

Interview Preparation Topics

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Safety Categories

- Design Safety
- Process Safety
- Project Safety
- General Safety

Level of Safety

- Plant Safety
- Worker Safety
- Consumer Safety

Safety Work System

- Documentation Work
- Site Work

Turn Around (TRA)

A scheduled and periodic shutdown (total or partial) of a plant. They stop daily plant operations completely during the duration of turnaround maintenance work and instead the focus shifts to maintenance related activities, cleaning, inspection, repair, and replace

Shutdown Names

- Turn Around(TRA)
- Annual Maintenance
- General Maintenance
- Shutdown

Shutdown Phase (Activities)

- Pre-Shutdown
- Shutdown
- Post-Shutdown

HSE Plan

It is a plan document that a contractor prepare and gives to Client

- A way to control and distribute up-to-date Documents
- Safety Inspection Check-list
- Risk-Assessments
- Emergency Response Plan
- Training Programme & Documentation System
- Internal Audit Policy & Schedule
- List of Laws & Health and Safety Regulations for Compliance
- Measurable Performance Metrics
- Regular Meetings & Communications Strategy
- Regular Management Review

Hydro jetting (High water pressure)

Hydro jetting is a widely-used method or process to remove corrosion, erosion, scaling, fouling, sludge by High water pressure through Hydro-Jetting Pump (also used for Cold Cutting Material)

- It is Loss Prevention Technique
- Pressure depends upon
 - MOC (Material of Construction)
 - Thickness
 - dia
 - length
 - Impurities

Hydro-jetting Technique also use for cutting Trees

Cold Cutting Material

- Turtle Cover all (Water Proof)
- Hydro-jetting Gun (1200-1300 Bar)
20000 Psi=1300 bar
- Hydro-jetting Screen
- Yard (Opposite side to avoid Failure)

N2S Pressure Testing

We use this technique where just half pipe is corrosive and erosion

Ex: A pipeline is 100 meter and 40 meter is full of corrosive and erosion and 60 meter is in good condition, we have not to change whole pipe just change 40 meter and use N2S pressure Testing

-ITP (Inspection, Temperature, Pressure)

-ITP of new Equipment (Inspection testing Plan)

-N2 pressure should be minimum 1.5 times to 4 time of operating pressure

-If Operating Pressure is 100 then N2 Pressure is (min=150 and Max 400) no more than this.

-Testing technique depends upon

- MoC (material of construction)
- Thickness
- Length
- Dia
- Stay time(see on Chart)

-For Gas Use N2 Gas because it is inert

Fresh Air also can be use

-For Liquid (use water with same procedure)
it is called hydro testing

Hydro-Testing

Hydro testing also known as Hydro-static test is a way of checking the integrity of pressure vessels such as natural gas pipelines, gas cylinders, boilers, storage tanks as well as fuel tanks. With the help of this test, pressure, tightness, strength and any leakages are checked.

Purging: To exit a gas from System (Pre Shutdown)

- To gas free a plant
- Kick Line is 1st inlet to Plant
- Process Time= 1 OR 1.5 days
- It is the responsibility of Client to do this
- Approximately 35 days Shutdown

Hot Bolting: It is the practice of removing and replacing or freeing and re-tightening bolts on live piping and equipment

- It is Pre-Shutdown activity to make sure that all bolts will open easily during shutdown
- Open Bolts in Diagonal/Star/ Hexa pattern
- Open one bolt at a time
- Clean with WD40/ Molicode
- Rounded mark the jam bolts for cold cutting activity
- Use Pneumatic Saw for cutting bolt
- New Bolts should be available at a time
- Hydro Hot Bolting
- Spanner & hammering hot bolt
- Hot Bolting is not allowed if there are 4 Bolts or Less
- Breaking Contamination of 1st bolt opening is :

=For Liquid Line, Open Bolt from top side

=For Gas, depend on density that Gas

Heavier or Lighter than Air

Spading/ De Spading

It is Mechanical Isolation in which use blind plate for block two pipeline flange then apply LOTTO (Lock Out Tag out)

Sand Grit Blasting

The process of removing rust dust, dirt, scales and old prints from the old surface using Compressed air is called sand blasting

- It is Loss Prevention Technique
- Use for external Cleaning
- Chemically Sack sand is called Grit
- For Open Vessel only use sand blasting

Painting

The process after sand blasting is called painting

- It is Loss Prevention Technique
- For enhance equipment quality
- Electro static Adhesion

PWHT (Post Weld Heat Treatment)

To Enhance weld quality after testing of weld

NDT (Non-Destructive Treatment) technique

NDT-Di-Penetration test (Qualitative test)

Radiography (Quantitative Test)

38 technique use for testing material

Fuel Bowser

It is a process the deploy to distribute fresh water in emergency situations where the normal system of piped distribution has broken down or is insufficient

Don't fill fuel while machine is in working and on hot machine

Only fill while it is at ambient temperature and machine must be earthing

Types of Waste Management

- Municipal/General Waste= (Green)
Eg: Paper, Wood
- Hazardous Waste= (Yellow)
Eg: Chemical, pyrophoric
- Non-Hazardous Waste= (Red)
Eg: Metal, Glass

Waste Management Method

- Reduce
- Reuse
- Recycle
- Disposal

Behavioral Audit

Walk around in the work place or the facility to obtain a general appraisal of the working environment and safety practices.

Traffic management System

- Diesel Vehicles allowed in the Plant
- Petrol Vehicles are not allowed In Plant

Defensive Driving training

- In Plant Area **30KM**/hour
 - In office Area **20 KM**/hour
- Distance from other vehicle (3 words gap technique: 1001-1002-1003
-Save distance always depend on speed

World's Dangerous Gases

- Co₂(carbon Mono-oxide)
- H₂S (Hydrogen Sulphide)
- NH₃ (Ammonia)

Detector Types

- Heat detector
- Smoke detector
- Dust detector
- Infrared detector

Types Of Hazards

- Mechanical Hazards
- Non-Mechanical Hazards
- Chemical hazards
- Physical Hazards
- Biological Hazards
- Electrical Hazards
- Ergonomic Hazards
- Radiation Hazards
- Pollution hazards

Types of Incident

- Near-Miss
- Incident
- Accident

Accident

Cause Of Accident: Direct Cause/Indirect Cause

Direct Cause: Unsafe Act & Unsafe Condition

Indirect Cause:

- Lack of Knowledge/Skill
- Improper Attitude
- Physical or Mental Deficiency

Types of Injury

- Lost Time Injury(**LTI**)
- Restricted Work Injury/Case (**RWI/C**)
- Medical Treatment Injury/Case (**MTI/C**)

- First-Aid Injury/Case (**FAI/C**)

Types of Safety Sign

- Prohibition(Circle in Red Color)
- Warning (Triangle with Dark Yellow background)
- Mandatory(Blue Background)
- safe Condition(Green Background)
- Fire-Fighting Equipment(Red Background)

Forms of Safety Communication

- Alarm
- Barrier
- Color Coding
- Hand Signal
- Memos
- Notice
- Poster
- Permit to Work
- Safety Sign
- Warning Lights

Types Of Radiation

- Ionizing Radiation

High Energy Particles and More Harmful to Environment

Eg: Alpha, Gamma, Beta, X-Rays, Neutron

- Non-Ionizing Radiation

Low Energy Particles & Less Harmful to Environment

Eg: Ultra-Violet, Infrared, Radio-waves & Laser

H₂S (Hydrogen Sulphide)

Two Types of Oil and Gas Industries

- Explore
- Refining

H₂S names

- Flammable Gas
- Toxic Gas
- Killer Gas
- Silent Killer
- Swab Gas

H₂S Concentration

- 0.13 PPM it smell like rotten egg
- Around 100 PPM it kill sense of smell on increase concentration
- 100 PPM as IDLH (Immediate dangerous to Life and health)
- 500-700 PPM Unconsciousness
- 1000 PPM death on the Spot

Properties Of H₂S

- Kill sense of smell
- Heavier than Air

Density Of H₂S

H₂O 34 gm /mole

Air Molecule Mass 29.32 gm./mole

It low lying area dangerous goes down

Basement, pits, sallow, culvert, confined space, vessels, pipelines, tunnels, columns

H₂s= 19% Heavier than Air

Density= 1.18 gm. /cm³

Solubility: H₂S+H₂O=H₂SO₄

Don't use water in case of H₂S

Flammability: Flammable Mixer

H₂S+Oxygen to form sulpher dioxide->SO₂

Blue Flame of H₂S

Unsmooth System when Blue flame from Chimney

- LEL=Lower Explosive Limit
- LFL=Lower Flammable Limit
- UEL=Upper Explosive Limit
- UFL=Upper Explosive Limit

(**LEL**)Mixer is too lean to burn

(**UEL**)Mixer is enriched to burn

H₂S LEL->4.3 PPM

H₂S UEL -> 44-46 PPM

Flammability Zone

- ⇒ Zone 0 = Continuously Flammable
- ⇒ Zone 1 = May or May Not Flammable
- ⇒ Zone 2 = Continuously Safe

Exposure Limit: The Maximum concentration of an air-borne substance reference over period of time in which an employee can be exposed by inhalation.

Exposure Limit names

OEL (Occupational Exposure Limit)

WEL (Workplace Exposure Limit)

WEEL (Workplace Environment Exposure Limit)

REL (Recommended Exposure Limit)

TLV (Threshold Limit Value)

ILV (Indicative Limit Value)

LEL (Long-Term Exposure Limit)

PEL (Permissible Exposure Limit)

STEL (Short-term Exposure Limit)

- STEL is Ceiling Limit for maintenance worker only allow to do work in 15 PPM for 15 min if it exceed then maintenance worker should leave the Area
- In case of Emergency Rescue team will come for rescue person or BA person come for work

H2S detection System

1-**Plant Fix Gas Monitor** with flashing light and Alarm

2-**Portable Gas Monitor** at center of workplace which will detect H2S in the range of 15 meter

3-**H2S Personal Toxic Clip** with beep, flashing light and vibration

- Bump test before use personal toxic clip to press blue button for auto calibration

These Detectors should be certified by 3rd Party

Types of Emergency

- Plant
- Personal

Emergency Procedure

In both type of Emergency follow same Procedure

- Stop the Work
- Manage your equipment
- See the wind direction(wind sock)

-Up wind=coming Air side

-Downwind=out Air side

- Use your emergency escape hood
-315 bar pressure (to avoid toxic gas inside hood), fiber gas (15 min)
- Go perpendicular to the wind direction towards near Assembly Point

Assembly Point names

- Assembly Point
- Safe Point
- Master Point
- Marching Point

Head Count for Counting People

And wait for further procedure

H2S Zone Classification

- Green= Less than 50 PPM
- Yellow =Less than 100 PPM
- Amber =Less than 1000 PPM
(Hood always with You)
- Red =1000 & Above
(Hood always with you)
-Marking Indicate the ZONE
-Hard Barricade for ZONE
-Attendant also there to check every entrant in that ZONE

Permit To Work (PTW)

It is formal documented piece of paper formulating safety procedure; it is part of SSW (Safe System of Work)

PTW Require for:

- Non Routine Activities
- High Risk Activities

Types of Work Permit

Cold Work Permit (No flame)

Hot Work Permit (Temperature involved)

Naked Flame Work Permit (Naked Eye Flame)

- Every Organization has different types of Work Permit

Time Duration of Permit

- Only for a shift
- Extension of permit depends on organization

-Cold Work permit for 14-15 days

-Use New permit with Old permit attached

-Same for Hot Work Permit

-Naked Flame Permit only for 7 days, new permit on 8th day

Permit Become Invalid

- Natural Disaster
- Accident
- Mock-Drill
- 2 conservative days if not work permit will become invalid

Fire Triangle

- Fuel
- Heat
- Oxygen

Classification of Fire

- Class A=Solid Combustible/Non Metal
 - Wood, Paper, Clothes, Rubber
- Class B=Flammable Liquid
 - Oil, Grease, Paint, Petroleum
- Class C=Flammable Gases
 - Acetylene, Ethane, Methane
- Class D=Combustible Metal
 - Sodium, Magnesium, Potassium
- Class K=Kitchen/Vegetable Fats

Fire Extinguisher Types & Usage: Red Cylinder

-Water →(A)→ Red

-CO2 →(A) & (B) → Black

-Foam → (A) & (B) → Yellow

-DCP→All General purpose→Blue

-Wet Chemicals →(F) →Light Pink

- Always Use Correct Type of Extinguisher for correct type of Fire

PASS: Apply PASS for extinguish fire

P=Pull the Pin

A=Aim the base of Fire

S=Squeeze the liver

S=sweep right and left

- Jerk Extinguisher 3 times upside down except DCP

RACE: In Case of Fire Apply RACE

R= Rescue

A= Alarm

C= Confine

E= Extinguish

- 50m fire hydrant Hose
- 8-30 bar water pressure

Fire-Fighting Equipment

- Fire-Alarm
- Sprinkler System
- Water/Fire Hydrant
- Emergency Light
- Hose Reels
- Fire-Extinguisher
- Fire Truck

Fire-Fighting Arrangement

- Emergency/Exit Doors
- Evacuation Plan
- Fire Blanket
- Fire-fighting Team
- Fire-Marshal
- Assembly Area
- Emergency Contact Numbers

Flare System: Towers having 5 Types

- Hydro-Carbon Gas Flame
- Sour Gas Flame (Sulphur Content)
- Sweet Gas Flame (Except Sulphur Gas)
- H₂s Flare
- Emergency Flare (Accident)

Code of Practice for flare Height

- 120 feet height
- No More than 120 feet
- Toxic gas convert in natural gas

Flammable/Asphyxiation Gases

- Carbon Dioxide=Asphyxiation
 - Nitrogen=Asphyxiation
 - Argon=Asphyxiation
 - Helium Balloon Gas=Asphyxiation
-
- LPG=Flammable/Extremely Hazardous
 - Acetylene=Flammable/Extremely Hazardous
 - Hydrogen=Flammable/Extremely Hazardous
 - Oxygen=Accelerate Flame/Fire

Color Coding For Pipelines (ANSI)

- Water = Green
- Steam= Silver
- Fire-fighting = Red
- Combustible Fuel= Brown
- Toxic/Corrosive Fuel= Orange
- Compressed Air/Other Gases= Blue
- Flammable/Other Oxidizing Fuel=Yellow

Chemical Forms

- Solid
- Liquid
- Gas
- Vapour
- Mist
- Dust
- Fumes

Forms of Biological Agent

- Fungi
- Bacteria
- Virus

Routes Of Entry

- Inhalation-Through Nose
- Ingestion-Through Mouth
- Absorption
- -through Skin
- -Injection through Skin

HAZOP (Hazard Operability)

Use in=

- Process Safety
- Design Safety
- Project Safety
- General Safety

PHA→Process Hazard Analysis

HAZIP (Hazard Identification)

Use In=

- Project Safety
- General Safety

(Two Technique) JSA - Risk Assessment

HAZCON (Hazard of Construction Industry)**HAZCOM (Hazard Communication)**

- Training
- Tool Box Talk
- Safety Signs
- Communication Methods
- Consultation
- Safety Campaign

Intrinsically Electrical Equipment

Any Electrical Equipment which does not possess the capability to produce spark

Flame Prove→24 Volt

- Local Light (normal)
- Spot Light

Pyrophoric Material: Self Ignition Material (Auto-Ignition)

- It catches fire itself
- H₂S react Iron→FeS

Store

- in pits
- In Wet Condition _

TBT: (Tool Box Talk)

The Safety talk conduct just before the start of work

2 types of TBT

- Local TBT
- Mass TBT

Mass TBT: Gathered announced problem**Local TBT:** According to Activity

- TBT form also should be provided for check competence

TBT POINTS

- Equipment
- Work Tools
- Job Site Safety
- Personnel

SOP Standard Operating Procedure

- Sequence wise do the activity
- Also tell information about SWL

Method Statement: The Agreed way of doing work between Client & contractor**Lifeline:** Use In confined space where poor communication create and walkie-talkie don't work proper, Life-line also way of communication

1 time pull lifeline→OK

2 time pull Lifeline→Come out

3 time pull Life-line→Emergency/
Something wrong

Tag-Line: Use during crane lifting activity to control and balance the suspended load and avoid swinging the load

BM25: It is the Best Monitor

- Multi Gas Detector
- Detect 5 gases at a time

MSDS: Material Safety Data Sheet

It contains 16 Section

- Chemical Product And Company Identification
- Composition/Information On Ingredients
- Hazards Identification
- First Aid Measures
- Fire Fighting Measures
- Accidental Release Measures
- Handling And Storage
- Exposure Control / Personal Protection
- Physical And Chemical Properties
- Stability And Reactivity
- Toxicological Information
- Ecological Information
- Disposal Considerations
- Transport Information
- Regulatory Information
- Other Information

Safety Harness:

The belt we use to avoid fall from height

2 types of Harness (On the Basis of Lanyard)

- Single Lanyard Harness
- Double Lanyard Harness

3 things required

- Body Harness
- Lanyard (Adding Shock absorber)
- Anchoring Point for Hook

Safety Harness +Lifeline =Fall Arrest System

For 100% Fall Protection

- Double Lanyard Safety Harness
- Proper Guard-rail
- Safety Net & Air Bag

LUX: Luminous per unit Area

Measure by: Luxometer

- Room Lux Level: 500 LUX
- Open Workplace: 150 LUX
- At Workshop: 300 LUX
- Watch maker: 2000 LUX

Noise

- Measure by: Audiometer
- dB (Decibel)
- Lower Limit: 75 dB (Use ear-plug)
- Upper Limit: 85 dB (Use Ear Muff)

Wind Speed

Measure By: Anemo-Meter

Unit:Knot

- Work at height is not allowed if 20 knot or above speed of wind

Atmospheric Pressure

- Measure by: Baro Meter
- Unit: m/sec, km/hr., miles/hr.

Devices in Industry

- **GFCI** : Ground Fault Circuit Interrupter
- **ELCB**: Earth-leak Circuit Breaker
- **MCB** : Miniature Circuit Breaker

Vibration Types

- Hand Arm Vibration
- Whole Body Vibration
- 6mm/sec

RPE (Respiratory Protective Equipment)

Types of RPE

1-Respirator (Simple Mask by Filter)

- Negative Pressure

2-B.A (Breathing Apparatus)

- Positive Pressure
- Use in Toxic Atmosphere
- Use where O₂ Concentration is Low

Types of BA # 3

1-Emergency escape set (4 names)

- Saver Set
- PP15(personal protective For 15 min)
- EEED=Emergency Escape Breathing Device
- Emergency Escape Hood

-Fiber Glass

-Having 315 bar pressure

-Total time=45 min

Breaking time=

30 min=Working time

15 min=Escape time

Flite Escape Set:

-Plug with Left Leg

-Fiber Glass Cylinder

-Having 315 bar pressure

-Total time=45 min

Breaking time=

30 min=Working time

15 min=Escape time

2-BA Trolley /BA Airline Trolley

-2 cylinders

One Weight Empty Cylinder=4.75KG

Gas Stored=2 KG

Cylinder With Gas=6.75KG

1800 Liter Gas Volume compressed in Cylinder

-207 bar pressure

Total Time=45 min

33 Min= Working time

12= Escape time

2 gauges (Hi-Cylinder Pressure & Low-Breathing Pressure)

2 whistle (High-207 bar -Low-55 bar)

Use by BA technician

60 Meter Hose Reel

Pig-Tail Point where breathing hose is attached

Demand Valve= (Main Valve plugged with Mouth)

Bypass Valve= (in case of Emergency)

Bleed valve= (changing duration of cylinder)

Red Tag= (Empty Cylinder)

FOUR Test Before Enter in Confined Space

- Positive Pressure test (Check Mask Seal)
- Bypass Test (Check Bypass wearing by Operating)
- Leak Test(Stop Breath for 10 sec then Stop the Air Nozzle)
- Whistle test(

CAT(8 Cylinders)

12 hr of 1 Cylinder

3-SCBA=(Self-Contained Breathing Apparatus)

-Just for Rescue Purpose

-1 gauge 1 Whistle

-207 bar Pressure

SCBA Weight=9.75 KG

- 3 KG of Equipment
- 2 KG of Compressed Air
- 4.75KG of empty Cylinder

Total Time=45 min

Breaking Time=

33 min for working time

12 min for leave the Area

Donning

The Process of wearing the SCBA

Wearing time=45 Sec

FOUR Test Before Enter in Confined Space

- Positive Pressure test (Check Mask Seal)
- Bypass Test (Check Bypass wearing by Operating)

- Leak Test(Stop Breath for 10 sec then Stop the Air Nozzle)
- Whistle test(

Doffing

The Process of Put off the SCBA

SCUBA

Self-Contained Under-water Breathing Apparatus

Battery-Limit

A battery limit is a defined boundary between two areas of responsibility, which may be physical

Work At Height

<u>HAZARD</u>	<u>Control Measure</u>
1-Fall of Person	1-S/F with Guard-rail, Fall Arrest System, Housekeeping, TBT
2-Fall of Object	2-Toe-board, Tool Kit, Tool Box
3-Loose/Uneven Ground	3- Level Of Ground by Soil Compaction, use timber board or Soil Board
4-Contact with Live Overhead	4-Electrical Isolation & LOTTO, use insulated PPE's and tools
5-Poor Communication	5-Radioactivity
6-Improper access & egress	6-Personal Lift (MEWP)(Ladder)(Cherry Picker)
7-Improper Material Lifting	7-Cargo Lift-Rope Bar-Gin Wheel System
8-Severe Weather Condition	8-Don't Work at 10 meter if there is 20 Knot
9-Poor Lighting	9-Maintain Minimum Lux Level (Luxometer)
10-Fragile Material	10-Don't Climb on it Use Crawling Board (center of Gravity) Don't Exceed SWL

Scaffolding Standard

Types of Scaffolding

- Independent
- Dependent
- Tower S/F
- Mobile S/F
- Bridge S/F
- Fixed S/F
- Canti-lever S/F
- Bird cage S/F
- Suspended S/F
- Hanging S/F
- Un-footed/Tous up S/F
- Cup & Screw/Lever S/F

- Mid Rail = 18" to 21"
- Top Rail = 36" to 41"
- Pipe =Thickness=4mm
- Internal Pipe = 1.5" Diameter

Transom (Under Planks) = load-Bearer of Planks

Ledger = Support standard pipe

Clamps Types

- Fixed Clamp = 90°
- Swivel Clamp = 360°
- Joint Pin/ Spigot

Extra Points

- Planks-Wooden, Metal
=2"x12"x120"
- Toe Board = 1"x5"x120"
- Kicker Lift = 6" from Ground
- 1st Lift = 6'.5"
- Spanner = 7/8"
- Manila Rope = 3/8" for tie planks
- 1/2" for lifting light Tool.
- Ladder = 3' Extended above from the platform
- Ladder (Rungs) W=11" L=14"
- S/F Pipe Dia=48.60mm
- Max Post to Post Distance= 2m
- Toe-Board Height=0.5m
- Guard-rail Height=1.1 to 1.5 m
- 2 ladder for 10 m long S/F
- Per Set of Standard 1 Bracing is must
- Max Safe Height= L(5)W(2)=10m

Typical Scaffolding Faults

- Gaps in Planks
- Damage Planks
- Scaffolding plank not Fastened with Rope
- Clamps in Loose Condition
- Scaffolding Checklist not Filled Properly
- Handrail Missing
- Bottom Runner Missing
- Passage was Blocked
- Extended Pipes
- Chain/Flop Bar not Available

Types of Base Plates

- Fixed/ Standard Base Plate
=6"x6"=150mmx150mm
- Swivel/Adjustment Base Plate
=6"x6"

Sole Base Plate/Sole Board

=300mmx300mm

Pipes Name

- Post = Vertical Pipe
- Runner = Ties in Longitudinal direction
- Bearer = Ties in Transverse/Cross direction

Additional Points

- Swinging Scaffolding = Use for Painting.
- Wooden planks should end with Hoop Iron

- Working Platform should be 2.5 to 3.0 feet below the place of work.
- Planks/Pipe should be Minimum 4" not extend then 12"
- Barricaded Area Minimum 4' out side
- Access Gap guarded with flop bar / chain
- Tag should be paste at Ladder, clear mention Location, Date, Name, Signature, and Valid for Seven Days

Distance of metal S/f from power line

- 4 Meter

Substance corrode the S/f Material

- Acids
- Alkalis
- Salts

Ladder

- Step Ladder
- Single ladder
- Extension Ladder
- Ladder setup
- Stairs
- A-Type Ladder
- Rope Ladder

Excavation

Hazards

- 1-Fall of Person
- 2-Fall of Object
- 3-Contact with Underground Services
- 4-Loose or Uneven Ground
- 5-Dust
- 6-Improper Communication
- 7-Improper Access & Egress
- 8-Improper Material Lifting
- 9-Severe Weather Condition
- 10-Poor Lighting
- 11-Poor Ventilation
- 12-Toxic Gases
- 13-O₂ Low Concentration
- 14-Snake & Scorpio
- 15-Flooding
- 16-Cave-in
- 17-Collapse of Adjacent Structure
- 18-Fire & Explosion
- 19-Collapse of Excavation Edge
- 20-Hazardous Material

Control Measure

- 1-Hard Barricade with Scaffolding
- 2-Toe-board
- 3-Site Map, Metal detector, Line tracking, manual digging for OIL & GAS, Cable detector, Radar Technique
- 4-Level Ground by Soil Compaction
- 5-Dust Mask
- 6-Radioactivity
- 7-Ladders
- 8-Cargo Lift, Rope with Bag, Gin Wheel
- 9-Don't Work If there is (20 Knot) Windsack
- 10-Maintain minimum lux level
- 11-Provide Forced Draft Fan
- 12-Gas testing, BA Trolley
- 13-Induced draft fan, BA trolley
- 14-Pet Control System
- 15-Water Extraction System
- 16-Don't work in severe condition
- 17-Don't excavate near adjacent structure
- 18-Isolate and LOTTO System
- 19-Battering, Shoring, trenching
- 20-Check Waste Management Plan

Confine Space

Any Enclosed place which is not designed for long term human occupancy in which ventilation and access egress may be difficult

Examples of Confine Space

- Tanks
- Manholes
- Boilers
- Furnaces
- Sewers
- Silos
- Hoppers
- Vaults
- Pipes
- Trenches
- Tunnels
- Ducts
- Bins
- Pits

Potential Hazards in Confine Space**1-Oxygen Deficiency**

- Less than 19.5% can effect Human Body

2-Oxygen Enriched

- Greater than 23% can be fire

3-Toxic Material

- Carbon Monoxide
- Hydrogen Sulfide
- Welding fumes
- Corrosives

4-Combustible

- Methane
- Hydrogen
- Acetylene

5-Electricity

- Electrical Sources

6-Mechanical Hazards

- Rotating/reciprocating parts
- Hazardous materials

O2 Limit

- 21% Oxygen by volume
- 78% Nitrogen_
- 1% other Gases

Deficiency of Oxygen

- Headache
- Death

Enriched Of Oxygen

- Fire

O2 standard In Confined Space

- Min-19.5%
- Max-20.9% in Pak (23.5% in other countries)

- All Hazards of Excavation Include in Confine space
- Additional Hazards of Confine space

Hazards

1-Residual Energy

2-Sharp Objects

3-Entanglement

4-Drawing-In

5-Engulfment

6-Suffocation

7-Fire Explosion

Control Measure

1-Electrical Isolation & LOTTO

Mechanical Elastic Potential Energy and LOTTO

2-Insulated PPE's

3-Cover-all Light Clothing

4-Mechanical Isolation LOTTO

5-Mechanical Isolation LOTTO

6-Proper Ventilation and BA, Mask

Crane Lifting & Rigging

Hazards

Control Measure

1-Suspended Load	1-Don't Come under suspended Load/ Barricade the Area for exclude the Unauthorized person
2-Overturn	2-Level The Ground, Use Outriggers fully Opened LOP (Lifting operating Plan)
3-Mechanical Failure	3-3 rd Party Certified, maintained and inspected
4-Collapse of Crane	4-Don't exceed SWL/Use SLI
5-Loose or Uneven Ground	5-Implement LOP/ Outrigger fully opened
6-Severe Weather Condition	6-Achieve Soil Stability certificate from Geologist, Level the Ground/ Use Timber Soil Board
7-Contact with Over Head Service	7-Safe Voltage Distance
8-Poor Communication	8-Use Certified Riggers
9-Striking with Nearby Structure	9-Implement LOP(maintain Load Angle Chart) Use proper lifting
10-Improper access & Egress	10-Implement SLW Path(LOP)
11-Improper Lifting	11-Follow Load Angle Chart (Safe Load Indicator)
12-Over-Loading	12-Don't Exceed SWL, Use certified Crane
13-Swing Hazard	13-Use tag line to Avoid swing the suspended Load

Crane Lifting & Rigging

Types of Crane

- Mobile Crane
- Tower Crane
- Crawler Crane (In Desert)
- Over Head Crane
- Jib Crane
- Boom Truck Crane
- Gantry Crane (At Port)
- Luffing Crane (Multi-Boom)

Types Of Lifting

- Light Lifting (Below 10 Ton)
- Heavy Lifting (More than 10 Ton)
- Critical Lifting
- Tandem Lifting/Head to tail Lifting

Critical Lifting: Any lifting in which Operator Can't see the load directly, in which we use two or more than two signal man to lift the load

Any Lift in which the load exceed the 85% of the crane capacity is known as Critical Lifting

Tandem Lifting: Any lift in which two or more than two crane use to lift the same object at the same time

Types Of Riggers

Level-3=Barricade the Area & signage

Area should be barricade 1 meter more than Boom

Level-2=Signal man, Attach, de-attach Load

Level-1=Rigging Supervisor-Plan LOP

LOP(Lifting Operating Procedure)

SLI(Safe Load Indicator)

LMI/Tripping Device

Load Monitoring Indicator

CPR= Cardio-Pulmonary Resuscitation

Types of CPR

- Manual
- Electrical

-1 min 100 Compressions

-Disposal Funnel by Hand

Risk Assessment Names

- TRA(Task Risk-Assessment)
- HIRA(Hazard Identification Risk Assessment)

Risk Matrix:

- Low= 4 or Below
- Medium= 5-16
- High=17-25

-Risk Assess By A Team

-Risk Assess Before start any activity

-No Description in RA

-Do Rating

JSA (Job Safety Analysis)

- JHA (Job Hazard Analysis)
- JRA(Job Risk Analysis)

-Do as Preliminary Stage

-Prepare by Individual

-Task well describe

-No rating

General Arrangement of ABC Activity

- JSA (Job Safety Analysis)
- RA (Risk Assessment)
- PTW (Permit-to-work)
- Engineering Drawing
- Method Statement
- Equipment Checklist
- Scope of Work
- ERP (Emergency Response Plan)
- EEP (Emergency Escape Plan)
- ERP (Emergency Retrieval Plan)
- First-Aid
- Fire-Fighting Equipment
- Barricade
- Safety Sign
- Emergency Lighting
- Proper Communication
- Competent Person
- IITS (Information, Instruction, Training and supervision)
- PPE (Personal Protective Equipment)
- Ground Condition
- Environment Condition
- TBT(Tool-Box Talk)
- Equipment Certified by 3rd Party