

DETROIT INVASIVE WORK RISK ASSESSMENT MATRIX

Value	Exposure Concerns Equipment or piping systems that CONTAINS OR CONTAINED:		Value	Exposure Volume		Value	Exposure Impact	
1	Unknown Atmospheres/ IDLH Material/ H2S Streams /CO>25 ppm	Material that is potentially immediately dangerous to life and health or unknown atmospheres, streams with any level of H2S or potentially high CO	1	"Live" Volume	Any equipment or piping circuit that is still in service or not completely isolated	1	Large Impact	Could have off-site impact
	Materials Above Auto Ignition	Material that will auto-ignite upon contact with the atmosphere		Large Volume	e.g. towers, vessels, receivers, and large bore piping circuits	2	Medium Impact	Could have a refinery wide impact
2	Hydrocarbons, SO2, NH3, or Other Hazardous Contaminants below IDLH	Material that contains hazardous contaminants below IDLH (reference SAF-025 for Contaminant Thresholds or contact safety)	2	Medium Volume	e.g. knock-out drums, pumps, compressors, and piping systems	3	Small Impact	Could have an impact contained to the local unit
	Flammable Material	Flammable material with potential for LEL	3	Small Volume	e.g. transmitter impulse lines, sight glass assemblies, sample stations and small-bore piping	4	Low/Localized Impact	Could have a localized impact at the invasive work site
	Corrosive Material	Material with a high (≥12) or low (≤2) pH						
3	Hot Service	Material that is above 130°F under normal operation	4	Low Volume	Volumes that have been quantifiably decontaminated or bleeder volume	10	No Impact	Could have no impact, safe isolation per energy isolation procedure, equipment and material below 130°F**, AND checked and verified free of volume and H2S/vapors NOTE: MUST MEET ALL OF THESE CONDITIONS
10	Other Material Verified	Any stream that does not meet any of the exposure concerns listed above	6	No Volume	Verified at a low point by operations to be free of any volume			

Risk Assessment Scoring Methodology

Use the Risk Assessment Matrix (RAM) for every job or task that involves invasive work to determine considerations for protection and mitigation. Use the RAM to generate a numerical value for the categories of exposure concern, volume and impact. These values are multiplied to generate the RAM Score.

Example: An invasive work job that has an exposure concern value of 1, a volume value of 3 and an impact value of 4 would generate a Risk Assessment Score of 12 (1x3x4) which would require Level 1 Mitigation.

Risk Assessment Scoring

- 1-12 Level 1 Mitigation**
- 14-46 Level 2 Mitigation**
- >46 Level 3 Mitigation**

Level 1 Mitigations

Inhalation Hazard Mitigation

- Breathing Air

Corrosive Material Hazard Mitigation

- Chemical Resistant PVC

Suit

- Chemical Gloves
- Face Shield
- Goggles
- Chemical Boots

Hot Service

- Safe Line Breaking Procedures
- Thermal PPE - consult safety

Fire Hazard Mitigation

- Bunker Gear
- Appropriate Gloves and Boots
- Helmet w/ Face Shield
- Continuous LEL Monitoring
- Non-Sparking Tools/ Cold Cutting
- Additional Fire Watch/ Extinguisher

Material Above Auto-Ignition

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

Level 2 Mitigations

Inhalation Hazard Mitigation

- Air Moving Device AND/OR
- Air Purifying Respirator* AND/OR
- Route potential source to safe location using tubing or pipe

***NOTE: Personal H2S monitors are required to be worn for APR use. If equipment/process contains potential for SO2, consider the use of personal SO2 monitors as well.**

Hot Service

- Safe Line Breaking Procedures
- Thermal PPE - consult safety

Corrosive Material Hazard Mitigation

- Chemical Resistant PVC Apron and Sleeves
- Chemical Face Shield or Goggles
- Chemical Gloves

Fire Hazard/LEL Mitigation (non-confined space)

- Non-Sparking Tools/ Cold Cutting
- Additional Fire Watch/ Extinguisher
- Also Consider Continuous LEL Monitoring

Level 3 Mitigations

- Normal Refinery PPE
- Normal Refinery Standard Work Practices

****NOTE: If the job task will involve reheating the equipment (e.g. welding, grinding, heat treating, steaming to reheat, etc.), the potential for liberating H2S or SO2 must be considered, and Level 2 mitigation must be used if these chemicals were present in the process/equipment.**

THE LISTED MITIGATIONS PROVIDE GUIDELINES FOR MINIMUM SAFETY PRECAUTIONS.

The use of the RAM does not supersede operation procedures or guidelines or safety procedures (including the mitigation lists).

If existing procedures are more restrictive, those requirements must be followed.

Involve your supervisor and area safety professional as often as needed to ensure proper protective measures are in place.