

Invasive Work Risk Assessment Matrix (RAM)

Risk Assessment Scoring Methodology

Utilize the Risk Assessment Matrix (RAM) to establish the proper level of protection and mitigation for invasive work. Use the RAM to generate a numerical value for the categories of exposure concern, volume and impact. These values can then be multiplied to generate the Risk Assessment Score. Example: An invasive job that has a exposure concern value of 1, a volume value of 3 and an impact value of 4 would generate a RAM score of 12 (1x3x4) which would require Level 1 Mitigation.

Risk Assessment Scoring Equation: Exposure Concern x Exposure Volume x Exposure Impact = RAM Score

Exposure Concern

Concern:	Score:
IDLH Atmosphere	1
Material above Auto Ignition	1
Corrosives – Acid/Caustic	2
Over PEL, STEL or 1-10% of LEL	2
Hot Service – Above 140°F	3
Other Material	10

- **IDLH Atmosphere** – Equipment or piping systems that contain material immediately dangerous to life and health. Examples: toxic chemicals above their IDLH or inert atmospheres.
- **Material Above Auto-Ignition Temperature** – Equipment or piping systems that contain material that will auto-ignite upon contact with the atmosphere.
- **Corrosives – Acid/Caustic/KOH** - Equipment or piping systems that contain material with any caustic, acid or KOH mixture.
- **Over PEL, STEL or 1-10% of LEL** - Equipment or piping systems that contain material that is above the Permissible Exposure limit, Short Term Exposure Limit or between 1% and 10% of the LEL.
- **Hot Service – Above 140° F** - Equipment or piping systems that contain material that is above 140° F. This includes hydrocarbons, catalyst, steam, condensate and Boiler Feed water.
- **Other Material** – Utilities such as air and water that are low temperature and low pressure or any stream that does not meet any of the exposure concerns listed above.

RAM Score: 1-12

Level 1 Mitigations

Inhalation Hazard

- Breathing air

Corrosive Material

- Chemical resistant suit
- Face shield & goggles
- Chemical gloves and boots

Material above Auto-Ignition Temperature

- Verify isolations and cool down below auto-ignition temperature before doing invasive work.

Fire or Hot Oil Hazard

- Bunker gear
- Heat resistant protective clothing

Miscellaneous Mitigations (Can be used with any of the above mitigations)

- Bleeder cleaner tool
- Face shield, goggles and protective clothing

Exposure Volume

Volume:	Score:
“Live” Equipment	1
Large Volume	1
Medium Volume	2
Small Volume	3
Low Potential	4
No Volume	6

- **“Live” Equipment** – Any equipment or piping circuit that is still in service or not completely isolated.
Examples – Tightening leaking flanges or process connections, or any equipment or system that has been isolated but the isolation valves are known to be leaking.
- **Large Volume** – Towers, vessels, receivers, and large bore piping circuits.
- **Medium Volume** – Knock-Out drums, pumps, compressors and piping systems.
- **Small Volume** – Transmitter impulse lines, sight glass assemblies, sample stations and small bore piping.
- **Low Potential** – All volumes that have been quantifiably decontaminated or the volume contained between a standard isolated bleeder of less than 1” in size and its plug or cap.
- **No Volume** – Verified by Operations to be free of any volume.

RAM Score: 14-46

Level 2 Mitigations

Inhalation Hazard

- Eductor to dilute and/or move toxic emissions from the work area.
- Air purifying respirator
- Route potential source to safe location using tubing or pipe.

Corrosive Material

- Chemical resistant suit, gloves, boots
- Face shield & goggles

Hot Service (Above 140°F)

- Heat resistant clothing
- Route potential source to safe location using tubing or pipe.

Fire Hazard/LEL Mitigation (non-confined space)

- Continuous LEL Monitoring
- Non-Sparking tools

Miscellaneous Mitigations (Can be used with any of the above mitigations)

- Bleeder cleaner tool
- Face shield, goggles and protective clothing

Exposure Impact

Exposure:	Score:
Large Impact	1
Medium Impact	2
Small Impact	3
Low Impact	4
No Impact	5

Exposure Impact

- **Large Impact** – Could have off-site impact.
- **Medium Impact** – Could have a refinery wide impact.
- **Small Impact** – Could have an impact contained to the local unit.
- **Low Impact** – Could have a localized impact at the invasive work site.
- **No Impact** – No negative impact to the invasive work site expected due to successful energy isolation, material below 140°F and verified free of volume and H2S.

Score: >46

Level 3 Mitigations

- Normal Refinery PPE
- Standard work practices