

27<sup>TH</sup>  
FEBRUARY  
2023



Technical Session-I

## Safety culture initiatives at HPCL-Mumbai Refinery



# HPCL – Mumbai Refinery

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COMMENCED OPERATION  
IN 1954.



NATIONALIZED IN 1975.



STATUS UPGRADED AS  
MAHARATNA PSU IN 2019

# Safety Management System

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REFINERY CAPACITY  
EXPANDED TO 9.5 MMTPA



35 MILLION MAN HOURS  
ACHIEVED



TIME BOUND INITIATIVES FOR  
CONTINUAL IMPROVEMENT

## Safety initiatives



Concept of What-Can-Go-Wrong Analysis,  
Assessing the risk in non-routine activities  
Instilling safety consciousness in functional decisions



Taking the necessary 'Pause' before commencement  
5 min PAUSE at site for 'Preventing An Un-Safe Event'



Digitizing Process Safety Management  
Implementing with EHS module of SAP and other IT modules



Road Safety initiatives  
Refinery Driving Permit, Dashboard dangler, Speed monitoring

## Safety initiatives



AI based visual analytics,  
PPE compliance and Trespass Control  
Leak detection with auto-maneuvering of CCTV



Cardinal Safety Rules  
Process Safety, Electrical, Rotory, Instruments and Stores  
Life Saving rules for occupational safety



Safety Capability Building  
Certifications from IFRC, NITIE, DGFASLI, NEBOSH, MCGM etc



Safety Tour  
T-Suraksha rounds by senior management for 'Safety in Action'

## Safety initiatives



Concept of Unit Area Team,

Decentralized decision making empowerment

Resolution efficiency augmented



Bad Actor monitoring

Focused monitoring of major Bad Actors in Safety

Leading- Lagging indicators are regularly reviewed



Safety Reward mechanism

Monetization for Safety Positivity reinforcement

Issue of Safety Challan to contractors as negative reward

## Safety initiatives



### Knowledge Sharing

Oh! God Bach Gaya: compilation of incident learnings  
Safety Animation: as part of safety story telling



### Operations Safety

Safe Operating Envelop (SOE) monitoring  
E-log sheet for charge handover

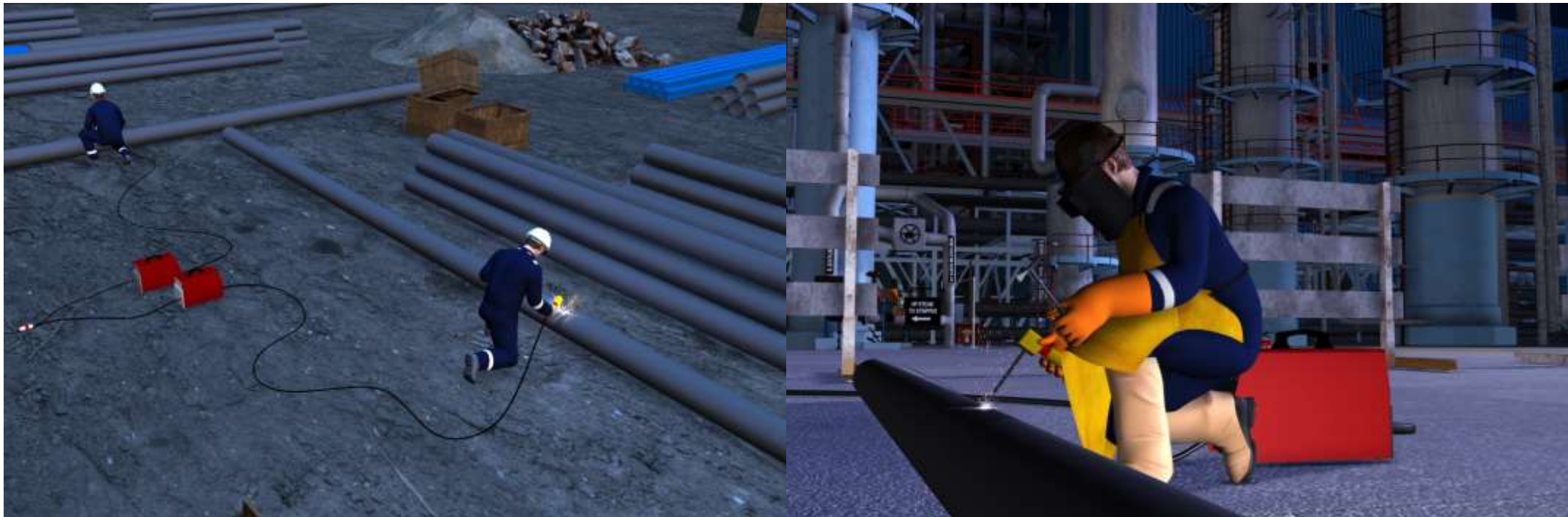


### Personnel Safety

Fire retardant coveralls for all field employees  
Portable multigas detectors for offsite areas



Let's Grade the Hazards



Let's Grade the Hazards

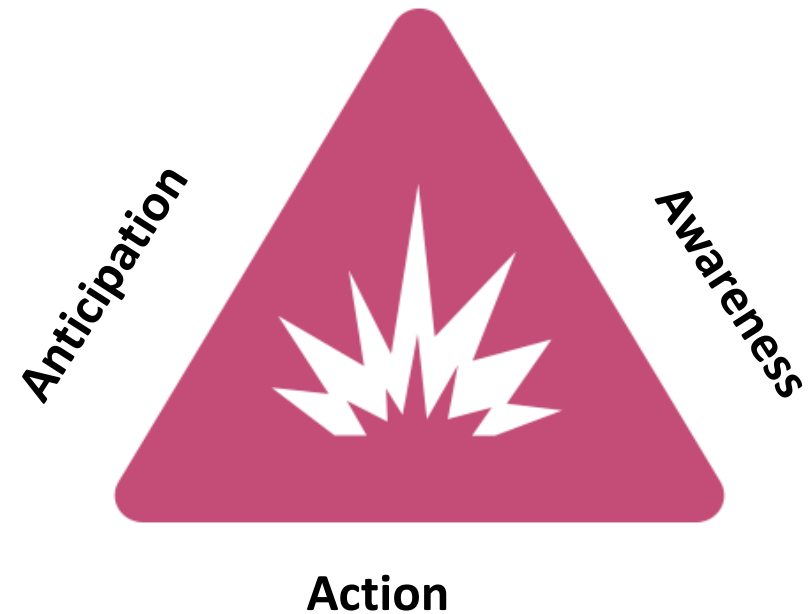
# Incident Triangle

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Anticipation of the Hazards

Awareness of stake holders

Timely Action



# Work Hazard : Influencers

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## Nature of Work

Hot-work  
Excavation  
Crane Operation  
Cleaning/Painting



## Location of Work

Plant Area  
Open Storage  
Tank Farm  
Road side



## Equipment Involved

Pipeline  
Wall / Structure  
Vehicle



## Personnel Involved

Employee  
Contractor  
Experienced / Trained  
Trainee / Apprentice

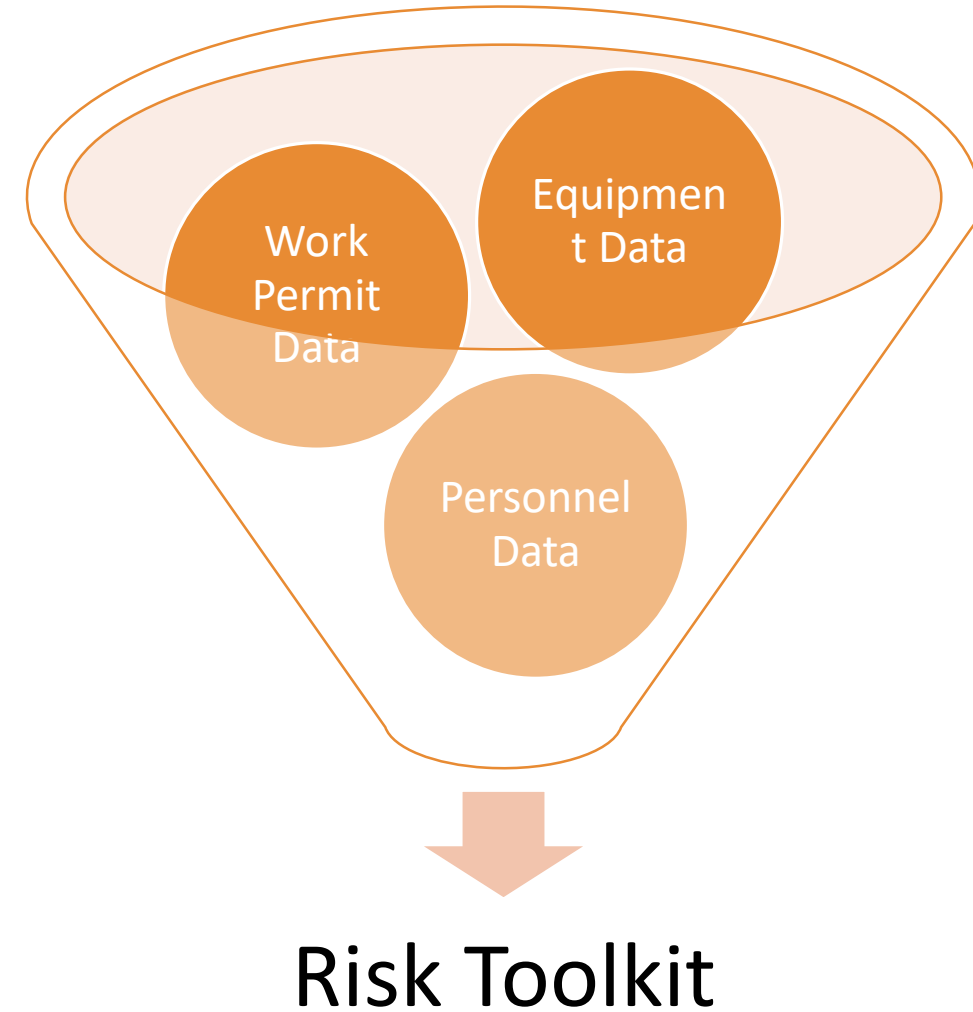
# Conventional Hazard Controls

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Work Permit System

Monitoring

Albeit apart from Design, Layout, Systems,  
Procedures, Statutory requirements, Staffing,  
Training, Emergency preparedness, MARG, etc





## An Indigenous Tool Vulnerability Index



Dynamic indexing of the hazards of day-to-day activities.



Supplementing the users with decision making capability.



Integration with work permit system and SAP.



Brings objectivity in identification of Hazards.

# Vulnerability Index : Vectors

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## Area Vector

(based on Assets, lines, instruments etc)



## Job Vector

(Type of permit)



## Human Vector

(Experience of supervisor, maintenance person, contractor resources etc)

# Area Vector



Three overlapping screenshots of a mobile application interface. The top screenshot shows a list of job-related categories: 'Area of Job' (Mechanical Engineer), 'Nature of Job' (Mechanical Engineer), 'Human Factor' (Mechanical Engineer), and 'Vulnerability Index (V)' (Mechanical Engineer). The middle screenshot shows the 'Area of Job' section expanded, with 'General Details' and a 'Select the Area' section. The bottom screenshot shows the 'Select the Area' section expanded, with 'Equipment' selected. Below this, there are fields for 'Unit', 'Section', and 'Equipment Type', each with a dropdown arrow. There are also icons for 'Add Note', a lightning bolt with '0', and a camera with '0'. A blue circular button with a camera icon is at the bottom right.

# Area Vector



← Vulnerability Index of a Jo... ☁ ⋮

☰ ⓘ 👤

**Details of the Equ**

Unit

Section

Equipment Type

Equipment tag no.

← Vulnerability Index of a Jo... ☁ ⋮

☰ ⓘ 👤

**Details of the Equipm**

Unit

NFCCU

Section

WGC Section

Equipment Type

Exchanger

Equipment tag no.

114E-3056 A/B (Shell)

← Vulnerability Index of a Jo... ☁ ⋮

☰ ⓘ 👤 ⚡ 🖼️ 💬

**Service/Location**  
Debutaniser bottoms / stripper bottoms preheater

**Design Temp. (°C)**  
155

**Design Press. (kg/cm2g)**  
22

**Operating Temp (°C in/out or top/btm)**  
100.9 / 118.9

**Operating Press. [kg/cm2g (Top/Btm)]**  
15

**Set Pressure**

**Vulnerability Index (VI)**  
5

🖼️

# Job Vector



← Vulnerability Index of a Jo... ☁️ ⋮

☰ ⓘ 👤 ⚡ 📷 🗨️

**Nature of Job**  
Mechanical Engineer

**Job Details**

Date of Job

Permit Type

Job Type

Job Details

Additional Job Details

✕ Permit Type SAVE

🔍 Search

- Hot Permit
- Cold Permit
- Height Permit

← Vulnerability Index of a Jo... ☁️ ⋮

☰ ⓘ 👤 ⚡ 📷 🗨️

**Date of Job**  
15 Jun 2022 03:07 PM 📅

**Permit Type**  
Hot Permit ▾

**Job Type**  
Confined space ▾

**Job Details**  
NA ▾

**Additional Job Details**  
NA ▾

**Vulnerability Index (VI)**  
10 📷

# Human Vector



Vulnerability Index of a Jo...

Work Experience

1. Does supervisor ha  
experience in that un

Vulnerability Index (V

2. Does DCS supervis  
experience in that un

Vulnerability Index (V

3. Does maintenance  
unit?

Vulnerability Index (V

Human Factor  
Mechanical Engineer

Work Experience

1. Does supervisor  
experience in that u

Yes

Vulnerability Index  
0

2. Does DCS super  
experience in that u

No

Vulnerability Index  
10

Vulnerability Index (VI)  
10

6. Does contractor labour has more than 1 year  
experience in that unit?

Yes

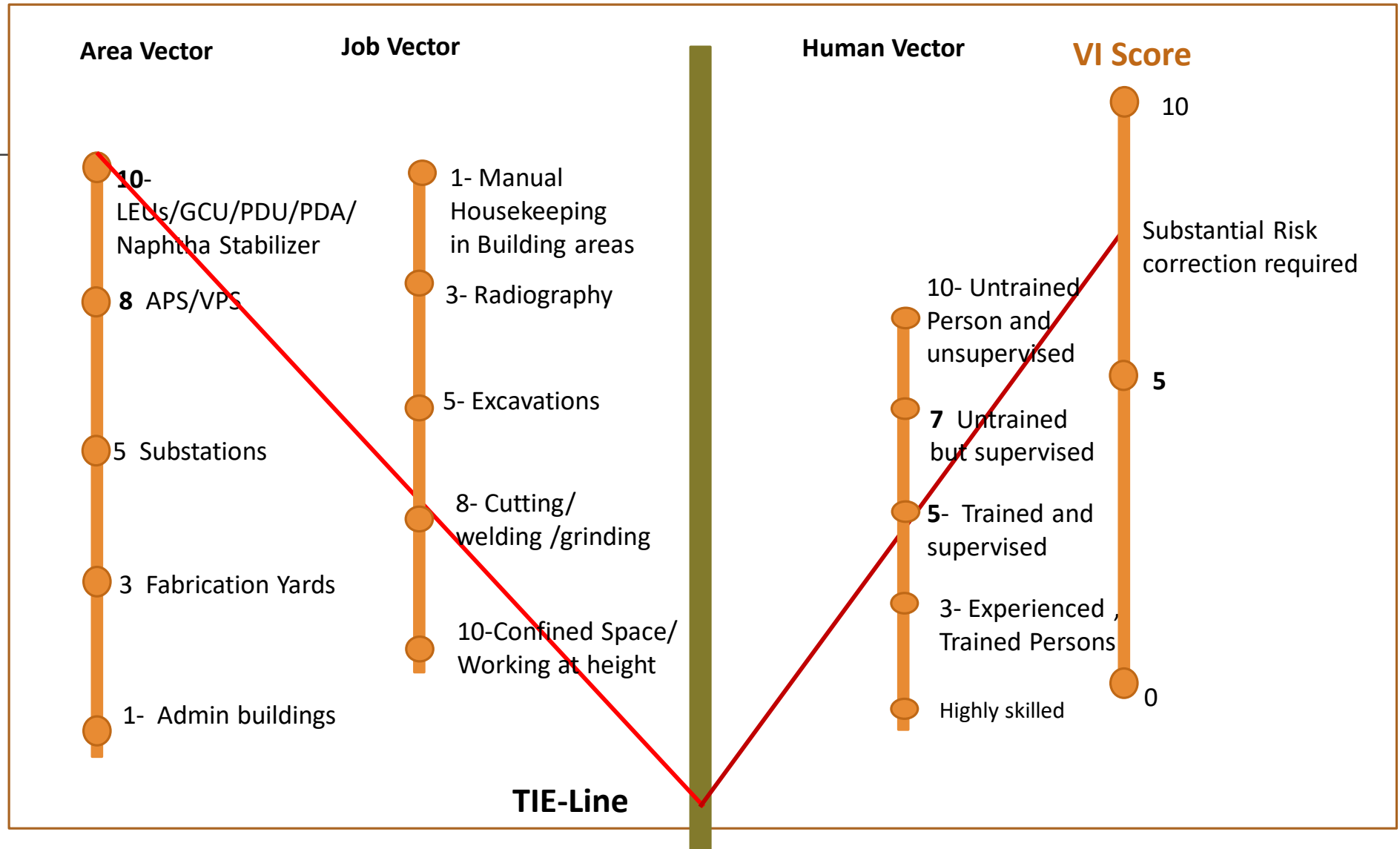
Vulnerability Index (VI)  
0

Vulnerability Index - Human factor  
5

COMPLETE STEP

# Tie Chart I

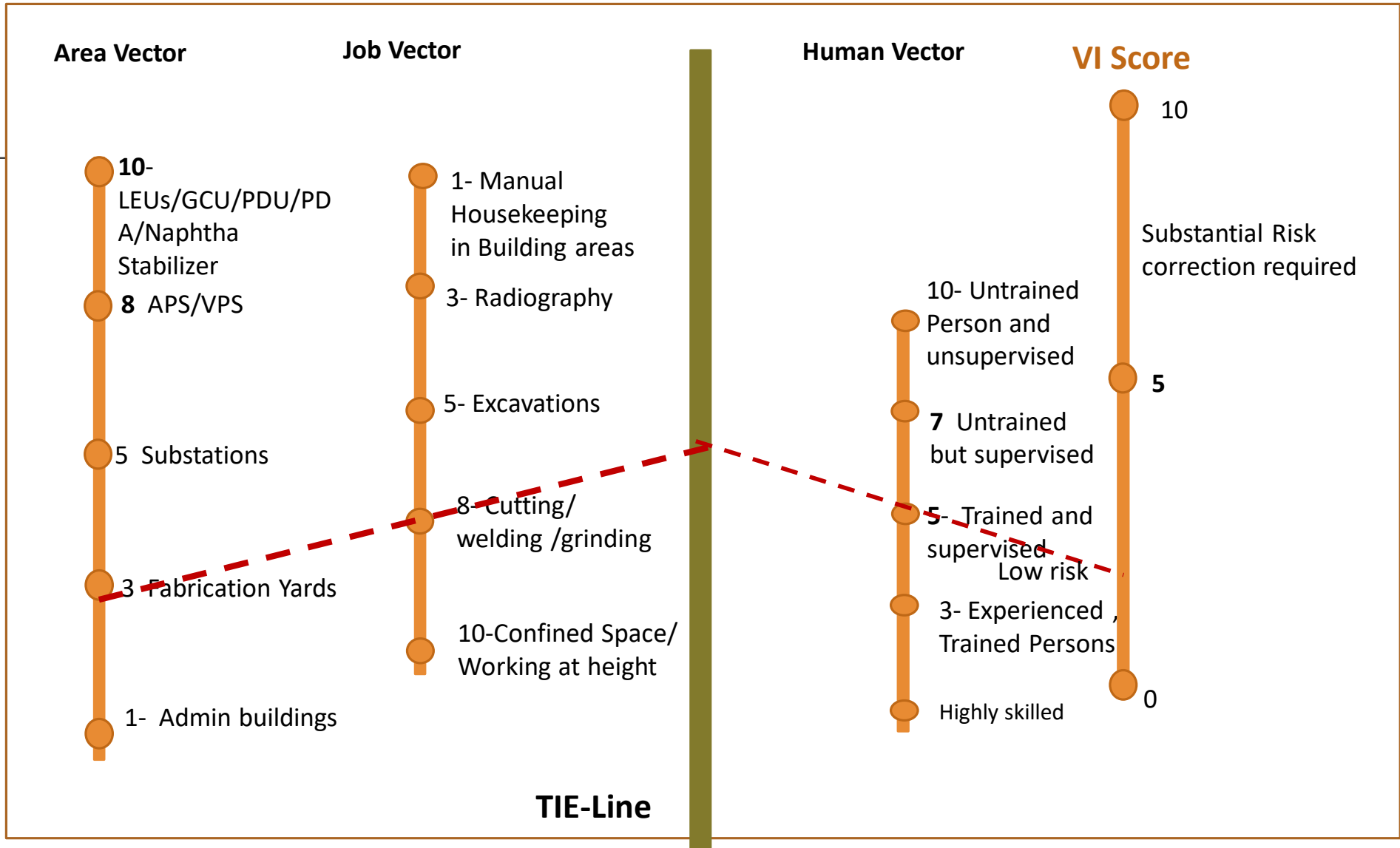
**Vulnerability Index :  
Hot work in Light  
Ends Unit**



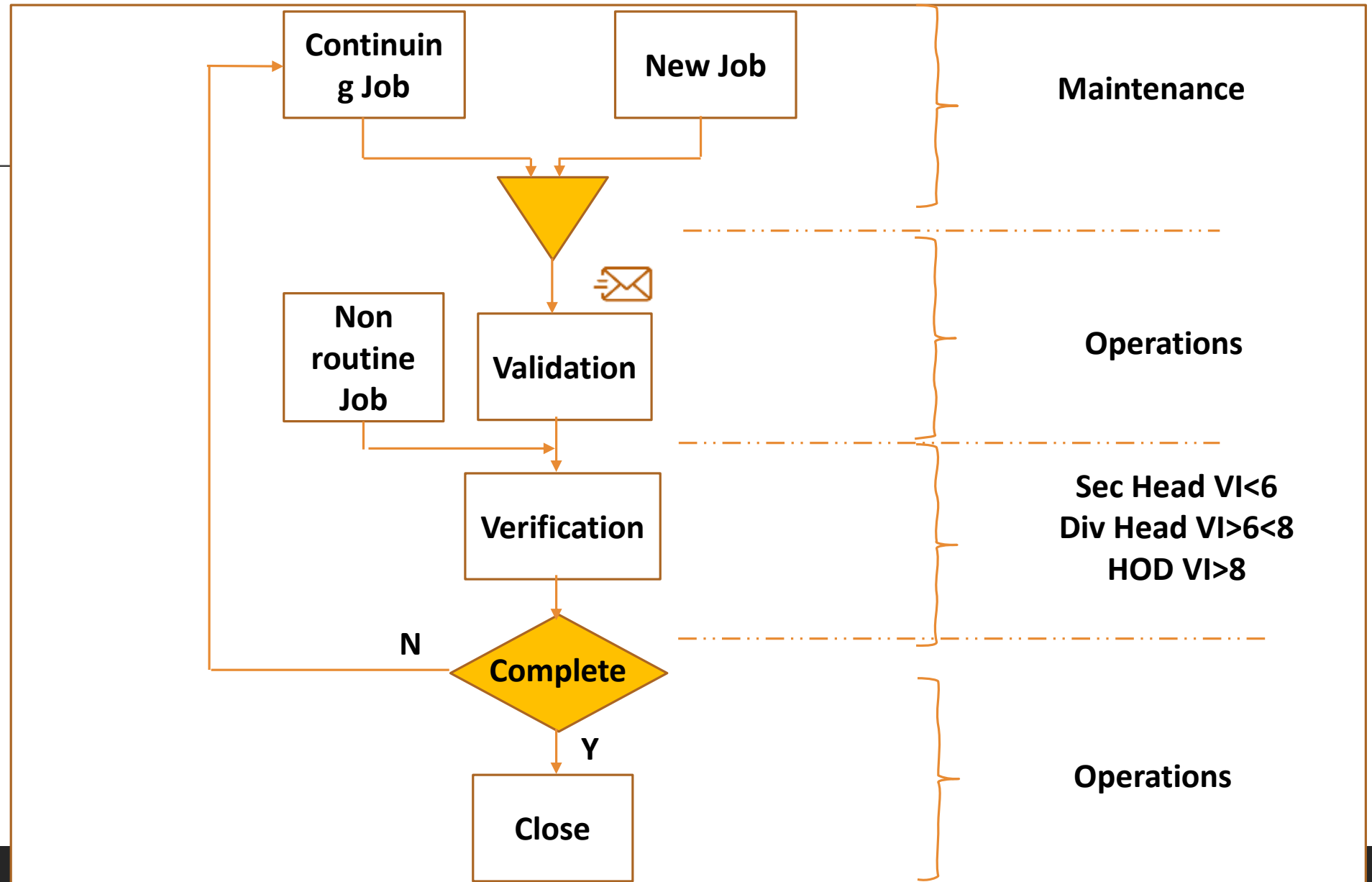
TIE-Line

# Tie Chart II

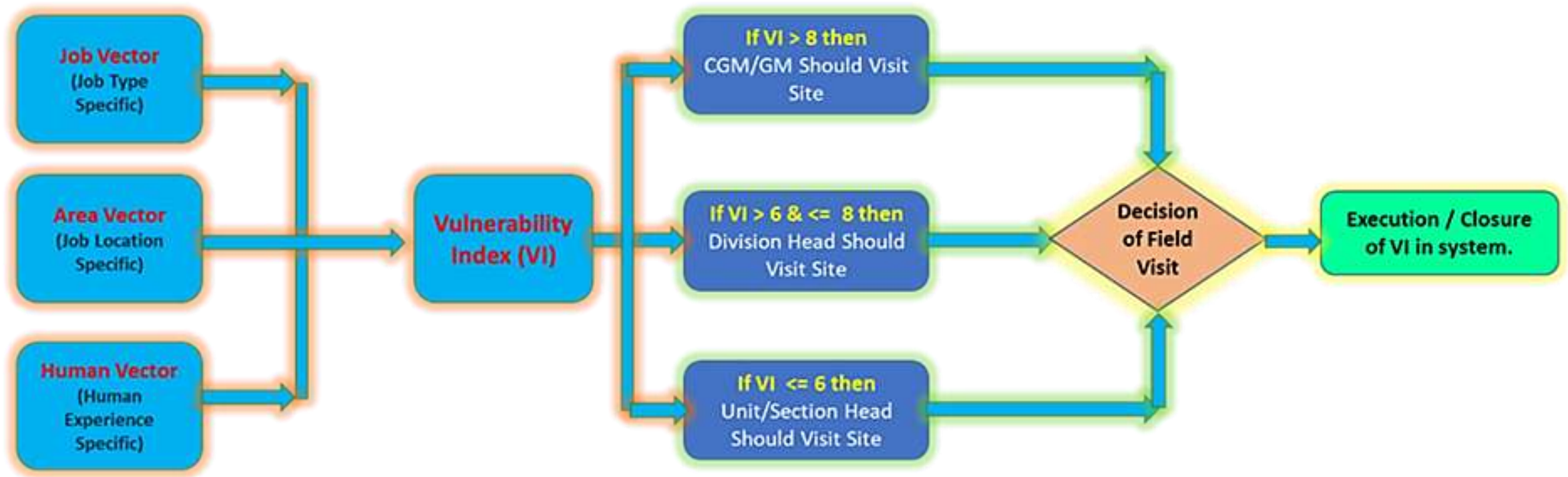
**Vulnerability Index : Hot work in Fabrication Yard**



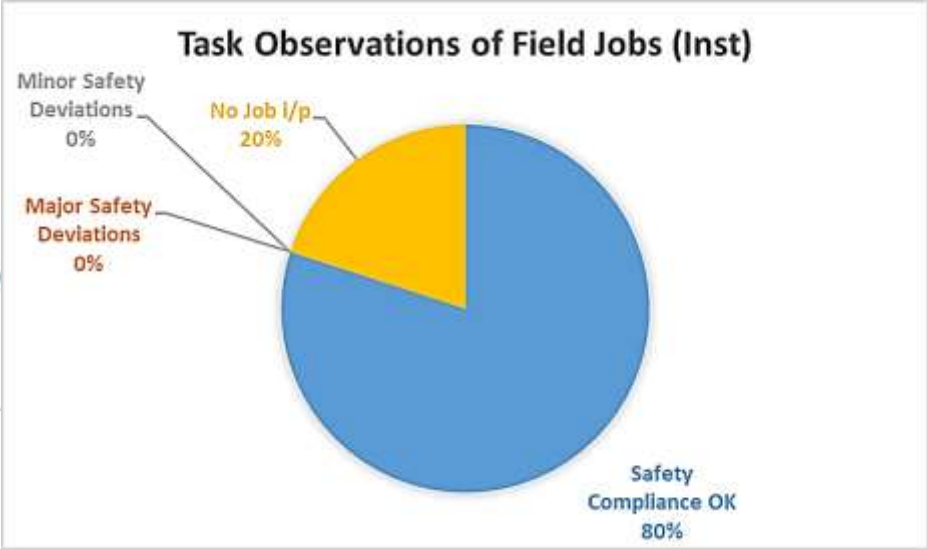
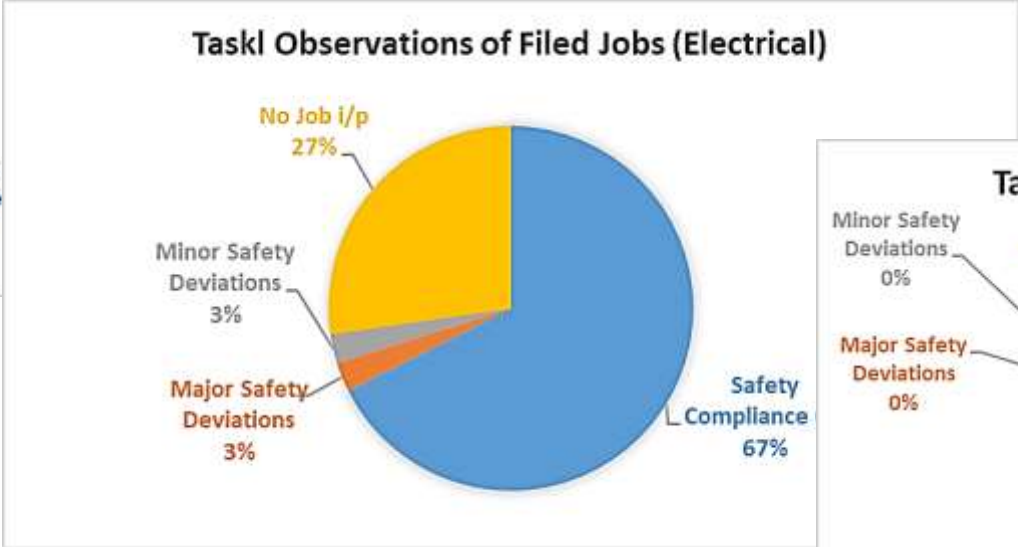
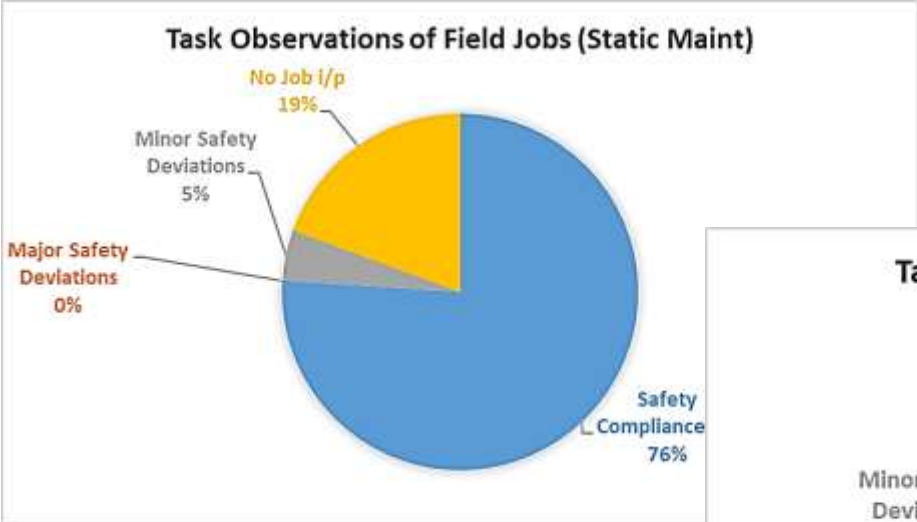
# Flow Chart



# Alert & Feedback escalation matrix



# Pie Chart: Field observations as of Jan '23



# Vulnerability Index

**Human Factor** ✔  
 Mechanical Engineer  
 Completed by Zeeshan Akram on 15 Jun 2022

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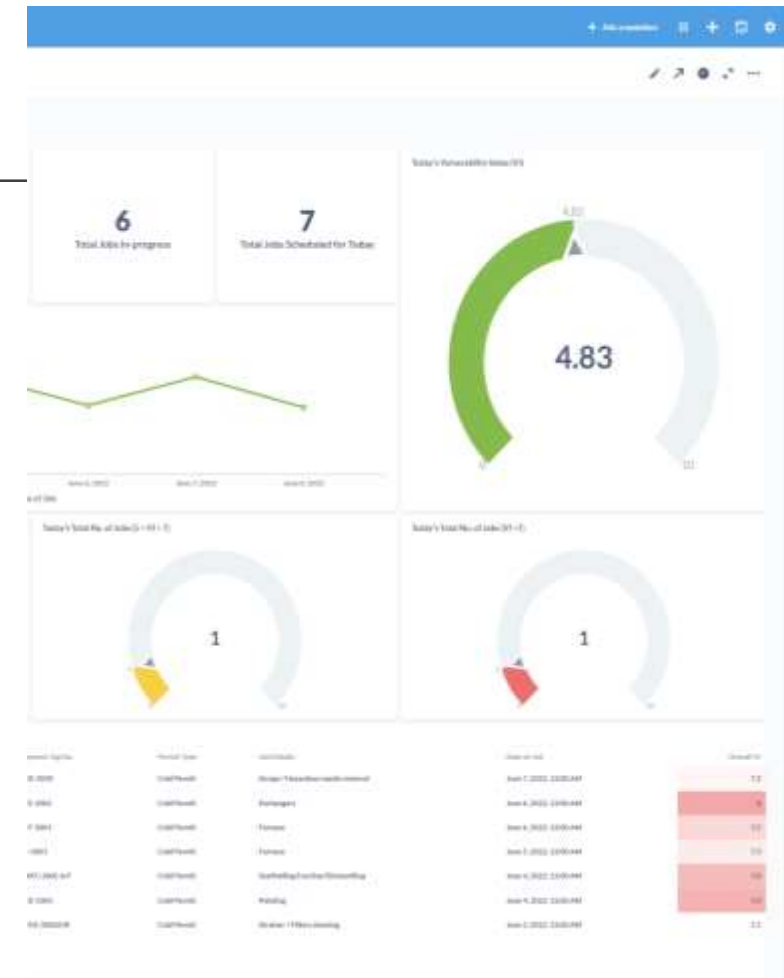
**Vulnerability Index (VI) of the Job** Ready 🔄  
 Mechanical Engineer

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**Results**

**Overall Vulnerability Index**  
 6.667

⚠ SMS Alert has been sent to Section Head for field visit



MONITORING TOOL

## Vulnerability Index : Online system leveraging work permit database

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Concept of Incident Triangle and Vulnerability Index helps in,  
Assessing the risk in day-to-day activities  
Creating awareness in cross functional groups  
Putting in place Monitoring mechanism.



Provides opportunities for leadership in exercising control over activities  
Pre-planning of activities  
Allocation of resources



Bringing objectivity in assessment of job hazards.

Thank you

