

# Hazard Identification and Risk Assessment in House Construction

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**ABSTRACT:**The important element of any safety and health program is the identification, assessment, removal and or control of potential risks within the worksite. The objective of this work is to pick out the capacity hazards arising out of a typical house construction site, examine the risks to decide their capacity to cause an accident, evaluate the risk, decide the people suffering from the danger and decide if the dangers are tolerable or not. If any work is to achieve success, it has to be secure, reliable, and sustainable in its operations. The work zone has to discover the dangers and assess the related risks and to convey the dangers to tolerable level.

**KEYWORDS:**HIRA, Construction, Safety, Hazards.

1. Hazard Identification.
2. Risk Assessment
3. Risk analysis.
4. Monitor and Review.



Steps in HIRA

## I. INTRODUCTION

Hazard Identification and Risk Assessment (HIRA) is carried for identity of undesirable activities that can result in a threat, the analysis of danger of this unwanted occasion, that might arise and normally the estimation of its extent, significance and probability of dangerous effects. It is extensively prevalent within industry in widespread that the diverse techniques of danger evaluation contribute significantly toward enhancements within the protection of complicated operations and system.

The goal of this work of hazard and risk analysis is to pick out and analyze dangers, the event sequences leading to risks and the chance associated with dangerous occasions. Many techniques starting from the easy qualitative techniques to the superior quantitative strategies are to be had to help perceive and examine hazards. The use of a couple of hazard evaluation techniques is usually recommended because every has its very own cause, strengths, and weaknesses.

## II.Hazard Identification and risk analysis

### AHIRA Processes –

The HIRA Processes consists of four steps

## B. Risk Assessment

A group of 6 workers were interviewed and asked to give their response over different hazards in the workplace and their consequences and determine its likelihood and severity and the average value of their ratings were considered for the work.

| Name        | Job               | Age | Experience |
|-------------|-------------------|-----|------------|
| Elumalai    | Mason             | 51  | 27         |
| Chinnarju   | Brick mason       | 49  | 30         |
| Sangeyan    | Carpenter         | 47  | 23         |
| Malaichamy  | Concrete finisher | 44  | 20         |
| Srinivasan  | Electrician       | 34  | 11         |
| Markandeyan | paniter           | 38  | 18         |

Worker Details

**C Likelihood of an Occurrence**

| Occurrences                             | Worker's rating (1-5 scale) |   |   |   |   |   | Avg. |
|---|-----------------------------|---|---|---|---|---|------|
|   | 1                           | 2 | 3 | 4 | 5 | 6 |      |
| Workers                                 | 1                           | 2 | 3 | 4 | 5 | 6 | 2    |
| Water logging                           | 3                           | 2 | 2 | 2 | 3 | 2 | 2    |
| Standing in the radius of poclair boom. | 2                           | 1 | 2 | 3 | 1 | 2 | 2    |
| Fall of material in pit                 | 4                           | 4 | 3 | 3 | 3 | 3 | 3    |
| Fall of human in pit                    | 2                           | 2 | 2 | 3 | 3 | 2 | 2    |
| Exposure to sand dust                   | 4                           | 4 | 4 | 5 | 3 | 2 | 4    |
| Exposure to cement dust                 | 5                           | 5 | 4 | 5 | 3 | 4 | 4    |

**Likelihood of an Occurrence**

| RISK  | DESCRIPTION | ACTION  |
|-------|-------------|---|
| 15-25 | HIGH        | A HIGH risk requires immediate action to control the hazard as detailed in the hierarchy of control. Actions taken must be documented on the risk assessment form including date for completion.                        |
| 5-12  | MEDIUM      | A MEDIUM risk requires a planned approach to controlling the hazard and applies temporary measure if required. Actions taken must be documented on the risk assessment form including date for completion.              |
| 1-4   | LOW         | A risk identified as LOW may be considered as acceptable and further reduction may not be necessary. However, if the risk can be resolved quickly and efficiently, control measures should be implemented and recorded. |

**Action and Description of Risk Martrix**

**D Severity of Hazards**

| Occurrences                                 | Worker's rating (1-5 scale) |   |   |   |   |   | Avg. |
|---|-----------------------------|---|---|---|---|---|------|
|   | 1                           | 2 | 3 | 4 | 5 | 6 |      |
| Workers                                     | 1                           | 2 | 3 | 4 | 5 | 6 | 2    |
| Cuts wounds                                 | 1                           | 1 | 2 | 1 | 1 | 1 | 2    |
| Contact with the bucket or dip of a poclair | 3                           | 3 | 2 | 3 | 2 | 2 | 3    |
| Hearing problem                             | 3                           | 3 | 3 | 3 | 3 | 3 | 3    |
| Lung disease                                | 2                           | 3 | 4 | 3 | 3 | 2 | 3    |
| Skin irritation                             | 2                           | 1 | 2 | 1 | 1 | 1 | 1    |
| Eye irritation                              | 2                           | 2 | 1 | 1 | 2 | 2 | 2    |
| Stress, fatigue                             | 1                           | 1 | 1 | 1 | 2 | 2 | 1    |
| Soil erosion                                | 1                           | 1 | 2 | 3 | 2 | 2 | 2    |
| Injuries due to fall                        | 2                           | 3 | 2 | 2 | 3 | 2 | 2    |

**Severity of Hazards**

**E. Risk Matrix**

| Likelihood (L) | Severity (S) |    |    |    |    |
|----------------|--------------|----|----|----|----|
|                | 1            | 2  | 3  | 4  | 5  |
| 5              | 5            | 10 | 15 | 20 | 25 |
| 4              | 4            | 8  | 12 | 16 | 20 |
| 3              | 3            | 6  | 9  | 12 | 15 |
| 2              | 2            | 4  | 6  | 8  | 10 |
| 1              | 1            | 2  | 3  | 4  | 5  |

**Risk Matrix**

**II. METHODOLOGY**

**A. Steps Considered in this work**

1. Site preparation and leveling.
2. Excavation and PCC
3. Foundation, plinth beam and slab.
4. Brick masonry work.
5. Building Roof-centring.
6. Electrical and plumbing.
7. Exterior finishing.
8. Interior finishing.

The Hira chart for Site levelling and Excavation is presented below.



**Site Leveling and Prepration**



**Excavation**



**Foundation**



**Building Roof-centring.**



**External Finishing**



**Internal Finishing**

**III. SAMPLE HIRA CHARTS**

| Sr No | Activity (job steps in sequence) | Hazard / Risk   | Consequences   | Probability | Risk | Present control measure | Additional Control measure   |   |
|-------|----------------------------------|---|--|-------------|------|-------------------------|--|---|
| 1     | Leveling the ground              | -Noise Pollution<br>-Imbalance of vehicles<br>-Mechanical Hazards<br>-Contact with the excavator.<br>-Person standing in the blind spot   | -Injury, wound<br>-Damage of material<br>-Hearing problem.   | 3           | 2    | 6                       | -Supervision<br>-Operator has to check the excavator before start of work.<br>-Dullified operator  | - Good housekeeping.<br>- Proper communication between the operator and the supervisor  |
| 2     | Excavation                       | • Fall of material<br>• Injury to person<br>• Electrical hazard<br>• Mechanical hazards<br>• Noise pollution<br>• sudden rain<br>• Fall of Person<br>• Imbalance of vehicles<br>• slip, trip<br>• soil erosion/ rock roll | • Injury - wound, cut,<br>• Lung disease<br>• Hearing problem<br>• Eye irritation/ Eye damage<br>• Damage of material<br>• Back pain, stress, fatigue etc.<br>• Electrical shock<br>• Fall of Excavator m/c etc.<br>• Water logging<br>• Mud / dust<br>• Soil collapse | 4           | 4    | 16                      | • supervision<br>• Use of proper PPE<br>• first aid box at job site<br>• Checking of Tools & tackle<br>• Checking of operator license.<br>• Operator has to check the Excavator before start of the work, brake, horn, bucket, etc<br>• Daily inspection | • Good housekeeping<br>• Proper Illumination<br>• Use only TPL approved JCB/ earth cutting m/c<br>• Keep soil material stored away from the edge<br>• water from accumulation in the excavation<br>• Backfill as soon as section job is completed<br>• Check the soil condition |

**HIRA CHART FOR LAYING FOUNDATION**

| Sr No | Activity (job steps in sequence)            | Hazard / Risk  | Consequences   | Probability | Risk | Present control measure | Additional Control measure                                       |   |
|-------|---|--|--|-------------|------|-------------------------|--|---|
| 1     | Mixing of sand & cement<br>Manually         | - Inhalation of asbestos<br>- Wet concrete<br>- Skin contacts with cement                          | • Respiratory problem<br>• Skin disease<br>- Cut, wound due to mixing tools & tackle | 3           | 1    | 3                       | • Mixed sand & cement as required<br>• Keep cement at safe place | • Use proper PPE<br>• Keep empty cement bag at one place  |
| 2     | Mixing of sand & cement in a concrete mixer | - Inhalation of asbestos<br>- Wet concrete<br>- Contact with machine parts<br>-Noise and Vibration | - Asbestosis<br>- Chemical Burns<br>- Injury<br>• - Hearing loss                     | 3           | 2    | 6                       | • Use proper PPE<br>• Keep cement at safe place                  | • Use proper hearing aid<br>• Keep empty cement bag at one place<br>• Avoid contact with rotating machine parts |
| 3     | POC   | -Rain<br>-Collapse of soil<br>-Fall  | • Fall of person in pit<br>• Water logging injury                                    | 3           | 1    | 3                       | • Use proper PPE   | • Proper sourcing should be done<br>• Barricading & cover   |
| 4     | Tying of re-bars                            | -Cuts<br>-Awkward lifting of rebars  | - Injury<br>- Musculoskeletal Disorder   | 3           | 1    | 3                       | • Use multiple people to lift<br>• Supervision                   | - Use of Proper PPE<br>- Use first aid kit on the site  |

**HIRA CHART FOR LAYING FOUNDATION**

#### IV. CONCLUSION

Based on methods used to communicate risk at a house construction site, toolbox meetings, site meetings and informal verbal communication are used to communicate risk. And also, proper supervision and communication from the engineer to the workers plays a very important role in safety. The given study also reveals that PPE is the main item used for controlling risk. They require that health and safety risk to be communicated to workers and that PPE be provided for worker. The risks were assessed based on experience of the worker in the construction site. Moreover, the work concludes that the factors like layout and location of the site, work size and nature, methods of working and working team influence health and safety risk management. Thus, the main key is that every job on the construction site must be carried out with at-most safety.

#### REFERENCES

- [1]. 1.Bell, R. and Glade, T., (2003), "Quantitative risk analysis for landslides"-, *Natural Hazards and Earth System Sciences*, Vol.4, (pp. 117-131).
- [2]. Carpignano, A., Priotti, W. and Romagnoli, R., (1998), "Risk analysis techniques applied to floating oil production in deep offshore environments", *International Society of Offshore and Polar Engineers*, Vol.1, (pp. 253- 258). Donoghue, A. M.
- [3]. Duijm, N. J., (2001), "Hazard analysis of technologies for disposing explosive waste", *Journal of Hazardous Materials*, A90, (pp. 123-135).
- [4]. Tauron A (2011) "Construction Risk modelling and assessment": Insights from a literature review". *The built and human Environment*, Vol 4, Special Issue 1.
- [5]. Khan, F. I. and Abbasi, S. A., (2001), "Risk analysis of a typical chemical industry using ORA procedure", *Journal of Loss Prevention in the Process Industries*, Vol.14, (pp. 43-59).
- [6]. Frank, T., Brooks, S., Creekmore, R., Hasselbalch, B., Murray, K., Obeng, K., Reich, S. and Sanchez, E., (2008), *Quality Risk Management Principles and Industry Case Studies*, (pp. 1-9).
- [7]. Anik Ratnaningsih, YenyDhokhikah (2018) "Hazard Identification, risk analysis and risk assessment on high rise building construction project", *International Conference on Engineering, Technology and Industrial Application*.
- [8]. Raja Shekar Mamillapalli, Srihari Vedartham (2020) "Hazard Identification and Risk Assessment (HIRA) framework for formwork and excavation at construction site in India", *International Journal of Technology*, Vol 10.
- [9]. Dr. Nadeem Ehsan (2010), "Risk Management in construction industry" *IEEE*
- [10]. Akintola S Akintoye and Malcolm J MacLeod (1997) "Risk analysis and management in construction" *International Journal of Project Management* Vol. 15, No. 1, (pp. 31-38).
- [11]. Samaneh Zolfagharian, (2011), "Risk Assessment of Common Construction Hazards among Different Countries" *Sixth International Conference on Construction in the 21st Century (CITC-VI)*.
- [12]. Li Bing and Robert L. K. Tiong (1999), "Risk management model for international construction joint ventures" *Journal of Construction Engineering and Management*, ASCE, Vol. 125, No.5, September/October, (Pg. 377-384).



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