CATALYST LOADING PROCEDURE

V:2023.1

Industrial Performance Services ★ Industrial Tubular Catalyst Services

Catalyst Loading Procedure

January 2023

Scope

This procedure details the process of Catalyst Loading for IPS★ITCS personnel and sub-contractors.

Objective

The objective of this procedure is to instruct personnel to load catalyst, in accordance with IPS★ITCS guidelines, State and Government legislation.

Introduction

The performance of catalysts is heavily dependent on proper loading technique. Careful attention, during the loading process, will ensure the maximum care will be given during the loading phase. These are guidelines on Planning the Reactor Load, Inspection of Reactor Internals and Cleanliness, Loading of the Reactor Outlet Support, Main Catalyst Bed Loading Techniques, Top Bed Grading, Final Inspection of The Distributor, and Maintaining the Proper Environment after Loading.

Definitions

Levelling Board – a long flat tool like that used when finishing new concrete surfaces.

IDLH – Immediately Dangerous to Life and Health. Oxygen below 19.5 or Toxins above PEL

PEL – Permissible Exposure Limit is the legal limit in the U.S. for maximum concentration of any chemical in the air to which a worker may be exposed continuously for eight hours without any danger to health and safety. PEL is established by the Occupational Safety and Health Administration (OSHA).

ITP – Inspection and Test Plan, used to sign off on important hold points during loading.

UOP - Universal Oil Products, is an American multi-national company developing and delivering technology to the petroleum refining, gas processing, petrochemical production, and major manufacturing industries. Now Honeywell UOP. Specifically refers to a dense load machine and process.

Planning The Reactor Load

Careful planning, before the actual turnaround of the reactor, is required to ensure that the catalyst loading will be performed efficiently and correctly.

Project Information

Pre project meetings will determine the loading process and requirements.

The Project Manager will advise the project crew on the specifics of the project, including:

- HSE requirements
- The method of loading
- Loading atmospheric conditions
- What equipment is required
- What PPE is required?
- Copies of all SDS sheets.
- Catalyst packaging and pre-bagging requirements.
- Vessel details and drawings.
- Resources available.
- Client contacts.

Isolations

Refer to IPS★ITCS procedure on Blinding Vessels, Tanks, Reactors and Exchangers.
There are two types of atmospheres when loading catalyst, Inert (<3% O_2 by volume), and Normal (20.9 % O_2 by volume).

Isolations will need to be put in place to ensure the vessel is made safe, depending on which atmosphere is used.

Loading Under Normal Atmosphere

The preferred O_2 content should be 20.9% but the atmosphere must remain above 19.5% O_2 to be considered normal atmosphere.

(Between >3% and <19.5% the atmosphere is deemed as an oxygen deficient atmosphere (IDLH) and for all intents and purposes will be treated as an inert atmosphere and all personnel must adhere to the IPS★ITCS “Inert Entry Operations” Procedure).

Isolations and ventilation must be put in place.

Instruction Description

The following instructions have been prepared by the HSEQT Manager to serve as a reference for users of various catalysts. They are submitted to assist the user in obtaining optimum performance and are written in a general tone to be compatible with the individual procedure preferred by a specific company.

General Safety

All personnel involved in the use of the catalyst must thoroughly review the catalyst safety documentation and loading procedures prior to proceeding with catalyst installation. Proper handling and special protection information as described in the
Material Safety Data Sheet or Safety Data Sheet must be always followed. In addition, these personnel must comply with current applicable occupational health and safety standards.

Catalyst Storage and Handling

Catalysts are generally shipped in sealed plastic lined metal drums, big bags (super sacks) or Flo-Bins Indoor storage is preferred. Catalysts should be stored in a clean and dry environment whenever possible. Freezing temperatures will not adversely affect the catalyst, provided it is kept free of moisture. Under normal conditions, the catalysts can be stored for years with no degradation of its performance or physical characteristics. If it is necessary to temporarily store the catalyst outdoors, it should be stacked on pallets at an elevated location to prevent contact with standing water and carefully covered to prevent wetting by precipitation. If the catalyst has been exposed to moisture or stored for long periods, a dry-out procedure is required prior to start-up. Rolling of the drums should be strictly avoided if possible.

Pre-Loading Requirements

Prior to catalyst loading, the following items must be checked:

1. Confirm that loading personnel do not have any items on their person that could potentially be accidentally left in the reactor (e.g., tools, gum, lighters etc.).

2. Thoroughly inspect the empty vessel to make sure that it is free of debris which could cause plugging or flow mal distribution. Inspect all reactor internals, manways, manway covers, bolts, nuts etc. and repair or replace parts if necessary.

3. Inspect all vessel connections such as inlet and exit lines and thermowells to ensure that they are in good condition.

4. Inspect any screens that are to be installed (old and new) to ensure that they are clear and damage free.

5. Inspect all grid supports and screen fasteners to ensure that catalyst particles or bed support material cannot pass around or through the support screen.

6. Ensure that all flanges or dump nozzles have been re-installed and tightened.

7. Inspect all catalyst and support balls when received. Although most catalysts have been screened prior to shipment and normally can be loaded directly into the reactor without further screening, rough handling during shipment could necessitate a light screening prior to loading. Therefore, be prepared by having equipment and facilities available to execute a catalyst screening if required.

Important: *If it is necessary for personnel to enter the vessel during loading, the following additional precautions need to be taken:*

8. Ensure that all vessel entrances not needed for the loading are blocked and blinded for personnel protection.

9. Supply all personnel entering the vessel with proper protective clothing to prevent contact between catalyst dust and skin.

10. Carefully review the provided catalyst SDS for any special exposure risks, handling precautions and proper protective equipment. Any personnel entering the vessel must also be provided with a dust mask respirator or, preferably, fresh air breathing

apparatus if required by plant regulations. If fresh air masks are not used, air circulation should be provided by some type of air mover to reduce dust levels and maintain a fresh air environment.

Fixed Bed Reactor Loading

After pre-loading inspections have been completed, the following loading procedure is recommended:

1. It is important to verify the type of material being loaded before the drum or bag is emptied into the loading hopper. Loading personnel should be familiar with the catalyst identification numbers and appearance. Catalyst should be loaded per the outages specified in the loading diagram. An accurate log of the drum or sack count should be kept enabling identification of any errors. Any deviations should be reported to the Technical Group of clients.

2. All inert support balls must be sock loaded and levelled. If multiple layers of support balls are to be loaded, each layer should be levelled prior to the addition of the next layer.

Caution: *The largest openings in the catalyst support grid or screen should not be greater than one half the smallest catalyst or support ball dimension. Record outages after each layer and confirm with the loading diagram. Care should be taken not to damage any reactor outlet screens present at the bottom of the reactor.*

3. The most common method used for loading is to use a large funnel or hopper located above the reactor or on the side of the reactor with a telescoping sock or sleeve extending down to the level of the material being loaded.

4. The hopper and attached sock are then filled with catalyst with flow regulated and distributed by a man working on plywood or planks inside the reactor. As the catalyst is loaded, the sock is periodically shortened as required to hold catalyst free fall to a maximum of 90 cm (36”). If a man cannot be in the reactor as the catalyst is loaded, he must periodically level the catalyst or have a method of moving the end of the sock for catalyst distribution.

Important: *The catalyst being loaded should be distributed and levelled as the loading proceeds. Never dump catalyst in one mound and level at the end because such a technique may result in a high concentration of fines in a section of the reactor directly under the loading sock. Such a fines concentration could result in poor flow distribution of the reacting gas across the catalyst bed.*

5. After the last drum or super sack has been loaded, the catalyst should be carefully levelled using a rake or wooden plank. Record the final catalyst outage prior to the installation of the top screen and support balls.

6. Install the top screen if required and complete sock loading of the upper support ball layer(s). Record the final outage.

7. Make sure that all debris and/or equipment used during the loading is removed from the reactor.

8. Notify the Technical Group of clients for a final inspection and review of the loading data.

9. Re-install the inlet distributor and loading manway cover.

Loading Of the Reactor Outlet Support

Diagram 1 shows sample loading diagram for loading support in the bottom of a reactor with an outlet screen.

Diagram 2 shows sample loading diagram for loading support in the bottom of a reactor an inter-bed outlet screen.

Diagram 1

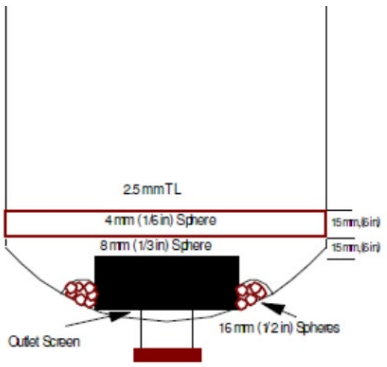


Diagram 2

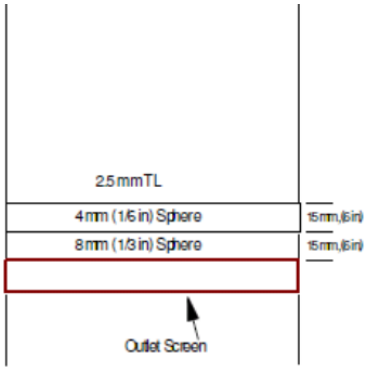
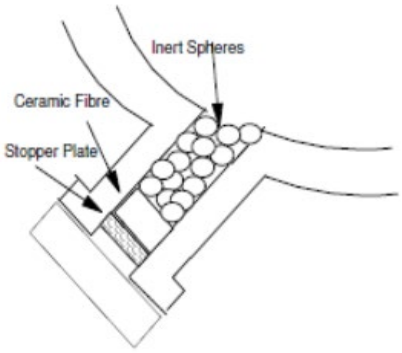


Diagram 3 represents the actual loading of a vessel dump nozzle.

Diagram 3

Figure 3



Loading

The principals of loading remain constant regardless of the loading method, i.e., sock loading and dense loading.

- Ensure all HSE requirements are met.
- Client to advise a nominated representative responsible for all loading criteria. Client to advise if any samples of the catalyst are required by them.
- Check weather conditions are suitable for loading.
- Brief all personnel involved, with the loading process (***HSE.FOR.Toolbox Training Session.2022***).
- Ensure all permits are in place.
- Ensure sufficient lighting inside and outside the vessel. Distribute all QA/QC documentation.
- Undertake a visual inspection of vessel isolations.
- Check quality, quantity and contents of all loading media are correct and clearly marked.
- All loading requirements i.e., drums, bulk bags, bins etc. are to be positioned near to the loading point in sequence for easy access.
- Check all equipment to be used is within required test dates. Blow down all hoses to be used inside the vessel.
- Set up all equipment and ensure all check lists have been completed. Undertake gas testing and complete QA sheets.
- Supervisor MUST confirm with the client that the loading diagram to be used is the correct and FINAL edition.
- Set up crane in most efficient location (lifting radius) and determine lifting point to minimize boom movements.
- Check the vessel is clean and dry.
- Mark-up loading heights inside the vessel as per the clients loading diagram, and record outages from the following reference points
    - Manway flange
    - Trays
    - Bottom of vessel
    - Top of outlet collector
- Box up dump nozzles and ensure dump key and packing is in place sign off on ITP.
- For vessels that require the catalyst being loaded to travel more than 8 meters from the top man way to the catalyst bed, position lengths of 6’’ steel piping in the vessel as required. Secure in position with certified rigging equipment, e.g., slings and chain blocks.
- The loading sock (6” lay flat hose) must not exceed 8 meters in length, and if the sock is required to pass through a tray section, where there is a possibility of the sock being perforated, the use of 6” steel piping should be considered.
- If required, position a hopper over the man way and connect the loading sock or loading pipe securely to the hopper.
- Ensure during set up of loading equipment inside a vessel, consideration is given to the safest access and egress possible.
- Position dust extraction equipment as required.
- One technician to don BA with communications and enter the vessel One technician to be responsible for all loading QA and documentation.
- One technician to be positioned to open loading hoppers on top of vessel.
- One technician on top of the vessel to keep track of media being loaded as a cross check for the QA documentation.

- Rigger to be positioned to direct the crane. Consideration must be given to staying in a position up-wind of any dust resulting in the transfer between hoppers.
- Rigger to be positioned at crane lift point to attach and detach loading containers, i.e., hoppers, catalyst bins or bulk bags.
- Transfer catalyst to be loaded to the crane lift point using a forklift.
- If using a hopper on the top man way, one technician must be positioned to control the flow of catalyst through the hopper by operating the slide valve on the bottom of the hopper.
- Arm Guards on hoppers shall be used when flying clam shell hoppers, single, or double bags.
- Ensure there is a good line of communication between the technician inside the vessel, on top of the vessel and the technicians at grade.

Sock Loading

The loading sock must not exceed 8 meters in length and should be cut no more than 600mm above the bed to obtain satisfactory loading densities and to aid in the prevention of loading in “mounds” which are conducive to creating channeling.

As the bed level rises with the loading, it is necessary to cut sections off the sock. These pieces must be removed from the vessel immediately and accounted for during the loading to ensure they do not remain inside the vessel.

IPS★ITCS uses a unique method of attaching the loading sock to a loading hopper which greatly reduces the chance of the sock breaking free from the fitting.

At no time should the sock be allowed to fill completely from top to bottom.

Once the desired loading height is achieved the technician will use a “levelling board” to make the final bed surface flat and level. At the completion of each layer of media loaded, the final outage is to be recorded on the QA documentation to prepare a detailed “as loaded diagram” for the client’s records.

Ceramics

When loading ceramics, to prevent damage to them, the sock is to be taken to the vessel wall and the end of the sock is “kinked” slightly to create a cushioning affect to reduce momentum and prevent them from freefalling onto hard surfaces at speeds that could possibly damage them.

After loading the first batch, check the new load for any signs of damage to the ceramics. If there is proof of damage consideration should be given to alternative loading methods.

Catalyst

As catalyst is loaded into a vessel a technician will be positioned on the catalyst bed and will guide the loading sock in a rotating figure of eight, taking care not to allow the catalyst to build up in large or unlevel mounds.

Great care must be taken to bring the bed up in a level profile. The entry technician must work in good communication with the technician above that is controlling the flow speed from the loading hopper.

If a catalyst supplier feels positioning a technician on the bed is detrimental to the catalyst, i.e., causing breakages and fines, consideration must be given to other loading methods and equipment.

Pre-Sulfided Catalyst

Consideration must be given the manufacturers guidelines for loading. Pre-sulfide catalyst has the potential to become active and/or release (Sulfur Dioxide) SO_2. When loading pre-sulfided catalyst place containers in a cool location away from direct sunlight.

Dense Loading

IPS★ITCS works with several companies that are certified to use the UOP dense loading method as well as a few others.

The use of this method will increase the amount of catalyst loaded within the bed by the particles being laid in a uniform pattern removing the possibility of small void spaces because of sock loading.

After loading the ceramic bed support material, the loading sock is removed, and the dense loading machine is carefully positioned inside the man way or just below the tray.
The loading sock attached to a hopper on the vessel man way, is repositioned above the loading machine and the machine is set using parameters supplied by UOP to distribute catalyst evenly as the bed rises.

The machine is pneumatically driven, and it is VITAL the driving force supplied matches the atmospheric conditions inside the reactor, i.e., inert atmosphere, N_2 must be used to drive the loading machine.

Tubular Reactor Tube Loading

After pre-loading inspections have been completed, the following loading procedure is recommended:

1. It is important to verify the type of material being loaded before the drum or bag is emptied into the funnel/loading machine. Loading personnel should be familiar with the catalyst identification numbers and appearance. Catalyst should be loaded per the outages specified in the loading diagram. An accurate log of the drum or sack count should be kept enabling identification of any errors. Any deviations should be reported to the Technical Group.

2. All inert support balls must be loaded by funnel or load machine. If multiple layers of support balls are to be loaded, each layer should be measured prior to the addition of the next layer. Caution: The largest openings in the catalyst support spring or clip should not be greater than one half the smallest catalyst or support ball dimension. Record outages after each layer and confirm with the loading diagram. Particular care should be taken not to damage any reactor springs or clips present at the bottom of the reactor.

3. The most common method used for loading is to use a large funnel or loading machine located above the tube The funnel is then filled with catalyst with flow regulated and distributed by a man or a machine that has been timed or set.

Important: *The catalyst being loaded should be distributed evenly as the loading proceeds. Manage the dumping of catalyst in such a technique to minimize a high concentration of fines. Such a fines concentration could result in poor flow distribution of the reacting gas across the catalyst bed.*

4. After the last drum or sack has been loaded, the catalyst should be carefully outage using gauging sticks.
5. Record the final catalyst outage prior to the installation of the top support balls.
6. Record the final outage.
7. Make sure that all debris and/or equipment used during the loading is removed from the reactor.
8. Notify the Technical Group for a final inspection and review of the loading data.
9. Re-install the inlet distributor/striker plate (If applicable) and loading manway cover.

IPS★ITCS works with several companies that are certified to use the Unidense loading technology.

The UNIDENSE™ technology is a loading method for primary reformer catalyst tubes which is simple and faster than the traditional "sock" loading method. Catalyst is slowly filled into the tube through a specially designed funnel and the loading rope is gradually pulled out of the tube as the catalyst layer builds up. The brushes with flexible springs reduce the speed of the catalyst particles so that breakage is avoided. With the UNIDENSE™ technology the catalyst particles will have a free fall of approx. 0.5 m from the lowest brush to the catalyst surface. This gives a "low-intensity" filling, and the particles will come to rest before being interlocked by other particles. Hence, there will not be any risk for bridging, and vibration of the tubes is not necessary. The UNIDENSE™ technology ensures a filling without extra voids and a high uniform density along the full length of the tubes is obtained. The catalyst is charged from buckets and the time consuming and expensive socking of the catalyst is avoided. Weighing of catalyst loaded in each tube is not necessary and is made in only a few tubes on the plants request.

- Set up loading funnels, scales, buckets and loading ropes. Prepare Delta Pressure (**ΔP**) rig and video equipment.
- Cover empty tubes so nothing can accidentally enter the tube.
- Ensure catalyst supports are correctly positioned by use of video equipment Record the outage of the empty tube using a measuring tape of sufficient length.
- Test empty tube and record ΔP’s on the QA documentation. Any abnormal ΔP readings that fall outside agreed tolerances must be investigated and reported.
- Ensure a constant supply, of quality dry air (instrument air).
- Inspect the rope, wire and brushes, and replace brushes that have been damaged. Start a loading with new springs.
- Contents of the bucket must be weighed. Do not exceed the predetermined amount to be loaded in each bucket.
- Catalyst is to be charged at a constant rate. The contents of each bucket should be charged gradually during approximately 30-seconds to give a constant loading density and a uniform pressure drop.
- Maintain the correct distance between the catalyst level and the rope during the loading. If any of the team members notice a problem with the loading, stop the loading

of the tube until the problem is discussed with the supervisor. Mark the rope properly and avoid overfilling of the level.
- Inform the Supervisor if excess broken catalyst or dust is observed. Never load the dust at the bottom of the bucket into the tube, (broken catalyst and dust will contribute to excess pressure drop).

- When loading multiple types of catalyst, ΔP readings must be taken and recorded on the QA documentation after completion of each layer.
- Box up tubes on correct new gaskets and tighten bolts to the clients stipulated torque values.
- Prepare loading report and all QA documentation for sign off and hand over to client.

Pressure Drop Measurements

Pressure drop of the empty tubes should be checked prior to a loading, and all should be low and at the same value.

Ensure that air or nitrogen used for pressure drop measurements is dry and free from oil. For a reliable measurement the header pressure should be constant. Be aware that temperature variations will give variation in the pressure drop measurements. It is recommended that one tube is used as reference during the measurements. Check the reading of the reference tube for every 25 tubes and adjust if necessary.

Measure the pressure drop in all tubes before doing adjustments vibration to, filling up or vacuuming of the tubes. Calculate average pressure drop, measurements should be within ± 5 %.

Recheck the tubes outside of this range with the reference tube before doing adjustments/ corrections.

With careful loading a variation in the pressure drop of less than ± 5 % is possible to obtain.

Static Loading

Static loading uses a specialized fitting that is hung inside the bed just below the man way or tray sections.

It has a series of discs that deflect the catalyst at different angles in an umbrella effect. Catalyst is distributed evenly over the bed as the bed rises. Due to the height the pattern that the catalyst falls, a higher density loading is achieved in comparison to standard sock loading.

Dense Phase Loading

This method of loading uses air to push the catalyst up a tube into the vessel. Catalyst is fed into the loader at grade alleviating the requirement of a crane.

The principal is the same as is used for platformer reactors when transferring the catalyst from the regenerator side back up to the top of the reactor stack.

Please refer to the IPS★ITCS Dense Phase Loading SOP.

Decanting

If decanting of loading media is required it is IPS★ITCS preferred method to use hydraulic operated equipment to remove all manual handling, e.g., Hydraulic drum rotators and hydraulic drum decanting machine. Refer to IPS★ITCS SOPs for this equipment.

Atmospheric Conditions

Loading Under Inert Atmosphere

The atmosphere inside the vessel must be purged with an inert gas, namely Nitrogen.

This is to prevent pre-sulfided and pyrophoric material from becoming active and self-heating increasing hazards to personnel and the environment.

When any entry into an inert vessel is required as part of the loading, all personnel must adhere to the IPS★ITCS “Working in Inert Atmospheres” procedure.

Nitrogen Purge Plan

The project manager will liaise with the client to determine the nitrogen purge plan and what equipment is to be used and who is responsible for that equipment.

Inert Loading

The following are procedures for loading of catalyst in single and multi-bed reactors under inert atmosphere conditions.

The general procedures for this work include:

A pre-operational meeting shall be held with both plant operations personnel and IPS★ITCS operations personnel to ensure that the entire scope of work is understood prior to load commencing.

Ensure that a JSEA has been performed.
Ensure that all permits meet the requirements of the JSEA and are properly signed and located as required in the work area.

Ensure that all equipment is on site and in proper working condition.
If loading is under normal atmosphere, dry (instrument) air must be used to ensure no moisture enters the vessel.

Stopping and starting the machine will affect the density of the loading as the machine will change speed as weight load comes on and off the machine, therefore it is better to have as few stops as possible to achieve the desired density. In most cases a small portion of catalyst will be loaded, and the bed profile will be checked to confirm the supplied parameters are

indeed giving a level profile. Stops to check density and profile generally are made at 25%, 50% and 75% of the loading.

All dense loading jobs will require a hopper to be positioned above the man way of the vessel, this is to allow catalyst to continue feeding the loading machine while the crane continues to raise and lower additional containers to feed the stationary hopper on top of the vessel.

Prior to the start of loading, charge the stationary hopper full of catalyst and position the next load above the hopper on the crane. Begin topping up the man way hopper as soon as possible so the crane hook can return to grade as soon as possible, to retrieve the next load before the man way hopper runs out of catalyst to ensure the loading machine speed remains constant ensuring desired densities are achieved.

As most loads are required to have small void spaces under trays, e.g., 100mm, the machine is used to load up to a point where it is no longer effective and the remaining “top up” is done by sock loading.

A detailed Dense Loading report will be completed as part of the QA documentation detailing the actual density achieved.

It must be remembered that the density of a bed is calculated over the entire contents of the bed after loading is completed. It is normal that sections of the loading, (particularly the beginning over inert support beds and while loading is below the tangent line), the density will be different to the expected overall density; this is no cause for alarm and will be resolved throughout the loading.

Responsibilities

Trades marked with * should be skilled in all duties to allow for rotation of people.

Within the minimum size inert team:

- The Supervisor has the overall responsibility for the job with regards to safety, progress, records and contact with client's representatives etc.
- One Technician will be responsible for the operation of the life support panel and communications at any one time during an entry under inert conditions.
- One Technician (to enter the vessel) will be fully equipped to meet all the expected hazards inside the vessel.
- One Technician (suited up) will be outside the vessel entry/exit point to watch and assist the individual inside the vessel.
- One Technician to assist with general activities related to the entry One Ground Support Supervisor

Inert Entry Personnel Requirements

Supervisor

- Leadership, supervision, and client liaison skills
- Certified inert entry operator
- Knowledge of site Experience
- Familiar with job scope and all equipment

- Commitment to safety

Technicians

- Certified inert entry operator
- Commitment to safety Project experience
- Ability to run all ground activities
- Knowledge of inert entry equipment and activities
- Commitment to safety

Supervisor Responsibilities

- Establish and maintain communication with Client Representative Obtain daily permits to work and ensure they are communicated to crew. Ensure all equipment is set out correctly
- Communicate location of safety facilities such as showers, eye wash, medical center, safe areas etc.
- Brief all personnel involved of the safety requirements Ensure all personnel involved are familiar with job scope
- Ensure that signage is placed at appropriate sites to warn of N2 presence Ensure all equipment is within test date
- Check reactor atmosphere for suitability to enter Monitor activities inside the reactor
- Preparation of JSEA
- Ensure adequate emergency response procedures, resources and equipment is available.
- Preparation of a rescue plan
- Report to client as soon as possible the need for spare parts General liaison with client
- Complete all QA/QC documentation and ensure it has appropriate approvals Ensure all QA/QC docs are submitted electronically to ITCS Technical Specialist.
- Prepare a job report and submit to ITCS Technical Manager
- Control of equipment on site:
    - Report defect equipment, by use of tag out system.
    - Security of equipment
    - Third party equipment

- **Once the technician enters the confined space, all personnel on the reactor should pay the utmost of attention to what is happening inside the vessel.**

Panel Watch Responsibilities

- Ensure all air/communication lines are securely connected Ensure Inert entry checklist is completed and signed
- Test alarms
- Ensure communications panel is charged and working Ensure that all air cylinders are connected
- Monitor all pressure gauges on the panel
- Control the operation of the panel during an inert entry

- Communicate to ground support to change cylinders when necessary (low pressure - before alarm sounds)
- Communicate with and relay messages from person inside Liaise with Project Supervisor
- Fill out inert entry checklist

- Ensure Crew is aware of details of rescue plan

Inert Entry Technician Responsibilities

- Check all equipment about to be used and make sure that it is clean and fit for purpose
- Ensure all correct PPE is worn
- Check integrity of all hose-connections to the harness Check egress bottle is full
- Ensure communications are functioning correctly Check reactor atmosphere
- Enter the reactor in an orderly and safe manner Work safely and efficiently while inside
- Continually inform panel watch of the status of work
- Check all lines and hoses are free from obstruction before exit Change contaminated PPE immediately after exiting the vessel Ensure personal hygiene is maintained
- Brief next entry person on status of work Understand details of the rescue plan

Standby Person Responsibilities

The primary responsibility of Standby person is to verify that the Technician entering the vessel has completed all appropriate pre-entry checks and is ready for an entry under inert conditions.

- Check all equipment about to be used and make sure that it is clean and fit for purpose
- Ensure all correct PPE is worn
- Check integrity of all hose-connections to the harness Check egress bottle is full
- Prepare all lights and tools necessary for the work Ensure any trip hazard is minimized on reactor top Connect fall protection system to entry Technician
- Assist entry Technician to enter and inform of any hazards Lower equipment and tools as required
- Monitor reactor atmosphere
- Assist entry Technician to exit the reactor
- Secure the reactor manway to prevent unauthorized entry and ensure the appropriate signage is in place and it is weather proofed
- Understands details of the rescue plan

Top Supervisor Responsibilities

- Assist Standby Technician
- Always maintain good housekeeping
- Assist Panel Watch
- Monitor reactor atmosphere
- Assist entry Technician to enter and exit the reactor and inform of any hazards Understand details of the rescue plan
- Secure the reactor manway to prevent unauthorized entry and ensure the appropriate signage is in place and it is weather proofed
- Assist in completing QA documentation

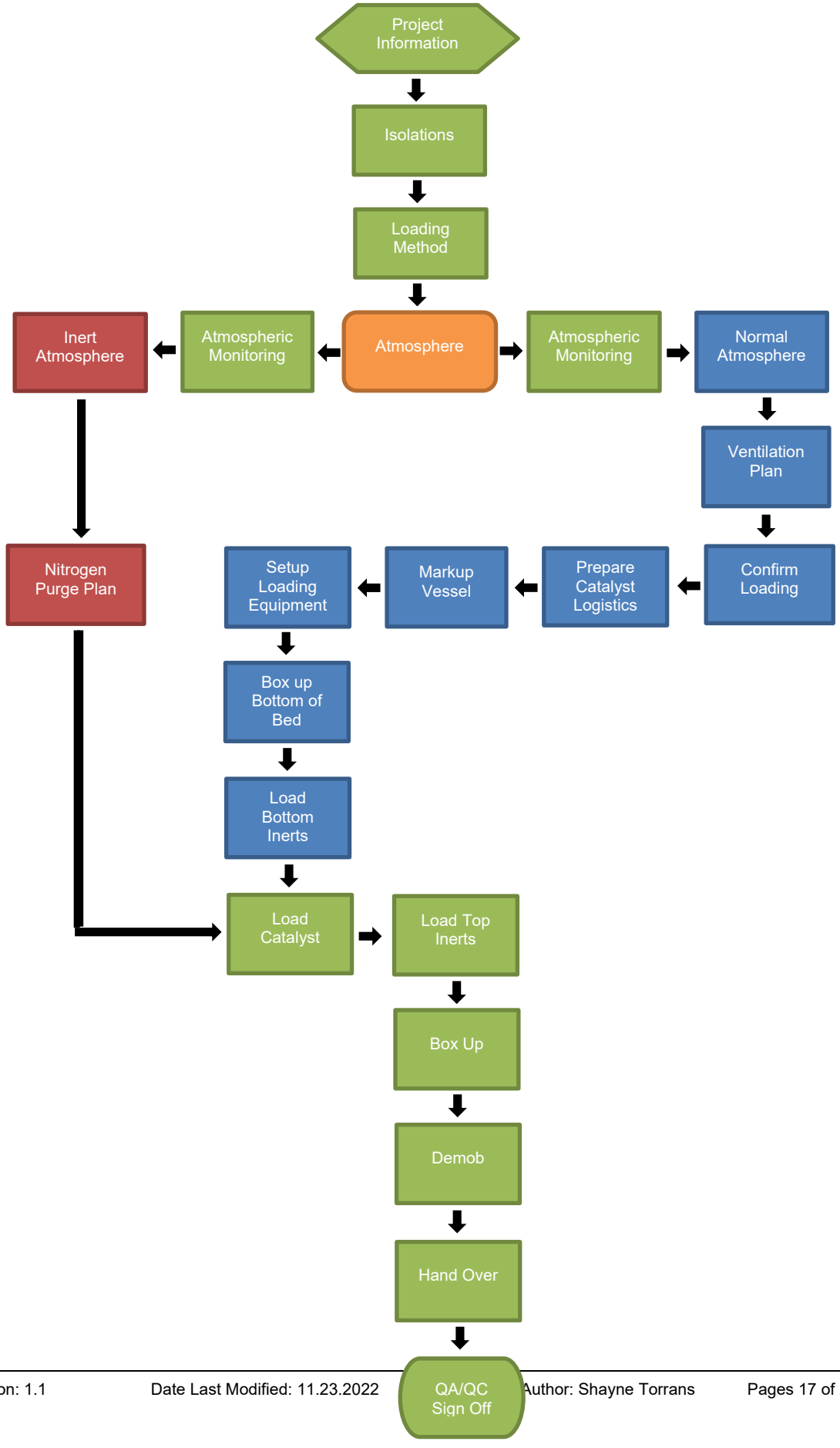
Ground Support Responsibilities

- Ensure all equipment is set out in an orderly manner Brief all ground support personnel on their duties Ensure all personnel wear correct PPE
- Ensure spent catalyst containers are prepared and labelled correctly Monitor catalyst flow and temperature
- Monitor nitrogen flow and supply

- Monitor life support air supply (e.g., bottle connections and changeovers) in conjunction with the panel watch

- Ensure spent catalyst containers are sealed correctly
- Ensure the spent catalyst containers are stored in an appropriate location Liaise with Project Supervisor
- Assist with control of QA/QC
- Maintain communication with Panel Watch to maintain status of operations within the confined space
- Control project area
- Always ensure communication with the inert crew, in the unlikely event of an emergency

Appendix 1 - Catalyst Loading Procedure Flowchart



Revision History

Rev	Rev Date	Rev By	Approved By	Description
1.0	1.03.2022	Shayne Torrans	Shayne Torrans	Initial Load Procedure Document
1.1	11.23.2022	Shayne Torrans	Shayne Torrans	Combined Loading Procedures

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

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