effective risk management rather than trying to eliminate the existing risk. These factors have guided this study to focus on understanding the way risk assessment is performed in the construction projects.*

*A detailed study was carried out to understand the causes of accidents, preventive measures, and development of safe work environment. This paper aims to list-out the hazards & then taking the suitable safety measures/precautions to minimize the hazards. To achieve this aim, the frequency, likelihood and severity of hazards from the most common activities in construction of harbor berth, are assessed. The data for this study were collected by quantitative approach applying semi-structuring interviews with various interviewees holding different roles in the project within a port birth constructions.*

**Keywords:** Hazards, risk, Harbour, construction, severity, accidents, near miss, injury, mock drill, training, Piling, Diaphragm wall, Dredging, Drowning, Safety, Electrical, Mechanical, Barge, Training, Fire etc.

## I. INTRODUCTION

Indian Construction Industries plays a vital role in the economy of the country. Robust construction set up and good safety practice is the strength for quality product. It takes months, years to ensure good safety practices, to build up safe working culture & maintain an organization reputation. But an incident might be a catastrophic agent to destroy all reputation, endeavor of organizations including the direct cost like damage to life of human being, property and environment at a larger scale. Port berth construction is not easy as other construction activities, as it comes under heavy infra category. Inadequate Safety measures may lead to catastrophic major incidents may results into harm to human being, to environment. It is a moral and legal responsibility of any employer to ensure Identification of hazards and take required steps to minimize the risk due for ensuring Zero Incident at work place. Hence, review of Hazards and required safety measured for each identified hazards in Port Berth Construction industry is much more essential to

control the hazards. Here, in this paper we have discussed all the hazard, risk and task involved while executing the Visakhapatnam Port Trust DM berth construction project.

## II. DIFFERENT DEPARTMENTS

In Constructing the Port Berth, different departments and sections involved:

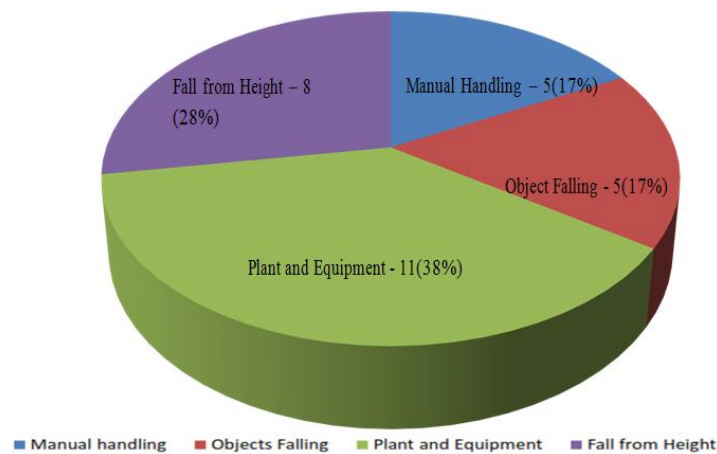
- Plant & Machinery.
- Store and Logistic.
- Quality Control.
- Quality Assurance.
- Civil Engineer.
- Environment Department - Handling of Waste Materials and preventing the surrounding environment.
- HR and Admin
- Purchase and Stores
- Information and Technology department.
- Legal Department.
- EHS (Environment, Health, Safety, Fire)
- Accounts.
- Planning.
- Commercial and Billing

## III. HAZARDS AND CONTROL MESURES

THERE ARE DIFFERENT HAZARDS INVOLVED IN EXECUTING THE DIFFERENT ACTIVITIES.

- Physical Hazard
- Chemical Hazard
- Electrical Hazard
- Mechanical Hazard
- Fire & Explosion Hazard
- Occupational Health Hazard
- Drowning Hazard

Reasons of Accidents



**IV. ACTIVITY INVOLVED FOR EXECUTING THE PROJECT:**

- Dredging.
- Under Water Drilling and Blasting.
- 35T Cage Lifting and Lowering at bore hole.
- Piling & Diaphragm Wall
- Civil Works

**V. PHOTOGRAPHS**



**DREDGING BY EXCAVATOR**



**UNDER WATER DRILLING AND BLASTING**



**35 TON DIAPHRAGM.WALL CAGE LIFTING**



DIAPHRAGM WALL CAGE LOWERING INTO BORE HOLE



PILE BORING



DIAPHRAGM WALL



CIVIL WORKS

**VI. HAZARD IDENTIFICATION RISK ASSESSMENT**

Procedure of Assessment: The procedure being followed by the EHS Management Team at site – All the section In-charge, Concerned Managers/ Engineers related to that particular task to be present for the assessment, in which they share the possible hazard that might be involved from their Vision, Prediction out of their past experience.

**RISK RATING SCORE CALCULATION PROCEDURE.**

Number Of person affected (N)

Number of Person Affected	N
1 Person	1
2-5 Person	2
5+ Person	3
Public/Vulnerable People	3

Severity (S)

Severity/Effect on Health	S
Negligible	1
Minor	2
Major	5
Fatal (Death)	10

Likelihood (L)

Likelihood	L
Probable	0.5
Remote	1
Possible	5
Likely	10
Certain	20

Risk Rating Score (RRS)

Acceptable	A	<10
Low	L	10-19
Medium	M	20-49
High	H	50-99
Very High	VH	100+



**Very high risk:** This risk is intolerable, immediate action of avoidance and protection needed urgently. Temporary mitigation measures should be taken instantly and action plan for final solution should be started and take place within 1 month.

**High risk:** Preventive and Corrective action are to be ensured to decrease the risk are required. Provisional countermeasure should within 1 month and action plan for final solution within 3 months.

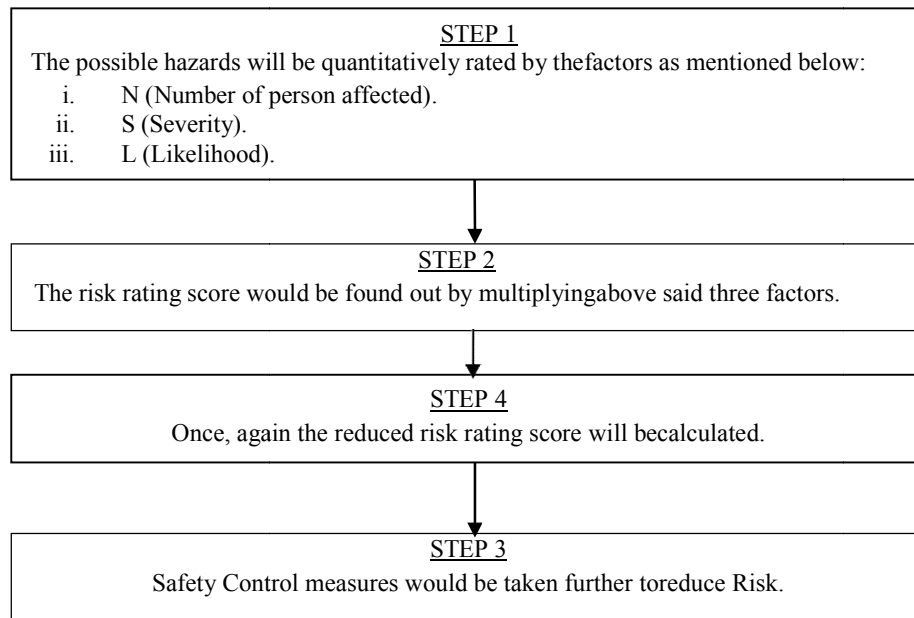
**Medium risk:** Regular Inspections are required to confirm that the risk is in control. Continuous Inspection is also required to ensure that risk is not rising further. Preventive and corrective actions can be taken as per need.

**Low risk:** This is green zone which displays that the risk is within tolerable limit. In the zone the risk is under control, regular monitoring of activities and administrative control is necessary.

RISK SCORE		GRAVITY			
		1	2	3	4
PROBABILITY	1	1	2	3	4
	2	2	4	6	8
	3	3	6	9	12
	4	4	8	12	16

Table : Risk Matrix

STEPS FOLLOWED FOR THE ASSESSMENT:



**VII. RESULT**

From table number 5.1 of Hazard Identification Risk Assessment we came into the conclusion that there were 221 risks in the process of construction of Port Berth Construction due to involvement of heavy risky activities, unsafe Act and Unsafe Condition. Out of 66 are of medium risk level, 57 are of high risk level and 80 are of very high risk level before any control measures are taken. The risk level drastically fell down after taking the control measures – 02 high level risk, 32 Medium level risk, 87 Low level Risk, 97 Acceptable risk

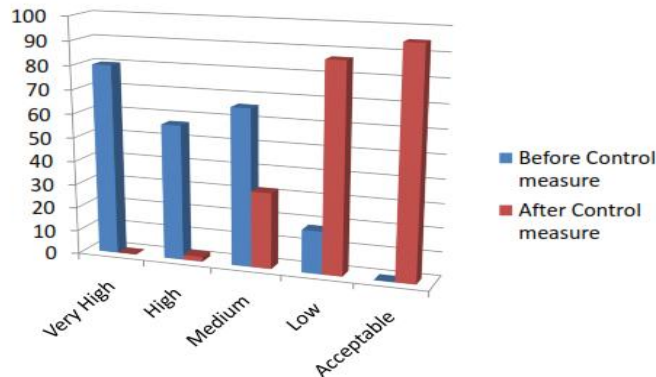


Fig-Statistics of Risk Level Changing

- By categorizing the risks, we could easily figured out the level of risk. By taking the control measures into consideration we brought down the risk into tolerable/acceptable level.
- Along with Control measures daily tool box talk has been imparted before executing each and every task. Technical job specific training was being imparted as per site condition and demand. The trainings were being conducted either by external agency or by internal technical experts.

#### VIII. APPLICATION DOMAIN

The zero incidents is the motto of any organization: Hazard Identification is the key for any organization to achieve the goal as it is the key process to evaluate the hazards and associated risk at the workplace.

To provide the safest work place the employees may take a help of Hazard Identification Risk Assessment to apply on:

1. Mock Drill
2. Near Miss Analysis
3. Job specific Training
4. Fulfilling the legal requirements.
5. Incident prevention Analysis. Benefits Of risk assessment method:
  1. Investigation of all major incidents.
  2. Applying control measures before executing the work.
  3. Prioritizing the High risk, medium risk, low risk activity easily.
  4. Accident Prevention.
  5. Major Incident Prevention.
  6. Conducting mock drill on the basis of risk level and vulnerability.
  7. Imparting training and educating people on the basis of risk level.

This Risk Assessment can be applied to any kind Routine and Non Routine Work, all kind of marine job, Off shore job, Port berth construction, harbor Jetty Construction.

#### IX. CONCLUSION

1. We have noticed the significant reduction in risk level i.e. RRS (Residual Risk Score) after the analysis. By Hazard Identification Risk Assessment we have reduced the risk from high level to Low and Acceptable level by taking all the applicable safety precautionary measures and preventive measures.
2. Hazard Identification Risk Assessment is a tool to mitigate the risk well before executing the work by analyzing the risk by finding the root cause with all the experts input. Organizations are now a day's using this HIRA tool as a major key player to mitigate the loss of life, property, environment etc as well as the indirect cost like Organization Image, problems in bagging the business/ projects, man-hour loss etc.

3. Organizations whether it may be Brownfield/Greenfield Project; Process/Manufacturing/Chemical Plant can use the Hazard Identification Risk Assessment as an effective tool and prevent themselves from catastrophic consequences and have better productivity, quality with zero incident

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