NICKEL CARBONYL PROCEDURE

V:2023.1

Nickel Carbonyl Procedure

January 2023

Nickel Carbonyl Procedure

IPS★ITCS will work according to the following procedures after receiving the initial monitoring information on Nickel Carbonyl from clients.

Table 1: Personal Protective Equipment Requirements for Personnel Entering Nickel Carbonyl Contaminated Vessel/Space

Concentration	Clothing
0 < 0.001ppm	Standard coveralls
> 0.001ppm < 1ppm	Standard coveralls with Tyvek coveralls
>1ppm < 10ppm	DuPont TyChem CPF3 or Equivalent
> 100ppm < 250ppm	Gas suit
> 250ppm	Evacuate reactor and ascertain reason for high Nickel Carbonyl concentration

Note: Due to presence of Nitrogen, supplied air respiratory protection required is mandatory equipment for all persons entering that space.

Due to the action of a nitrogen purge on a vessel, personnel working at the open manway can potentially be exposed to Nickel Carbonyl. If Nickel Carbonyl concentrations in the area surrounding the manway are high, consider adopting other control actions:

- Tarp over manway (to deflect vapours away from the technicians)
- Relocate the panel and other operations to a location upwind of the vapour plume
- Personal protective equipment as outlined below (see Table 2) (for concentrations monitored in the technicians personal breathing space).

Table 2: Personal Protective Equipment Requirements for Personnel Working in Nickel Carbonyl Contaminated Areas (Outside the Vessel/Space)

Concentration	Respiratory	Clothing
0 < 0.001ppm	No respiratory protection required	Standard overalls
> 0.001ppm < 1ppm	Air purifying respiratory protection (full face)	Standard overalls with Tyvek(including gloves)
> 1ppm < 50ppm	Supplied air respiratory protection	DuPont TyChem CPF3 or Equivalent

Decontamination

Standardized Decontamination Procedures will apply in the case of any findings of Nickel Carbonyl. IPS★ITCS will also follow the standard heat stress management plan in order to mitigate heat stress as needed, if applicable. Both of these plans are available in the ***HSE.PRO.Inert Entry Operations Procedure.2022.***

Note: Personnel working outside the vessel will not be exposed to excessive Nickel Carbonyl concentrations for excessive periods of time and as such the wearing of a gas suit has not been deemed necessary.

Additional Information Nickel Carbonyl		
Substance	Nickel carbonyl (Tetracarbonyl nickel) CAS 13463-39-3	
Formula	$Ni(CO)_4$	
Physical Properties	Colorless liquid bp 43 °C, mp -25 °C Very slightly soluble in water (0.0018 g/100 mL at 20 °C)	
Odor	Sooty odor detectable at 0.5 to 3 ppm (Low Odor Threshold)	
Vapor Density	5.89 (air = 1.0)	
Vapor Pressure	321 mmHg at 20 °C	
Flash Point	< -20 °C	
Autoignition Temperature	Explodes above 60 °C	
Toxicity Data	LC_{50} inhal (rat)	35 ppm (240 mg/m^3; 30 min)
	PEL (OSHA)	**0.001 ppm** (0.007 mg/m^3)
	TLV-TWA (ACGIH)	0.05 mg/m^3
Major Hazards	High acute toxicity; possible human carcinogen (OSHA "select carcinogen"); highly flammable.	
Toxicity	The acute toxicity of nickel carbonyl by inhalation is high. Acute toxic effects occur in two stages, immediate and delayed. Headache, dizziness, shortness of breath, vomiting, and nausea are the initial symptoms of overexposure; the delayed effects (10 to 36 h) consist of chest pain, coughing, shortness of breath, bluish discoloration of the skin, and in severe cases, delirium, convulsions, and death. Recovery is protracted and characterized by fatigue on slight exertion. Nickel carbonyl is not regarded as having adequate warning properties. Repeated or prolonged exposure to nickel carbonyl has been associated with an increased incidence of cancer of the lungs and sinuses. Nickel carbonyl is listed by IARC in Group 2B ("possible human carcinogen"), is listed by NTP as "reasonably anticipated to be a carcinogen," and is classified as a "select carcinogen" under the criteria of the OSHA	

Revision History

Rev	Rev Date	Rev By	Approved By	Description
1.0	1.3.2022	Shayne Torrans	Shayne Torrans	Initial Procedure Document
1.1	12.5.2022	Shayne Torrans	Shayne Torrans	Format Revision

Approvals:

Procedure Owner

_____ _____

Print Name Date

_____

Signature

Competency Assessment

No.	Questionnaire	C/NYC
Q1		
A1		
Q2		
A2		
Q3		
A3		
Q4		
A4		
Q5		
A5		

Enclosed Attachments	
Risk Assessment	☑
Environmental Aspect and Impact	☑
Training and Competency	☑
Measure and Evaluation Tools	☑

Competency Checklist

To be filled out by Trainer and signed by Employee, Assessor and Supervisor before being returned to the HSEQT Manager for recording purposes.

Procedure	Competency	Date	Competent YES / NO	Employee Signature

(Please tick appropriate box)

This employee is competent in performing the job. ☐

This employee has not attained the competency level. ☐ *

* *If the employee has not attained all competency levels, the General Manager must assess the action to be taken, provide an extension of training or alternative action as listed below.*

Alternate action to be taken: _____

Signed By Employee: _____ Date: _____

Trainer: _____ Date: _____

Assessor: _____ Date: _____

Regional Manager: _____ Date: _____

Environmental Aspects and Impacts

Identified Environmental Aspects and Impacts

The following table is a summary of the likely environmental aspects and impacts that may be identified during site inspections. The significance of each impact needs to be assessed using the Risk Assessment Model.

Activity	Aspect	Impact
Purchasing & Administrative Work	Consumption of goods	Conservation of natural resources
	Consumption of energy (eg. Electrical equipment and facilities)	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of waste (eg. Paper)	Consumption of space for waste disposal; Habitat loss
Climate Control	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of noise	Disturbance to community; Habitat loss
Cleaning of – offices / vehicles	Storage, use and release of chemicals	Contamination of air, water or soil; Risk to human health
Transport (Fleet vehicles / staff travel)	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Loss of habitat at all stages of generation; Light pollution
	Consumption of goods (eg. Oil)	Consumption of natural resources; Generation of waste; Habitat loss; Biodiversity impacts
	Generation of waste (eg. Oil)	Consumption of space for waste disposal; Potential contamination of water or soil; Habitat loss
	Exhaust emission	Release of greenhouse gases and atmospheric pollution
	Use of dangerous goods (eg. Batteries)	Potential contamination of air, water or soil; Risk to human health
	Generation of noise	Disturbance to community; Habitat degradation
Operations		

Risk Assessment

Industrial Performance Services ★ Industrial Tubular Catalyst Services

Risk Assessment // insert name here					
Step No: Logical sequence	**Sequence of Basic Job Steps documented in the Procedure, Work Instruction and project plans. Break down Job into steps.** Each step should be logical and accomplish a major task.	**Potential Safety & Environmental Hazards/Impacts at the site of the Job** Identify the actual and potential health and safety hazards and the environmental impacts associated with each step of the job.	**Risk Rating** Refer to the risk matrix or HSEQT.PRO. Risk Mgt	**Recommended Corrective Action or Procedure** ***Determine the corrective actions necessary to reduce the risk to as low as reasonably practical (ALARP) refer to HSEQ.PRO.Risk Mgt. The risk must be rediced or controlled to ALARP before work commences.*** Document who is responsible for implementing the controls to manage each hazard identified.	**Risk Rating** refer to the risk matrix or HSEQT.PRO.Risk Mgt
1.					
2.					
3.					
4.					
5.					

Audit

Process: insert// **Procedure**: Insert //	Date:	Audited by:
	Location of Audit:	Area Mgr/Supervisor:

Item	Question	Evidence Sited	Comments	Conformance Score 0,3,5
1.				
2.				
3.				
4.				
5.				
6.				
7.				

AUDITOR'S SIGNATURE:	CONFORMANCE SCORE: / 25	0 – Non-Conformance 3 – Continuous Improvement Opportunity
SAFETY REP'S SIGNATURE:	CONFORMANCE %:	5 – Total Conformance