

Chemical and gas work guide

Review hazards and checks for each example, then prepare an assessment and work documents for your actual site.

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01 Local documents and scope

Use the Risk Assessment (RA) to identify hazards and controls, then describe the work sequence in a Safe Work Procedure (SWP). Communicate the plan at the Toolbox Meeting. Select a Permit to Work (PTW) after checking the activity, workplace and applicable rules; it is not automatically required for every task. Keep the RA, SWP and current site checks consistent.

Risk Assessment (RA)

Safe Work Procedure (SWP)

Permit to Work (PTW)

Toolbox Meeting

Safety Inspection Checklist

This is a planning reference. Verify numerical limits, permits and qualifications for the jurisdiction, sector and equipment. Record fresh site measurements, people and signatures for each job.

02 From example to site use

1 Define the job

Identify equipment, location, sequence, people, nearby activities and access. Separate preparation, execution and close-out, and record hazards observed at the site.

2 Match controls to each step

Consider elimination, substitution and engineering controls first, then procedures and PPE. Assign an owner, a verification method and stop-work conditions for each control.

3 Connect documents and site checks

Choose the local assessment, procedure and applicable permits, then brief the crew. Add drawings and checklists, reassess changes and retain the output for this job.

CHEM-01**Shell & Tube Heat Exchanger Inspection & High-Pressure Water Jet Cleaning****Potential hazards**

Tissue penetration by high-pressure water, chemical burns from residual fluids

Checks to verify and specify on site

- Isolate, release and verify pressure and contents before opening. Use the design code and approved procedure for test pressure, medium and sequence; define exclusion and stop criteria.
- Check the SDS, compatibility, containment, extraction, leak isolation and emergency response. Select test targets, limits and respiratory protection for the actual substances and exposure.

CHEM-02**High-Pressure Hydrogen Compressor Packing Replacement****Potential hazards**

Explosion due to hydrogen leakage, asphyxiation due to nitrogen purging

Checks to verify and specify on site

- Isolate, release and verify pressure and contents before opening. Use the design code and approved procedure for test pressure, medium and sequence; define exclusion and stop criteria.
- Check the SDS, compatibility, containment, extraction, leak isolation and emergency response. Select test targets, limits and respiratory protection for the actual substances and exposure.

CHEM-03**Toxic Chemical Piping Valve & Gasket Replacement****Potential hazards**

Splashing of residual liquids during flange disassembly, toxic gas poisoning

Checks to verify and specify on site

- Isolate, release and verify pressure and contents before opening. Use the design code and approved procedure for test pressure, medium and sequence; define exclusion and stop criteria.
- Check the SDS, compatibility, containment, extraction, leak isolation and emergency response. Select test targets, limits and respiratory protection for the actual substances and exposure.

CHEM-04

Flare Stack Tip Replacement & Ignition System Maintenance

Potential hazards

Falls due to high winds, fire exposure if residual gas ignites

Checks to verify and specify on site

- Avoiding height work; platforms and collective fall protection; Fall restraint/arrest equipment, anchors and required clearance; Access, fragile surfaces, openings and falling-object controls; Weather, work conditions, equipment inspection and stop criteria; Site rescue method, people, equipment, communication and readiness.
- Combustible removal/shielding; opposite faces, lower areas and openings; Fire watch, extinguishing equipment, post-work watch duration and completion time; Gas, vapour, fume and dust assessment, testing and ventilation; Vessel/pipe residues, cylinders, hoses, flashback protection and equipment checks.

CHEM-05

Function Check of Emergency Disaster Prevention Equipment

Potential hazards

Impact from hose detachment during high-pressure water discharge, gas inhalation

Checks to verify and specify on site

- Isolate, release and verify pressure and contents before opening. Use the design code and approved procedure for test pressure, medium and sequence; define exclusion and stop criteria.
- Verify task-specific training, qualifications and procedures. Record process and equipment protections, exposure controls, emergency arrangements and the responsible person's checks in the work plan.

CHEM-06

PSA Adsorption Tower Lower Automatic Valve Inspection

Potential hazards

Crushing due to unexpected valve operation, respiratory issues from adsorbent dust

Checks to verify and specify on site

- Check manufacturer procedures, guards, energy isolation and release of stored energy; account for people and tools before restart.
- Check the SDS, compatibility, containment, extraction, leak isolation and emergency response. Select test targets, limits and respiratory protection for the actual substances and exposure.

CHEM-07

Internal Visual Inspection & NDT of High-Pressure Hydrogen Storage Tanks

Potential hazards

Asphyxiation in confined space, explosion caused by lighting leakage

Checks to verify and specify on site

- Space identification, need for entry, access and escape routes; Entrants, outside attendant, person in charge and communication; Atmospheric test targets, acceptance criteria and repeat/continuous monitoring; Isolation of incoming substances and energy; locks and stored-energy checks; Ventilation, respiratory protection, contaminant controls and failure response; Site rescue method, people, equipment, communication and readiness.
- Equipment, circuits, supplies, backfeed, induced voltage and stored energy; Disconnection, prevention of re-energisation, locks and tags; Voltage detector, functional check, absence-of-voltage result and tester; Earthing/short-circuiting where required; adjacent live-part protection and boundaries; Completion, personnel clearance, lock removal and re-energisation authority.

CHEM-08

High-Pressure Hydrogen Tanker Unloading & Charging Bay Connection

Potential hazards

Crushing due to vehicle rolling, hydrogen gas explosion due to static discharge

Checks to verify and specify on site

- Separate vehicles and pedestrians; check visibility, reversing and loading areas. Set speed and signalling for the site, and stop for unstable loads or ground.
- Isolate, release and verify pressure and contents before opening. Use the design code and approved procedure for test pressure, medium and sequence; define exclusion and stop criteria.

CHEM-09

DCS/PLC Panel Inspection & Field Transmitter Calibration

Potential hazards

Unexpected process shutdown due to interlock failure, electric shock from live parts

Checks to verify and specify on site

- Equipment, circuits, supplies, backfeed, induced voltage and stored energy; Disconnection, prevention of re-energisation, locks and tags; Voltage detector, functional check, absence-of-voltage result and tester; Earthing/short-circuiting where required; adjacent live-part protection and boundaries; Completion, personnel clearance, lock removal and re-energisation authority.
- Verify task-specific training, qualifications and procedures. Record process and equipment protections, exposure controls, emergency arrangements and the responsible person's checks in the work plan.

CHEM-10

Cooling Water System Biocide & Corrosion Inhibitor Chemical Replenishment

Potential hazards

Gas explosion if different chemicals mix, chemical eruption when opening containers

Checks to verify and specify on site

- Check the SDS, compatibility, containment, extraction, leak isolation and emergency response. Select test targets, limits and respiratory protection for the actual substances and exposure.

04 Fresh site records

Record date, location, equipment ID, responsible people, crew, permit references, measurements, times, testers, inspections and changes. Do not reuse previous signatures or readings.

05 Official references

These sources support local terminology and scope. The examples are editorial planning prompts from Smart JSA Bridge, not official forms.

- MOM · Risk management ↗
- MOM · Safety and health management systems ↗
- Singapore Statutes Online · Risk Management Regulations, regulation 5 ↗
- MOM · When to review risk assessments ↗
- WSH Council · Code of Practice on Risk Management ↗
- MOM · Permit-to-Work systems (OPEC guidance) ↗

<https://smartjsabridge.com/en-SG/guideline/chemical>