

**AMMONIA REFRIGERATION
PROCESS SAFETY /
RISK MANAGEMENT PROGRAM**

PRE- STARTUP SAFETY REVIEW CHECKLIST

MCF Number: _____ Pre-Startup Safety Review Number: _____

Description: _____

Pre-startup Safety Review Compiled by: _____ Date: _____

Contact Number (____) - ____ - ____

Please list the number of attachments:

____ 1.0 General Requirements, 2.0 Safety Systems, 3.0 Labeling, 4.0 Environmental, 5.0 Fire Protection, 6.0 Material Handling Equipment – Complete each section for each project. Mark each section that is applicable

Complete a pre-startup Safety Review Checklist for each associated component (if two compressors are installed, then two copies of 10.0 Compressors will be needed). A filed collection form should be attached for each component. Mark the number (if any) for each section covered.

- ____ 7.0 Piping
- ____ 8.0 Instrumentation, Controls, and electrical
- ____ 9.0 Vessels
- ____ 10.0 Compressors
- ____ 11.0 Evaporative Condensers
- ____ 12.0 Pumps
- ____ 13.0 Evaporators
- ____ 14.0 Heat Exchangers
- ____ 15.0 Ventilation
- ____ 16.0 Pressure Relief Systems
- ____ 17.0 Site security

Follow-up items (these items should be transferred to the Management of Change Form and added to the deficiency log).

Start-up is authorized by _____ Date ____ / ____ / ____
(Facility Personnel (signature))

Printed: _____

Question		Answer	Comments
1.0 General Requirements			
1.1	All Process Safety Information (as specified on the Management of Change Form) has been compiled and is complete, current, accurate, and accessible to the employees. Redlines are acceptable.	Yes / No / NA	
1.2	Construction and equipment is in accordance with the design specifications.	Yes / No / NA	
1.3	Recommendations (if any) from the Engineering review have been resolved.	Yes / No / NA	
1.4	Recommendations (if any) from the Safety and Health Review or Process Hazard Analysis have been resolved.	Yes / No / NA	
1.5	Guards are installed.	Yes / No / NA	
1.6	Lockout / tagout procedures have been developed, or modified, and are implemented.	Yes / No / NA	
1.7	Appropriate preventative maintenance schedules have been updated.	Yes / No / NA	
1.8	Critical spare parts have been procured and added to the Spare parts inventory.	Yes / No / NA	
1.9	Work area lighting is adequate.	Yes / No / NA	
1.10	All Standard Operating Procedures have been developed, or modified, and are implemented.	Yes / No / NA	
1.11	All maintenance procedures have been developed, or modified, and are implemented.	Yes / No / NA	
1.12	Training has been completed for all employees involved in operating the process.	Yes / No / NA	
1.13	Training has been completed for all employees involved in maintaining the equipment in the process.	Yes / No / NA	
1.14	Training has been completed for all employees that are required to respond to emergencies involving the process.	Yes / No / NA	
2.0 Safety Systems			
2.1	Ammonia detector placements have been reviewed, are appropriate, and functional.	Yes / No / NA	
2.2	Other Ammonia detector placements have been reviewed, are appropriate, and functional.	Yes / No / NA	
2.3	Confined space assessments for new confined spaces have been completed.	Yes / No / NA	
2.4	MSDS for new chemicals are on-site and have been incorporated into the facility HAZCOM program.	Yes / No / NA	
2.5	New Safety Equipment has been installed and incorporated into the facility inspection checklist.	Yes / No / NA	
2.6	Eyewash / Safety Showers are installed and functional.	Yes / No / NA	

Question	Answer	Comments
2.7 All emergency procedures have been developed, or modified, and are implemented. (list).	Yes / No / NA	
2.8 Outside Emergency Responders have been notified of changes.	Yes / No / NA	
2.9 If modification involves the engine room E-Stop has the E-Stop been tested and verified functional.	Yes / No / NA	
3.0 Labeling		
3.1 Equipment has been labeled with appropriate identifiers.	Yes / No / NA	
3.2 Emergency exit signs are installed and alarm systems function in the area.	Yes / No / NA	
3.3 Exit aisles have been marked.	Yes / No / NA	
3.4 Confined spaces have been labeled.	Yes / No / NA	
3.5 Warning signs have been installed.	Yes / No / NA	
3.6 Emergency evacuation signs have been updated.	Yes / No / NA	
3.7 Emergency evacuation drawings have been updated.	Yes / No / NA	
3.8 Shelter in place signs have been updated.	Yes / No / NA	
3.9 Shelter in place drawings have been updated.	Yes / No / NA	
3.10 Engine room signs have been updated.	Yes / No / NA	
4.0 Environmental		
4.1 Environmental permits updated (water, air, waste streams, etc.).	Yes / No / NA	
5.0 Fire Protection		
5.1 Fire protection systems are adequate for the modified area or equipment.	Yes / No / NA	
5.2 Fire alarms are located correctly for the modified area	Yes / No / NA	
5.2 Fire extinguishers for are located for use in the modified area.	Yes / No / NA	
6.0 Material Handling Equipment		
6.1 Fasteners are secured.	Yes / No / NA	
6.2 Pinch points are protected.	Yes / No / NA	
6.3 E-stops are located near work stations and functional.	Yes / No / NA	

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - ____ - ____

Date: _____

7.0 Piping – Description		
7.1	Piping is adequately supported	Yes / No / NA
7.2	Pipe materials are as specified.	Yes / No / NA
7.3	Valves can be accessed	Yes / No / NA
7.4	Valve handles are installed.	Yes / No / NA
7.5	Plugs, caps, or blind flanges are installed (no open pipe).	Yes / No / NA
7.6	Locked open valves have been verified open and locked.	Yes / No / NA
7.7	Provisions have been made to allow condensed liquid in the hot gas defrost mains to safely return to the engine room.	Yes / No / NA
7.8	All ball valves used in ammonia lines are vented.	Yes / No / NA
7.9	Pipe supports are adequate.	Yes / No / NA
7.10	Piping is protected from traffic hazards.	Yes / No / NA
7.11	Piping has been properly insulated.	Yes / No / NA
7.12	Pipes have been properly pressure / vacuum tested.	Yes / No / NA
7.13	Gaskets have been installed and appropriately tightened.	Yes / No / NA
7.14	Piping has been labeled with appropriate pipe markers.	Yes / No / NA

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - _____ - _____

Date: _____

8.0 Instrumentation, Controls, and electrical – Description		
8.1	Instruments have been calibrated.	Yes / No / NA
8.2	Computer software and hardware has been tested and backups completed (if necessary).	Yes / No / NA
8.3	Fuses are installed and adequately sized for the application.	Yes / No / NA
8.4	Breakers are installed and adequately sized for the application.	Yes / No / NA
8.5	All electrical switches are labeled.	Yes / No / NA
8.6	All electrical panels and devices are labeled.	Yes / No / NA
8.7	HMI are readily understandable. (instructions are available)	Yes / No / NA
8.8	E-Stops have been verified and function properly	Yes / No / NA
8.9	Gauges have been installed properly where appropriate	Yes / No / NA

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - ____ - ____ **Date:** _____

9.0 Vessel – Description			
9.1	Oil has been drained?	Yes / No / NA	Gallons: _____
9.2	Float column appears oil free	Yes / No / NA	
9.3	The vessel is equipped with a means of visual level indication.	Yes / No / NA	
9.4	Vessel is equipped with a high level float switch to prevent liquid slugging of the associated compressor.	Yes / No / NA	
9.5	Vessel is adequately anchored and supported.	Yes / No / NA	
9.6	Bollards or other protective guarding is installed to protect the vessel from vehicular traffic.	Yes / No / NA	
9.7	Are catwalks or other means of access for maintenance and emergency isolation installed (or available).	Yes / No / NA	
9.8	Vessel has been insulated appropriately.	Yes / No / NA	
9.9	Vessel has been appropriately pressure / vacuum tested.	Yes / No / NA	
9.10	The vessel has an ASME nameplate and is visible.	Yes / No / NA	
9.11	Low level cutout / shutdown is installed and operational.	Yes / No / NA	Set point: _____
9.12	Low level alarm is installed and operational.	Yes / No / NA	Set point: _____
9.13	Operating level (#1) is installed and operational.	Yes / No / NA	Set point: _____
9.14	Operating level (#2) is installed and operational.	Yes / No / NA	Set point: _____
9.15	High level alarm is installed and operational.	Yes / No / NA	Set point: _____
9.16	High level cutout / shutdown is installed and operational.	Yes / No / NA	Set point: _____
9.17	Level probe has been calibrated?	Yes / No / NA	

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - ____ - ____

Date: _____

10.0 Compressor – Description		
10.1	Is there an apparent excessive noise or vibration? (readily detectable by the service technician)	Yes / No / NA
10.2	Are there any refrigerant leaks?	Yes / No / NA
10.3	Are there any oil leaks?	Yes / No / NA
10.4	Oil analysis complete	Yes / No / NA
10.5	Belt tension/Coupling alignment	Yes / No / NA
10.6	Motor rotation has been checked and marked.	Yes / No / NA
10.7	All exposed rotating components (e.g. shafts, belts, pulleys, flywheels, couplings) are protected with guards	Yes / No / NA
10.8	Compressor is anchored and grouted in place.	Yes / No / NA
10.9	Bollards or protective guarding is installed to protect against traffic hazards.	Yes / No / NA
10.10	Compressors are equipped with internal or external relief valves.	Yes / No / NA
10.11	Operating Conditions at slide valve position has been checked? (applicable to Rotary Screw compressors only)	Yes / No / NA
10.12	Actual Voltage has been checked?	Yes / No / NA L1: _____ L2: _____ L3: _____
10.13	Actual Amperage has been checked?	Yes / No / NA L1: _____ L2: _____ L3: _____
10.14	Actual Discharge Pressure has been checked?	Yes / No / NA _____ PSIG
10.15	Actual Discharge Temperature has been checked?	Yes / No / NA _____ Deg. F.
10.16	Actual Suction Pressure has been checked?	Yes / No / NA _____ PSIG
10.17	Actual Suction Temperature has been checked?	Yes / No / NA _____ Deg. F.
10.18	Actual Net Oil Pressure has been checked?	Yes / No / NA _____ PSIG
10.19	Actual Net Oil Temperature has been checked?	Yes / No / NA _____ Deg. F.
10.20	SOC Liquid TX Valve External Pressure at the regulator has been checked?	Yes / No / NA _____ PSIG
10.21	Pressure drop across the oil filter has been checked?	Yes / No / NA _____ PSIG
10.22	Pressure drop across the coalescing Elements has been checked?	Yes / No / NA _____ PSIG
10.23	Oil Level in the Primary oil sump has been checked?	Low/Normal/High
10.24	Oil Level in the Secondary Side has been checked?	Low/Normal/High
10.25	Oil Level in the crankcase has been checked?	Low/Normal/High

10.0 Compressor – Description		
10.26	Oil Filters have been checked and are sufficient? Please note in comments if you changed them.	Yes / No / NA
10.27	Have the pressure gauges been installed?	Yes / No / NA
10.28	Have the pressure gauges been calibrated?	Yes / No / NA
10.29	Have the pressure Transducers been installed?	Yes / No / NA
10.30	Have the pressure Transducers been calibrated?	Yes / No / NA
10.31	Have the Temperature Thermocouples been installed?	Yes / No / NA
10.32	Have the Temperature Thermocouples been calibrated?	Yes / No / NA
10.33	Have the correct stings of the operational controls been verified correct?	Yes / No / NA
10.34	Has the Volume Gear Motor been calibrated? (Applicable to the Vilter VSS)	Yes / No / NA
10.35	Has the settings of the operating controls been verified?	Yes / No / NA
10.36	High Discharge Pressure Control is functional?	Yes / No / NA Set point: _____
10.37	Low Suction Pressure Control is functional?	Yes / No / NA Set point: _____
10.38	High Oil Pressure Control is functional?	Yes / No / NA Set point: _____
10.39	Low Oil Pressure Control is functional?	Yes / No / NA Set point: _____
10.40	High Filter Pressure Control is functional?	Yes / No / NA Set point: _____
10.41	High Discharge Temperature Control is functional?	Yes / No / NA Set point: _____
10.42	Low Discharge Temperature Control is functional?	Yes / No / NA Set point: _____
10.43	High Oil Temperature Control is functional?	Yes / No / NA Set point: _____
10.44	Low Oil Temperature Control is functional?	Yes / No / NA Set point: _____
10.45	Oil Heaters are functional	Yes / No / NA Set point: _____
10.46	Motor Load Current Control is functional?	Yes / No / NA Set point: _____
10.47	CT Ratio Control is functional?	Yes / No / NA Set point: _____
10.48	Manual Operation and Holding capability of the unloader control valve is functional?	Yes / No / NA
10.49	Timing and switching function of the Wye/Delta, Auto Transformer, or Solid State Starter is functional?	Yes / No / NA
10.50	Hot Alignment data has been checked and recorded? (See form on the following page)	Yes / No / NA
10.51	Realignment was required and completed?	Yes / No / NA
10.52	Thrust bear movement has been checked?	Yes / No / NA Movement: _____
10.53	Vibration Analysis complete?	Yes / No / NA
10.54	Suction strainer has been cleaned?	Yes / No / NA

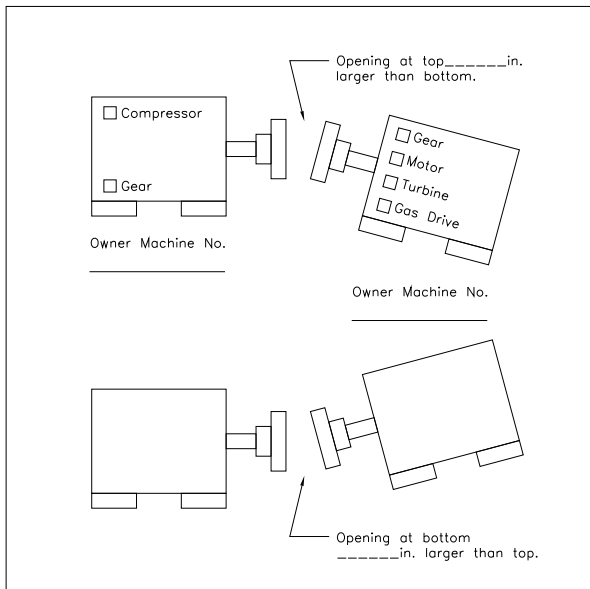
10.0 Compressor – Description		
10.55	Oil Pump Strainer has been cleaned?	Yes / No / NA
10.56	Liquid injection strainer has been cleaned?	Yes / No / NA
10.57	Oil Return strainer has been cleaned?	Yes / No / NA
10.58	Operation of the discharge check valve has been verified.	Yes / No / NA
10.59	Operation of the suction check valve has been verified.	Yes / No / NA
10.60	Motor has been greased?	Yes / No / NA
10.61	Motor is clean?	Yes / No / NA
10.62	Motor starter contacts have been checked?	Yes / No / NA
10.63	Motor and compressor bolts have been checked for integrity and tightness?	Yes / No / NA
10.64	Coupling bolts have been checked for integrity and tightness?	Yes / No / NA
10.65	Capacity control operation has been checked and is functional?	Yes / No / NA
10.66	Oil has been replaced (if required)	Yes / No / NA _____ Gallons
10.67	Oil return float has been disassembled and cleaned?	Yes / No / NA
10.68	Thrust clearance has been checked and is acceptable?	Yes / No / NA
10.69	Rod clearances have been inspected and are correct? (Applicable to reciprocating compressors only)	Yes / No / NA
10.70	Has a top end inspection been performed? (Applicable to reciprocating compressors only)	Yes / No / NA
10.71	Blade Shelf Clearance has been checked? (Applicable to the Vilter VSS)	Yes / No / NA Micro Side: _____ Gear Side: _____
10.72	Damper Pin Float has been checked? (Applicable to the Vilter VSS)	Yes / No / NA Micro Side: _____ Gear Side: _____
10.73	Damper Gate Rotor Support Float has been checked? (Applicable to the Vilter VSS)	Yes / No / NA Micro Side: _____ Gear Side: _____

This Pre-startup Safety Review Checklist has been Completed by: _____

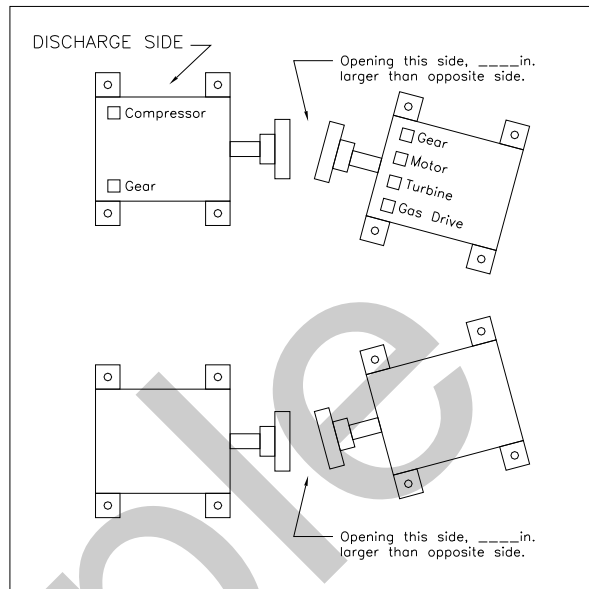
Contact Number (____) - _____ - _____

Date: _____

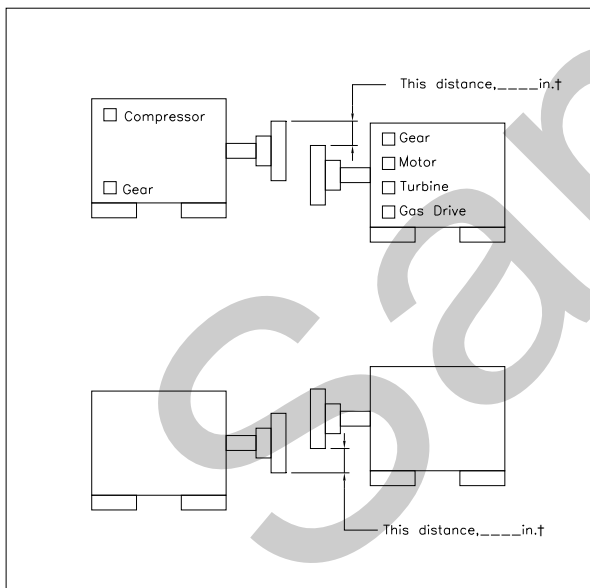
ALIGNMENT REPORT



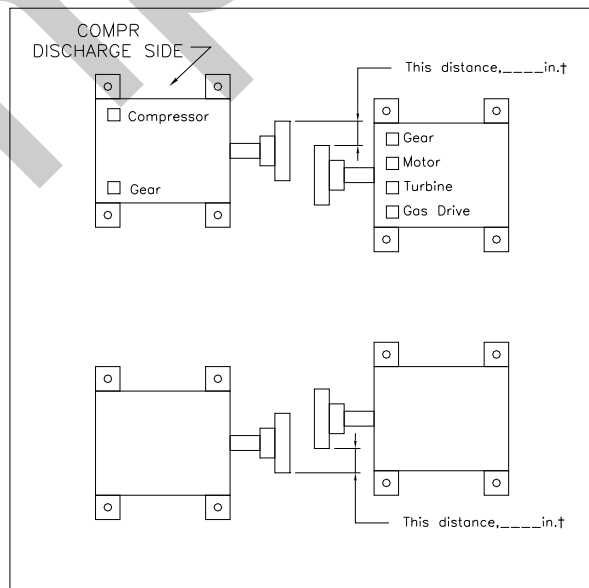
Step 1 – Angular in Elevation*



Step 3 – Angular in Plan*



Step 2 – Parallel in Elevation*



Step 4 – Parallel in Plan*

*Elevation – Side View, Plan – Top View

†Recorded distance in Step 2 and 4 is half of the total dial indicator reading.

INSTRUCTIONS: Check squares to indicate components being aligned. Make separate report for compressor coupling and drive coupling.

11.0 Evaporative Condenser – Description

11.1	Is there an apparent excessive noise or vibration? (readily detectable by the service technician)	Yes / No / NA	
11.2	Are there any refrigerant leaks?	Yes / No / NA	
11.3	Fan operation has been checked.	Yes / No / NA	
11.4	Water nozzles working properly	Yes / No / NA	
11.5	Sump water level correct	Yes / No / NA	
11.6	Bearings lubricated appropriately	Yes / No / NA	
11.7	Mist eliminators are in place	Yes / No / NA	
11.8	Belts are properly aligned	Yes / No / NA	
11.9	Belts are in good working condition	Yes / No / NA	
11.10	Head pressure control settings	Yes / No / NA	
11.11	Motor rotation has been checked and marked.	Yes / No / NA	
11.12	Assure man ways are closed and secured.	Yes / No / NA	
11.13	Fan guards are in place.	Yes / No / NA	
11.14	Condenser is adequately anchored and supported.	Yes / No / NA	
11.15	Bollards or other protective guarding is installed to protect the condenser from vehicular traffic.	Yes / No / NA	
11.16	Are catwalks or other means of access for maintenance and emergency isolation installed (or available).	Yes / No / NA	
11.17	Properly sized hydrostatic or pressure relief protection is installed.	Yes / No / NA	
11.18	Sump water has been tested	Yes / No / NA	
11.19	Coils are clean, free of corrosion, and free of white rust? (to an extent allowed by safe operation)	Yes / No / NA	
11.20	Expansion Valve is functional?	Yes / No / NA	Type: _____ Set point: _____
11.21	Hand Expansion Valve is functional?	Yes / No / NA	Type: _____ Set point: _____
11.22	Suction Regulator is functional?	Yes / No / NA	Type: _____ Set point: _____
11.23	Hot gas regulator is functional?	Yes / No / NA	Type: _____ Set point: _____
11.24	Purge solenoid valves are functional?	Yes / No / NA	Type: _____ Set point: _____
11.25	Solenoid valves are functional?	Yes / No / NA	Type: _____ Purpose: _____ Set point: _____

11.0 Evaporative Condenser – Description

11.26	Reheat regulator is functional?	Yes / No / NA	Type: _____ Set point: _____
11.27	Space thermostat is functional?	Yes / No / NA	Type: _____ Set point: _____
11.28	Fan control is functional?	Yes / No / NA	Type: _____ Set point: _____
11.29	Sump heaters are functional?	Yes / No / NA	Type: _____ Set point: _____
11.30	Motor Load Current functional?	Yes / No / NA	Type: _____ Set point: _____
11.31	Correct timing and function of defrost control has been verified?	Yes / No / NA	
11.32	All strainers have been cleaned?	Yes / No / NA	
11.33	Drain pan / sump basin has been cleaned?	Yes / No / NA	
11.34	Fan / blower assembly has been cleaned?	Yes / No / NA	
11.35	Air intake screen has been cleaned?	Yes / No / NA	
11.36	Spray nozzles have been cleaned?	Yes / No / NA	
11.37	Fan / blower bearings have been lubricated?	Yes / No / NA	
11.38	Fan / blower motor bearings have been lubricated?	Yes / No / NA	
11.39	Local condenser pump controls have been set and are functional?	Yes / No / NA	Type: _____ Set point: _____
11.40	Remote condenser pump controls have been set and are functional?	Yes / No / NA	Type: _____ Set point: _____
11.41	Belts and sheaves have been inspected and are functional?	Yes / No / NA	
11.42	Electrical wiring has been inspected and is functional?	Yes / No / NA	
11.43	Electrical connections are tight?	Yes / No / NA	
11.44	Fan motor contactor / starter has been inspected and is functional?	Yes / No / NA	
11.45	Coil has been checked and is clean (reasonably clean for the age of the condenser)	Yes / No / NA	
11.46	Space thermostats have been calibrated?	Yes / No / NA	
11.47	Dampers and linkages have been checked and are functional?	Yes / No / NA	
11.48	Pressure gauges are installed and calibrated?	Yes / No / NA	
11.49	Pressure transducers are installed and calibrated?	Yes / No / NA	
11.50	Temperature Thermocouples are installed and calibrated?	Yes / No / NA	

11.0 Evaporative Condenser – Description

11.51 Has the settings of the operating controls been verified?	Yes / No / NA	
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This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - ____ - ____

Date: _____

Sample

12.0 Pump – Description

12.1	Oil reservoir is filled.	Yes / No / NA	
12.2	Reservoir safety switch functions	Yes / No / NA	
12.3	Pump controls function.	Yes / No / NA	
12.4	Motor rotation has been checked and marked.	Yes / No / NA	
12.4	All exposed rotating components (e.g. shafts, belts, pulleys, flywheels, couplings) are protected with guards	Yes / No / NA	
12.5	Pump is adequately anchored and supported.	Yes / No / NA	
12.6	Bollards or other protective guarding is installed to protect the pump from vehicular traffic.	Yes / No / NA	
12.7	The pump is equipped with a means of visual oil level indication.	Yes / No / NA	
12.8	Properly sized hydrostatic or pressure relief protection is installed.	Yes / No / NA	
12.9	Pump bearings have been lubricated?	Yes / No / NA	
12.10	Pump motor bearings have been lubricated?	Yes / No / NA	
12.11	Mounting bolts have been checked for integrity and tightness?	Yes / No / NA	
12.12	Pump bolts have been checked for integrity and tightness?	Yes / No / NA	
12.13	Alignment has been checked?	Yes / No / NA	
12.14	Water heater controls have been checked and are functional?	Yes / No / NA	
12.15	Pump Sequencing has been checked?	Yes / No / NA	
12.16	Pump operation controls have been checked?	Yes / No / NA	
12.17	Pump shaft seal has been checked?	Yes / No / NA	
12.18	Minimum flow valve setting has been checked and is functional?	Yes / No / NA	
12.19	Pump Heater controls have been checked and are functional?	Yes / No / NA	
12.20	Volute vent valve is open?	Yes / No / NA	
12.21	Water make-up control has been checked and is functional?	Yes / No / NA	
12.22	Refrigerant make-up control has been checked and is functional?	Yes / No / NA	
12.23	Pump rotation has been checked and marked?	Yes / No / NA	
12.24	Freeze stat has been checked and is functional?	Yes / No / NA	
12.25	Pump has been lubricated?	Yes / No / NA	

12.0 Pump – Description		
12.26	Motor bearings have been lubricated?	Yes / No / NA
12.27	Oil has been drained from the pump?	Yes / No / NA _____ Gallons
12.28	Differential Pressure Safety control is installed and functional?	Yes / No / NA
12.29	Actual voltage has been checked?	Yes / No / NA Voltage: _____
12.30	Actual amperage has been checked?	Yes / No / NA Amperage: _____
12.31	Pump Suction pressure has been checked and recorded?	Yes / No / NA Pressure: _____
12.32	Pump Discharge pressure has been checked and recorded?	Yes / No / NA Pressure: _____
12.33	Pump voltage has been checked and recorded?	Yes / No / NA Voltage: _____

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - ____ - ____

Date: _____

13.0 Evaporator – Description		
13.1	Is there an apparent excessive noise or vibration? (readily detectable by the service technician)	Yes / No / NA
13.2	Are there any refrigerant leaks?	Yes / No / NA
13.3	Fans are tested and functional	Yes / No / NA
13.4	Drain heat trace is functioning.	Yes / No / NA
13.5	Drain pan is clean? (reasonable clean for a well maintained system)	Yes / No / NA
13.6	Drain pan is free draining?	Yes / No / NA
13.7	Suction pressure has been set.	Yes / No / NA
13.8	Defrost relief pressure has been set.	Yes / No / NA
13.9	Fan condition has been checked and they are satisfactory?	Yes / No / NA
13.10	Fan belts tension has been set.	Yes / No / NA
13.11	Motor rotation has been checked and marked.	Yes / No / NA
13.12	Fan guards are in place.	Yes / No / NA
13.13	Evaporator is adequately anchored and supported.	Yes / No / NA
13.14	Bollards or protective guarding is installed to protect against traffic hazards.	Yes / No / NA
13.15	Evaporator can be accessed for normal inspection and maintenance.	Yes / No / NA
13.16	An adequate pump-out period been provided before initiating a defrost cycle to ensure that the evaporator is not full of liquid when hot gas is introduced.	Yes / No / NA
13.17	Hot gas is introduced gradually, for example by using a slow, gradual, or stepped opening valve?	Yes / No / NA
13.18	Pressure is gradually bled down before re-opening the main Suction valve.	Yes / No / NA
13.19	Automatic hot gas defrost control valves have been arranged so that abnormal liquid pressure will be relieved during defrost cycles or power failures.	Yes / No / NA
13.20	Coils are clean and free of corrosion	Yes / No / NA
13.21	Evaporator coil is free of ice?	Yes / No / NA
13.22	Evaporator housing and piping is free of excessive ice?	Yes / No / NA
13.23	Superheat setting has been set / verified? (This is applicable to Direct expansion evaporators utilizing superheat)	Yes / No / NA
13.24	Electrical connections are tight?	Yes / No / NA

Setting: _____ ΔT

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - ____ - ____

Date: _____

Sample

14.0 Heat Exchanger – Description		
14.1	Heat exchangers are equipped with pressure relief devices (properly sized and having the proper pressure settings)?	Yes / No / NA
14.2	Heat exchangers are adequately anchored and supported (including piping).	Yes / No / NA
14.3	Bollards or protective guarding is installed to protect against traffic hazards.	Yes / No / NA
14.4	Heat exchangers are can be accessed for normal inspection and maintenance.	Yes / No / NA
14.5	The heat exchanger is equipped with a means of visual liquid level indication.	Yes / No / NA
14.6	Adequate safeguards are in place to prevent freezing of the secondary fluid.	Yes / No / NA
14.7	Gauges and sensors working?	Yes / No / NA
14.8	An adequate pump-out period been provided before initiating a defrost cycle to ensure that the evaporator is not full of liquid when hot gas is introduced.	Yes / No / NA
14.9	Hot gas is introduced gradually, for example by using a slow, gradual, or stepped opening valve?	Yes / No / NA
14.10	Unusual noise or vibration?	Yes / No / NA
14.11	Drain Valves and any valves valved off to atmosphere fitted with plugs or caps?	Yes / No / NA

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - _____ - _____

Date: _____

15.0 Ventilation – Description		
15.1	Ventilation fans have been tested and are operational.	Yes / No / NA
15.2	No excessive noise or vibration	Yes / No / NA
15.3	Equipment Identification Labels installed?	Yes / No / NA
15.4	Ventilators are sized properly and a calculation is on file.	Yes / No / NA
15.5	An alarm is installed should ventilation fail.	Yes / No / NA
15.6	Intake Louvers fail open type.	Yes / No / NA
15.7	The ventilation system can be started from outside the engine room.	Yes / No / NA
15.8	If the machinery room is located in a basement, is the ventilation system operated continuously at the emergency ventilation rate?	Yes / No / NA
15.9	Sail switch or other positive means of alarming if continuous ventilation fans stop?	Yes / No / NA
15.10	Provisions have been made for inlet air to replace the air being exhausted.	Yes / No / NA
15.11	Intake dampers are a fail-open type.	Yes / No / NA
15.12	The openings for air inlets are positioned to avoid intake of discharged air.	Yes / No / NA
15.13	Intake and exhaust points are located to promote mixing and avoid short circuiting of the machinery room air.	Yes / No / NA
15.14	Ventilation system functions properly when the E-Stop button is pressed.	Yes / No / NA
15.15	Do the heaters in the engine room provide adequate heating to cover heat loss and ventilation load	Yes / No / NA

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - _____ - _____

Date: _____

16.0 Pressure Relief System – Description		
16.1	Relief valves are installed and have been verified per the Relief Calculation.	Yes / No / NA
16.2	Relief valve pressure set point has been verified.	Yes / No / NA
16.3	Relief valve capacity has been verified to meet the requirements of the protected equipment.	Yes / No / NA
16.4	Relief valve outlets have been inspected to assure that they relieve in a safe location.	Yes / No / NA
16.5	Relief valve inlet piping is the same size or larger than the relief valve inlet.	Yes / No / NA
16.6	Relief valve discharges are at least 15 above adjoining grade.	Yes / No / NA
16.7	Relief valve discharges are at least 20 feet from any opening into the building such as a window, ventilation opening, or exit.	Yes / No / NA
16.8	Proper diffusers are installed on relief vent outlets.	Yes / No / NA
16.9	Are proper drains installed on the relief valve headers.	Yes / No / NA
16.10	No stop valves are installed in the inlet or outlet of the relief devices (except normally locked open valves in hydrostatic applications).	Yes / No / NA

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Contact Number (____) - _____ - _____

Date: _____

17.0 Site security – Description		
17.1	Critical ammonia equipment and valves enclosed and/or locked so that they are inaccessible to unauthorized personnel.	Yes / No / NA
17.2	Appropriate access control measures (e.g. signs, secure doors and windows, locks, card-based access control systems, and control of gates and docks) have been implemented for employees, contractors, suppliers and visitors?	Yes / No / NA
17.3	Appropriate perimeter protection (e.g. fences, gates, barriers, bollards, and security lighting) has been installed	Yes / No / NA
17.4	Surveillance systems have been implemented.	Yes / No / NA
17.5	Appropriate data protection (e.g. firewalls, virus protection, encryption, user identification and passwords) have been provided to prevent unauthorized computer access.	Yes / No / NA

This Pre-startup Safety Review Checklist has been Completed by: _____

Contact Number (____) - ____ - ____ **Date:** _____