PROCESS SAFETY AND RISK MANAGEMENT

Resource Materials

Volume 2

DUPONT

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Specialty Chemicals
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JOB CYCLE CHECK

JOB CYCLE CHECK

The job cycle check is a cooperative, supervisor-employee analysis of the employee's performance on some part of his or her job.

It is a training tool to ensure that each employee knows correct procedures and uses the right equipment. Results should be

- Safer operations.
- Discovery of hidden hazards.
- Review of standard practice.
- Improvement of efficiency.

These objectives might not be accomplished unless a standardized procedure, such as the job cycle check, is used. Maintaining records of the job cycle check made on each employee will facilitate reviewing the entire job of all employees in a set period of time.

The job cycle check procedure is as follows:

1. The supervisor and the employee review standard practice of the job that will be checked.
2. The supervisor explains to the employee that he or she will observe the employee perform his or her job for the next several minutes in a job cycle check. If this is the employee's first job cycle check, the philosophy and procedure are explained.
3. The supervisor corrects and instructs during the observation cycle.
4. At the end of the cycle, the supervisor and the employee discuss the entire operation. The supervisor solicits suggestions from the employee. There should be mutual agreement that the job can be done as described.
5. The supervisor completes a job cycle write-up.
6. The job checked and the date are entered by the employee's name on an employee training record.

PURGE GAS TREATING–DETAILED OPERATING PROCEDURES AND PARTIAL STANDARD OPERATING CONDITIONS

DETAILED OPERATING PROCEDURE

PURGE GAS TREATING—
START-UP FROM STANDBY CONDITION

1. **Start-Up Purge Gas Stripper**

   1.1 Start aromatic distillate flow to the stripper to be placed in service, per OCs. This must always be done prior to Step C on page 14.

   1.2 Place back pressure controller in service on rich oil tank and set pressure per OCs.

   1.3 Place purge gas stripper pressure controller in service per OCs [VII A-4-11-(OC)] and place purge gas stripper flow controller in service per OCs depending on which column is to be placed in service.

   1.4 Route all unit purges containing comonomers to the stripper.

   NOTE: If purge gas stripper has been warmed by injection of 200 psig steam and contains a steam blanket, the system must be purged with nitrogen for at least two hours prior to return to service. When the stripper contains a nitrogen blanket, introduce ethylene purge at a rate such that stripper pressure does not increase faster than 100 psig per minute. These steps are required to provide an adequate safety margin against a possible ethylene decomposition.

   1.4.1 D Unit and G Unit both have individual 2" headers to the stripper.

   1.4.2 There is a 4" common header from D and G Units to the stripper; however, one unit can come in on the 4" common header and one unit on its individual 2" header.

   1.4.3 If both units are on the 4" header, close the 4" chain valve to the flare at EA-409 and open the 4" chain valve to the stripper on east side of the stripper.

   1.4.4 If both units are on individual 2" headers, close D Unit's 2" chain valve to flare in front of EA-406B and G Unit's 2" chain valve to flare east of EA-151. Open D Unit and

G Unit individual 2" chain valves to stripper on west side of stripper.

1.4.5 C Unit has its own 4" header. There are two ways to route C Unit purge to the system. When C Unit makes copolymers the purge will be routed through the stripper. When C Unit makes homopolymers, the purge will bypass the stripper. This flow is controlled by a switch (229-HS) located in the CCR.

NOTE: When C Unit changes from copolymers to homopolymers, continue to route purge through the stripper for 12 hours to clear header before bypassing the stripper.

1.4.6 When C Unit product has been determined, close C Unit's flare valve and activate 229 HS to the proper position.

1.4.7 The above is for placing purges into the system. To flare the purges, reverse the above valving.

1.4.8 Sometimes there is only one unit purging at a time.

1.4.9 The unit's purges may be routed to Power at chain valves south of Gulf metering station on 5th Street over the ditch.

1.4.9.1 Unit purge should be routed to the flare to depressure the header before routing to Power.

1.4.9.2 Slowly open chain valve to Power. To keep from blowing the relief valve, which is set at 70 psi, close off purge to area flare.

NOTE: The purge gas treating and fractionation system will be started up with the high pressure purges routed to the charge compressor third stage discharge.

1.5 Route rich oil to the return column and then to HAD storage as soon as adequate levels are established in rich oil tank and column base. Vapor from rerun column must be routed to the flare via the relief valve bypass line.

1.6 Start steam flow to rerun feed preheater per OCs.

1.7 Start rerun column tails pump when level builds in rerun tower base.

1.8 Route the rich oil through the rich oil cooler and to HAD storage.

DETAILED OPERATING PROCEDURE

PURGE GAS TREATING—
NORMAL OPERATION AND PERIODIC CHECKS

1. **Purge Gas Stripper**

   1.1 Patrol the purge gas stripping equipment twice per shift for leaks, improper pump operation, or other abnormal conditions.

   1.2 Check the temperature gauge exit the purge gas stripper once per shift.

   1.3 Check the temperature exit the rich oil flash tank once per shift.

   1.4 Check the temperature inlet the lean oil surge tank.

   1.5 Check the levels in lean oil tank, rich oil tank, and in the stripper.

   1.6 Check steam tracing and insulation on rich oil tank for leaks, fallen insulation, etc.

   1.7 Check temperature exit rerun feed preheater once per shift.

   1.8 Check level in rerun tower base.

   1.9 Check level in rerun column surface condenser.

   1.10 Check flow rate for correct setting.

   1.11 Periodically check outlet pressure on top regulator to see if set at 100 psig.

   1.12 Bottom regulator should not operate from oil injection.

DETAILED OPERATING PROCEDURE

PURGE GAS TREATING—
SHUTDOWN TO STANDBY CONDITION

1. **Purge Gas Stripper**

   1.1 Start diverting a portion of the purge gas flow from purge gas knockout drum, FA-1201, to third stage discharge drum, FA-204, by use of FC-1601.

   1.2 Reduce the liquid level in the purge gas storage tank to a minimum.

   1.3 Reduce refrigerant levels in purge gas condenser and purge gas subcooler that will stop condensing the purge gas.

   1.4 Pressure remaining liquid in storage tank to the ethylene fractionator.

   1.5 Route remaining purge gas flow from purge gas knockout drum, FA-1201, to third stage discharge drum, FA-204.

   1.6 Shut down the lean oil circulation pump.

   1.7 Close Light Cycle Oil supply valve (1-1/2") from GA-208.

      1.7.1 Use blocks and bleeds provided to clear system.

      1.7.2 Open high point vent and low point drain to drain system.

      1.7.3 Purge clear with nitrogen.

   1.8 Pressure the contents of the rich oil flash tank to heavy aromatic distillate storage.

   1.9 Purge gas flow continues through stripper and to charge gas system if it does not contain comonomers.

DETAILED OPERATING PROCEDURE

PURGE GAS TREATING—
SHUTDOWN FOR EXTENDED PERIOD OR REPAIRS

This procedure outlines steps to be taken for a complete shutdown of the purge gas treating. Only the portion that applies to repairs need be used. Before certain repairs can be made, the purge recovery propylene refrigeration system and the ethylene refrigeration system must be shut down and properly cleared. See procedures pertaining to these systems for details.

It is important that all liquid hydrocarbons be removed from the column, vessels, and lines before depressuring the equipment. Failure to maintain pressure can result in subcooling equipment, possible equipment damage, and a delay in the clearing operation. This includes all equipment exit the purge gas dryers, through the ethylene fractionator. Equipment should not be completely depressured unless a nitrogen purge is added immediately; otherwise maintain 5-10 psig process pressure on vessel.

Care should be exercised to prevent overloading the flare system during the depressuring operation.

1. **Purge Gas Stripper**

   1.1 Route D and G Unit purges to the flare. When the flare is out of service as during general plant shutdown, then the purges will be routed to the Powerhouse for use as fuel. D Purge will have to be in 4" header or 2" G Unit purge line.

   NOTE: If the charge compressor system is going to be shut down, then C Unit purge will be routed to the flare or Powerhouse, as are D and G Unit purges.

   1.2 Isolate the part of the system to be worked on and depressure to the flare.

   1.3 Vent the system to be repaired to the flare and purge system per Shutdown Clearing Procedure Series 024.

   1.4 After clearing, isolate equipment from the flare, vent to atmosphere and tag the system following Safety Procedure No. 5.

2. **Caustic Tower**

2.1 Valve off wash water to caustic tower.

2.2 Shut down caustic circulating pump.

2.3 Pressure liquid from base of tower to Distillate Recovery System.

2.4 Pressure liquid from water knockout drum.

2.5 Depressure purge gas knockout drum, caustic tower, water knockout drum, and dryer at relief valve on dryer.

2.6 Valve off water flush on level instrumentation.

2.7 Water wash caustic tower.

2.7.1 Manually close water section level control valve. This will allow water to overflow in upper section of tower, flowing into the base washing the caustic section trays.

2.7.2 Open water wash valve to caustic tower.

2.7.3 Continue until base level is 90%.

2.7.4 Drain base level to spent caustic dumpster or milk truck or to sewer drain if Distillate Recovery System is being pumped to 27-acre pond.

2.7.5 Repeat wash flush in Step 2.

2.8 Nitrogen purge caustic system, purge gas knockout drum and water knockout drum per Shutdown Clearing Procedure No. 34. The system is free of caustic but still contains some hydrocarbon gases and will require purging before opening for maintenance or inspection.

3. **Purge Gas Dryers**

NOTE: Isolate both dryers when the purge system is down.

3.1 Close and tag process inlet and exit guard valves. Open atmospheric bleed between double block valves.

DETAILED OPERATING PROCEDURE

PURGE GAS TREATING— OPERATING DIFFICULTIES AND ABNORMAL CONDITIONS

1. **Purge Gas Stripper**

1.1 High level in rich oil tank. This problem occurs when the units do not remove the comonomers from the purge gas stream.

1.1.1 Call D and G Units to see if their liquid removal facilities are operating correctly and if they can reduce the comonomers in the purge gas.

1.1.2 Open bypass around level control automatic until level can be reestablished.

1.2 Temperature of aromatic distillate exit the rich oil flash tank exceeds value specified by OCs. This off-standard condition can cause undesirable quantities of comonomers to enter the purge gas treating system. It will result from an inadequate supply of aromatic distillate. The following steps should be taken:

1.2.1 Check the lean oil circulating pump to be sure that it is operating properly. Switch to the spare pump if necessary.

1.2.2 Check bypass valves to be sure they are closed and heavy aromatic distillate is not flowing directly to storage.

1.3 Freezing of aromatic distillate in rich oil tank. Turn on rich oil tank steam tracing.

1.4 Inlet purge gas temperature drops below OCs alarm point. Route purges, which were passing through purge gas stripper, to the flare until temperature exceeds 5°C.

1.5 Loss of purge gas stripper base level. Route purges to flare. Check temperature of inlet purge gas. If it is below OCs, check that low density synthesis units are injecting methanol to eliminate possible hydrate plug. Warm up stripper and attempt to reestablish base level.

NOTE: If system is warmed with steam, it must be purged with nitrogen for at least two hours prior to return to service. Ethylene purge must be introduced at a rate such that stripper pressure does not increase faster than 100 psig per minute.

1.6 If stripper stays out of OCs and attempts fail to reestablish OCs, switch purge gas strippers.

2. **Caustic Tower**

2.1 High CO_2 in exit gas, caustic concentration below OCs. Make up caustic to bring concentration back in range.

2.2 Erratic or low caustic circulation. Check pump performance.

2.3 Check carbonate analysis; add water as required.

3. **Dryers**

3.1 Moisture leakage through dryers as indicated by moisture analyzer monitoring the gas exit the primary dryer. See OCs. This is caused by

3.1.1 Molecular sieve not completely regenerated.

3.1.1.1 See VII A-3-11.7 to regenerate.

3.1.1.2 See SOP VII A-3-11.1 to change molecular sieve.

3.2 Dryer being in service past its effective duration.

3.2.1 Remove from service per VII A-3-11.7.

3.3 Pressure increases above normal. A hydrate plug in the purge gas condenser is probably the cause due to the low temperature in this exchanger.

3.3.1 Inject methanol into tube side of exchanger (see VII A-3-21).

NOTE: Block valve in line exit the dryer regeneration gas cooler is to remain locked open at all times. This valve is provided to isolate the dryer regeneration system from the fuel gas system when drying out the plant on original start-up using air.

1.3.2 If pilots are not lit, activate the dryer regeneration heater as follows:

1.3.2.1 Check to see that all burner gas valves and all pilot gas valves are closed.

1.3.2.2 Check to see that temperature control, automatic valve, and 3" bypass block valve are closed.

1.3.2.3 Open 3" guard valves on either side of temperature control automatic and open 3/4" bypass valves.

1.3.2.4 Check explosibility of firebox and area around heater. If not zero (0), allow natural draft to purge combustibles.

1.3.2.5 Engage reset on fuel gas interlock automatic valve. (This bypasses low burner fuel gas pressure interlock and high and low pilot gas pressure interlocks.) While holding reset button, have assistant open each pilot gas valve and light them with pilot torch provided.

NOTE: Pilot gas to converter regeneration heater is supplied from this system and this pilot should be lit after checking explosibility and valving on regeneration heater.

1.3.2.6 Open burner fuel gas valves slowly. If these valves are opened too quickly, flame will blow downward out of firebox, possibly burning operator. **MAKE CERTAIN THAT BURNERS LIGHT.**

1.3.2.7 Establish temperatures specified in OCs with burners in heater.

1.3.2.8 Adjust gas flow, and burner air ports as required to stabilize flame.

1.3.2.9 When exit dryer temperature stabilizes, hold per OCs.

1.3.3 Heat dryer to final holding temperature. See OCs.

1.3.4 Hold this temperature as specified in OCs.

(Procedure continues)

STANDARD OPERATING CONDITIONS

PURGE GAS TREATING AND FRACTIONATION SYSTEM

NO.	ITEM	NORMAL	STANDARD Min.	STANDARD Max.	CRITICAL
A.	**Purge Gas Stripper**				
1.	Purge stripper pressure, psig	440	435	445*	-
2.	Purge gas stripper override DA-152 flow, pph	20,000	-	20,000	-
3.	Purge gas stripper override DA-153 flow, pph	36,000	-	36,000	-
4.	Purge gas stripper override to flare, psig	500	-	500	-
5.	Rich oil flash tank pres., psig	55	20	80	-
6.	Lean oil surge tank exit temperature, °C	30-50	-	-	-
7.	Rich oil flash tank exit temperature, °C	10-30	-	-	-
8.	Rerun column feed preheater steam pressure, psig	25	15	80	-
9.	Rerun column feed preheater exit temperature, °C	60	40	70	-
10.	Rerun column base level, %	40	20	60	-
11.	Rerun column pres., psig		1 (Flare header pressure)		
12.	Purge gas stripper exit gas temperature, °C	33-37	-	-	-
13.	Purge gas stripper exit liquid temperature, °C	5-35	-	-	-

*Override set point—any amount above this will flare.

APPROVAL: _____ _____ _____

Production Technical Date

NO.	ITEM	NORMAL	STANDARD Min.	Max.	CRITICAL
14.	Purge gas stripper inlet gas temperature, °C	6-35	5	150	4.9
15.	Lean oil flow to purge gas stripper				
	A. One unit on G-6, (other unit on G-8, H-2, H-17, C3, H-19, or Homopolymer). Min. pump setting	50% (5 gpm)*		-	-
	B. Increase pump setting if G-6 concentration in rich oil is greater than 12% or is greater than .25 mol% in stripper overhead.**				
16.	G-6 concentration in purge gas stripper tails (rich oil), wt%	8-10	1	12**	30**
17.	G-6 in stripper overhead, mol%	.01-.1	0	.25**	.50**
18.	Purge gas stripper gas flow, pph	2000-7000	1M	20M***	20M
19.	Lean oil stripper tank level, %	40-60	-	-	-
20.	Purge stripper level, %	40-60	-	-	-
21.	Rich oil flash tank level, %	40-60	-	-	-
22.	CO in purge gas stream, pph (Refer to A-4-11-Fig. 1)	-	-	40	40

* A once/shift sample of the purge gas stripper tails for G-6 analysis is required when either one or two units are on G-6.

** If both pumps are on and the G-6 concentration still exceeds 12%, in rich oil or .25 mol% in stripper overhead, increase pump strokes in 5% increments to achieve the standard concentration range. If both pump strokes are 100% and the G-6 concentration exceeds 30%, in rich oil or .50 mol% in stripper overhead, flare all of the incoming purge gas containing the G-6 (normally D-Unit).

*** Override set point—any amount above this will flare.

APPROVAL: _____ _____ _____

Production Technical Date

HEAT PRODUCING PERMIT (HOT WORK)

HEAT PRODUCING PERMIT (HOT WORK)

_____ FLAME
_____ SPECIAL TOOL PERMIT

_____
Date

(Including Heat Producing and Electrical Arcing Devices used in hazardous areas, i.e. saws, drills, electric tools & test equipment, flame devices)

LOCATION OF WORK: _____

DESCRIPTION OF WORK: _____

PERMIT COVERS PERIOD: FROM: Date _____ Time _____

TO: Date _____ Time _____

ASSIGNED TO: Maintenance Supervisor _____ Number of nearest

Construction Supervisor _____ Fire Alarm Box _____

JOB COMPLETED: Date _____ Time _____ Signature _____

FINAL OPERATIONS CHECK: Date ____ Time ____ Signature _____
(30 minutes after job is completed)

REQUIRED SAFETY PRECAUTIONS (INDICATE WITH YES OR NO BESIDE EACH OF FOLLOWING)

_____ EXPLOSIBILITY TEST 0%
EXPLOSIBILITY TEST:
_____ CONTINUOUS
_____ BEGINNING OF EACH SHIFT WORKED
_____ PRIOR TO JOB
_____ WATER AT JOB
_____ STANDBY FIRE EXTINGUISHER
_____ BARRICADE AREA
_____ SPILL POSSIBILITIES REMOVED
_____ FIRE WATCH (SEE OSHA 1910.252)
_____ FIRE RESISTANT DITCH COVERS
_____ WET DOWN AREA
_____ TARPS (UNDER) OR (AROUND) WORK
_____ POST WARNING SIGNS
_____ WIND DIRECTION PRECAUTION
_____ CLEANING, BOIL OUT, RINSING
_____ ARE CABLE TRAYS PROTECTED
_____ LOCK OUT
_____ HEAT CONDUCTION THROUGH DUCT OR PIPEWALL PREVENTED

_____ PURGING (INERT GAS) (STEAM)
_____ COORDINATE WITH ADJACENT JOBS
_____ SHIELD ARC
_____ CONFINE HOT SPARKS OR CHIPS
_____ CHECK/COVER SEWERS AND DRAINS
_____ GROUND ATTACHED TO EQUIPMENT
_____ IF WITHIN 10 FEET OF EXHAUST DUCT, LOCK FAN IN OFF POSITION, IF FAN CANNOT BE STOPPED, COVER INTAKE TIGHTLY WITH NON-FLAMMABLE MATERIAL
_____ TEST DATE AT BOTTOM OF PAGE
_____ STOP WORK IF FUME RELEASE OCCURS
_____ SMOKING PERMITTING IN DESIGNATED AREA
_____ LOOP AND TAPE ELECTRICAL CONNECTIONS
_____ COMBUSTIBLE ON FLOOR REMOVED TO 35' RADIUS
_____ WHERE SPRINKLERS PROVIDED THEY ARE FUNCTIONING

WORK MUST NOT BE STARTED UNTIL ALL PRECAUTIONS ARE MET

PROPRIETARY SUPERVISION:

Supervisor _____
Sht./Sr. Supr. (PID)
_____

CONSTRUCTION SUPERVISION:

Supervisor _____
Sht./Sr. Supr. (PID)
_____

MAINTENANCE SUPERVISION:

Foreman _____

Engineer _____

THE EXPLOSIBILITY TEST AND SAFETY CHECK TO INSURE ALL PRECAUTIONS ARE ME MUST BE VERIFIED BY OPERATING SUPERVISOR AT THE TIME WORK IS TO BEGIN

___ EXPLOSIBILITY TEST ____% DATE _____ TESTED BY _____
___ EXPLOSIBILITY TEST ____% DATE _____ TESTED BY _____
___ EXPLOSIBILITY TEST ____% DATE _____ TESTED BY _____
___ EXPLOSIBILITY TEST ____% DATE _____ TESTED BY _____
___ EXPLOSIBILITY TEST ____% DATE _____ TESTED BY _____

___ SAFETY PRECAUTION CHECK: DATE _____ CHECKED BY _____
___ SAFETY PRECAUTION CHECK: DATE _____ CHECKED BY _____
___ SAFETY PRECAUTION CHECK: DATE _____ CHECKED BY _____
___ SAFETY PRECAUTION CHECK: DATE _____ CHECKED BY _____
___ SAFETY PRECAUTION CHECK: DATE _____ CHECKED BY _____

1. Construction or Maintenance supervisor doing the job will insure all required safet precautions have been taken. He will sign under Maintenance or Construction and deliver the permit form to the proprietary area day supervisor, shift supervisor, or supervisor responsible. (This assurance and authorization must be made within two working hours prior to starting.)

2. The responsible operating supervisor or his designate will by verify by inspection that all precautions have been met and the supervisor will authorize, by signature, under proprietary supervision not more than 1/2 hour prior to starting a job.

3. After the job is completed and the 30 minute check has been made, the completed flame and special tool permit form is to be turned over to the day supervision in th area in which the work was done.

4. This permit does not relieve the group doing the work from responsibility of watching for and correcting any hazard which may develop during the progress of the job.

5. Any deviations from the above procedure must be covered by written procedure in the area involved.

6. Senior Supervisor (PD) authorization is required for open flame, burning or welding. Special tool permits are authorized by proprietary supervisor of the area.

7. The number of the nearest fire alarm box should be written in the specified blank.

VESSEL ENTRY PERMIT

VESSEL ENTRY PERMIT

DESCRIBE WORK AREA, WORK TO BE DONE, AND EQUIPMENT AFFECTED BY THE WORK

SCHEDULED START _____ A M / P M
DAY DATE TIME

SCHEDULED FINISH _____ A M / P M
DAY DATE TIME

MECHANICAL GROUP OR CONTRACTOR FIRM _____

TYPE OF HAZARDOUS WORK

COMBUSTION HAZARDS

WELDING _____ BURNING _____ OPEN FLAME _____

SPARK PRODUCING

CHIPPING _____ GRINDING _____ DRILLING _____

ELECTRICAL _____ OTHER _____

OTHER HAZARDS

- ☐ TOXIC MATERIAL _____
- ☐ CORROSIVE MATERIAL _____
- ☐ FLAMMABLE MATERIAL _____
- ☐ SPILLED MATERIAL _____
- ☐ HOT EQUIPMENT OR PROCESS _____
- ☐ ELECTRICAL CLOSE CLEARANCE
- ☐ DISCONNECT AND BLANK
- ☐ UNPLUGGING LINES AND EQUIPMENT
- ☐ RADIOACTIVE EQUIPMENT
- ☐ WELDING AND CUTTING
- ☐ TIGHTENING JOINTS UNDER PRESSURE
- ☐ ENTERING CLOSED SPACES
- ☐ CHEMICAL AND JET CLEANING
- ☐ WORKING ON UNGUARDED EQUIPMENT
- ☐ ADJACENT PROCESSES SHUT DOWN
- ☐ WELDING UNDER PRESSURE
- ☐ DRAINS, SUMPS
- ☐ WELDING ON VESSEL OR ENCLOSED SPACE
- ☐ RUNNING UNGUARDED EQUIPMENT
- ☐ _____

SAFETY PREPARATIONS

PERSONAL SAFETY

- ☐ PROTECT AGAINST _____
- ☐ FRESH AIR BLOWER SIZE _____
- ☐ FRESH AIR MASK
- ☐ SCOTT AIR PAK
- ☐ DUST RESPIRATOR
- ☐ COVERALLS
- ☐ SAFETY SHOWER
- ☐ ACID SUIT
- ☐ ACID HOOD
- ☐ FACE SHIELD
- ☐ CHEMICAL GOGGLES
- ☐ TELEPHONE
- ☐ LOCATION OF ADDITIONAL ASSIST
- ☐ _____
- ☐ EVACUATION INSTRUCTIONS
- ☐ TWO ESCAPE ROUTES
- ☐ LIFELINE HARNESS
- ☐ LIFELINE BELT
- ☐ ACID-PROOF LIFELINE
- ☐ RUBBER GLOVES
- ☐ RUBBER BOOTS
- ☐ RAIN CLOTHES
- ☐ SKIN CREAM
- ☐ EAR PROTECTION
- ☐ CLOTH NECK COVERING
- ☐ FIRE ALARM BOX
- ☐ ESCAPE LADDERS

REMARKS _____

ISOLATE EQUIPMENT

- ☐ STOP TRANSFERS
- ☐ TAG AND LOCK
- ☐ DISCONNECT AND BLANK
- ☐ POST WORK SIGNS
- ☐ ROPE OFF WORK AREA
- ☐ ERECT BARRICADE
- ☐ BLOCK ROADWAY
- ☐ PROTECT AGAINST EXTERNAL HAZARDS

ELECTRICAL SAFETY

- ☐ LOCKOUT CIRCUITS
- ☐ PULL FUSES
- ☐ ELECTRICAL TRACING
- ☐ LIFEGUARD
- ☐ EXPLOSION-PROOF EQUIPMENT
- ☐ SPARK-RESISTANT TOOLS
- ☐ SPARK CONTAINERS AND SHIELDS
- ☐ WELDING-ARC PROTECTION
- ☐ GROUND FAULT INTER PROPER GROUNDING

CLEAN EQUIPMENT

- ☐ STEAM _____
- ☐ FILL AND DRAIN _____
- ☐ REMOVE DEPOSITS _____
- ☐ LEAK INSP _____
- ☐ VISUAL INSP _____
- ☐ NEUTRALIZE CONTENTS _____
- ☐ _____
- ☐ _____

FIRE SAFETY

- ☐ AREA ALARM NO _____
- ☐ FIRE HOSE LAID OUT
- ☐ WATER HOSE RUNNING
- ☐ STEAM HOSE BLEEDING
- ☐ KEEP AREA WET
- ☐ COVER SEWER OPENINGS
- ☐ CO2 EXTINGUISHER
- ☐ DRY POWDER EXTINGUISHER
- ☐ FLAME RETARDANT BLANKET

☐ SPECIAL FIRE WATCH REQUIREMENTS

GAS TESTS

SPECIFY FREQUENCY IN HOURS BETWEEN TESTS IN BLOCKS BELOW. IF START ONLY MARK "S" IN BLOCK. MARK "C" FOR CONTINUOUS MONITOR. TURN AUXILIARY AIR OFF FOR TESTS.

	LOCATION	EXPLOSIBILITY	O_2	AUTHORIZED GAS TESTER	REMARKS
TEST IN AREA		☐	☐	☐	☐
TEST IN EQUIPMENT		☐	☐	☐	☐
		☐	☐	☐	☐

AUTHORIZATIONS

PRODUCTION SUPERVISOR IS TO DESIGNATE AUTHORIZATION REQUIRED OTHER THAN HIS/HER OWN

- ☐ PROD SUPV _____
- ☐ MECH SUPV _____
- ☐ [illegible] AREA SUPV _____
- ☐ MAINT AREA SUPV _____
- ☐ SUPT _____

WORK PERMIT IS VALID FROM _____ A M / P M
DAY TIME DATE

READ AND INITIALED BY:

MECHANICAL _____

PRODUCTION _____
(DESIGNATED PERSONNEL FOR THE JOB)
AT START OF WORK _____
AS STANDBY PERSON _____

IN CASE OF TROUBLE _____

A M / P M TO _____
DAY TIME DATE

INITIAL ENTRY OR OPENING OF EQUIPMENT AND PIPELINES

INITIAL ENTRY OR OPENING OF EQUIPMENT AND PIPELINES

BACKGROUND

The initial act of entering into or opening pipes or equipment can present a severe injury potential due to the hazardous nature of materials, high pressures, and high temperatures. To prevent injuries, specific procedures should be developed and each case evaluated by supervision.

Every effort should be made to make the job safe before authorization is given for breaking into equipment. This should include draining hazardous materials, isolating the work area by locking and tagging, relieving pressures, cooling hot materials, providing special shielding, and thoroughly checking each aspect of the job.

Regardless of how thoroughly the job is prepared, it must be assumed that a hazardous condition exists during the initial entry or opening of the equipment. Some organizations may require full body protection for all initial entries or openings when personnel are exposed to the more hazardous materials. Other organizations require that the selection of personal protective equipment be based on the hazards of the materials, the condition of the equipment or magnitude of exposure, and injury potential.

These conditions could include a system that

1. Is isolated, drained, and/or vented, flushed, purged, or evacuated.
2. Is isolated, drained and/or vented, and residual material is present.
3. Is isolated, not drained and/or vented, and residual material and/or pressure is present.
4. Is not properly isolated or where the isolation is in doubt.

Some organizations require the work, protective equipment, and precautions for conditions 1 and 2 to be approved by first-line supervision, while second-line supervision usually approves conditions 3 and 4, since the risks are greater.

For some products, such as 30 percent acetic acid, the personal protective equipment for condition 1 situation may be chemical goggles and rubber gloves; but a full acid suit would be required for condition 4. A more hazardous material, such as 50 percent caustic soda, would probably require a full acid suit for conditions 1 through 4. Preparation of a matrix listing the

required personal protective equipment based on the factors listed above for the products handled on a site is suggested.

GENERAL

A. Landlord supervision is responsible for

- Approving the work.
- Isolating the point of work.
- Tagging all isolation, drain, and vent points (valves, blanks, couplings, etc.). Locking of valves is recommended.
- De-energizing all powered equipment between the isolation points, such as pumps, compressors, turbines, steam or electric tracing on pipelines. De-energizing equipment shall be in accordance with applicable lock, tag, clear, and try procedures.
- Removing the locks and tags after maintenance work is complete.

B. Landlord supervision and supervision of those performing the work are responsible for

- Jointly approving the work and the precautions to be taken.
- Agreeing on the level of personal protective equipment required, based on the condition of the equipment and product hazards, as noted earlier.

C. Employees performing the work are responsible for

- Knowing where the system is isolated, drained and/or vented, flushed and/or purged or evacuated.
- Locking and tagging all sources of energy between isolated points, and locking and tagging in the proper position all isolation, drain, and vent points as specified by landlord supervision.
- Providing protection as necessary to prevent exposing other personnel to sprays, fumes, or residual contact. Considerations should be given to volume/pressure of suspect contained material and height at which the work is being performed.
- Locating and testing the nearest safety shower before breaking into lines. If the job requires an acid suit and the shower is more than 50 feet away, some other source of flowing water must be provided.

- Deciding on an escape route to use in case of an unexpected or uncontrollable material release or flash fire.

- Wearing at least the minimum protective equipment specified by procedures, or additional equipment as directed by their supervision. Standby personnel, where required, or observers must have immediately available or wear the same protective clothing as the person(s) doing the job, and be prepared to assist in an emergency.

- Containing or cleaning up spills as they occur.

- Standing to the side opposite where the flange is loosened to avoid exposure from unexpected sprays, pressure impacts, or other discharges. Screwed connections must be loosened slowly to release any residual pressure in a controlled fashion. Spread flanges before removing the last bolt(s).

  Specific details for performing this type work are often included in maintenance work procedures.

- Removing the minimum protective equipment after the first break, only after one of the following conditions has been met:

  1. The job has been completed.
  2. A visual check can be made to verify that no hazard exists.
  3. Agreement has been reached on the job between the landlord supervision, employee(s) performing the work, and their supervisor, that there is no possibility of unexpected release of pressure or any other hazards. All must agree.
  4. A standard practice or unusual job procedure has been written and approved for performing a specific job, and the conditions have been specified and met for relaxing the minimum protective equipment requirement.
  5. Openings have been sealed by installing blind flanges, screw caps, plugs, etc.

- Removing their locks and tags when they have completed their part of the job or at the end of the shift, and ensuring that the equipment is safe for operation prior to releasing it to landlord supervision.

DISCUSSION AND EXAMPLES OF MULTIPURPOSE WORK PERMITS

WORK PERMITS

I. PURPOSE

To provide a uniform procedure for obtaining authorization to perform work:

- Requiring special consideration to ensure the safety of personnel, and protection of facilities.
- By groups outside the normal area work force.
- By the construction division and/or off-plant contractors.

II. SUMMARY

This procedure deals with the types of activities requiring a work permit, the method for obtaining a work permit, and the authorization level required.

III. PROCEDURE

A. General

1. Work permits are required for the following specific types of activities:
    a. In Division 1 or 2 and/or "no smoking" areas, all work that may produce heat or sparks.
    b. Work on equipment containing radioactive materials. (IH Procedure No. 19)
    c. Vessel Entry. (S&F Procedure No. 506)
    d. Welding on lines or vessels under pressure.
    e. Excavation. (S&F Procedure No. 510)
    f. Repairing leaks on process and service lines and equipment while in service. (S&F Procedure No. 523)

g. Equipment or material lifts in or near manufacturing areas with mobile cranes and similar equipment.

h. Lifting of personnel in a crane basket. (S&F Procedure No.)

i. Plant road blockage. (S&F Procedure No.)

j. Performing other work that presents a particular or unusual hazard.

2. Work permits are also required by certain specific work groups.

   a. Work groups outside the normal area work force.

   b. Work performed by construction division forces, or off-plant contractors.

3. Figures I and II are shown to identify the forms to be used for permit authorization.

B. Procedure for Obtaining Work Permit (Du Pont Work Force)

1. Supervision or a member of the group performing the work will make the necessary contacts with proprietary supervision concerning the job. Potential hazards and needed precautions should be reviewed.

2. Prior to the time that the work is to be done, the work permit will be filled out in duplicate to show the types of work involved, precautions to be taken, etc. A member of the group doing the job will be responsible for filling out the form. Proprietary supervision will be responsible for determining what job and safety precautions are to be taken.

3. Before the permit is authorized, the authorizer will ensure that all precautions called for on the permit have been taken and so indicate by checking them off on the permit form. The original copy of the signed permit is then given to a member of the group responsible for doing the work. All precautions should be covered by supervision of the employees doing the work. The original copy of the permit must be retained at the job site, with the carbon copy retained by the proprietary group.

The permit will normally be limited to a particular shift; however, for certain jobs requiring a longer time, a definite time limit longer than eight hours may be specified. In these cases, it will be the responsibility of the member of supervision authorizing the permit to pass this information on to the relieving shift supervision.

4. No blanket permit is to be signed for general work in a number of proprietary areas. Each job requiring a permit must be handled individually. However, one permit can be issued to cover several types of work if all are required to do the specific job. This is to be designated on the permit by crossing out all but those types of work for which the permit is issued. It may be prudent to issue separate permits at times, however, even though all work is needed to complete the same job. This will allow a portion of the work to be performed without authorizing other, perhaps more hazardous work, until later in the job when additional precautions may be needed.

C. Procedure for Obtaining Work Permit (Contractors)

1. Construction Division

   a. All work performed by construction division forces and their contractors and/or subcontractors in or near operating areas and facilities will require a work permit.

   b. The construction foreman will submit a completed work permit form in duplicate on the afternoon before the work is to be performed. The permit must indicate the nature and location of the job and must be signed by the appropriate Du Pont construction engineer.

   c. Proprietary supervision will list on the permit all necessary preparations to be made and precautions to be taken during execution of the work. The permit will not be authorized and turned over to construction until proprietary supervision is satisfied that compliance has been attained for all prerequisites.

d. It shall be the responsibility of the person authorizing the permit for the proprietary group to obtain all necessary clearance from any other operations sections which may be affected by the work.

e. The original copy of the permit will be given to a member of construction responsible for the job. All precautions shall be covered by supervision of the craftsmen performing the work. This copy of the permit will be the construction division's authorization to proceed with the work and must be retained by a member of the work crew or posted on a work permit board in the vicinity of the work.

f. It is the joint responsibility of the proprietary and construction groups to see that the conditions agreed upon are maintained until the work is completed or the work is stopped immediately when conditions change.

g. The permit will be limited to authorization for specific work on the specific date. However, with the agreement of both proprietary and construction supervision, longer time limits may be authorized and so noted on the permit form.

2. Off-Plant Contractors

a. The group requisitioning contractors to do work on the site shall be responsible for initiating work permits. This includes groups such as hydroblasters, acid cleaning groups, outside mechanical contractors, etc.

b. The procedure for obtaining contractor work permits is the same as that used for the plant work force. (Section II)

3. Contract Maintenance

a. The supervision of the contract maintenance group ("Pink Hats") shall be responsible for initiating work permits when permits are required to do specific work.

b. The procedure for obtaining work permits for this group is the same as the procedure used for the construction division. (Section III)

D. Permit Authorization

1. The proprietary superintendent is responsible for authorization of all permits. This procedure provides flexibility by allowing authorization to be delegated in some cases. This delegation in no way relieves the superintendent of his or her responsibility to maintain control of all work and to ensure that it is done safely.

2. The proprietary superintendent in each division is responsible for determining and issuing written requirements, within the limits of this procedure, describing the criteria for delegation. Such requirements will be retained in the appropriate manuals for each division.

E. Minimum Levels of Authorization (See V. Exemptions)

1. Area Superintendent

   The proprietary area superintendent is the minimum level of authorization for the following work permits. On nights, weekends, and holidays, the chief shift supervisor may authorize permits after consulting with the area superintendents or their supervision.

   a. Leak repair under pressure. (S&F Procedure No. 523)

   b. Vessel entry. (S&F Procedure No. 506)

   c. Excavation (Duration Permit). (S&F Procedure No. 510)

   Authorization for the following permits may be delegated to a proprietary supervisor. This delegation of authority must be made formally within the requirements set forth by the proprietary superintendent.

   a. Burning

   b. Welding

   c. Open flame

   d. Melt pot

   e. Excavation. Daily area superintendent must authorize duration permits.

2. Proprietary Supervisor

The proprietary supervisor is the minimum level of authority for the following work permits:

a. Grinding

b. Drilling (where all work is exposed)

c. Chipping

d. Hacksaw

e. Impact Tools (spark producing)

f. Drilling or cutting concrete and drilling where all work area is not exposed, such as walls, ceilings, etc. (I/E supervision approval required)

g. Electric tools (nonexplosion-proof)

h. Radioactive sources (plant radiation officer or alternate approval required)

i. Entering Restricted Area

j. Handling

k. Asbestos removal

l. Crane operation

m. Hydroblast

n. Acid cleaning

o. Work in a crane basket (rigging supervisor approval required) (S&F Procedure No.)

3. Detail Proprietary Supervisor

A qualified operator, temporarily relieving the regularly scheduled proprietary supervisor, may authorize permits following the same guidelines as the proprietary supervisor. This delegation must be made formally within the requirements set forth by the proprietary superintendent.

4. Process Operator

   Authorization for the following permit may be delegated to a qualified process operator. This delegation of authority must be made formally within the requirements set forth by the proprietary superintendent.

   - Motorized Equipment

5. The following special kinds of work will require additional approval as indicated. This approval should be obtained prior to taking the permit to the authorizer.

   a. Drilling, cutting, or chipping concrete and drilling where all the work is not exposed, such as ceilings, walls, etc. (I/E supervision)

   b. Excavation (Proprietary I/E supervisor and the excavation researcher). In the absence of the excavation researcher, the area superintendent—engineering or the plant services superintendent may approve the duration permit. The plant services superintendent will issue appropriate guidelines for the delegation of permit authorization.

      When the work in (a) and (b) extends over a number of days, the daily permit may be approved by the proprietary supervisor without the additional signatures as long as the scope of the work does not change.

   c. Radioactive material (plant radiation officer or alternate).

   d. Crane basket procedure (rigging and field mechanical supervisor).

IV. EMERGENCIES

In case of any emergency on the plant, all work permits are automatically canceled. Permits must be reauthenticated before work can be resumed. Initials of authorizing supervision, date, and time should be shown on reauthenticated permit.

It should be recognized that failure to show strict attention to the above rules can result in cost by delays to work or result in employees working under hazards that can be avoided.

V. EXEMPTIONS

In special instances, the proprietary superintendent may delegate this permit authorization responsibility beyond the limits of this procedure to a specified individual or individuals.

1. This delegation must be done formally.
2. The individual(s) being delegated must be named.
3. The scope of the delegation must be specified.
4. A length of time must be specified.

The area specialist can provide the minimum level of authorization described under permit authorization Section V, when delegated by the proprietary superintendent.

Figure 1

PLANT WORK PERMIT

REQUESTED BY _____

)RK GROUP _____

ERE _____

TE/TIME: START _____ EXPIRES _____

)RK DESCRIPTION _____

_____

_____

ECIAL EQUIPMENT OR PROCEDURE

ducing	Spark Producing	Other
____ Burning	_____ Grinding	_____ Radioactive Sources
____ Welding	_____ Drilling	_____ Leak Repair Under Pressure
____ Open Flame	_____ Chipping	_____ Enter Restricted Area
____ Melt Pot	_____ Hacksaw	_____ Vessel Entry
____ _____	_____ Impact Tools	_____ Excavation
	_____ Concrete Cutting or Drilling	_____ Asbestos Removal
	_____ Nonexplosion-Proof Electrical	_____ Crane Operation
	_____ Motorized Equipment	_____ Work in Crane Basket
	_____ _____	_____ Road Blockade
		_____ Handling
		_____ _____

AFETY AND JOB REQUIREMENTS AND PRECAUTIONS

Req.	Field Check		Req.	Field Check	
____	_____	Dedicated Air Supply			
____	_____	• Explosibility Freq. _____	_____	_____	Gloves, Goggles, Faceshield, Ear Protection
____	_____	• Standby Man	_____	_____	• Safety Belt, Harness, Wristlets
____	_____	Fire Extinguisher _____ (Type)	_____	_____	• Lifeline
____	_____	Spark Protection (Shields)(Ditch) (H_2O Hose)	_____	_____	Blower
____	_____	• Oxygen _____ (Freq.)	_____	_____	Acid Suit
____	_____	• Toxic/Hazardous Mat'ls _____	_____	_____	• Horn (Alarm)
____	_____	_____ (Freq.)	_____	_____	• Elec. Voltage Req. _____
____	_____	• Type 1 Breathing System	_____	_____	Contractor Orientation
____	_____	Breathing Air			Additional Identification and/or Protection of Piping and Equipment
____	_____	Barricade Area, Post Warning Signs			

• REQUIRED FOR VESSEL ENTRY, REVIEW S & F PROCEDURE #20

DITIONAL INSTRUCTIONS: _____

_____

_____

_____

THORIZED BY: _____ TITLE: _____

HERS (AS REQ.) _____ I & E Supervision

_____ Chief Draftsman

_____ Radiation Officer

_____ Construction Engineer

SSEL ENTRY PERMITS AND SIGN-IN SHEETS MUST BE POSTED AT VESSEL'S ENTRY POINT AND RETURNED TO PROPRIETARY SUPERVISOR AT ORK END.

RMIT IS VOID WHEN EMERGENCY ALARM IS SOUNDED: MUST BE RE-AUTHORIZED PRIOR TO RE-STARTING WORK.

Figure 2

CONSTRUCTION
PLANT WORK PERMIT

REQUESTED BY _____

WORK GROUP _____

WHERE _____

DATE/TIME: START _____ EXPIRES _____

WORK DESCRIPTION _____

_____

_____

SPECIAL EQUIPMENT OR PROCEDURE

Producing

_____ Burning
_____ Welding
_____ Open Flame
_____ Melt Pot
_____ _____

Spark Producing

_____ Grinding
_____ Drilling
_____ Chipping
_____ Hacksaw
_____ Impact Tools
_____ Concrete Cutting or Drilling
_____ Nonexplosion-Proof Electrical
_____ Motorized Equipment
_____ _____

Other

_____ Radioactive Sources
_____ Leak Repair Under Pressure
_____ Enter Restricted Area
_____ Vessel Entry
_____ Excavation
_____ Asbestos Removal
_____ Crane Operation
_____ Work in Crane Basket
_____ Road Blockade
_____ Handling
_____ _____

SAFETY AND JOB REQUIREMENTS AND PRECAUTIONS

Req.	Field Check		Req.	Field Check	
_____	_____	• Explosibility Freq. _____	_____	_____	Gloves, Goggles, Faceshield, Ear Protection
_____	_____	• Standby Man	_____	_____	• Safety Belt, Harness, Wristlets
_____	_____	Fire Extinguisher _____ (Type)	_____	_____	• Lifeline
_____	_____	Spark Protection (Shields)(Ditch) (H_2O Hose)	_____	_____	Blower
_____	_____	• Oxygen _____ (Freq.)	_____	_____	Acid Suit
_____	_____	• Toxic/Hazardous Mat'ls _____	_____	_____	• Horn (Alarm)
_____	_____	_____ (Freq.)	_____	_____	• Elec. Voltage Req. _____
_____	_____	• Type 1 Breathing System	_____	_____	Contractor Orientation
_____	_____	Breathing Air			
_____	_____	Barricade Area, Post Warning Signs			

• REQUIRED FOR VESSEL ENTRY. REVIEW S & F PROCEDURE #20

ADDITIONAL INSTRUCTIONS: _____

_____

_____

_____

AUTHORIZED BY: _____ TITLE: _____

OTHERS (AS REQ.) _____ I & E Supervision

_____ Chief Draftsman

_____ Radiation Officer

_____ Construction Engineer

VESSEL ENTRY PERMITS AND SIGN-IN SHEETS MUST BE POSTED AT VESSEL'S ENTRY POINT AND RETURNED TO PROPRIETARY SUPERVISOR AT WORK END.

PERMIT IS VOID WHEN EMERGENCY ALARM IS SOUNDED: MUST BE RE-AUTHORIZED PRIOR TO RE-STARTING WORK.

SAMPLE PPE MATRIX FOR INITIAL PROCESS ENTRY

SAMPLE PPE MATRIX FOR INITIAL PROCESS ENTRY

SYSTEM	QUALIFIED OPERATOR PRESENT	PRODUCTION FLS PRESENT OR DELEGATE	STANDBY FOR WORK GROUP	CHEMICAL GLOVES AND GOGGLES	FULL ACID SUIT	BREATHING AIR MASK	RESPI-RATOR	EXEMP-TION	REMARKS
OP 1 & OP 1A									
NVR	●				●			1	
Versene	●			●					
Phosphate	●			●					
Span 85	●			●					
Cobalt Catalyst	●			●					
Chromium Catalyst	●			●					
Absorbent Oil	●			●					
Class "A" Waste	●				●			1	
Caustic	●				●				
Hydrogen	●			●					
Cyclohexane	●				●			1	
KA	●				●			1	
Scrubber Off Gas	●			●					
NaOH/KMn	●				●			1	
OP 2-4									
ADBA	●				●		●	1	
Nitric Acid	●	●	●		●	●		3	
Betz 10K	●			●					
Class "B" Waste	●				●			1	
Nitric Oxides	●	●	●		●	●			
Chlorine	●	●	●	●		●			
AA Solution	●				●			1	
COMMON									
Air Above 60 C	●			●				2	
Water Above 60 C	●				●			2	
Steam Condensate	●				●			2	
Steam	●				●			2	
Nitrogen	●			●				2	
Cesco ND 255	●			●					
Acid Wash Solution	●				●			1	

Notes: o For process instruments inside manifold valves which are continually N2, air or water purged, rubber gloves and goggles are required for worker. For service (steam, H2O, air, N2 and CH4) instruments, leather gloves and goggles are the minimum requirement. No standby is required for these instruments.

o Rescue is the primary function of the standby person who may be anyone able to perform the rescue function. The standby person will wear the same safety equipment as the person making the first break. However, the standby person may hold the hood and respiratory protection equipment in their hand rather than wearing it.

EXCEPTIONS: 1) For systems that are depressurized, flushed with water, drained and cooled to the touch (60°C or less) minimum safety requirement is rubber gloves and coverall goggles.
2) For systems that are depressurized, drained and cooled to the touch (60°C or less), the minimum safety requirement is leather gloves and coverall goggles.
3) For pumps in nitric or HCl service, the work group standby and respiratory protection for the worker are not required for the first break if water is observed flushing through the pump and the pump is drained immediately prior to the break. This check must be made by production FLS, or delegate, and person making the break.

CONFINED SPACE ENTRY

PERMIT-REQUIRED CONFINED SPACE ENTRY PROCEDURE

SCOPE

This procedure contains the basic rules to protect personnel from the hazards of entry into permit-required confined spaces (PRCS). Common hazards include oxygen deficiency, flammable vapors, toxic substances, difficulty in escaping, rotating parts, and electrical shock. Examples of PRCS include tanks, vessels, certain pits, ditches, sewers, excavations, and vessel support skirts. Entry will be allowed only after compliance with the specific policies of this procedure.

To assist individuals in their efforts to determine which protection systems are required for various confined space conditions, a decision matrix has been included at the end of this procedure.

DEFINITIONS

A **confined space** is a location that

- Is large enough and so configured that an employee can enter and perform assigned work.
- Has limited or restricted means for entry or exit.
- Is not designed for continuous employee occupancy.

Examples include

- Tanks, vessels, silos, storage bins, hoppers, vaults, pits, manholes, and ports, including any piping large enough to enter.
- Pits, dikes, ditches, or excavations more than 5-feet deep or pits less than 5-feet deep that require personnel to work with their heads below the rim.

A **permit-required confined space (PRCS or permit space)** is a confined space that has one or more of the following characteristics:

- Contains, or has a potential to contain, a hazardous atmosphere.
- Contains a material that has the potential for engulfing the entrant.

- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section.
- Contains any other recognized serious safety or health hazard.

Examples are tank cars, tanks (open or closed top), and boilers.

A **nonpermit-required confined space (nonpermit space)** is a confined space that does not contain, or have the potential to contain, any hazards except atmospheric hazards, and these hazards are not capable of causing death or serious physical harm (some dikes, most excavations).

Agitated equipment means all vessels or spaces that contain rotating parts.

Permit space entry is the action by which a person passes through an opening into a permit space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

TRAINING

Training must be provided for all employees who

- Authorize entry (landlords).
- Supervise entrants.
- Enter permit spaces.
- Serve on the rescue team.

Refresher training must be conducted at least every 36 months, except for rescue team members, who must have annual training.

NONPERMIT SPACES

Entry into nonpermit spaces must be in accordance with all the provisions of this procedure, except

- A permit is not required.
- The atmosphere inside the space does not have to be tested unless required by other site procedures.

The following spaces have been identified as nonpermit spaces:

- Confined spaces below slurry silos and slurry storage tanks
- Coal conveyor pits
- Water filters at water treatment.

- Water clarifiers at water treatment
- Oxidation flue reservoirs when drained
- Dikes not exceeding 5 feet in height
- Excavations less than 4-feet deep
- Wood-lined trenches deeper than 5 feet

AUTHORIZATIONS

All entries, including nonpermit spaces, require the approval of

- The landlord area manager, or his or her designee.
- The team manager of the personnel making the entry, or his or her designee.

When contract personnel are performing the work, approval must be given by

- The contractor foreman of personnel making the entry, or his or her designee.

Where radiation devices are involved, approval must be given by

- The radiation protection officer (RPO), or one of his or her authorized alternates.

A confined space entry permit (CSEP) must be issued by the landlord before personnel can enter a permit space. (A sample CSEP and its accompanying Atmospheric Monitoring Log are included at the end of this procedure.) Before any work is done, the work must be reviewed with the area manager, or his or her designee. The area manager or designee indicates approval of the work by signing the permit in the appropriate place.

- Each tag is valid for only one shift and should be executed on that shift before starting work.
- Upon completion of the shift or job, the permit must be given to the landlord area manager of the unit by the supervisor (or designee) of the personnel making the entry.
- The permit must be retained for at least 12 months for auditing purposes.
- Audits of the canceled CSEPs should be conducted annually.

SPECIAL CONSIDERATIONS

Landlord supervision and supervision of employees who will work on the job (including contractors) should consult with each other and agree on minimum precautions necessary for safe execution of the job. Rules established for the job must comply with OSHA 1910.146 and must be followed by all employees. *All spaces into which employees must never enter should be identified by permanently posted warning signs.*

Shoring an Excavation

- Excavations 5-feet deep or more must be protected by shoring, be laid back to a stable slope, or have some other means of protection for personnel.
- Trenches less than 5-feet deep must also be protected, either by shoring or by being laid back to a stable slope.
- In average soil where sides of an excavation are sloped, the slope must be at least 1 foot horizontal to every 1 foot vertical. Soil banks must be kept at least 2 feet from the edge of the excavation.

Entry under Vessels Having Support Skirts or Similar Confinements

The space under some columns and other vessels is confined by support skirts, structural steel, or other obstacles.

- Landlord supervision should have a list of all vessels for which entry into this confined space requires use of the Permit-Required Confined Space Entry Procedure. This list should also be included in the area safety rules.
- The vessel skirt or confining obstacles must be labeled "Permit-Required Confined Space—Entry Permit Required."

Responsibilities

1. The landlord area manager is responsible for
    - Ensuring that the vessel has been properly cleaned and prepared for entry.
    - Locking and tagging all power-driven equipment.
    - Ensuring that rotary equipment is secured.
    - Ensuring that the internal moving parts are secured to prevent them from turning.

- ❑ Ensuring that blanking, disconnecting, or capping of all pipelines attached to a vessel is complete as required by instructions on pages 9 and 10.

- ❑ Ensuring that all isolation valves in the involved pipelines are set in the required positions and are properly tagged and/or locked.

- ❑ Ensuring that testing for oxygen deficiency, explosive atmospheres, and toxic materials is complete.

- ❑ Ensuring that all permits have been properly executed, signed, and issued.

- ❑ Obtaining agreement with employee supervision on the minimum precautions needed to safely perform the work.

- ❑ Ensuring that all excavations are prepared as described on page 4.

- ❑ Providing qualified standby personnel.

- ❑ Providing proper safety equipment and tools.

2. Supervisors of employees doing the work are responsible for

   - ❑ Ensuring that their employees are qualified to lock out.

   - ❑ Ensuring that their employees have locked and tagged properly.

   - ❑ Ensuring that rotating equipment has been properly immobilized and/or deenergized and locked/tagged.

   - ❑ Ensuring that all involved pipeline valves are set in the required position and are properly locked/tagged (lines disconnected, blanked, or capped).

   - ❑ Ensuring that area radiation procedures are followed.

   - ❑ Ensuring that all permit requirements have been met and that the CSEP has been signed.

   - ❑ Ensuring that minimum personal protective clothing is worn.

   - ❑ Obtaining agreement with landlord supervision on the minimum precautions needed to perform the work safely.

3. Employees performing the work are responsible for

   - ❑ Locking and tagging all power-driven equipment.
   - ❑ Tagging all disconnected rotating equipment.
   - ❑ Tagging the restraining device on all rotating vessels. (See pages 9 and 10.)
   - ❑ Visually checking the tagging on all valves (unless under group tag) in their required position, blanks, and disconnections on pipelines feeding the vessel.
   - ❑ Ensuring that radiation procedures are followed.
   - ❑ Wearing required personal protective equipment.
   - ❑ Reading and understanding the permit requirements, and ensuring that all permit requirements have been met before signing the CSEP.
   - ❑ Understanding the duties of the standby employee.
   - ❑ Tagging all entrance and exit points.

4. Employees on duty as standby must

   - ❑ Lock and tag as described on pages 9 through 11 of this procedure.
   - ❑ Remain at the entry point as long as anyone is in the tank, and remain alert for anything that could affect the employees' safety (e.g., fumes and noise).
   - ❑ Have wristlets or a safety harness, plus a lifeline; a Falcon horn; and either a SCBA or an air-line mask.
   - ❑ Know who is in the permit space at all times. Frequently confirm that they are all right. Alert them to any hazards. Prevent fouling of air hoses or lifelines. During a gas release or an area fire alarm, require them to exit the tank and then discontinue use of site air.
   - ❑ Assist in handling materials and tools, and in conveying messages.

- Use the Falcon horn to summon help in case of emergency. Have someone turn in the fire alarm. The standby *must not enter the permit space, even in an emergency, until another qualified standby arrives, and unless he or she has been trained as a rescuer.* The standby must not allow anyone to enter the permit space to effect a rescue unless he or she is part of the designated rescue service and is wearing the necessary personal protective equipment.

PREPARATION FOR ENTRY

Cleaning

The landlord is responsible for properly emptying, cleaning, and purging all permit spaces before entry is permitted.

Isolating Permit Spaces

1. Physically disconnect and blank all process material lines, including nitrogen purging or padding lines. This includes steam, water, or other coolants in coils of permit spaces to be entered.
2. Air, water, or steam lines may be blanked or disconnected. Where steam lines are blanked, a line break or open bleed valve ahead of the blank is required; the valve should have a "Caution—Do Not Operate" tag.
3. Ventilation ducts or stacks open to the atmosphere must be evaluated by the team manager of the personnel preparing the space for entry to ensure proper protection is provided.

    - When the stack or duct is in dedicated service to the space being entered and is open to the atmosphere, blanking or disconnecting the stack or duct is not necessary.

      If the stack or duct is left open, any other line to the stack or duct should be disconnected or blanked.

    - When the stack or duct is shared with other vessels through a common header, the duct or stack must be disconnected or closed with a blank of equivalent strength and material of construction as the duct or stack.

      Exception: This is not required for normal entry into powerhouse boilers and finishing spray dryer and micronizer baghouses.

4. Charging chutes should be protected at the charging point in one of the following ways:

   - Cover, and tag cover with a "Caution—Do Not Operate" tag.
   - Lace opening with safety tape, and tag with a "Caution—Do Not Operate" tag.

5. Lockout

   - All power-driven equipment associated with the permit space must be locked out in accordance with the Lock, Tag, and Try Procedure.
   - Agitated equipment must be physically disconnected from the power source and tagged, even though the work may not involve that particular piece of equipment.

     The tag used in the lockout of agitated equipment for permit space entry must list "vessel entry" as the reason.

6. Obstructions: The areas surrounding the access to permit spaces should be maintained in a safe housekeeping condition.

   - Access must not be blocked with equipment or materials that would interfere with safe egress from the permit space.
   - Lines, cords, hoses, etc., must be properly arranged and secured to prevent tripping hazards.

Equipment

The following safety equipment may be required for permit space entry jobs:

1. An explosimeter, with sufficient hose to reach the bottom of the tank from the manway.
2. An oxygen analyzer, with sufficient hose to reach the bottom of the confined space from the manway.
3. If equipment is entered by means of a ladder, the ladder must remain firmly placed and tied while individuals are in the equipment.

   Exception: slurry cars

4. A safety drop light (low voltage—bulb guarded) or equipment with a ground-fault circuit interrupter, if additional lighting is required.

5. A safety harness and rope for every individual who will enter the permit space and two for emergency use, unless exempted by the unit's safe job procedures.
6. An air mask and emergency breathing apparatus (Escape Pak for immediately dangerous to life and health [IDLH] atmosphere) for every individual who will enter the permit space and two of each for emergency use. (This applies to permit spaces when air masks are required.)
7. A Falcon alarm horn. If used, the Falcon horn must be briefly sounded to ensure its operability.
8. A properly executed CSEP must be displayed at the job site, if a permit is required.
9. An air mover or exhausts for welding or burning jobs or where hazards can be controlled by ventilation.
10. Protective clothing, as required.

PROCEDURE

Lock, Tag, and Try All Power-Driven Equipment.

For tank and permit space entry purposes, supervision will *not* delegate lockout responsibilities.

Secure Rotating Equipment.

1. Before anyone enters any rotating vessel or a tank with an agitator, fan, or other internal moving parts, the motor must be locked out and fuses pulled. Then, one of the following conditions must be satisfied:

   - ❑ The drive coupling must be disconnected.
   - ❑ The drive belts must be removed.
   - ❑ The leads at the motor must be disconnected.

   The appropriate drive coupling, drive sheave, or motor leads must be properly tagged by landlord supervision, supervision of the group performing the work, and by each individual who is to enter the vessel.

2. Secure the internal moving parts and/or the rotating vessels to prevent them from rotating.

   - Shafts for propellers, fan blades, or agitators must be restrained to prevent their movement before anyone enters the tank if a draft or other force can produce freewheeling. If this is not possible, the blades or shaft must be restrained as soon as possible after entry.

   - Restraints on propellers, fan blades, and agitators may be temporarily removed for the period when manual rotation is required, provided no safety hazard is created.

   - Rotating vessels must be restrained to prevent rotation before anyone enters. The vessel must remain restrained while people are inside it.

   - The restraining devices must be tagged by landlord supervision, supervision of the group performing the work, and each individual working in the vessel.

Blank, Disconnect, and/or Cap All Pipelines.

1. All pipelines that contain hazardous materials must be positively disconnected and solidly blanked or capped to ensure that no material can enter the permit space. Disconnected vessel nozzles must be open to provide air circulation through the top, bottom, and/or end(s) of the vessel.
2. Disconnection or blanking is sufficient for all lines carrying nonhazardous materials such as air or water at low pressures, or for exhaust ducts and vent stacks.
3. Blanking alone is sufficient for isolating very large lines from a permit space provided that

   - The valve in the process piping upstream of the blank is closed and locked.

   - The piping upstream of the blank is vented between the blank and locked valve by disconnecting appropriate piping or opening a vent valve and locking it open.

4. In a ditch or excavation, landlord and employee supervision must evaluate the potential hazards and take appropriate action to eliminate any such hazard.

5. A list or diagram of the blanks and disconnections must be attached to the permit.
6. Guarding or covering and tagging charging chutes in a way that prevents materials from entering is an acceptable alternative to disconnecting or blanking chutes.

Follow Required Tagging Procedures.

1. All valves used to isolate the permit space must be tagged by landlord and employee supervision and every person entering the permit space. Before signing the CSEP, those entering must visually check all isolation valves, blanks, and disconnections, then attach to each a properly executed "Danger—Do Not Operate" tag marked "Permit-Required Confined Space Entry." Disconnections should be tagged on the permit space side of the disconnect. Supervision *will not delegate* tagging responsibilities.
2. Each person entering the permit space and all standby personnel will tag the breathing air supply line open and the vent closed.
3. Each person, excluding landlord supervision, will remove his or her personal tag at the end of the current shift. Landlord supervision's tag remains until the job is finished.
4. Every person entering the permit space must tag each entrance/exit point.

Use Group Tagging Procedures When Appropriate.

Where tagout by all employees involved becomes impractical because of their number or the length of time the system will be out of service, landlord supervision may tag out isolation valves and blanks and vent or drain valves for all employees who will perform the work. A Group Tagout Checklist should be prepared, signed by landlord supervision, and posted on the Group Lockout stand located on the work site. *No delegation* of tagout responsibilities is permitted.

Clean the Vessel.

It is the responsibility of landlord supervision to have a vessel cleaned prior to entry by purging, steaming, draining, washing, or neutralizing, as necessary. When it is necessary to enter a vessel to clean it out and there is any possibility of toxic fumes being released from pockets of crusty or sludgy material, the necessary personal protective and respiratory equipment must be worn.

Test the Atmosphere Inside the Permit Space.

The atmosphere inside the permit space must be checked for proper oxygen content and to ensure that no flammable vapors or toxic gases are present. The tests must be conducted in the following order:

1. O_2
2. Lower explosive limit (LEL)
3. Toxic gases

Consideration must also be given to the work to be performed and any conditions nearby that could cause an oxygen deficiency, create a flammable atmosphere, or form toxic gases.

Oxygen

The oxygen test must be made by a properly trained and qualified person no more than 30 minutes before initial entry, at least every two hours thereafter for acute hazards and up to four hours for nonacute hazards, and after any work stoppage (breaks, lunch).

1. Test readings should be taken at several locations and levels within the permit space.
2. A reading of greater than 19.5 percent and less than 22.5 percent is required. If the oxygen concentration is within the acceptable limits between 19.5 percent and 22.5 percent, and provided all other conditions are acceptable, personnel may elect not to wear a breathing device. An air-line mask with a 5-minute Escape Pak or Scott Air Pak must be provided for the standby employee at the job site to be used in case of emergency.
3. When the oxygen content is outside acceptable limits (below 19.5 percent or above 22.5 percent) or when air contamination is suspected, check the air for toxic materials. Correct the situation causing their presence, and use positive (forced air) ventilation to improve the quality of air in the vessel.
4. Results of this test must be recorded on the CSEP and signed by the employee performing the test.
5. Continuous O_2 monitoring may be required on some jobs, such as interior welding on small tanks.
6. If any materials that could affect the safety of the employees (e.g., solvent vapor) are introduced into the vessel after it has been properly prepared for entry, forced air blowers should be used and continuous oxygen tests should be made.

Explosive Atmosphere

An explosimeter must be used by qualified personnel to test the air in a permit space at several elevations or locations no more than 30 minutes before initial entry, at the beginning of each shift, after lunch, and as required while the work proceeds. Results of the explosion test must be entered on, or attached to, the CSEP. Testing procedures are as follows:

1. If the meter indicates more than 0 percent, the source of flammable vapor must be identified and removed, if possible. If a minor vapor source (such as a small amount of polymer) cannot be removed, supervision must evaluate the degree of hazard and need for additional precautions and then allow entry only after determining that work can proceed safely.
2. In no case shall entry be permitted if the meter indicates as much as 10 percent of the LEL.
3. A lack of oxygen will nullify the function of the explosion meter; therefore, this test must not be made unless acceptable oxygen readings are obtained.

Toxic Materials

When presence of toxic materials or fumes is known or suspected in a permit space, entry must not be permitted until the concentration of the material is determined. Results of the toxic materials test must be entered on or attached to the CSEP.

1. Each area will develop procedures and utilize appropriate testing equipment for determining the concentrations of toxic materials used in that area.
2. Tests must be made at several elevations or locations no more than 30 minutes before initial entry, at the beginning of each shift, after lunch, and as required while the work proceeds.
3. If the concentration exceeds the exposure limit (threshold limit value [TLV], permissible exposure limit [PEL], or allowable exposure limit [AEL]), entry will not be permitted unless the employee wears proper protective equipment, which includes an air-line mask with a 5-minute Escape Pak. If the concentration exceeds the IDLH concentration, entry will not be permitted unless the employee wears proper protective equipment, which includes Scott Air Pak or air-line mask and 5-minute Escape Pak, and utilizes a properly executed Especially Hazardous Work Permit. Refer to material safety data sheets for exposure limits and IDLH concentrations.

Evaluate Radiation Hazard.

Entry into spaces that have potential for a radiation hazard must be reviewed and approved by the site RPO or his or her alternate.

Landlord supervision, the RPO, supervision of personnel entering the permit space, and each individual entering will lock and tag the shutter device shielding the radiation source or have the source removed.

Provide Standby Personnel.

1. Each entry must have a standby stationed outside the entry point. The duties of the standby are as follows:

   - ❑ Know potential hazards.
   - ❑ Be aware of the effects of hazards on entrants.
   - ❑ Summon rescue services when needed.
   - ❑ Keep unauthorized persons from entering the space.
   - ❑ Perform rescues that do not require entry into the space.

2. Before personnel enter, standby personnel must be familiar with the location of the

   - ❑ Telephone, if available nearby.
   - ❑ Safety shower.
   - ❑ Exit.
   - ❑ Fire and fume alarm boxes.
   - ❑ Scott Air Paks and Escape Paks, if available.

3. Standby personnel must be in continuous contact with the personnel in the space (by sight, verbal communication, etc.). When a radio is used for communication, a radio check must be made every 5 minutes.

4. Standby personnel must have immediately available the same protective equipment as those entering the permit space. If fresh air masks and emergency breathing apparatus are being worn in the permit space, the standby personnel must have such equipment immediately available.

5. Standby personnel must be physically capable of performing the duties assigned.
6. Standby personnel are responsible for stopping the job and seeing that personnel exit from the permit space in the event that a site fire or fume alarm is sounded.

Obtain a CSEP.

No one may enter a permit space until a CSEP has been properly executed and authorized. The permit may be initiated, but not authorized, by any supervisor who will participate in the job.

1. **PRCS Permit.** A standby is required. Examples include storage tanks and railroad tank cars.
2. **Low-Hazard Permit.** No standby is required. An example of a low-hazard location is a diked area that is less than 5-feet deep with a very low likelihood of a flammable or explosive atmosphere or engulfment hazards.
3. **Supervisory Signatures.** The permit must be signed by each immediate supervisor who is responsible for an employee on the job and by landlord supervision.
4. **Employee Signatures.** Each individual involved with the permit space entry is responsible for ensuring that all aspects of the permit have been met before signing it.
5. **Persons Entering the Permit Space.** Each person, including supervision, who intends to enter must

   - ❑ Obtain authorization of his or her immediate supervisor.
   - ❑ Read and understand the requirements on the CSEP.
   - ❑ Lock and tag as required by this procedure.
   - ❑ Wear the required personal protective equipment.
   - ❑ Sign the permit.

Note: Each person intending to enter the permit space after the job has begun must follow all of the above steps and also notify landlord supervision.

Post the CSEP.

A properly executed and approved CSEP must be posted at the job site, if entering a permit space.

Know When the Permit Is Canceled.

The CSEP is automatically canceled when a fire alarm, gas release alarm, or disaster alarm sounds in the area, or when the shift ends.

Provide Rescue Team.

1. If an on-site rescue team is utilized, each team member must be properly trained to use all rescue and related personal protective equipment for making rescues from all permitted spaces. All team members must receive hands-on training in making permitted space rescues at least once every 12 months. All team members must have had basic first-aid and cardiopulmonary resuscitation (CPR) training. At least one team member must maintain current certification in basic first-aid and CPR skills. Training records must be maintained.
2. If an outside rescue team is utilized, site supervision is responsible to ensure that the outside team is adequately trained and appropriately equipped and staffed to make a rescue commensurate with the permitted activities.

Provide Proper Safety Equipment and Tools.

Safety equipment required for a job must be indicated on the CSEP. Before entry can proceed, equipment must be available at the entry point for each person who is to enter and for each standby employee. Safety equipment will be checked before each use to be sure equipment has not exceeded its usable date.

1. **Safety Wristlets/Harness and Lifeline.** Each person in the permit space must wear safety wristlets or a harness and lifeline at all times. If the work cannot be performed with the lifeline attached, the appropriate block of the CSEP must be checked by the supervisor authorizing the permit. Two extra sets of harnesses and lifelines for emergency use must be available on-site. The lifeline must be kept available at the permit space entry point with one end secured outside the tank.
2. **Canister Masks.** *Canister masks are not approved for confined space entry.*
3. **Falcon Horn.** A Falcon horn must be kept available for immediate use by the standby employee.
4. **Lighting.** Lighting equipment (and wiring) inside the confined space must carry no more than 12 volts. Low-voltage lights and transformers are available in the Tool Room. Equipment requiring more than 12 volts to operate should be used only with a ground-fault circuit interrupter. The transformer should be located outside the permit space.

5. **Power Tools.** Normally, only pneumatic or low-voltage (12 volts or less) electric power tools are allowed in a permit space. Electric tools with higher voltage (120 volts maximum) can be used if the area superintendent and Safety Office grant authorization in writing on the CSEP. Power for such tools must be supplied from a ground-fault interrupter located outside the permit space.

   Only tool air supply must be used. *The use of nitrogen is strictly forbidden.*

6. **Two-Way Radios.** Two-way radios will be used when the standby employee cannot maintain visual or audible contact with a person in the permit space.

7. **Welding.** When welding or burning inside a vessel, it is critical that adequate breathing air be provided to avoid gas pockets and fumes. When breathing air is deficient or it is necessary to weld while wearing an acid suit, a special air supply welder's hood must be used. The maintenance supervisor of the employee doing the welding or cutting must initiate and approve the necessary procedures for this work. Continuous monitoring for oxygen deficiency, oxides of nitrogen and other toxic gases, and explosive conditions must be provided to further ensure a safe atmosphere.

8. **Cylinders and Welding Machines.** When welding or cutting is to be done inside a permit space, all cylinders and welding machines should be left outside the permit space.

9. **Protective Coatings.** All protective coatings should be removed at least 2 feet from either side of a weld prior to making that weld.

10. **Flame Permits.** Use of an arc or open flame requires a Flame Permit to be displayed at the work site. A fire extinguisher should be available nearby.

Provide Employee Training.

Any employee who may be required to enter a permit space because of the nature of his or her job or because of an emergency should be trained in all aspects of the PRCS Entry Procedure. Refresher training must be conducted at least every 36 months, except for rescue team members, who must have annual training.

ACTUAL ENTRY

1. All personnel entering the space must review the posted requirements on the CSEP; make all the required safety checks; place locks and tags as required by the Lock, Tag, and Try Procedure; and then sign the CSEP before entering the permit space. All personnel who enter permit

spaces must understand the hazards to which they may be exposed, properly use necessary equipment, and communicate with the standby.

- ❑ Any individuals joining a job already under way in a permit space equipped with agitated equipment must check the physical disconnect of the motor leads before they sign the CSEP and enter the permit space.

- ❑ Each individual working on equipment is responsible to ensure that it is safe for him or her to proceed with the work.

2. Individuals leaving the permit space and job must cross out their names on the CSEP and remove their locks and tags.

3. Lifelines used in vessels greater than 12 feet in depth shall be kept snubbed with minimum slack so that the standby person can provide sufficient support to prevent individuals from falling from the ladder when entering or leaving the vessel.

   Lifelines that have been disconnected in the tank should be reconnected to the individual prior to exiting the vessel or permit space.

4. Job space must be considered when determining how many persons are permitted to enter.

5. Contractor personnel performing work in a permit space must follow the provisions of the PRCS Entry Procedure.

   - ❑ Permit space is prepared for entry by site personnel.

   - ❑ Contract job supervisor and contractor personnel should review the various lockouts, disconnects, blanks, etc. Where applicable, the contractor should add his or her personal lock and tags.

   - ❑ Contractors should sign the CSEP when they enter and remove their names when they leave.

HANDS AND ARMS ENTRY

1. Breaking the plane of the permit space with the hands and arms only requires

   - ❑ Lock, tag, and try, as discussed on pages 9 through 11.

   - ❑ Standby.

- ❑ Applicable permits.

- ❑ Personal protective equipment, as necessary.

OSHA will not require a fully executed CSEP if there is no intent to enter the space (except for the hands and arms) as long as the above four provisions are met.

2. Atmospheric testing is not required if the head will not break the plane of the space.

RESCUE SERVICES

1. Nonentry rescue is preferred and should be used whenever possible.
2. If entry is required for rescue, the rescue personnel will wear personal protective equipment to protect against the hazards present.
3. The emergency team is designated as the site rescue service and should be trained accordingly.
4. The emergency team should practice rescues from each type of permit space on the site annually.

MARKING

1. Each permit space that does not require tools or keys for entry must be marked with a sign reading "Notice—Confined Space Entry Permit Required for Entry."
2. These signs may be obtained from Stores.
3. The sign should be placed as close to the point of entry as possible.

CONFINED SPACE DECISION MATRIX

CONFINED SPACE CONDITIONS		Purged/Cleaned Disconnected Blinded Vessel. No Potential Atmospheric Hazard. No Welding or Other Work That May Create a Hazard.	Purged/Cleaned Disconnected Blinded Vessel. Welding or Nonacute Chemical Exposure. Potential for Exceeding AEL, PEL, TLV.	Potential O_2 Deficiency or IDLH Condition.	Potential LEL >0%.	Potential to Exceed AEL, PEL, TLV. Below IDLH. No Acute Hazard.	Potential to Exceed AEL, TLV, PEL. Below IDLH. Acute Chemical Hazard.	Potential for HF Exposure.	Unknown Hazards.
PROTECTION SYSTEMS	Attendant communication with rescue system	Horn/whistle	Horn/whistle	Radio	Radio	Horn/whistle	Radio	Radio	Radio
	Attendant communication with entrant(s)	Visual, hand signals, horn, etc.	Visual, hand signals, horn, etc.	Constant 2-way communication on radio	Constant 2-way communication on radio	Visual, hand signals, horn, etc.	Constant 2-way communication on radio	Constant 2-way communication on radio	Constant 2-way communication on radio
	Periodic monitoring	Each entry	Each entry, or at least every 4 hours	No	No	Each entry, or at least every 4 hours	Each entry, or at least every 2 hours (See footnote 1)	Each entry, or at least every hour	Check LEL at each entry, or at least every hour
	Continuous monitoring	No	No	Yes	Yes	No	See footnote 1	No	Yes
	Respiratory protection	None	Supplied air for stainless, inconel, monel welding. Air purifying for other work.	Supplied air with escape air supply	Supplied air with escape air supply	Air purifying (see footnote 3)	Air purifying (see footnote 3) or supplied air (see footnote 1)	Air purifying if concentration < 5 ppm. Supplied air if concentration > 5 ppm.	Supplied air with escape air supply
	Body harness & line*	No	Yes	Yes	Yes	No	Yes	Yes	Yes
	Ventilation needed	None	The greater of 15 changes/hour or 2,000 cfm/welder	15 changes/hour (see footnote 2)	15 changes/hour	15 changes/hour	15 changes/hour	15 changes/hour	15 changes/hour

*Unless harness or lifeline present on entanglement/entrapment hazards

1. Monitoring for contaminants not necessary if supplied-air respiratory protection worn. If air-purifying respirators are worn, continuous monitoring is required.
2. Ventilation may not be feasible during inerting operations. Alternate precautions are necessary.
3. Must not exceed the protection factor for the respirator.

ATMOSPHERIC MONITORING LOG

PERMIT #_____ DATE: _____

NAME OF SPACE: _____ LOCATION: _____

Test Required	Result	Time	Initials of Teste
Oxygen			
Explosibility			
Other			
Oxygen			
Explosibility			
Other			
Oxygen			
Explosibility			
Other			
Oxygen			
Explosibility			
Other			
Oxygen			
Explosibility			
Other			
Oxygen			
Explosibility			
Other			
Oxygen			
Explosibility			
Other			

ALLOWABLE LIMITS

Oxygen: 19.5% - 22.5%

Explosibility <10%

Other:

TYPE OF MONITORING EQUIPMENT USED

CONFINED SPACE ENTRY PERMIT (CSEP)

DESCRIBE WORK AREA, WORK TO BE DONE, AND EQUIPMENT AFFECTED BY THE WORK.

SCHEDULED START _____ A.M. P.M.
DAY DATE TIME

SCHEDULED FINISH _____ A.M. P.M.
DAY DATE TIME

MECHANICAL GROUP OR CONTRACTOR FIRM INVOLVED: _____

TYPE OF HAZARDOUS WORK

COMBUSTION HAZARDS
WELDING _____
BURNING _____
OPEN FLAME _____

SPARK-PRODUCING
CHIPPING _____
GRINDING _____
DRILLING _____

ELECTRICAL _____
OTHER _____
SYSTEM UNDER PRESSURE _____

OTHER HAZARDS

- ☐ TOXIC MATERIAL _____
- ☐ CORROSIVE MATERIAL _____
- ☐ FLAMMABLE MATERIAL _____
- ☐ SPILLED MATERIAL _____
- ☐ ELECTRICAL CLOSE CLEARANCE
- ☐ DISCONNECT AND BLANK
- ☐ UNPLUGGING LINES AND EQUIPMENT
- ☐ RADIOACTIVE EQUIPMENT
- ☐ TIGHTENING JOINTS UNDER PRESSURE
- ☐ ENTERING CLOSED SPACES
- ☐ CHEMICAL AND JET CLEANING
- ☐ WORKING ON UNGUARDED EQUIPMENT
- ☐ WELDING UNDER PRESSURE
- ☐ DRAINS SUMPS
- ☐ WELDING ON VESSEL OR ENCLOSED SPACE
- ☐ RUNNING UNGUARDED EQUIPMENT
- ☐ HOT EQUIPMENT OR PROCESS _____
- ☐ WELDING AND CUTTING
- ☐ ADJACENT PROCESSES SHUT DOWN
- ☐ _____

SAFETY PREPARATIONS: PERSONAL SAFETY

- ☐ PROTECT AGAINST _____
- ☐ FRESH AIR BLOWER SIZE _____
- ☐ FRESH AIR MASK
- ☐ SCOTT AIR-PAK
- ☐ DUST RESPIRATOR
- ☐ COVERALLS
- ☐ SAFETY SHOWER
- ☐ ACID SUIT
- ☐ ACID HOOD
- ☐ FACE SHIELD
- ☐ CHEMICAL GOGGLES
- ☐ TELEPHONE
- ☐ LOCATION OF ADDITIONAL ASSISTANTS
- ☐ LIST OTHER PERMITS _____ _____
- ☐ EVACUATION INSTRUCTIONS
- ☐ TWO ESCAPE ROUTES
- ☐ SAFETY HARNESS
- ☐ SAFETY WRISTLETS
- ☐ LIFELINES ATTACHED AT ENTRY POINT ☐ YES ☐ YES
- ☐ RUBBER GLOVES
- ☐ RUBBER BOOTS
- ☐ RAIN CLOTHES
- ☐ SKIN CREAM
- ☐ EAR PROTECTION
- ☐ CLOTH NECK COVERING
- ☐ FIRE ALARM BOX
- ☐ ESCAPE LADDERS
- ☐ ALARM HORN

REMARKS _____

ISOLATE EQUIPMENT

- ☐ STOP TRANSFERS
- ☐ LOCK AND TAG
- ☐ DISCONNECT AND BLANK
- ☐ POST WORK SIGNS
- ☐ ROPE OFF WORK AREA
- ☐ ERECT BARRICADE
- ☐ BLOCK ROADWAY
- ☐ PROTECT AGAINST EXTERNAL HAZARDS

CLEAN EQUIPMENT

- ☐ STEAM _____
- ☐ FILL AND DRAIN _____
- ☐ REMOVE DEPOSITS _____
- ☐ LEAK INSPECTION _____
- ☐ VISUAL INSPECTION _____
- ☐ NEUTRALIZE CONTENTS _____
- ☐ _____
- ☐ _____

ELECTRICAL SAFETY

- ☐ LOCKOUT CIRCUITS
- ☐ PULL FUSES
- ☐ ELECTRICAL TAGGING
- ☐ LOW-VOLTAGE TOOLS
- ☐ EXPLOSION-PROOF EQUIPMENT
- ☐ SPARK-RESISTANT TOOLS
- ☐ SPARK CONTAINERS AND SHIELDS
- ☐ WELDING-ARC PROTECTION
- ☐ GROUND-FAULT CIRCUIT INTERRUPTER

FIRE SAFETY

- ☐ AREA ALARM NO. _____
- ☐ FIRE HOSE LAID OUT
- ☐ WATER HOSE RUNNING
- ☐ STEAM HOSE BLEEDING
- ☐ KEEP AREA WET
- ☐ COVER SEWER OPENINGS
- ☐ CO_2 EXTINGUISHER
- ☐ DRY POWDER EXTINGUISHER
- ☐ FLAME-RETARDANT BLANKET

GAS TEST S: SPECIFY FREQUENCY IN HOURS BETWEEN TESTS IN BLOCKS BELOW. IF STUDY ONLY, MARK "S" IN BLOCK. MARK "C" FOR CONTINUOUS MONITOR. TURN AUXILIARY AIR OFF F

LOCATION	O_2	EXPLOSIBILITY	TOXIC MATERIALS	AUTHORIZED GAS TESTER
TEST IN AREA _____	☐ _____	☐ _____	☐ _____	☐ _____
TEST IN EQUIPMENT _____	☐ _____	☐ _____	☐ _____	☐ _____
_____	☐ _____	☐ _____	☐ _____	☐ _____

Use attached monitoring log for additional readings.

SUPERVISORY APPROVALS

The following supervision with personnel on the job have verified that all precautions have been taken and have approved the work.

- ☐ Landlord area manager
- ☐ Permit space entry employees' supervisor(s)
- ☐ Permit space entry employees

SIGNATURES OF PERSONS ENTERING CONFINED SPACE

Signature indicates the person has read the permit and is certain that all precautions are being met.

_____ _____
_____ _____
_____ _____
_____ _____

EMERGENCY INFORMATION

In case of an emergency contact: _____

LIFTING OVER PROCESS LINES

LIFTING OVER PROCESS LINES

I. Purpose

To ensure that adequate consideration is given to contingency plans when handling loads by crane or other lifting device over hazardous materials that could potentially endanger personnel on or off the site.

II. Principles

Process and service lines and equipment are vulnerable to damage from having suspended loads dropped on them. Primary emphasis should be placed on using proper rigging and lifting practices to maintain control and prevent dropping the load.

III. Definition

1. A lift over process lines or equipment occurs when the load, or any portion of the crane bottom used in the lift, is suspended over process piping or equipment inventoried with process materials.

2. Serious Process Incident (SPI) is an incident on or off the site with the potential for any of the following: multiple serious injuries, significant explosion, significant fire, or significant release of chemicals.

IV. Procedures

1. A Lifting Over Process Lines Permit is required before any lift is made over process lines or equipment. If there is no potential for on SPI to occur should the load or boom drop, only the date, time, and location of lift need be filled out, along with the operating supervisor's signature.

2. If there is a potential for an SPI to occur, should the load or boom drop, the rest of the permit must be filled out. Thorough consideration should be given to

    a. Worker safety.

    b. Impact on people not directly involved in job.

    c. Communication of lift to all those who should know.

    d. Process releases and their impact on and off site.

    e. Loss of service due to ruptured lines.

    f. Equipment damage.

    g. Downtime to repair damage.

3. Bumping process lines and equipment with rigging equipment can also cause a process incident. Even if a lift does not occur directly over such equipment, it may be close enough to warrant the use of this procedure.

4. Many lifts offer flexibility in location of the rig, and also what path the boom takes to reach the object. Careful consideration should be given to where the rig sets up. With planning, the number of process lines under the lift may be reduced or eliminated. Doing so will minimize the consequences of a potential accident.

5. The lifting permit will be originated by a person from the group doing the work. The originator will put the date, time, and location of lift on the permit. The operating supervisor will determine whether the lift has potential for an SPI, mark the permit yes or no, and sign. If the lift does not have this potential, no further information is needed on the permit. If the lift does have SPI potential, the remainder of the permit must be filled out. The emergency director on duty shall be notified of the lift, and the appropriate authorization signatures obtained.

6. The authorized permit shall be reviewed with all those directly involved in making the lift, and those potentially affected, including operators required to secure the plant should a hoisted load fall and cause a process leak.

7. If the permit is required to go beyond the end of the shift, reapproval is necessary. Before reapproving, the supervisor will ensure that conditions

of the lift still match the permit. If they do not, a new permit will be initiated. Also, the supervisor will be responsible for ensuring that all new people, both those directly involved and those potentially affected by the lift, review the permit before the work is performed.

8. The PED coordinator and craft superintendent must sign the permit if PED initiates the permit, or is involved in the work.

9. Permanently mounted hoists and lifts covered by an area procedure are exempt from requiring this permit. Lifts made with chainfalls do not require this permit, but such lifts should be carefully thought out as to the potential consequences should the load drop.

10. In addition to the permit, established safe practices for lifting must be followed, such as barricading under the boom, inspection of rigging materials, and using tag lines.

11. A Lifting Over Process Lines Permit shall be used in addition to other required permits, such as a Vehicle or Flame and Spark Permit.

V. Responsibilities

1. Originator is anyone from the group doing the work. He or she will initiate the permit by contacting the crane operator and determining where and what path the lift will take.

2. Operating supervisor must sign the permit.

3. Operating group will fill out the remainder of the permit by identifying process materials under the lift, defining what contingency plans are necessary, and communicating to those people who could be affected.

4. Operating or Maintenance area superintendent must approve the permit if there is potential for an SPI.

5. Crane operator will work with the originator to determine the path of the lift, and shall keep a copy of the signed permit on his or her person at the time of the lift. The crane operator will not make a lift without an authorized Lifting Over Process Lines Permit.

LIFTING OVER PROCESS LINES PERMIT
ISSUED: 10/28/90 REVISED: __/__/__

Date of lift:_____ From (time):_____ To:_____

Location of lift:_____

Is there potential for a Serious Process Incident from a falling load or boom?

Yes_____ No_____ Operating Supervisor_____
Note: A yes answer requires the rest of the permit be filled out. A no answer requires no further input on this permit.

==========

Crane Operator:_____ Designated Flagperson:_____

Ground condition at crane site:_____

Description of lift, including path load will take from start to finish, and where boom will swing (A sketch or map can be attached):_____
_____
_____
_____
_____

What hazardous materials are present under the path of the lift? _____
_____
_____

Check if
Required
_____ Run Safer program to identify potential exposure area
_____ Inform potentially affected people ahead of time
_____ Identify emergency shutoff valves
_____ Review production response to a leak
_____ Clear and barricade the affected area (in addition to under the boom)
_____ Operator with radio in attendance
_____ Notify operating supervision immediately before lift
_____ Other _____

Describe contingency plans should the load and or boom drop and cause a process release. The plans shall be reviewed with all involved in the lift.
_____
_____
_____
_____
_____
_____
_____

Name of emergency director who has been notified :_____
Area Supt._____
PED Coordinator_____ PED Craft Supt._____
(If applicable) (If applicable)
Shift Reapproval: Supv._____ Area Supt._____
PED Coordinator_____ PED Craft Supt._____

SAMPLE INTEGRITY CHECK

SAMPLE INTEGRITY CHECK

CHECKLIST REPAIRS/APPROVED MODIFICATION **DATE** _____

		Initials		
		FLS	**Employee Removing**	**Employee Installing**
1.	Personnel have had annual training related to hazardous substances in the process being worked on.	_____	_____	_____
2.	If not, technicians must not work the job.			
3.	Work order is attached. W.O. # or Procedure #____	_____	_____	_____
4.	Work permit for line break is filled out.	_____	_____	_____
5.	Verify that the pipe code is correct and the materials of construction conform to that pipe code.	_____	_____	_____
6.	Check that the Critical Service Valve Tag or Critical Service Equipment Inspection Tag is attached to the valve, piping, or instrument that you are going to install.	_____		_____
7.	If substitution is required, a temporary line permit with proper signature is required.	_____		_____
8.	Attach Critical Valve Service Tag or Critical Service Equipment Inspection Tag and work permit to this checklist and return to your supervisor (coordinator).	_____		_____
9.	Torquing, all flange gasket installation, bolting and torquing per _____. (See reverse side of sheet.)	_____		_____

MECHANIC(S) **DATE:**

_____ _____ _____

_____ _____ _____

_____ _____ _____

JOB CHECKED BY OPERATIONAL FLS OR COORDINATOR:

_____ _____ _____

NOTES:

_____

_____

Turnover to: _____

To Area ___ File When Complete

EXAMPLES OF STANDARD OPERATING INSTRUCTIONS

STANDARD OPERATING INSTRUCTIONS
RIP SAW
CARPENTER SHOP

Operating Steps	Key Points	Safety Instruction
1. Observe and set up	Cuts or fractures from kickbacks or poor guard adjustment	Have bladeguard, anti-kickback device and kickback shield in position during operation of saw. Barricade area between saw and kickback shield. Check parallel alignment of rip fence to blade at each fence setting. Do not tilt rip saw bed.
	Injuries to nonqualified personnel	Use only qualified personnel who have received training and approval by landlord supervision to operate saw.
	Cuts from unexpected start-up, during blade changes, or incorrect blade setting	Follow the lockout procedure and wear gloves when installing saw blade and checking blade for defects. Use proper blades. Height of blade to be no more than 1/2 inch above material to be sawed. Clear machine of unnecessary items.
	Lacerations from inadequate personal protective equipment	Wear side-shield safety glasses at all times. Do not wear loose clothing.
2. Operate	Contusions or punctures from flying particles	Stand clear while energizing and until saw is up to speed. Do not use gloves while operating saw.
	Lacerations from hands too close to blade	Watch for loose knots and defects in lumber; use push stick when material is within 6 inches of feed end of blades. Do not rip any material less than 3/4-inch wide or 24-inches long. While sawing, do not turn material loose until sawing is complete.
	Falls from poor housekeeping	Keep floor clear. Watch for pinch points on conveyor table. Conveyor table can be removed only when operator has an assistant. Push operating switch to "OFF" in the event of a power failure.
3. After shutdown	Lacerations from blade running unattended	Do not leave saw until the blade stops. Lock out and tag main switch at end of the shift.
	Falls from poor housekeeping	Clean up area.

Date:_____ Approved By:_____
Maintenance Supervisor

STANDARD OPERATING INSTRUCTIONS
MILLING MACHINE
MACHINE SHOP

Operating Steps	Key Points	Safety Instruction
1. Observe and set up	Equipment	Wear leather gloves and side-shield sa glasses. Check oil and lubricate machin needed.
	Only qualified personnel are permitted to operate this machine.	Securely fasten material to be worked or wear leather gloves; use extreme care an avoid pinch points when handling materials; get help if necessary. Check cutters. See that they are in good condition.
	Check for working clearance of rotating equipment prior to initial start-up.	Rotate manually (if possible) for clearar checks prior to applying power. Certain conditions relating to equipment use and set up may require visual inspection or measurement.
2. Operate machine	Start machine	Do not wear gloves; watch for sharp edg and cuttings.
		Keep hands away from cutters at all tin while machine is running. Milling machine must not run unattended. Acqui standby observer for finish cuts if you mu leave machine.
	Inspect	Stop machine. Wear leather gloves; smooth off all burrs and sharp edges.
	Housekeeping	Clean up machine and area.
3. Change speed and shut down		Do not change speeds or feeds while machine is running.
	Power failure	Turn operating switch to "off."

Refer to S. O. I. 450 for instructions if jam or equipment malfunction occurs.

Date:_____ Approved By:_____

Maintenance Supervisor

FORMS FOR TEST AUTHORIZATION, TEST CONCLUSION, A COMBINED TA/TC FORM, CHANGE OF DESIGN AUTHORIZATION, DESIGN CHANGE CONCLUSION

TA FORM

DATE _____

TEST AUTHORIZATION NO. TA-C- _____

PRODUCT NAME _____ PRODUCT CODE _____

AREA _____ POUNDS PROPOSED _____

BUILDING NAME _____ BUILDING NO. _____

TITLE _____

PREPARED BY _____ RESPONSIBLE FOR TEST AND TEST CONCLUSION _____

PURPOSE OF TEST:

DURATION OF TEST: _____

STANDARD INVOLVED: _____

TSCA REGISTRATION

[ ] No change *[ ] New chemical* *[ ] TSCA No.* _____

ANALYTICAL CONTROL OR SPECIFICATIONS:

[ ] No change *[ ] Changes described under Test Details*

PROCESS HAZARDS REVIEW:

[ ] Required before test—see attached *[ ] Not required*

MATERIAL SAFETY DATA SHEET:

[ ] Revision required *[ ] No change*

[ ] New Raws (see attached)

PACKAGING AND SHIPPING CLASSIFICATIONS:

[ ] Revision required *[ ] No change*

TECHNICAL BASIS FOR CHANGE: _____

TEST DETAILS: (Include Safety & Occupational Health and Waste Disposal) _____

_____

Have Operating Instructions been prepared and approved?

[ ] Yes—see attached *[ ] Not required*

DISTRIBUTION: _____

APPROVED BY: _____

AUTHORIZED BY: _____

_____

TC FORM

For DuPont Use Only DATE _____

TEST AUTHORIZATION NO. TA-C- _____

PRODUCT NAME _____ PRODUCT CODE _____

AREA _____ POUNDS ACTUAL _____

BUILDING NAME _____ BUILDING NO. _____

TITLE _____

PREPARED BY _____ STANDARD INVOLVED _____

PURPOSE OF TEST:

RESULTS OF TEST:

RECOMMENDATIONS:

FACE SHEET CONTROLS

Have Operating Instructions been prepared to reflect recommended changes and attached to the authorization copy?	*[ ] Not required*	*[ ] Yes*
Has PHR final report been completed and attached?	*[ ] Not required*	*[ ] Yes*
Evergreen Process Update attached?	*[ ] Not required*	*[ ] Yes*

DISTRIBUTION: _____

APPROVED BY: _____

AUTHORIZED BY: _____

TA/TC FORM

DATE _____

COMBINED TEST AUTHORIZATION NO. TA-C- _____

PRODUCT NAME _____ PRODUCT CODE _____

AREA _____

BUILDING NAME _____ BUILDING NO. _____

TITLE _____

PREPARED BY _____ STANDARD INVOLVED _____

PURPOSE OF CHANGE: (Include Technical Basis) _____

DETAILS OF CHANGE: (Include Safety & Occupational Health and Waste Disposal)
(Include recommended changes to Process Technology) _____

_____

ANALYTICAL CONTROL OR SPECIFICATIONS:

[ ] No change *[ ] Changes described under Details of Change*

MATERIAL SAFETY DATA SHEETS:

[ ] Revision required *[ ] No change*
[ ] New Raws (see attached)

PACKAGING AND SHIPPING CLASSIFICATIONS:

[ ] Revision required *[ ] No change*

Have Operating Instructions been prepared to reflect changes and attached to the authorization copy?

[ ] Not required *[ ] Yes*

Has PHR final report been completed and attached?

[ ] Not required *[ ] Yes*

Process Update attached?

[ ] Not required *[ ] Yes*

DISTRIBUTION: _____

APPROVED BY: _____

AUTHORIZED BY: _____

_____

CHANGE OF DESIGN AUTHORIZATION

Area: _____ ID#: _____

Title: _____

Author: _____ Date: _____

Purpose: _____

Type of Change:
__ Physical Change __ Alarm/Interlock Change
__ Change in Operating Conditions
__ Software Change __ Technology Change
__ Other _____

Duration of Change: From _____ To _____

Background:

Technical Basis:

Description of Change:

Effects Considered:
- Safety:
- Environment:
- Production:
- Product Quality:
- Structural Integrity:
- Waste Disposal:

PSM Elements:	Required Yes	No
Test Authorization Document:		
Process Hazards Review:		
Operating Procedures:		
Training and Communication:		
Prestart-up Safety Review:		
MSDS:		

Responsible for Test: _____

Approvals:		Date
Technical:	_____	_____
Production:	_____	
Mechanical (Maintenance):	_____	
Safety & Environmental:	_____	

Authorized: _____ Date: _____

DESIGN CHANGE CONCLUSION

Area: _____ ID#: _____

Title: _____

Author: _____ Date: _____

Purpose: _____

Type of Change:
__ Physical Change __ Alarm/Interlock Change
__ Change in Operating Conditions
__ Software Change __ Technology Change
__ Other _____

Background:

Technical Basis:

Description of Change:

Observed Effects On:
- Safety:
- Environment:
- Production:
- Product Quality:
- Structural Integrity:
- Waste Disposal:

Results of Change of Design:

Recommended Action:

Responsible for Action Plan: _____

Approvals:		Date
Technical:	_____	_____
Production:	_____	
Mechanical (Maintenance):	_____	
Safety & Environmental:	_____	

Authorized: _____ Date: _____

A COMPARISON OF THE CONTENT OF MANAGEMENT OF CHANGE DOCUMENTS

CONTENT OF MANAGEMENT OF CHANGE DOCUMENTS

	TA	TC	COD	DCC
Date	X	X	X	X
Process Area	X	X	X	X
Title	X	X	X	X
ID#	X	X	X	X
Author	X	X	X	X
Purpose	X	X	X	X
Background	X	X	X	X
Technical Basis for Change	X	X	X	X
Duration of Test	X		X	
Description of Test	X	X	X	X
Operating Procedures	X		X	
Training Requirements	X		X	
Safety Concerns	X	X	X	X
Environmental Concerns	X	X	X	X
Waste Disposal	X	X	X	X
PHR Required	X		X	
Responsibility for Test	X	X	X	X
MSDS	X		X	
Results of Test		X		X
Recommendations		X		X
Approvals	X	X	X	X
Authorization	X	X	X	X

CHANGE AUTHORIZATION ACTION CHECKLISTS

CHANGE AUTHORIZATION ACTION CHECKLIST

Title _____ Date _____

The following items must be considered for both temporary and permanent PCRs:

Required		If Required, Complete?			If Not Required for Start-up		
Yes	No	Yes	No	Item	Responsibility	Date Required	Date Completed
___	___	___	___	Specific training requirements	_____	_____	_____
___	___	___	___	Specific communication requirements	_____	_____	_____
___	___	___	___	Software Change Request (SCR) required	_____	_____	_____
				Design review required...			
___	___	___	___	a. Metallurgist	_____	_____	_____
___	___	___	___	b. Process	_____	_____	_____
___	___	___	___	c. Power	_____	_____	_____
___	___	___	___	d. Electrical	_____	_____	_____
___	___	___	___	e. Instruments	_____	_____	_____
___	___	___	___	f. Structural Integrity	_____	_____	_____
___	___	___	___	g. Others	_____	_____	_____
___	___	___	___	Pipe codes prepared or variances issued	_____	_____	_____
___	___	___	___	Safety or hazards review required	_____	_____	_____
___	___	___	___	Material Safety Data Sheets available	_____	_____	_____
___	___	___	___	Fire protection changes required	_____	_____	_____
___	___	___	___	Safety equipment location changes	_____	_____	_____
___	___	___	___	New equipment inspection	_____	_____	_____
___	___	___	___	Environmental control action plan necessary	_____	_____	_____
___	___	___	___	Relief device calculations performed	_____	_____	_____
___	___	___	___	Analytical procedures developed	_____	_____	_____
___	___	___	___	Lab supervisor notified of analytical changes	_____	_____	_____
___	___	___	___	Operating procedures developed	_____	_____	_____
___	___	___	___	Process to service interconnections	_____	_____	_____

All required items have been completed—Signature _____
(*) Originator

(*) The Originator of the PCR is responsible for ensuring that all applicable items are completed and signed off on.

Required		If Required, Complete?			If Not Required for Start-up		
Yes	No	Yes	No	Item	Responsibility	Date Required	Da Comp
___	___	___	___	Start-up/operating/shutdown checklists developed	_____	_____	_____
___	___	___	___	Field/control room reading sheets modified	_____	_____	_____
___	___	___	___	Control limits (SOCs) established	_____	_____	_____
___	___	___	___	Interlock and alarm sheets created	_____	_____	_____
___	___	___	___	Investment/cost estimate required	_____	_____	_____

All required items have been completed—Signature _____
(*) Originator

(*) The Originator of the PCR is responsible for ensuring that all applicable items are completed and signed off on.

CHANGE AUTHORIZATION ACTION CHECKLIST

Title _____ Date _____

The following items must be considered for both permanent PCRs

Required		If Required, Complete?			If Not Required for Start-up		
Yes	No	Yes	No	Item	Responsibility	Date Required	Date Completed
___	___	___	___	Turnaround-Tag procedures updated	_____	_____	_____
				Marked prints forwarded for update . . .			
___	___	___	___	a. P&Is	_____	_____	_____
___	___	___	___	b. Electrical Schematics	_____	_____	_____
___	___	___	___	c. Loops/SAMAs	_____	_____	_____
___	___	___	___	d. Maps	_____	_____	_____
___	___	___	___	e. Motor Schematics	_____	_____	_____
___	___	___	___	Loop files updated	_____	_____	_____
___	___	___	___	NEXUS files updated	_____	_____	_____
___	___	___	___	Pipe code/Process-service index changes	_____	_____	_____
___	___	___	___	Area safety rule or procedure changes	_____	_____	_____
___	___	___	___	Material Safety Data Sheet manual updated	_____	_____	_____
___	___	___	___	Environmental control action plan updated	_____	_____	_____
___	___	___	___	Relief device calculations placed area PHM file	_____	_____	_____
___	___	___	___	Analytical procedure manual updated	_____	_____	_____
___	___	___	___	Raw material specifications updated	_____	_____	_____
___	___	___	___	Finished product specifications updated	_____	_____	_____
___	___	___	___	Technology manual updated	_____	_____	_____
___	___	___	___	Operating procedure manual updated	_____	_____	_____
___	___	___	___	Start-up/operating/shutdown checklists updated	_____	_____	_____
___	___	___	___	Field/control room reading sheets updated	_____	_____	_____
___	___	___	___	Control limits (SOCs) updated	_____	_____	_____

All required items have been completed---Signature _____
(*) Originator

(*) The Originator of the PCR is responsible for ensuring that all applicable items are completed and signed off on.

CHANGE AUTHORIZATION ACTION CHECKLIST

Title _____ Date _____

The following items must be considered for both permanent PCRs

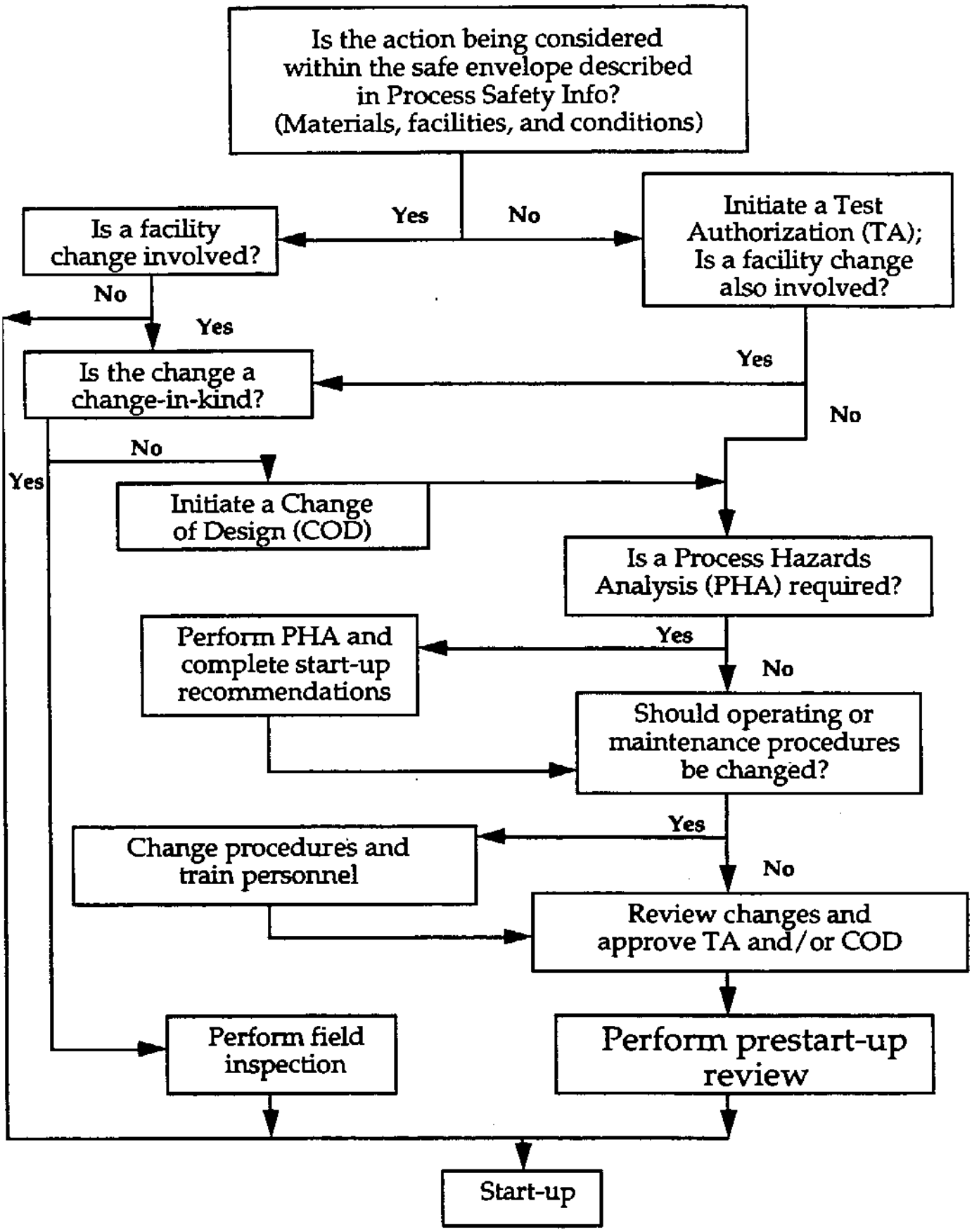
Required		If Required, Complete?			If Not Required for Start-up		
Yes	No	Yes	No	Item	Responsibility	Date Required	D. Comj
___	___	___	___	Interlock and alarm lists updated	_____	_____	____
___	___	___	___	Spare parts setup	_____	_____	____
				Vendor instruction manuals and drawings filed . . .			
___	___	___	___	a. Equipment files	_____	_____	____
___	___	___	___	b. E/C files	_____	_____	____
___	___	___	___	Preventive maintenance program changes	_____	_____	____
___	___	___	___	Maintenance notified of changes in materials of construction	_____	_____	____
___	___	___	___	Cost versus capital determination	_____	_____	____
___	___	___	___	Other _____	_____	_____	____

All required items have been completed—Signature _____
(*) Originator

(*) The Originator of the PCR is responsible for ensuring that all applicable items are completed and signed off on.

DECISION TREE FOR PROCESS ACTIONS

DECISION TREE FOR PROCESS ACTIONS



QUALITY ASSURANCE REFERENCES

QUALITY ASSURANCE REFERENCES

Du Pont Publications

"Process Safety Management Reference Manual" by the Safety and Environmental Resources group

ANSI (American National Standards Institute)

45.2.10—Quality Assurance Terms and Definitions

ANSI/ASOC (American National Standards Institute/American Society Control)

A3-1987—Quality Systems Terminology
C1-1985—Quality Program—General Requirement
E2-1984—Inspection Planning
Q1-1986—Generic Guidelines for Auditing Quality Systems
Q90-1987—Quality Management and Quality Assurance Standards—Guidelines for Selection and Use
Q91-1987—Quality Systems—Model for Quality Assurance in Design/Development, Production, Installation, and Servicing
Q92-1987—Quality Systems—Model for Quality Assurance in Production and Installation
Q93-1987—Quality Systems—Model for Quality Assurance in Final Inspections and Tests
Q94-1987—Quality Management & Quality Systems

API (American Petroleum Institute)

Specification Q-1 Specification for Quality Programs—June 1, 1990

Miscellaneous Publications

"Manual of Quality Assurance Procedures and Forms" published by Prentice Hall

Miscellaneous Articles

"Vendor Evaluation Checklists," Quality Assurance Register, a Hitchcock Publication, 43 pages; "Appraising and Raising Vendor Quality," Quality Assurance, July, 1964, Dr. F. E. Cotton, Jr., 4 Pages

AUDIT QA PROCEDURE CHECKLIST

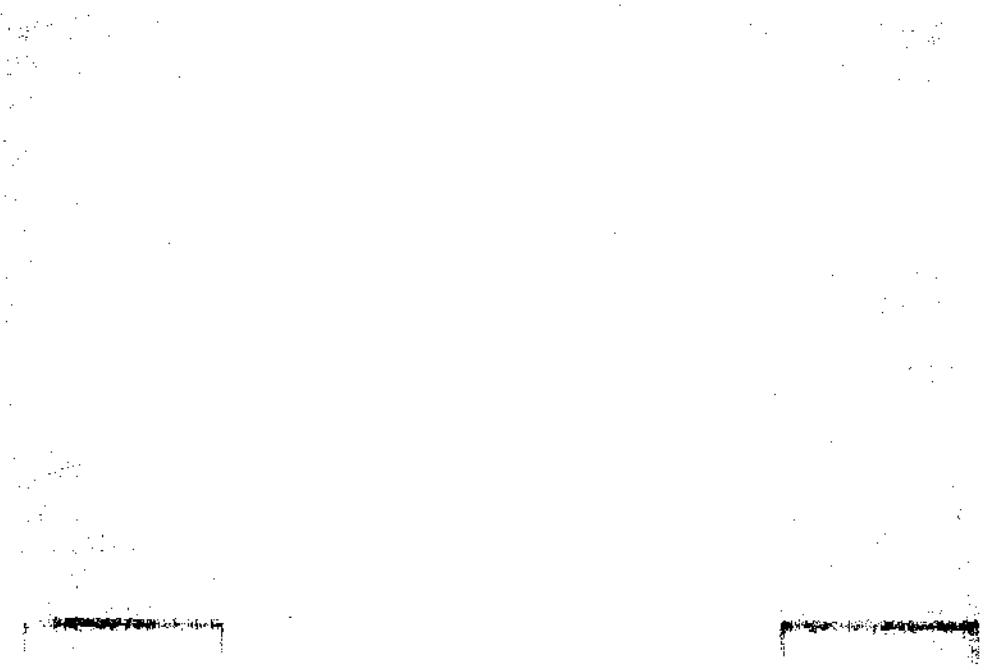
AUDIT QA PROCEDURE CHECKLIST
SAMPLE FORMAT
MECHANICAL INTEGRITY GUIDELINE

	YES	NO	NA	INIT
1. Has management set policy and delegated authority for QA activities?	___	___	___	___
2. Is all process equipment designed and fabricated in accordance with all engineering specifications and appropriate codes, Conoco Standards, design criteria, and recognized engineering practices?	___	___	___	___
3. Is all material purchased in accordance with all engineering specifications and appropriate standards and codes?	___	___	___	___
4. Has it been verified that all material received conforms to the purchasing documents and applicable codes?	___	___	___	___
5. Has construction/maintenance performed work in accordance with the designs, procedures, and codes?	___	___	___	___
6. Are verifications being performed that all our QA Procedures are in place prior to installation of new equipment?	___	___	___	___
7. Do our QA Procedures address the following:				
❑ Design basis	___	___	___	___
❑ Company standards/specifications, national codes and standards, and specifications preparation	___	___	___	___

	YES	NO	NA	INIT
❑ Vendor and contractor selection	____	____	____	____
• Evaluation criteria	____	____	____	____
• Responsibility	____	____	____	____
• Purchase orders and contracts	____	____	____	____
❑ Jurisdictional requirements				
• Personnel	____	____	____	____
• Equipment	____	____	____	____
• Procedures	____	____	____	____
❑ Technical reviews				
• Design drawings	____	____	____	____
• Design calculations	____	____	____	____
• Welding specifications	____	____	____	____
• Nondestructive examination procedures	____	____	____	____
• Testing procedures	____	____	____	____
• Prefabrication meetings	____	____	____	____
❑ Shop fabrication	____	____	____	____
❑ Field construction and installation	____	____	____	____
❑ Inspection	____	____	____	____
❑ Testing	____	____	____	____
❑ Certification	____	____	____	____
❑ Drawings and documentation	____	____	____	____
❑ Material control	____	____	____	____

QUALITY ASSURANCE CHECKLIST

QUALITY ASSURANCE CHECKLIST



QUALITY ASSURANCE CHECKLIST

PROCUREMENT:

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are QA inspections required? (E100Q, R1A, SW61W)	___	___	___	_____	_____
Are inspection/test instructions documented? (SW60W, SW61W)	___	___	___	_____	_____
Has applicable inspector(s) been selected? (SW61W, SW12.2W, SW60W, SG8T, SG5T, SG2.IS, SG1.9S, P2Z)	___	___	___	_____	_____
Are approved vendors used?	___	___	___	_____	_____
Have FAB drawings been approved (by area personnel)? (SG4A, SG2S, SG77.2S)	___	___	___	_____	_____
Are prefab vendor/contractor meetings required?	___	___	___	_____	_____
Will subcontractors be used?	___	___	___	_____	_____
Are qualifications of vendor/sub-contractor documented? (SW60W)	___	___	___	_____	_____
Are mill test reports available? (SW800M, SW6N, SW8N, SW10N, SW11N, SW13N, SW3P)	___	___	___	_____	_____
Are inspection reports available? (SW61W)	___	___	___	_____	_____
Are hydrostatic test reports available? (SG5T, BTS-1.0)	___	___	___	_____	_____
Are packing and gaskets for valves specified per P.M. index? (U1A, U2A, U5A)	___	___	___	_____	_____

SHIPPING REQUIREMENTS:

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are there special packing/shipping requirements? (SG1S, SW6L, SG1X, PL44)	___	___	___	_____	_____
• No marking or painting on S/S vessel (SG5S, SP3D, SN1A)	___	___	___	_____	_____
• Nitrogen blanket (PL44, SG1X)	___	___	___	_____	_____
• Openings covered (PL44, SG1X)	___	___	___	_____	_____
• Equipment orientation	___	___	___	_____	_____
• Desiccant or VPI required (L2A, PL44, SG1X)	___	___	___	_____	_____
• Bracing of internal or rotating elements	___	___	___	_____	_____
• Properly cribbed and tied down	___	___	___	_____	_____
• Rigging problems	___	___	___	_____	_____
• Over-road shipping problems	___	___	___	_____	_____
• Bearings protected from vibration	___	___	___	_____	_____
• Equipment free of water (SG19S)	___	___	___	_____	_____
• Lubricated per L2A	___	___	___	_____	_____
Is final inspection required prior to shipment?	___	___	___	_____	_____

RECEIVING:

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Was equipment inventoried?	___	___	___	_____	_____
Are qualified personnel required to:					
• Identify?	___	___	___	_____	_____
• Inspect for damage?	___	___	___	_____	_____
• Oversee unloading? (PV8)	___	___	___	_____	_____
• Verify receipt of required documents, manuals, drawings, parts lists, etc.?	___	___	___	_____	_____
Are special inspection/tests required?	___	___	___	_____	_____
• Material verification (bolts, valves, pipe, gaskets, etc.) (M17H, P1V, P4V, SP1.1A, SP11A, SPO.03, SP0.03P, SP.0.03U, U1A, U2A, U5A)	___	___	___	_____	_____
• Are bolt markings correct? (M10H)	___	___	___	_____	_____
• Cloride cracking—improper marking methods (SG5S, SP3D, SN1A)	___	___	___	_____	_____
• Check for cleanliness (SP2M, SP4M, PP17, PP19)	___	___	___	_____	_____

STORAGE:

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are there special storage requirements? (PL44, SG1X, SW6L)	___	___	___	_____	_____
Responsibility assigned for periodic inspection of compliance and documentation (weekly log, cards, etc.)?	___	___	___	_____	_____
• Periodic rotation (SG1X)	___	___	___	_____	_____
• Inert gas purging	___	___	___	_____	_____
• Prevention of corrosion while in storage (SG19S)	___	___	___	_____	_____
• Proper segregation of materials (SG5S, SW7P, SW50W, PZ1)	___	___	___	_____	_____
• Indoor—AC or heated (E6K, PL44, SG1X)	___	___	___	_____	_____
• Outdoor	___	___	___	_____	_____
• Protection—close openings, off ground, covered, etc. (PL44, SG11.4S, SG1X)	___	___	___	_____	_____
• Protect from paint and cooling tower spray (SG1X, PL44)	___	___	___	_____	_____
• Lubricated per L2A (SG1X)	___	___	___	_____	_____
• Desiccant or VPI (L2A, PL44, SG1X)	___	___	___	_____	_____
• Proper equipment orientation	___	___	___	_____	_____
• Power on—computer, etc. (E6K, PL44, SG1X)	___	___	___	_____	_____
• Assure motor heaters are on (E6K, PL44, SG1X)	___	___	___	_____	_____

SHOP FABRICATION BY PC&O/CONSTRUCTION/CONTRACTORS:

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Clean shop practices to avoid contamination of critical materials? (SW7P, SW50W, PZ1)	___	___	___	_____	_____
Do drawings show as-built conditions?	___	___	___	_____	_____
Are fabricated items					
• Cleaned? (SG14.1S, SP2M, SP4M, PP19)	___	___	___	_____	_____
• Identified?	___	___	___	_____	_____
• Protected? (SG19S, PL44, SG1X)	___	___	___	_____	_____
• Sealed? (SG19S, PL44, SG1X)	___	___	___	_____	_____
• Hydrostatic tested per BTS 1.0 and BTS 6.0?	___	___	___	_____	_____
Are hydro test gauges calibrated per BTS-1.0?	___	___	___	_____	_____

INSTALLATION: FOUNDATION

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are QA inspections necessary?	___	___	___	_____	_____
Has appropriate inspector(s) been selected?	___	___	___	_____	_____
Soil bearing sampling documentation (C1J soil boring) (SC4, SC5E backfill material, degree of compaction)?	___	___	___	_____	_____
Concrete forms correct configuration, etc. (SB7U, ACI318, ACI347)?	___	___	___	_____	_____
Are keys, water stops, etc. adequate?	___	___	___	_____	_____
Reinforcing documentation (ACI315, SB4U)?	___	___	___	_____	_____
Electrical grounding of anchor bolts (B34S)?	___	___	___	_____	_____
Are there any special conditions (freezing, raining, etc.) pertaining to the four?	___	___	___	_____	_____
Concrete type (SB3U, SB6U, [latest revisions] ACI301, 304, ASTM C94)?	___	___	___	_____	_____
Slump test (each truck) (ASTM C143 and 94)?	___	___	___	_____	_____
Concrete pours witnessed, all items correct (SB9U, ACI304)?	___	___	___	_____	_____
Correct curing (SB12)?	___	___	___	_____	_____
Backfill compaction test results (SC4, 5E, ASTM D1557, 4318, 2167, 1556, 2992 [Testing])?	___	___	___	_____	_____
Are inspection/test instructions documented?	___	___	___	_____	_____

INSTALLATION: MECHANICAL, EQUIPMENT

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Base level properly grouted (B33S.PH90, PH94)?	___	___	___	_____	_____
Alignment/pipe strain, etc., documented?	___	___	___	_____	_____
Proper start-up screen (SG1R, S1M)?	___	___	___	_____	_____
Coupling installation and type (PL40)?	___	___	___	_____	_____
Adequate guarding (S1M, S8M)?	___	___	___	_____	_____
Are auxiliary systems installed per design?					
• Lubrication? (DL9A, L14B)	___	___	___	_____	_____
• Seal flush? (DL7A, U2S)	___	___	___	_____	_____
• Hydraulic Controls?	___	___	___	_____	_____
• Emission controls (S17G, J3K J3P, J4P)	___	___	___	_____	_____
• Other	___	___	___	_____	_____
Have vendor instructions been checked for compliance?	___	___	___	_____	_____
Are all braces and temporary shipping constraints removed?	___	___	___	_____	_____

INSTALLATION: PROCESS VESSELS

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Vessels fabricated on site API 620 & API 650 compliance (SG11.4S, SG11S, SG11.1S, SG11.2S, SG4A)?	___	___	___	_____	_____
Testing and inspection per BTS 1.0, BTS 6.0, SG5T, API, etc.?	___	___	___	_____	_____
Hydrostatic verification per BTS 1.0, BTS 6.0?	___	___	___	_____	_____
Hydro test guage calibration per BTS 1.0?	___	___	___	_____	_____
Level and oriented correctly?	___	___	___	_____	_____
Piping alignment O.K.?	___	___	___	_____	_____
Internal inspection, everything in place and clean (PP17, PP19, PH83, SP2M, SG14.5S, SG14.1S, SG1.2S)?	___	___	___	_____	_____
Bolting, manways, etc., things that can be removed—verified?	___	___	___	_____	_____

INSTALLATION: PIPING AND VALVES

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are welding procedures followed per SW60W, SW61W, BTS 6.0?	___	___	___	_____	_____
Are all welds stenciled by welder per ASME B&PV, ASME B31.3?	___	___	___	_____	_____
Are flange finishs per ANSI B16.5?	___	___	___	_____	_____
Is thread compound/lubricant compatible? (P25E)	___	___	___	_____	_____
Is pipe clean per SP2M and SP4M?	___	___	___	_____	_____
Hydrostatic verification per BTS 1.0?	___	___	___	_____	_____
Hydro test gauge calibration per BTS 1.0?	___	___	___	_____	_____
Is pipe installed per Du Pont and ANSI Code B31.3?	___	___	___	_____	_____
Is bolting per pipe code SP1A?	___	___	___	_____	_____
Is bolt torque check or critical piping required? (DM1D, PP25, M10H)	___	___	___	_____	_____
Is flange alignment per SP1A?	___	___	___	_____	_____
Flex analysis required? (DP8A)	___	___	___	_____	_____
Is piping insulated/traced per SN3D, SN5D, SN100A, SN180A, SN181A, SN190A, SN400A, SN100M, SN700M, SN800M, SN900M, SN206P, SN211P?	___	___	___	_____	_____
Are hangers on insulated piping per 216P, SN220P?	___	___	___	_____	_____
Is piping adequately supported per P1F, P17F, P28F?	___	___	___	_____	_____
Are spring hangers correctly set per P1F, P17F, P28F?	___	___	___	_____	_____

Installation: Piping and Valves (Continued)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are gaskets per P.M. index? (Type/Size) U1A, U2A, U51)	___	___	___	_____	_____
Is cathodic protection documented per SZ7F, DG1.3W?	___	___	___	_____	_____
Are valves per P&I code?	___	___	___	_____	_____
Are valves insulated per SN213P?	___	___	___	_____	_____
In compliance w/pipe codes for special chemicals? (CL, 0_2, etc.)	___	___	___	_____	_____
Are all blanks removed?	___	___	___	_____	_____

INSTALLATION: INSTRUMENTATION

	REQUIRED			COMPLETED\ DATE/	
	YES	NO	N/A	INITIAL	NOTES
Visual check/identification—Loop numbers verified as correct and are durable and visible (PR8, PR9)?	___	___	___	_____	_____
Calibrated (documented) PR44)?	___	___	___	_____	_____
Adequately supported, accessible for maintenance (service and process lines identified. [SE41B, R170K])?	___	___	___	_____	_____
Are bypass and block valves provided for future maintenance? (R271V)	___	___	___	_____	_____
Leak-checked (unused ports plugged, vents open) (R141K)?	___	___	___	_____	_____
Electronic: are conduit joints tight, seal-offs poured and painted, cover gaskets in place, grounding jumpers in place, wires and cables properly terminated and identified, junction boxes closed, with a reference to the drawings on which they are documented? (E2T, E14J, DE3, E4V)	___	___	___	_____	_____
Does tracing/insulation meet design specifications/area standards? (DE1H, E7K, DR1K, DE6H)	___	___	___	_____	_____
Electric: Have all lines that have electric tracing been identified? (DE1H, 37K, DR1K, D36H)	___	___	___	_____	_____
Is grounding adequate, electrical controls suitable for area classification? (E13P, 314P, DE5P, EV4, PE15, PE17, E8A)	___	___	___	_____	_____

INSTALLATION: INSTRUMENTATION (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are joints and splices properly installed/identified for maint./inspection? (E5U, E1Q, R171K, R121J, R110J)	___	___	___	_____	_____
Is heat-transfer compound required/installed? (SN500M	___	___	___	_____	_____
Steam: Are traps in place, condensate routed properly, lines insulated, moisture barriers in place? (P6B, P6.1B, PP15.1, SP17M)	___	___	___	___	___
Loop/continuity check: Are all components in loop properly identified and their sequence/relationship to ground reference verified? (PR8, PR9, R121J, DR130S)	___	___	___	_____	_____
Are interlocks and their by-passes, alarms and "direction of action" verified? (DR131S, R242K, R113J)	___	___	___	_____	_____
Special checks (specify)	___	___	___	_____	_____
• Is proper voltage(s) supplied? (DE9C, DX3C)	___	___	___	_____	_____
• Are materials of construction correct? (DG10A)	___	___	___	_____	_____
• Are the components in correct physical orientation?	___	___	___	_____	_____
• Are there process-to-service tie-ins? (S23G)	___	___	___	_____	_____
Are there thread lubricant/compound restrictions? (P25E)	___	___	___	_____	_____

INSTALLATION: INSTRUMENTATION (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Proper gaskets, fittings, flanges, etc. ([SP1A, B16.5, U1A, U2A, U5A)?	___	___	___	_____	_____
Is direction of flow correct for control valves, magnetic flow meters, turbines, vortex shedding, annubars, pitot tubes, rotameters, and venturi flow meters? (SR100V, SR110V, DR25F, DR26F, DR27F, DR29F)	___	___	___	_____	_____
Are positioners required for fail-safe conditions? Fail-safe direction verified? 9DR130S, DR132S,)	___	___	___	_____	_____
Are interlock solenoids properly installed? (DR131S)	___	___	___	_____	_____
Are travel limit-switchs in correct position? (E5H, E5.1H)	___	___	___	_____	_____
Are orifice plates oriented correctly? Identified? (R10F, R11.1F, R12F, R13F)	___	___	___	_____	_____
Is physical relation to the transmitter correct? (R20V, SR120P)	___	___	___	_____	_____
Are transmitters installed correctly? (R20V, SR120P, R214P, R111T, SR111T)	___	___	___	_____	_____
Process isolation, drain/flush valves to allow removal for maint (R270, R217V, SP0.02P, SP0.02S)?	___	___	___	_____	_____
Can the instrument be isolated electrically? (PE27, S14G)	___	___	___	_____	_____
Can interlock device(s) be bypassed? (DR131S, R113J, BTS9.0)	___	___	___	_____	_____

INSTALLATION: INSTRUMENTATION (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Is a review of auxiliary equipment, peripheral to instrumentation installations, required?	___	___	___	_____	_____
Air supply: Regulators, block valves, filters, gauges, adequate and properly set? (DH3D, H4P, R100N, SP0.02U, SR181P)	___	___	___	_____	_____
Air pressure gauges of proper material of construction/range, with chemseal, pig-tail, blow-out back (If required), have block valve, located and oriented properly? (R5A, R212P, SR211P)	___	___	___	___	___
Are solenoids adequately supported with no stress or strain on electrical or tubing/pipe connections? (SR141V)	___	___	___	_____	_____
Are solenoids explosion-proof or water-proof if required? (SR141V)	___	___	___	_____	_____
Are the solenoids' vent ports oriented in a safe direction? (SR141V)	___	___	___	_____	_____
Are there CCR isolation switches on electrical devices and field loops requiring 120VAC power? (E8A, S14G, SR15, R171K)	___	___	___	_____	_____
Is there adequate lighting? (OSHA) 9D10F, DE2.1F, DE5F)	___	___	___	_____	_____

INSTALLATION: ELECTRICAL

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are procedures in place for what is expected and how site will achieve the goal of trouble free start-up? (E100Q, DE4D, E1Z, E8A)	___	___	___	_____	_____
Are electricians certified for high voltage installations? (E1Z)	___	___	___	_____	_____
Are aerial cables installed per E2B, E3B, E4B, E5B, E6B, E10B, E11B, E12B, E20B, E22B, E30B, E31B, E32B, E40B, E42B, E51B, E52B, E53B, E54B, E55B, E56B, E10D, E10.1D, E11D, E11.1D, E12D, E13D, E14D, E17D, E21D, E24D, E1E, E57B, E1W, E2W?	___	___	___	_____	_____
Are wooden utility poles installed per E10.1D, E1C, E9D, E16D, E24D, E1E, E2E, E3E, E6E, E12E?	___	___	___	_____	_____
Are transformers installed per E1E, E2E, E3E, E5E, E6E, E12E, E14E, E15E?	___	___	___	_____	_____
Are underground electric cables installed per E1.3F, E1.4F, E3F, E5F, E5.1F, E7F, E7.4F, E7J?	___	___	___	_____	_____
Are cable trays and wiring per E13J, E13.1J, E13.2J, E13.3J, E13.4J, E13.5J, E13.6J, E13.7J?	___	___	___	_____	_____
Are bus boxes and starter racks per E1G and E2G?	___	___	___	_____	_____
Are NEMA enclosures for control equipment per E13G?	___	___	___	_____	_____

INSTALLATION: ELECTRICAL (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are there motor power isolation verification circuits for lockout "try" step? (S14G, E6H)	___	___	___	_____	_____
Are conduit and cables sealed per E14J?	___	___	___	_____	_____
Are terminations, taps, and splices for medium voltage cables per E15J?	___	___	___	_____	_____
Are splices, taps, and terminations for 600 volts and below per E16J?	___	___	___	_____	_____
Are enclosed equipment and raceways drained and vented as per E5K?	___	___	___	_____	_____
Is there overcurrent protection for 600 volt and less? E12K	___	___	___	_____	_____
Are cable insulation tests documented? (E10D, E2Z)	___	___	___	_____	_____
Are pipes, substation equipment, and fences grounded per E5P, E11P, E12P, E13P, E13.1P, E13.2P, E14P?	___	___	___	_____	_____
Are receptacles and plugs per E1N?	___	___	___	_____	_____
Is platform and catwalk lighting adequate? (OSHA, E10L, E1Z, E1.5Z)	___	___	___	_____	_____
Is there obstruction lighting for stacks and towers? (E25L)	___	___	___	_____	_____
Is there grounding for surge (lightning) arresters, overhead wires, and air terminals (lightning rods) E13P, E13.1P, E13.2P, E14P, E16P?	___	___	___	_____	_____
Is there lightning and static protection for solid, liquid, and gas systems? (E3P)	___	___	___	_____	_____

INSTALLATION: ELECTRICAL (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Is uninterruptible power supply per E3R?	___	___	___	_____	_____
Have the following checks been made and documented?	___	___	___	_____	_____
• Testing of cables? (Continuity, megging, etc.)? (E5J, DE30, SP3M)	___	___	___	_____	_____
• High voltage splices and terminations? (E5J, E8J)	___	___	___	_____	_____
• Loop checks to verify terminations were made correctly?	___	___	___	_____	_____
• Function check out? (E8A, E1Z)	___	___	___	_____	_____
• Transformer and high voltage switchgear? (PE53)	___	___	___	_____	_____
• Motor control centers? (EG1, EG2, EG3, EG4, EG13)	___	___	___	_____	_____
• Relay cabinets?	___	___	___	_____	_____
• Motor starters and pushbutton stations? (E1H)	___	___	___	_____	_____
Has wire insulation been ringed in submerged start/stop stations? (E8J)	___	___	___	_____	_____
Power and lighting panels and transformers? (DE1T, E1Z)	___	___	___	_____	_____
Electric equipment and motors? (E1X, E5X, E5.1X, E5.3X, E6X)	___	___	___	_____	_____
Circuits checked for obvious conflicts and necessary interlocking? (E8A)	___	___	___	_____	_____

INSTALLATION: ELECTRICAL (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Have fail-safe control circuits been designed? (E8A)	___	___	___	_____	_____
Grounding electrodes and ground grid connection testing verified? (E13P, E13.1P, E13.2P, E14P)	___	___	___	_____	_____
Are interlocks and their by-passes, alarms and "direction of action" verified? (DR131S, R242K, R113J)	___	___	___	_____	_____
Are limit switches installed per E5H, E5.2H?	___	___	___	_____	_____

INSTALLATION: INSULATION

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Was a qualified inspector used to follow insulation work?	___	___	___	_____	_____
Have the following items been verified?	___	___	___	_____	_____
Is the surface properly prepared prior to insulating (painting, sodium silicate on S/S, etc.)? (SN1A, SZ14F, SZ15F, SZ7F)	___	___	___	_____	_____
Is the material correct for the application? (SN1A, SN3A, SN100A)	___	___	___	_____	_____
Is the thickness of the insulation correct? (SN5D)	___	___	___	_____	_____
Is insulation for hot piping and equipment per SN180A, SN181A, SN184A, SN185A, SN187A?	___	___	___	_____	_____
Is insulation for cold piping and equipment per SN190A, SN191A, SN195A?	___	___	___	_____	_____
Is the working surface/insulation dry? (SN196A)	___	___	___	_____	_____
Was insulation checked for voids prior to jacketing?	___	___	___	_____	_____
Jacketing and banding correct? (SN180A, SN181A, SN184A, SN185A, SN187A, SN190A, SN191A, SN195A, SN196A, SN197A, SN305A, SN 400, SN900M)	___	___	___	_____	_____

INSTALLATION: INSULATION (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Jacket overlapped and applied in water shed fashion? (SN180A, SN181A, SN184A, SN185A, SN187A, SN190A, SN191A, SN195A, SN196A, SN197A, SN305A, SN 400A, SN223P)	___	___	___	_____	_____
Is jacket adequately caulked? (SN180A, SN181A, SN184A, SN185A, SN187A, SN190A, SN191A, SN195A, SN196A, SN197A, SN305A, SN 400A, SN800M)	___	___	___	_____	_____
Does nonjacketed insulation have a vapor barrier and is it applied in a water shed fashion? (SN180A, SN181A, SN184A, SN185A, SN187A, SN190A, SN191A, SN195A, SN196A, SN197A, SN305A, SN 400A, SN700M)	___	___	___	_____	_____
Is protective coating adequate? (SN180A, SN181A, SN184A, SN185A, SN187A, SN190A, SN191A, SN195A, SN196A, SN197A, SN305A, SN 400A, SN700M)	___	___	___	_____	_____
Bedding and joint sealer correct if used? (SN180A, SN181A, SN184A, SN185A, SN187A, SN190A, SN191A, SN195A, SN196A, SN197A, SN305A, SN 400A, SN800M)	___	___	___	_____	_____
Are support rings or flanges adequately flashed on vessels? (SN223P)	___	___	___	_____	_____

INSTALLATION: INSULATION (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are all insulation terminations properly sealed to prevent the entry of moisture? (SN180A, SN181A, SN184A, SN185A, SN187A, SN190A, SN191A, SN195A, SN196A, SN197A, SN305A, SN 400A)	___	___	___	_____	_____

MISCELLANEOUS

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Relief Devices					
Are all calculations for relief devices documented? (SG6T, SG7T)	___	___	___	_____	_____
Are all records (serial numbers, material of construction, orifice size, lift, spring number, etc.) for relief valves available? (SG6T, SG7T)	___	___	___	_____	_____
Have the worst case calculations for relief devices been done?	___	___	___	_____	_____
Are all rupture disk/relief valve/ 3-way installations correct per BTS? (SG6T, SG7T)	___	___	___	_____	_____

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Protective Coatings					
Was a qualified inspector used to follow preparation and painting?	___	___	___	_____	_____
Has surface been properly prepared prior to painting? (SZ1B, SZ1.3B, SZ1.5B, SZ1.6B, SZ1.7B, SZ2B)	___	___	___	_____	_____
Was painting to specifications? (SZ24D, SZ1D, SZ2D SZ252S, SZ253S, SZ259S, SC2C)	___	___	___	_____	_____
Prime coat thickness checked?	___	___	___	_____	_____
Intermediate coat thickness checked?	___	___	___	_____	_____
Top coat thickness checked?	___	___	___	_____	_____
Visual examination O.K.?	___	___	___	_____	_____

MISCELLANEOUS (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Fire Protection					
Has identification of the fire hazards of materials been done? (F4A)	___	___	___	_____	_____
Has basic fire protection of plants, laboratories, warehouses, and offices been done? (F5A, F21E)	___	___	___	_____	_____
Are computer installations adequately protected from fire? (F18H)	___	___	___	_____	_____
Is venting of flammable and combustible atmospheric and low pressure storage tanks in compliance with F2G, F3G, F4G, F6, F9G, F13G, F8J, F11J, F12J?	___	___	___	_____	_____
Is explosion and fire protection required for dust handling systems? (F22H, F4J)	___	___	___	_____	_____
Are all wall openings for conveyers, pipe, conduit, etc., in compliance with F22B, F23B, F26B?	___	___	___	_____	_____
Are fire walls and partitions in compliance with F24B, F25B, F26B?	___	___	___	_____	_____
Are all fire doors in compliance with F27B?	___	___	___	_____	_____
Are fire box and hydrant installations in compliance with F10C, F11C, F17C?	___	___	___	_____	_____
Are all permanently installed fire systems (deluge, foam, monitors, etc.) in compliance with F5A, F1D, F21E, F22E, F23E, F24E, F14G, F18H, F4J?	___	___	___	_____	_____

MISCELLANEOUS (CONTINUED)

	REQUIRED			COMPLETED	
	YES	NO	N/A	DATE/ INITIAL	NOTES
Are fire alarm systems—circuit installation, lightning protection, and grounding per E6M?	___	___	___	_____	_____
Are drainage ditches in compliance with F16G?	___	___	___	_____	_____
Have expansion joints been tested? (SG34, SG3.1R, SG3.2R, SG3.3R, BTS 7.0)	___	___	___	_____	_____
Have flexible hoses been identified and tested? (SW24S, SW44S, SW45S, BTS 8.0)	___	___	___	_____	_____
Do safety showers have freeze protection and tracing? (E10K)	___	___	___	_____	_____

SPECIFICATION/DATA SHEET–PRESSURE VESSELS

SPECIFICATION/DATA SHEET

PRESSURE VESSELS

EQUIPMENT NAME OR TITLE

NAME OF PROJECT

LOCATION

EQUIP. NO. /(PLANT)

PROJECT NO:

AFE NO. P.O. NO.

PLANT

ISSUE	PURPOSE	DATE	BY	APR
1.				
2.				
3.				
4.				
5.				

GENERAL

1	MFGR:	TYPE
2	NO. REQ'D	SERIAL NO:
3	VOLUME CU. FT.	NAT'L BOARD NO.
4	VERTICAL ☐ HORIZONTAL ☐	VESSEL LOCATION:
5	CODE: ASME	CODE STAMP REQ'D. ☐
6	O REFERENCE VESSEL DWG. NO.	O FOUNDATION DWG. NO.

PROCESS DATA

7	OPER. TEMP. TOP _____ °F : BOT. _____ °F	VESSEL SKETCH (SECTIONS AND ELEVATIONS)
8	OPER. PRESS. PSIG	
9	DES. TEMP: MAX °F: MIN. °F	
10	DES. PRESS: PSIG VACUUM. PSIA	
11		

CONSTRUCTION

12	DIA: 10 OD: LENGTH TT OL
13	HEADS: ELLIP ☐ DISHED ☐ CONE ☐ FLANGED ☐ HEM1 ☐
14	BASIC WIND SPEED EXPOSURE
15	EARTHQUAKE ZONE (WIND & EQ. PER ANSI A58 1. 1962)
16	STRESS RELIEF/*PWHT* PERCENT X-RAY-RADIOGRAPHY
17	DESIGN JOINT EFFICIENCY: SHELL - HEAD -
18	MAT'L OF CONST: SHELL HD'S
19	MAT'L OF CONST: CLAD CLAD TKS.
20	THICKNESS: SHELL HEADS CLAD
21	CORROSION ALLOW:
22	SURFACE PREP. COATING
23	INSULATION SUPPORT TYPE INSUL. THICKNESS
24	SUPPORT TYPE: LEGS ☐ SKIRT ☐ SADDLES ☐ LUGS ☐
25	NO. REQ'D O.D. HEIGHT
26	CHAIRS ☐ NO. MAT'L
27	INTERNALS TYPE: MAT'L
28	DEMISTER TYPE: MAT'L
29	VORTEX BREAKER TYPE: MAT'L
30	LADDERS ☐ PLATFORMS AND HANDRAILS ☐ CLIPS ONLY ☐
31	AGITATION REQ'D YES ☐ NO ☐ BY _____
32	HEATING REQ'D YES ☐ NO ☐ BY _____

NOZZLE SCHEDULE

33	ITEM	NO. REQ'D.	SIZE RATING/FACING	DESCRIPTION
34				INLET
35				OUTLET
36				MANWAYS
37				HANDHOLES
38				DRAINS
39				VENTS
40				LEVEL GUAGE CONN
41				LEVEL CONTROL NOZZLES
42				SAMPLES
43				UTILITY CONN
44				RELIEF VALVE CONN
45				TEMP. GAUGE
46				PRESS GAUGE
47				
48				
49				
50				

PRESTART-UP SAFETY REVIEW CHECKLISTS

PRESTART-UP SAFETY REVIEW CHECKLIST

Facility _____ Date _____
Project No. _____ Area/Building _____

Process safety information:

Physical and hazardous properties of all materials documented _____
Process design basis documented _____
Design bases for equipment and safety devices documented (Above communicated to proprietor and filed to be readily available to operating personnel) _____

Equipment fabricated and installed according to specifications _____

Maintenance procedures and preventive maintenance program are adequate to ensure mechanical integrity throughout life of the process _____

Operating procedures, safe practices, safety procedures, and emergency procedures are adequate _____

Training programs are in place for operators and mechanics _____

Management of Change procedures to be used for all changes _____

Process hazards analysis/process hazards review completed and recommended actions completed _____

Emergency plan based on consequence analysis (people trained) _____

Incident Investigation and Reporting Procedure in place _____

Procedure in place for interaction with contractors in the area _____

PRESTART-UP SAFETY REVIEW TEAM MEMBERS

_____ _____
_____ _____
_____ _____

PRESTART-UP SAFETY REVIEW RECOMMENDATIONS

Recommendations to Be Complete Before Start-up	Responsibility	Date Completed

ALL ABOVE COMPLETED, OPERATING SUPERVISION _____

Can Be Completed After Start-up

All Recommendations Completed

Operating Supervisor _____ Date _____

A second and more detailed sample checklist follows.

Category	N/A	OK	Temp-orary	Req'd for S/U	Remarks
Electrical Equipment					
Conformance to Hazard Classification					
Grounding, Bonding/ Lightning (Surge) Protection					
Safety or Process Interlocks/Alarms					
Out of Service Equip. De-Energized					
Electrical Inspection Complete					
Emergency Switches Required?					
Conduits and Boxes Sealed?					
Evacuation Alarms Available?					
P. M. Records in Place					
Structures					
Doors - Ramps - Fire Doors, Walls					
Exits (Traffic Flow, Door Swings, Emergency Escape)					
Safety Chains/Handrails/Guard Rails					
Walks, Ladders, Stairs					
Floor Drainage/Curbs/Dikes					
Overhead Hazards Removed					
Operations/Maintenance Platforms Provided Where Needed					
Procedures					
Equipment Description					
A&I Check					
A&I Listing					
Analyzer Maint/Calibration					
Equipment Guards					
Maintenance					
Bldg Safety Instructions					
Operating (SOP's)					
Spill Control					
Emergency (E&D)					
MSDS Approved					
Labeling					
C.A.S. & Flow Direction					
Instrument (Transmitters, Gauges, Panelboards, DCS)					
Electrical (Switches, MCC's Buttons, Local Disconnects)					
Hi Voltages Labeled?					
Hot Surfaces Marked?					
Equipment (Tanks, Pumps, Condensers, Exchangers, Feeders, Monorails, Hoists, Etc.)					
"Do Not Touch" Labels					
Other (Nitrogen, Air)					

Category	N/A	OK	Temp-orary	Req'd for S/U	Remarks
General Items					
3MCS Records Updated					
Accessibility for Maint./Operations					
Try/Tag/Lock/Try Provisions In Place, Training Complete					
Any Tripping Hazards or Pinch Points					
Spill Containment Facilities					
Fire Prot'n Equip./Sprinklers Extinguishers, Procedures Updated					
Safety Shower/Eye Washes Procedures Updated					
Painting/Safety Painting					
Safety Rules or Signs Installed					
Area and Spot Ventilation Adequate					
Noise Level Measured					
Lighting Adeq./Emergency Lights Adeq.					
Special Operating Tools Provided Where Needed					
Equipment Run-In					
Hidden/Stored Energy Sources Identified?					
Mechanical/Contractor Cleaned Up Area					
Training					
"Safety Pause"					
Employee Communication Prepared					

Title _____

Project/LF/WO No. _____ Date _____

Deficiencies to be Corrected Before Startup	Responsibility	Completed

Deficiencies to be Corrected Not Required Before Startup	Responsibility	Completed

Inspected & Approved by:

Supervisor, Mechanical - Date	Mechanical Coordinator - Date	Liaison Engineer - Date
Technical		

STARTUP OF EQPT AUTHORIZED BY AREA SUPERVISOR _____ DATE _____

Approved for L.F. Closing by Liaison Engineer _____ DATE _____

MECHANICAL PROCEDURES

MECHANICAL PROCEDURES

SCOPE

Site management must ensure that proper procedures are available to maintenance personnel for them to fully understand how to perform their tasks safely and so that the maintained equipment performs its job correctly and reliably.

All mechanical work needed for the proper operation of equipment in hazardous service or critical to the safe operation of a hazardous process shall be covered by a written procedure.

RESPONSIBILITIES

Site Management shall provide necessary resources to review and develop mechanical procedures for work performed by mechanical and contractor personnel. Management shall ensure that periodic auditing of mechanical procedures takes place and that there is a means of keeping them current.

The Site Mechanical Integrity Committee will audit for compliance of mechanical procedures to S&OH Guideline 6.1 Mechanical Integrity & Quality Assurance sections.

Operators are responsible for being familiar with mechanical procedures related to their process equipment and may be used as resources for reviewing, updating, and writing procedures.

Site Maintenance Personnel will be responsible for the implementation of the written procedures. All personnel performing mechanical tasks will be accountable to adhere to written procedures. Line management will be responsible to ensure that their subordinates follow all written procedures.

The Site Safety, Occupational Health, and Environmental Groups will provide readily accessible information and resources needed on safety, health, and environmental issues concerning mechanical procedures.

DEVELOPING PROCEDURES

Procedure Categories: Procedure categories include and are not limited to:

- Generic maintenance tasks, such as rigging, flange tightening, seal installation, automatic valve installation, line breaks, and transmitter overhaul; such procedures should cover most of the needed mechanical tasks.
- Procedures for work on a specific, unique piece of equipment for which the generic procedures are inadequate.
- Procedures for working in or near particular chemical hazards, such as a specific chemical or flammable environments.

Procedure Objective: Written procedures should provide a clear understanding for personnel performing tasks on process-related equipment so that they perform the task safely and correctly.

Procedure Format: Refer to the last page of this section for a specific procedure format which shows the essential information and order of presentation in a procedure.

Preparation: Task teams for the preparation of written procedures should be formed with personnel knowledgeable about the task, preferably a mechanical or maintenance engineer and a mechanic. For procedures associated with a particular piece of process equipment, a process engineer and operator should be included.

Procedure Changes: Any new or revised mechanical written procedure must be approved by the line organization in accordance with the management of change policy for the site.

Record Keeping: Written mechanical procedures must be maintained and kept evergreen at all times consistent with the mechanical integrity guideline. These procedures must be readily available for all mechanical personnel.

AUDIT CRITERIA

Purpose: Periodic audits will be performed to determine whether written procedures are being followed and whether they are adequate. The audit provides a mechanism for obtaining feedback from those involved on the

effectiveness of the procedure and to determine whether the desired results are being obtained.

Frequency: The audit frequency will vary according to the criticality of the procedure and how frequently the procedure is used. OSHA compliance requires that audits be performed a minimum of every three (3) years.

Performance of the Audit: Line organization audits will be performed by a team (two or more) selected by the person responsible for ensuring that the audit is conducted. The audit team should consist of a multidisciplined group, with at least one person knowledgeable about the process when a particular process is involved.

Results: The documented results should provide both a positive and negative feedback. A copy of the audit document should be distributed to the respective area supervision and to the Mechanical Integrity Committee.

Audit Checklist: Check at least:

- ❑ Is the procedure still needed? Is the task still performed? If not, cancel the procedure.
- ❑ Does it meet the attached format? If not, has a knowledgeable judgment been made that is acceptable?
- ❑ Is the procedure readily available at all times that the work is needed?
- ❑ Is the procedure followed? This may require an unannounced field check.
- ❑ Do the personnel currently performing the task feel that improvements in the procedure are needed?

SPECIFIC PROCEDURE FORMAT

- Procedure number
- Title
- Location/area
- Authorization signatures and date, issue/revision No., review date
- Purpose
- Scope
- Safety and Occupational Health (hazards, health precautions, PPE, applicable safety rules, etc.)
- Environmental (spill, waste disposal, emissions, etc.)
- Prerequisites for use (training and certification)
- Responsibility
- Frequency of use
- Permits
- Tools/test equipment needed
- Body (how-to instructions)
    - Reference to existing procedures and practices
    - Troubleshooting techniques
    - Manufacturer instructions
    - Maintenance engineering standards
    - Corrective measures and final check-out
    - Documentation (turnover to operations)
- Audit frequency
- Attachments (pictures, diagrams, manufacturer instructions)
- References

EXAMPLE OF A PREVENTIVE MAINTENANCE PROCEDURE

LOMBARD 1039-14N 1039-15S ELMS 1039-10N 1039-11S

NAME & E.P. NO. TEMPERATURE CONTROLLERS FOR HEAT CABINETS

PAGE 1 OF 1

INSPECTED BY BC DATE 6-24-96

ITEM NO.	OPERATION	PROCEDURE	CONDITION O.K.	ADJUSTED *	ATTENTION REQUIRED
1.	PLEASE INSPECT TEMPERATURE CONTROLLERS ON ALL (4) HEAT CABINETS.	A. USE DIGIMITE® & VERIFY CORRECT OPERATION OF TEMP. CONTROL SYSTEM. OBSERVE & ADJUST FOR THE FOLLOWING CONTROL SEQUENCE.			
		1. SET = 130°F DIGIMITE @ 0°F, VALVE FULL OPEN.	✓		
		2. SET = 130°F DIGIMITE @ 120-130°F, VALVE MODULATING.	✓		
		3. SET = 130°F DIGIMITE = 130°F, VALVE FULL CLOSED.	✓		
		B. USE DIGIMITE® AND VERIFY CORRECT OPERATION OF SLUG TEMP INDICATION. CALIBRATION 0-250°F.		✓	
		C. SET CONTROLLER TO 210°F - VERIFY FANS SHUT DOWN. AT APPROX. 190°- 200°F ADJUST TEMP. SWITCH AS NEEDED. IT WILL TAKE APPROX. 2-3 HRS TO HEAT CABINET TO 200°F.			
2.	CHECK INTERIOR OF CABINET	A. CHECK FOR WATER LEAKS.	✓		
		B. CHECK FOR MISSING BOLTS IN WALLS AND MAKE SURE THEY ARE SEALED.	✓		
		C. REPLACE EXHAUST BLOWER FILTER (IF NEEDED).	✓		
3.	CHECK OUTSIDE OF CABINET	A. CHECK CONDITION OF BLOWER BELT.	✓		
		B. GREASE BEARINGS ON BLOWER (GENERAL PURPOSE GREASE).		✓	

QUALITY CONTROL OF MAINTENANCE SUPPLIES AND PARTS

QUALITY CONTROL OF MAINTENANCE SUPPLIES AND PARTS

SCOPE

Quality control of maintenance supplies and parts is needed to ensure that maintenance materials and spare parts meet design specifications and to prevent the inadvertent use of improper materials, so that the involved equipment can reliably accomplish its process safety mission.

ESSENTIAL ROLES AND KEY ELEMENTS

Design/Technical

Proper design and specifications must be provided to the individuals placing orders for maintenance supplies and spare parts.

Technical advice related to quality control is to be provided when requested by operating units. Such advice may be needed on explanation of specifications, substitutability, and other matters.

Requisitioners

Persons preparing bid packages or purchase requisitions are to use correct specifications as given in the design. If the design or specifications are missing or appear inadequate, then this must be brought to the attention of whoever is responsible for the design of the equipment in question.

The requisitioner should indicate on the requisition that the particular item is "critical to process safety."

Purchasing

Those placing orders with vendors must adhere to the specifications given in the requisition. Such specifications may include that an item be obtained from a particular supplier if that supplier's product is uniquely needed for process safety reasons.

If the specifications appear inadequate or incorrect, or there is a problem with the specified vendor, then the requisitioner should be contacted and asked for clarifications and to improve the requisition if needed.

Routine material suppliers that are both inside and outside the integrated supply system should be audited for an appropriate level of quality control to meet codes and standards.

The strength of the suppliers' quality program must be a key factor in selecting suppliers.

Receiving/Stores

Materials must be protected from environmental degradation during transportation and storage.

A system must be established to handle materials not meeting specifications (rejection, review for adequacy, etc.)

Paperwork, certifications, markings, and other documentation must stay with the item until it arrives at its installation location.

Inspectors

Someone must be designated as an "inspector" to ensure

- Fabricated/repaired equipment is per industry standards and is inspected to ensure compliance with standards.
- Installation/repair is per established mechanical integrity guidelines as outlined elsewhere in this manual, especially provisions concerning mechanical procedures and training.

Inspection techniques should include visual examination for workmanship, size, shape, markings, voltage ratings, and other factors that may be important. Alloy content can be checked to ensure that the item is the correct alloy.

Mechanical Integrity Organization

This document (Attachment D) must be reviewed, upgraded, and reissued as required to maintain procedures for quality control.

Periodic qualitative audits of operating unit compliance should be conducted with this procedure and the findings reported as appropriate.

Follow-up must be conducted to ensure deficiencies are corrected.

Contractors must comply with all aspects of this procedure.

TRAINING

Area planners, schedulers, material-take-off personnel, and stores/receiving personnel are to be trained to correctly purchase, receive, sort, and transport materials.

Requisitioners of parts and repairs and those who inspect the received items or completed repairs are to be trained to correctly use the appropriate local and national consensus standards.

In addition to whoever is officially designated as the "inspector," the people who install the part and who begin to use it are the "Inspectors Of Last Resort" and should be recognized and trained as such.

RECORDS

Appropriate material certifications, compliance records, manufacturers directions, and other documentation that is received with purchased items must be retained.

Equipment records must be updated to reflect changes as necessary.

Portions of pipes, bolting, plates, or other maintenance supplies not immediately used and stored for future use should be adequately marked to allow traceability back to their origination.

BEST PRACTICES

The use of integrated suppliers is recommended where feasible as they can be contracted with to accomplish much of the above.

The use of approved manufacturers who have a demonstrated, successful quality program is encouraged.

INSPECTION AND TEST PROGRAM

INSPECTION AND TEST PROGRAM
General

SCOPE

Guidelines must be established for the implementation of an inspection and test program to ensure that all equipment and systems critical to the safe operation of hazardous services are in safe operating and reliable condition and comply with all applicable jurisdictional requirements and codes.

INSPECTION OR TEST DESIGN

A written or computer-based design or procedure for inspecting or testing each equipment piece or system must be prepared in advance. It should include

- The equipment or system identification.
- Inspection or test frequency.
- The inspection methods to be used, including measurement locations.
- Codes and standards to be followed.
- Acceptable limits.
- A means for finding the design basis and previous history.
- Any special safety considerations.
- Instructions for those who are to prepare the equipment or system for inspection.

A tickle system is needed to ensure the inspections are conducted when due.

In general, components should be evaluated for conformance to applicable national codes, standards, and recommended practices. However, where these do not exist or are inappropriate or inadequate, other methods may be used while exercising good engineering practices and judgment. Variances from or substitutions for national codes, standards, and recommended

practices shall be documented, including the reason for variance or substitution and a description of the engineering practice used.

Items both in and out of conformance may be subjected to further evaluation, such as metallurgical examination or chemical analysis to determine cause, extent, corrective, or preventive action.

INSPECTORS

Each plant must have access to qualified inspectors to carry out this program. These may be site employees, the engineering function, or from outside contract companies. The specific inspector qualifications are given in the following pages under specific equipment types.

RECORDKEEPING

Master Files

Each equipment piece, assembly, or system shall have a master file in which all inspection reports, recommendations, and follow-up documentation reside. These files should be assigned a specific person to maintain them and ensure that the proper information is in the files.

The master file may be a paper file or a computer file. If in a computer file, a back-up system shall be used to protect against accidental erasure or other loss.

The master file should be kept by the plant group responsible for mechanical integrity of the equipment. At some sites this may be a central group, while at other sites, individual business units may be responsible.

Record Retention Timing

The inspection and test records shall be kept for the life of the equipment.

Record Content

The records shall contain whatever is required by the appropriate national standard or by federal or local regulations, if any.

At a minimum, all of the records shall contain

- The name and identifying number (if any) of the equipment or system.
- The date the work was completed.
- The name of the individual who made observations or measurements and what his qualifications were.
- Whatever standards (NBIC, API 510, etc.) were followed and any exceptions.
- Any records received, such as nondestructive testing company reports.
- Location on the equipment; be specific and refer to a drawing or sketch when appropriate.
- Findings, such as observations and measurement.
- Recommendations and who is making the recommendation (If follow-up is needed, see section below on follow-up). The recommendations should clearly state whether the equipment or system may be returned to service as is, or what conditions must be met (such as a temporary repair) before a return to service is permitted.

Record Security

A means must be provided to ensure that records are not removed from the files and not returned. Sign-out sheets or cards, such as those used at a library, are one way to accomplish this. Computer systems must have adequate security means to ensure against accidental or improper erasure or modification.

FOLLOW-UP

An inspection program has little value if the results of the inspection are not followed up with corrective action.

The quality of the follow-up is proportional to the quality of the recommendation. Recommendations for significant follow-up should be finalized only after input is considered from the business unit and those who will do the follow-up work. These considerations are important, but in no

case is business need or the apparent inability to perform the follow-up work a valid reason to return unsafe or unreliable equipment to service.

The key elements of a sound follow-up program are discussed below:

Documentation of Inspection Results

Each recommendation should be listed separately and specifically. It must be definite, achievable, and specific.

It is recommended that a number be given each recommendation to improve follow-up. A typical number might be 92-B-1.2, representing 1992 inspection in "B" area of the plant, inspection report No. 1 for the year, and recommendation 2.

Publication of Recommendations

Appropriate members of supervision must be made aware of the recommendations. They need this information to develop a sense of the condition of the plant and to ensure follow-up is being completed. A "secret" inspection report that is made and filed away has little long-term value.

Recommendations should also be distributed to people who will do follow-up and to operators and mechanics who need to be aware of the condition of their process.

Assignment of Each Recommendation to a Specific Individual

Each recommendation should be assigned to a specific individual who will be held responsible for its completion. Recommendations that are unassigned or assigned to an organization rather than an individual are often left incomplete.

Each recommendation should have a target date for completion. It is also helpful if a priority rating is assigned to the recommendation. For example: immediate action needed, correct within six months, correct within one year.

Tracking System for Recommendations

A system must be put into place to track the recommendation from the time it is made until its completion.

The tracking system should include

- The identification of the equipment.
- The recommendation with its identifying number.
- The date the recommendation was made.
- The due date of the recommendation completion.
- The person responsible for the completion.

This tracking report must be published on a periodic basis (perhaps quarterly), and distributed to management and recommendation assignees to remind them of open items and to highlight items that are overdue.

The tracking system should be assigned to a specific individual who will have responsibility for its accuracy and for ensuring timely publication.

Written Closing Notices

The completion of a recommendation should be documented by a note to the file stating what action was taken, who did the work, and the date of completion. Items should not be removed from the tracking system by verbal notification of completion.

Written documentation provides an audit that the corrective action was made. It assures future reviewers of the file that corrections were made. It documents changes that can be useful in future inspections (for example, if the next inspection finds that the thickness reading has increased, documentation of a repair will provide the explanation). Written documentation also provides discipline to the organization to treat the recommendations with proper respect. They are important and should not be treated lightly.

If circumstances change and a recommendation should be canceled or changed, this should be documented in writing and included in the file.

SPECIFIC TYPES OF EQUIPMENT

Narrower requirements for specific types of equipment or assemblies are given on the following pages. However, the safety of some processes may rely on equipment or systems not covered in this list. Methods must also be provided for these, following the same guidelines.

BEST PRACTICES

Tickle Systems

There should be a tickler system to incorporate recordkeeping of all maintenance work

INSPECTIONS AND TESTS
Pressure Vessels, Tanks, and Piping

SCOPE

The general provisions beginning on page 1 are a part of this section and must be followed in addition to what is stated below.

Pressure vessels, storage tanks, and piping whose integrity are critical to the safety of a hazardous process are to be inspected periodically to ensure adequate integrity and to predict their expected useful lifetime. Predicting useful lifetimes allows orderly plans for replacement and avoids failures and the crisis atmosphere resulting from failures and the shortcuts and quick fixes that occur during crises.

TEST METHODS

Requirements for pressure vessels as well as other tanks and piping include

- External inspection
- Internal inspection
- Inspection for corrosion
- Nondestructive testing

The nondestructive methods may include visual inspection, ultrasonic testing, magnetic particle testing, radiographic testing, liquid penetrant testing, acoustic emission testing, leak testing, eddy current testing, and others.

Refer to the 1992 National Board Inspection code section I-502.10 for guidance when a pressure test is of value. Pneumatic tests are very hazardous and shall not be performed without specific review and approval of the site.

INSPECTOR QUALIFICATIONS

Individuals who make the various measurements must have qualifications equivalent to Level 2 ASNT in any nondestructive methods being used.

Minimum qualification for an inspector must be equivalent to that of an API 510 inspector. The inspector's role is to interpret inspection results and make recommendations on fitness for service and remaining useful life. He may or may not be the individual who makes the measurements.

INSPECTION FREQUENCY

Each business unit is responsible for establishing the test frequency based on expected deterioration as a result of operating conditions or experience.

All pressure vessels must be inspected according to the timing given in API 510 or the NBIC (See Best Practices below). External inspections are required at least once every five years or more frequently as needed. Internal inspections may not be required if corrosion is not expected. If corrosion is expected, then the frequency of internal inspection is a function of the expected corrosion rate.

If ultrasonic or other nondestructive inspections are expected to be used during periodic inspections, then these should be conducted on new vessels before they are put into service to obtain baseline readings.

ACCEPTABLE PERFORMANCE LIMITS

Typically, through-wall leaks are unacceptable and must be patched or repaired immediately.

Whether or not a particular amount of selective corrosion such as pitting or stress corrosion cracking, is acceptable should be subject to individual study by a materials or mechanical engineer who will take into account existing damage and its effect on integrity and the expectation of the damage continuing.

The first action point for thickness measurements is when the thickness is reduced to the thickness specified in the design minus the corrosion allowance. At that point, the thickness needed to accommodate the design conditions should be recalculated, and if all is OK, then return to service is

appropriate. If insufficient wall is remaining or if such a condition is expected to soon occur based upon the corrosion or wear rates, then immediate action is needed to repair, rerate, or replace the unit.

BEST PRACTICES

Applicable National Codes, Standards, and Recommended Practices

A. Pressure Vessels

1. API (American Petroleum Institute) 510, "Pressure Vessel Inspection Code"

   API 510 is the preferred code because its inspector training and certification testing emphasizes pressure vessels.

2. National Board Inspection Code—ANSI/NB 23

   NBIC may be required by a site's local jurisdiction and in such cases should be the code followed. Its inspector training and certification testing emphasizes steam boilers and minimizes unfired pressure vessels.

B. Tanks

API 653, "Tank Inspection, Repair, Alteration, and Reconstruction"

C. Piping

API 570, "Inspection, Repair, Alteration, and Rerating of In-Service Piping Systems"

API 570 is available at this writing only in draft form as it has not yet officially issued.

Documentation of Pipe and Vessel Inspection Design and Results

A. PIPE+ computer program available from

Krautkramer Branson, Inc.
P. O. Box 350
Lewistown, PA 17044
(717) 242-0327

Runs on IBM and IBM compatible PCs

Advantages: Allows- up and downloading from data loggers.

INSPECTIONS AND TESTS PRESSURE RELIEF SYSTEMS, VENT SYSTEMS AND DEVICES

SCOPE

The general provisions beginning on page 1 are a part of this section and must be followed in addition to what is stated below.

All business units must have policies and procedures in place to ensure that all pressure relief systems, vent systems, and devices are in proper functioning condition and will reliably perform their function when needed.

All emergency vents (such as rupture disks, safety/relief valves, explosion vents, conservation vents, liquid legs, and flame arrestors) and atmosphere vents must be inspected on a routine basis.

TEST METHODS

Specific inspection or test requirements for each device are:

- **Rupture Disks**

  Inspection of the rupture disk system is required when the disk is removed and/or replaced. Inspection should include

  - The "as found" condition of the disk (OK, blown, corroded, mechanically damaged, perforated, etc.)
  - The condition of the inlet and outlet lines and their ability to permit free unthrottled flow and sustain thrust forces.
  - The functionality of any sensors, gauges, etc., associated with the relief system.

  A rupture disk need not be removed if it can be inspected from both sides.

A rupture disk that is removed can be reinstalled if it is clean and not damaged and is of the type that is held captive within a pretorqued bolted holder and the bolts on the safety head have not been disturbed.

Rupture disks in cyclic service may require replacement to avoid fatigue cracking. Follow manufacturers directions and whatever the design basis says about replacement frequency.

- **Safety/Relief Valves**

Inspection and testing of relief valves must conform to detailed procedures that are based on the appropriate ASME codes, National Board Inspection Code, and Du Pont Engineering Standards (SG6T, PH85).

Inspection should include

- The "as found" condition of the device.
- The condition of the inlet and outlet lines and their ability to permit free, unthrottled flow, and sustain thrust forces.
- The functionality of any sensors, gages, etc. associated with the relief system.

- **Explosion Vents/Blow-Out Panels**

Explosion vents and blow-out panels require a visual inspection of the following items: condition of vent panel or door (warping, corrosion, etc.); condition of springs or counterweights; hinge condition to permit full opening of panel; accumulation of dirt, rust, debris in discharge duct or piping; and accumulation of product in inlet duct or piping.

- **Conservation Vents**

Conservation vents shall be visually inspected in place for cleanliness, damage, corrosion, and functionality of mechanical parts. These checks should also be performed on vacuum breakers when applicable.

- **Flame Arrestors**

Flame arrestors shall be visually inspected in place for cleanliness, damage, and corrosion.

- **Atmosphere (Open) Vents**

  Atmosphere vents shall be visually inspected in place for cleanliness, damage, and corrosion.

INSPECTOR QUALIFICATIONS

The individual conducting these inspections must be qualified by training to an appropriate procedure. Some of the equipment manufacturers offer excellent training courses.

INSPECTION FREQUENCY

1. Each business unit is responsible for establishing the test frequency based on expected deterioration as a result of operating conditions or experience.

2. The initial frequency of inspections should be based on the following guidelines:

   - One year—all pressure relief devices and vents in process service.
   - Two years—rupture disks, safety/relief valves, and vents in noncorrosive, nonplugging service (instrument air, nitrogen, steam, etc.).
   - If the same service as the new one being installed has been trouble free, then the new one can be started at the same frequency as the existing same services.

3. Subsequent inspections times can be increased, based on a solid record of no problems and upon thorough review and approval of appropriate area supervision and the PSM Committee (MI and QA or equivalent). In no case can the inspection period be extended beyond five years.

ACCEPTABLE PERFORMANCE LIMITS

Limits must be specified for each inspection or test that define the point at which corrective action must be taken. For safety/relief valves testing, the limits are specified by appropriate ASME codes, while for the other devices in this procedure a "go-no-go" type limit is appropriate.

INSPECTIONS AND TESTS
CRITICAL* INTERLOCK AND ALARM SYSTEMS

SCOPE

The general provisions beginning on page 1 are a part of this section and must be followed in addition to what is stated below.

All critical Safety Interlock Systems (SIS) will be maintained in a manner that will ensure reliable/repeatable performance. To ensure that the devices are in a safe operating condition, they will be tested at scheduled intervals and maintained on a periodic, preventive maintenance schedule.

Included in the scope of this procedure are all SIS that are installed to prevent or indicate hazardous conditions that might endanger personnel, cause significant damage to the environment, or develop a major business risk. This procedure describes only the **minimum** requirements needed to ensure the safety of personnel and equipment and is not intended to restrict, in any way, additional precautions deemed necessary by the individuals responsible for proper and safe plant operation.

TEST METHODS

Testing the correct equipment action and process operation performed by the SIS is generally referred to as the functional test. This provides verification that the interlock logic does control the action of the final-control elements as specified by the functional requirements.

The functional test must be designed to verify each function of the SIS logic and the interactions of the various components to uncover any problem areas that might exist.

The written test procedure should be specific to each SIS.

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* Critical means class A or B interlock per Engg. Std. DX3S.

The procedure for the functional test should include or verify

- A general description of the test procedure based on the system specification.
- A definition of the responsibilities for each task and each group involved during the test.
- A definition of the responsibilities for each task and each group involved during the test.
- A list of the documents that will be required during the test.
- A list of the test equipment and instruments and their calibration status required to conduct the test.
- A list of trip device set points.
- Personnel safety issues that may apply during the test.
- A detailed procedure to be followed during the test; the detailed procedure is to include
    - The operation and range of all input devices, including primary sensors and SIS input modules (this must include the field sensor and all connecting wiring).
    - The logic operation associated with each input device.
    - The logic associated with combined inputs where appropriate.
    - The trip initiating values (set points) of all inputs/trip devices or the contact position of all switch inputs.
    - The alarm functions that may be included.
    - The operating sequence of the logic program.
    - The function of all outputs to final-control elements.
    - The correct action of the final-control elements.
    - The first-out alarms, as appropriate.
    - Any variable or output status indications that might be provided for operator monitoring (e.g., printed messages, prealarms, etc.)
    - Any computational functions performed by the SIS logic.

- That any manual trip provided for bypassing the SIS logic program works to bring the system to its "fail-safe" condition.
- The software version in the processor (if present) is the correct version.
- System action on loss of power, both instrument and utility.
- All hardware components, whether different or exact replacements, used in maintenance activities have been verified as compatible with current system configuration.
- All field sensor calibrations have been verified against a master list of ranges for field instruments.
- All wiring and communication links from field to control room equipment have been verified and tested to ensure correct operation.
- All software operating systems have been tested to ensure that SIS controls still function as designed.

A separate part of the functional test should verify the "fail-safe" position of all inputs, outputs, and final-control elements that are a part of the SIS. Checklist-format documents are preferred for recording status found during testing and any corrections that may be required should be noted on these documents.

Persons performing the functional verifications should initial and date each step that they verify on the checklist. Verification is interpreted to mean observation of the correct function, value, display, position, etc., and indicating this on the checklist.

If more than one SIS is installed on the same process unit, the testing procedures must ensure that each one is tested independently of the other. They should also be tested at different times and not simultaneously.

It should again be emphasized that each SIS is an independent system that will require its own testing procedure. There may be some synergy between parts of other systems, but each SIS should have its own written and approved, functional test procedure.

Inspector Qualifications

The functional testing should be done by personnel using a written procedure describing each step to be performed during the test. The individuals should be trained on how to conduct such functional tests according to the site's procedure and training policies.

INSPECTION FREQUENCIES

The frequency of testing required for SISs is dependent on the safety protection the SIS provides. If the safety function is minimal, the testing interval can allow longer periods between tests. If the safety function is critical, the testing may have to be performed more frequently.

Another factor that can impact testing frequency is the finding of faults or failures of any system components during a test. The number of failures may dictate more frequent testing or the lack of failures could allow longer intervals between tests.

In no instance should the frequency of testing be less than that included in the risk assessment analysis performed on the operation.

This testing should be performed prior to initial operation of the SISs for all new installations. It should be repeated for all modifications prior to their initial operation. It should be repeated, in total, any time changes have been made to SIS logic or when physical changes have been made to arrangements of inputs, outputs, or final control elements. For high-risk safety systems, it should be repeated at least annually or at times of major maintenance work, whichever is more frequent. If the frequency of testing of SIS comments has been factored into the overall operation risk assessment, the test frequency used in the risk evaluation should be used.

ACCEPTABLE PERFORMANCE LIMITS

Any deviations from SIS set points greater than 2% of range is unacceptable and is to be corrected and documented.

All interlocks that are found to be in a bypassed, disabled, or otherwise nonfunctional condition without proper authorization are to be formally investigated as a safety incident, complete with conclusions and recommendations to prevent recurrence.

AUDITING

Maintenance of the technology embodied in the SISs will require that procedures be in place to monitor the health of these systems. Periodic verifications of their function should take place. This can be accomplished by scheduled audits of the SIS Inspection & Test Procedures, the administrative procedures, the documentation of the test procedures, and the overall understanding of the test procedures by all functional groups.

For SIS, a scheduled review of the system operation should be incorporated into normal practice. As a minimum, this should include

- Review of all tests conducted since the last audit and verification of the documentation status.
- Review of all problems with equipment or logic associated with the SIS since the last review to ascertain if potential problems are developing that might degrade the system's safety in the future.
- Functional check of the systems operation during annual, or other turnarounds.
- Verification that all official copies of the documentation are in agreement.
- Review of all associated personnel's understanding of their responsibilities during the Inspection & Test Procedures.

The audit program should be conducted by plant personnel, including representatives of operations, engineering, maintenance, and the safety subcommittee.

BEST PRACTICES

- "Safety and Environmental Interlock Standard—TS123
- "Inspection and Testing of Safety Interlock and Alarm Systems—S&HP 516

INSPECTIONS AND TESTS
EMERGENCY ALARM/COMMUNICATION SYSTEM

SCOPE

The general provisions beginning on page 1 are a part of this section and must be followed in addition to what is stated below.

There is a need for reliable, responsive indication and communication in the event of an emergency at a chemical facility (See S&OH Procedures 5.1 & 6.1). Adequate warning and communications are needed to mitigate injury or exposure of personnel at or near the area of release, across the entire facility, and in the surrounding community.

To ensure that existing emergency alarm and/or communication systems are operating properly, it is necessary that periodic inspection and testing programs be formally established and maintained.

This guideline defines the objectives, methods, frequencies, acceptable performance limits, and appropriate follow-up actions/audits that are necessary to ensure acceptable and reliable emergency alarm/communication systems.

Emergency alarm/communication systems include and are not limited to

- Plantwide fire alarm systems.
- Local evacuation alarm systems.
- Emergency phone alerting systems.
- Emergency hand-held radios.
- Community alerting systems.
- Radio broadcasting systems.

TEST METHODS

Testing of emergency alarm/communication systems will consist of functionally operating each input element of the system and checking each output/receiving element of the system to ensure satisfactory operation.

The functional test must be designed to verify that each element in the system is operational and to uncover any problem areas that might exist.

The functional testing should be done by a team of appropriately trained personnel, using a written procedure describing the exact sequence of steps to be performed. There will be a separate, distinct written test procedure for each individual emergency alarm/communication system.

There will also be formal documents provided for recording the results of the testing. These documents will provide for sign-off by the team performing the test and serve as a reference for any questions that might arise concerning system operation. These documents are to be retained three years to comply with federal regulations.

The procedure for the functional test should include

- A general description of the test procedure based on the system specifications.
- A definition of the responsibilities for each task and each group involved during the test.
- A list of the documents required during the test.
- A list of any test equipment and its calibration status required to conduct the test.
- Personnel safety issues that may apply during the test.
- A detailed procedure to be followed during the test.
    - The operation and functionality of all input devices in the system (this would include all initiating switches, transmitter controls, master initiating controls, etc.).
    - The operating sequence of any applicable logic system (coded signals, multiple inputs, etc.).

- The correct action of the final control element (horn, bell, electronic signal generator, speaker, headset, etc.).
- System action on loss of power (alarms, alerts, printer output, low battery signal, etc.).
- Specification of the responsibilities of all personnel associated with preparing, authorizing, performing, documenting, and auditing the test procedures.
- Definition and understanding of all significant terms used in the body of the procedure.
- Qualifications and/or certifications required for all personnel involved with any application phase of the procedure.
- Security for access to software that controls the emergency alert system (Control of Management of Change).

A checklist format document is preferred for recording status found during testing. Also, any corrections that may be required should be noted on these documents.

Persons performing the functional test should initial and date each step that they verify on the checklist. Verification is interpreted to mean observation of the correct function, value, display, alert sound, etc., and indicating this on the checklist.

It should be emphasized that each emergency alarm/communication system should be considered independent and will require its own testing procedure. There may be some commonality between parts of other systems, but each emergency alarm/communication system should have its own written and approved functional test procedure.

Documentation of procedures and results is key to accomplishing the test's intended purpose. One method of ensuring that all findings are documented is to maintain a recorded list for logging any errors found during the test. Each item on the list should be specifically identified, dated when found, described in an understandable format, dated when corrected, and entered into a historical system for future analysis.

INSPECTOR QUALIFICATIONS

Persons performing these tests shall be trained to an appropriate procedure in accordance with the site's procedure and training policies.

INSPECTION FREQUENCIES

The frequency of testing required for emergency alarm/communication systems is dependent on the safety protection the system provides. If the safety function is minimal, the testing interval can allow longer periods between tests. If the safety function is critical, the testing may have to be performed more frequently.

Another factor that can impact testing frequency is the finding of faults or failures of any system components during a test. The number of failures may dictate more frequent testing or the lack of failures could allow longer intervals between tests.

Complete testing should be performed prior to initial operation of any emergency alarm/communication system. Whenever modifications are made to any part of the alarm/communications system, all affected parts of the system shall be function-tested following installation and before returning the system to service. Knowledgeable supervision will determine what parts of the system are affected. This would include changes to system logic or when physical changes have been made to arrangements of inputs, outputs or final signal elements. A complete test of all system inputs should be completed as scheduled by the standard regular testing frequency indicated by Engineering Standard F 6 A.

Minimum frequencies for making various emergency alarm tests are detailed in Engineering Standard F 6 A-Section 5.

ACCEPTABLE PERFORMANCE LIMITS

To pass the tests, the systems must demonstrate the following:

- All hardware components, whether different or exact replacements, used for system maintenance, are compatible with correct system configuration.

- All communications links from system control center to field located initiating and final elements demonstrate correct operation.
- All operator displays and controls meet defined operational actions.
- All signaling sequences are accurate and recognizable.
- All alarms and communication signals are readily heard by the intended individuals and groups.

AUDIT

Verifying the adequacy of all procedures used with emergency alarm/ communication systems will require that specific guidelines be in place to monitor the functionality of these systems. Periodic verifications of their function should take place. This can be accomplished by scheduled audits of the emergency alarm/communications system Inspection & Testing Procedures, the administrative procedures, the documentation of the test procedures, and the overall understanding of the test procedures by all functional groups.

For emergency alarm/communication systems, a scheduled audit of the system operation should be incorporated into normal practice. As a minimum, this should include

- Review of all tests conducted since the last audit and verification of the documentation status.
- Review of all problems with equipment or controls associated with the systems since the last review to ascertain if potential problems are developing that might degrade the system's functionality in the future.
- Verification that all official copies of the documentation are in agreement.
- Review of all associated personnel's understanding of their responsibilities during the Inspection & Test Procedures.

The audit program should be conducted by plant personnel including representatives of the emergency control organization, safety office, and plant management.

Reprinted from
Spec SC6T, page 27
Dated Oct 1978

PRESSURE-RELIEF VALVES

Forms may be obtained from the Standards Section, Louviers Bldg, Wilm, DE

VALVE TEST RECORD

Valve No. FA-51

E. I. du Pont de Nemours & Co, (Inc)

Manufacturer Vickers Manufacturer's No. CT-06-C-50

Size 3/4" NPT Manufacturer's rating (range of setting) 500 psig to 2500 psig

Operating area Fasloc® Process unit Catalyst pressure pump #5

Location Lower center of pump base (on reservoir)

Valve to discharge to Oil reservoir

All equipment protected Pump housing, pump piping

Orifice size 1/2" Design pressure 1350 psig

Set pressure for valve 1000 psig Maximum operating pressure of unit 1000 psig

Back pressure for valve 0 psig Maximum operating temperature of unit 75 °F

Valve flow capacity 20 gpm

Process flow capacity required 2.0 gpm

Test frequency 12 Months

Date Tested By Maint	Date Installed By Maint	Set Pressure When Installed	Back Pressure	Date Removed By Maint	Set Pressure On Removal	Reason Removed	Condition of		Recorded by	
							Valve *	Line *	Oper	Safety
3/30/89	3/30/89	1000	0				X	X	WW	
11-9-90							↓	↓		
10-31-91							↓	↓		

* G – Good F – Fair P – Poor

Signal month next inspection due

J	F	M	A	M	J	J	A	S	O	N	D

FIGURE 26 – VALVE TEST RECORD FORM

PRESSURE-RELIEF VALVES

VALVE TEST RECORD

Valve No. W. ENG. 19

Manufacturer KUNKLE VALVE Manufacturer's No. FIG. 600011

Size 2" Manufacturer's rating (range of setting) ______ psig to ______ psig

Operating area 700 HP BOILER North Process unit STEAM

Location BLDG. 745 CENTER VALVE

Valve to discharge to ATMOSPHERE

All equipment protected BOILER LINES AND EQUIPMENT

Orifice size ______ Design pressure ______ psig

Set pressure for valve ~~150~~ 145 psig Maximum operating pressure of unit ______ psig

Back pressure for valve ______ psig Maximum operating temperature of unit ______ °F

Valve flow capacity 9831

Process flow capacity required ______

Test frequency 12 Months

Date Tested By Maint	Date Installed By Maint	Set Pressure When Installed	Back Pressure	Date Removed By Maint	Pressure On Removal	Reason Removed	Condition of Valve *	Condition of Line *	Recorded by Oper	Recorded by Safety
9/8/81					150		G	G		
9/7/82					145		G	G		
4/13/83					145		G	G		
4/13/84					145		G	G		
4-22-85	[illegible]	[illegible]	[illegible]	[illegible]	145		G	G		
4-29-86					145		G	G		
5-4-87					145		G	G		
5-4-89					145		G	G		
4-5-90					145		G	G		

* G – Good F – Fair P – Poor

Signal month next inspection due

J	F	M	A	M	J	J	A	S	O	N	D

FIGURE 26 – VALVE TEST RECORD FORM

MANAGEMENT OF FACILITIES CHANGE FORM

TITLE/DESCRIPTION:

TECHNICAL BASIS FOR CHANGE:

The following are required prior to implementing facility changes:

	YES	NO	COMPLETED	
Test Authorization	_____	_____	_____	TA- ____
Process Hazards Review	_____	_____	_____	PHR- ____
Operating Instructions	_____	_____	_____	
Safety Checklist	_____	_____	_____	
Field Inspection	_____	_____	_____	

APPROVED:

	Prior to Change		After Completion	
	Signature	Date	Signature	Date
Production Supervisor	_____	_____	_____	_____
Production Senior Supervisor	_____	_____	_____	_____
Mechanical Senior Supervisor	_____	_____	_____	_____
Production Superintendent (Projects Only)	_____	_____	_____	_____

SAFETY CHECKLIST FOR NEW INSTALLATIONS OR ALTERATIONS

Project Title _____

Project/LF No. _____ Area/Building No. _____

Equipment Piece No. _____ Date of Inspection _____

SAFETY CHECKLIST

CATEGORY ITEM	NOT APPLICABLE	SPECIAL ATTENTION NEEDED	OK	REMARKS
Equipment Hazards				
A. Physical Conditions				
Electrical Classification Conformance				
Movement/Guards				
Pressure/Pressure Test Completed				
Temperature/Correct Insulation				
Tracing Complete/Tagged, Identified				
Radioactive				
Noise				
Supports/Vibration				
B. Environment				
Lighting Adequate				
Escape Doors, Exits, Fire Doors				
Clearances				
Bumping or Pinch Points				
Storage				
Hazardous Area Separation of Isolation				
Footing/Tripping Hazards				
Handrails/Safety Chains				
Identification of Piping/Equipment				
Identification of Instruments				
Bleed, Drain, or Vent Discharge				
Waste Disposal/Spill Containment				
Satisfies Permit				
Other (Specify)				
C. Instrumentation				
Pressure Gauges as Required by Design/Adequate				
Temperature Gauges as Required by Design/Adequate				
Fail-Safe Valve Position/Acceptable				
Loop Checks Complete				
Procedure Hazards				
A. Operation				
Operating Procedures				
Starting/Stopping/Emergency Switches				
Location of Controls				
Sampling				
Material Handling				
Mobile Equipment				
Other (Specify)				

CATEGORY	ITEM	NOT APPLICABLE	SPECIAL ATTENTION NEEDED	OK	REMARKS
Maintenance					
	Isolation Valves				
	Ditch/Drain Valves Identified and Blanked				
	Purging				
	Lock & Tag Procedure				
	Vessel Entry				
	Access				
	Identification of Switches/Starters				
	Identification of Interlocks/Alarms				
	Other (Specify)				
Safety Equipment					
	Area Safety Rules				
	Safety Shower/Eye Wash Station				
	Breathing Air Station				
	Scott Air Pak				
	Alarms-Audible or Visible				
	Fire Extinguisher/Sprinkler Prot'n.				
	Lighting Adequate/Emergency Lighting				
	Ventilation				
	Hazard Detection Instrument				
	Grounding/Bonding//Lightning Prot'n.				
	Guards and Shields/Guardrails				
	Safety Signs/Safety Painting				
	Relief Devices Installed				
Mechanical Equipment					
	Equipment Run-in				
	Lubrication Complete				
	Alignment Complete				
	Emergency Stop Facilities				
	Correct Rotation				
	P.M. Records/Spare Parts				
Training					
	Operators/Mechanics				
Process Hazards Review					
	Recommendations Complete				

Comments:

Inspection Initiated By: _____ Date _____

Approvals:

Production Supervisor Date	Senior Supervisor - Production Date
Supervisor Mechanical (If Involved) Date	Supv. Instruments/Electrical (If Involved) Date

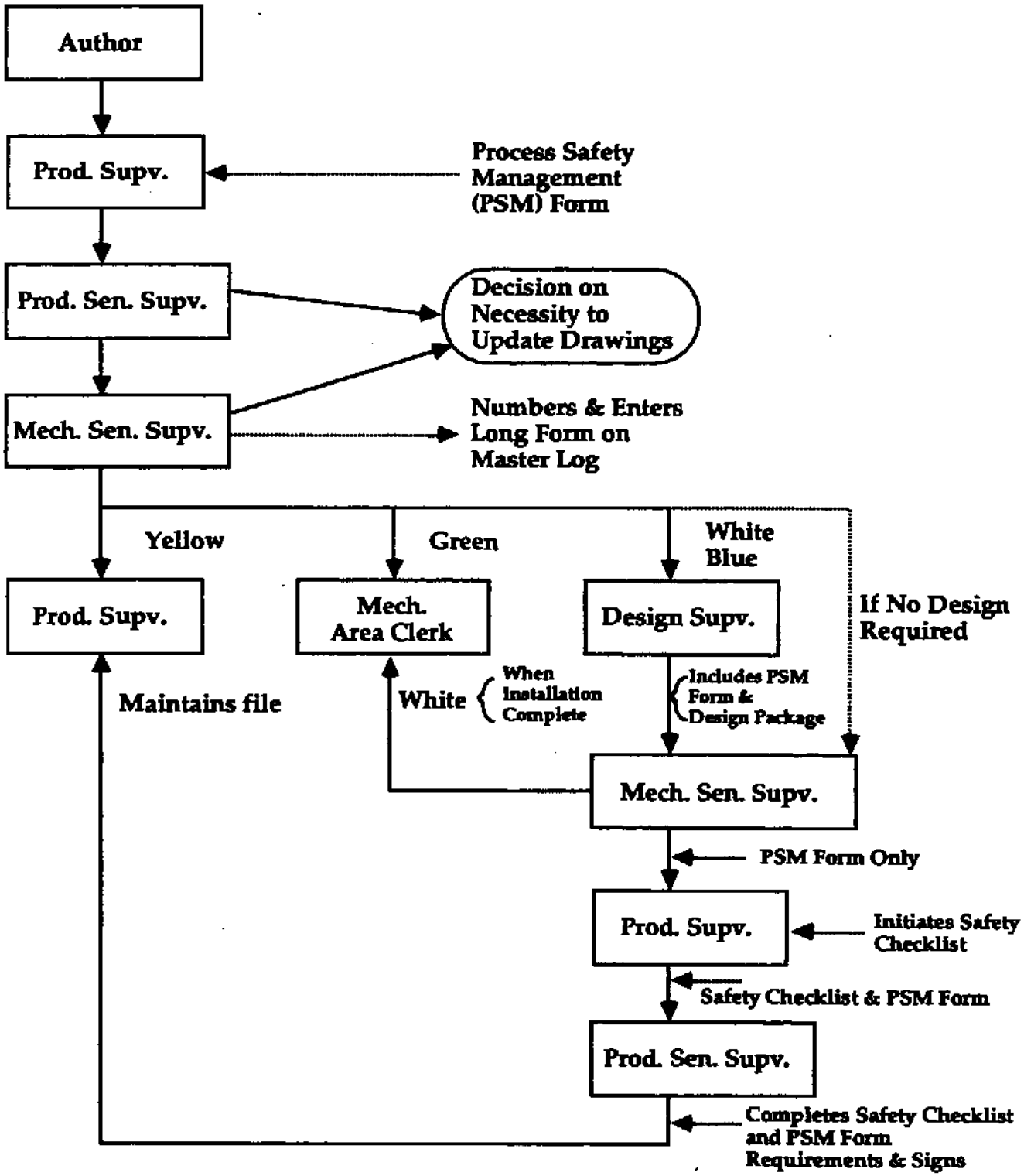
WORK ORDER NO	CODE	JOB TITLE

REQUESTED BY	DATE ISSUED	AREA	BUILDING NAME	BLDG NO	FLOOR	SECTION

DATE REQUIRED	DATE COMPLETED	☐ YES ☐ NO DECISION REQUIRED	UPDATE PRINTS ONLY ☐ CHECK HERE IF	SUPERVISOR MECHANICAL	ESTIMATED HOU

DRAFT	WORK ORDER - MECHANICAL DEPT. JOB ANALYSIS	LABOR	MATERIALS

DESIGN CHANGE LONG FORM
SCHEMATIC FLOW



LONG FORM MASTER LOG

LONG FORM NUMBER	BUILDING	EQUIPMENT NUMBER	DATE AUTHORIZED BY MECHANICAL	DATE DESIGN ISSUED	DATE WORK IS COMPLETED	P&I DRAWINGS UPDATED	E&I DRAWINGS UPDATED	OTHER MECHANICAL RECORDS UPDATED	DATE LONG FORM CLOSED

MU-670

and the Specific Training Required by Each

SOURCE OF REGULATION	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
(OSHA General Industry Standards)					
29CFR1910.20 - Access to Employee Exposure & Medical Records	29CFR1910.20.(g).(1) (i)-(iii)	All employees	All employees upon inital employment and at least annually thereafter for all employees exposed to toxic substances or harmful physical agents	The existence, location, & availability of records;person responsible for maintaining & providing access; each employee's rights of access to these records	29CFR1910.1200 29CRF1910.95 29CFR1910.134 29CFR1910 sub part Z 29CFR1910.96
29CFR1910.38 Employee Emergency Plans & Fire Prevention	29CFR1910.38: (a).(5).(i)-(iii) (b).(4).(i)-(ii)	All employees	Initial assignment, when plan changes, when employee's responsibilities in plan change	Train & inform employees in proper evaluation procedures;duties of those who remain for critical operations; how to account for all after evacuation; rescue & medical duties; preferred means of reporting fires & emergencies; apprise of fire hazards of materials & processes employee is exposed to.	29CFR1910.134 29CFR1910.151 29CFR1910.156 29CFR1910.157 29CFR1910.165 29CFR1910.1200
29CFR1910.67 Vehicle-Mounted Elevating and Rotating Work Platforms	29CFR1910.67.(c)(2).(ii)	Employees who are to use this equipment	Not explicitly defined requirements. (Conversation with area OSHA office recommends initially & at periodic intervals such that the employee is knowledgable.	Specific training so the equipment may be operated knowledgeably & safely.	
29CFR1910.68 Manlifts	29CFR1910.68.(b).(1)	Employees who use this equipment.	Not explicitly defined. (See above explanation)	Equipment specific training for safe use.	

and the Specific Training Required by Each

SOURCE OF REGULATION	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
(OSHA General Industry Standards)					
29CFR1910.20 - Access to Employee Exposure & Medical Records	29CFR1910.20.(g).(1) (i)-(iii)	All employees	All employees upon inital employment and at least annually thereafter for all employees exposed to toxic substances or harmful physical agents	The existence, location, & availability of records;person responsible for maintaining & providing access; each employee's rights of access to these records	29CFR1910.1200 29CRF1910.95 29CFR1910.134 29CFR1910 sub part Z 29CFR1910.96
29CFR1910.38 Employee Emergency Plans & Fire Prevention	29CFR1910.38: (a).(5).(i)-(iii) (b).(4).(i)-(ii)	All employees	Initial assignment, when plan changes, when employee's responsibilities in plan change	Train & inform employees in proper evaluation procedures;duties of those who remain for critical operations; how to account for all after evacuation; rescue & medical duties; preferred means of reporting fires & emergencies; apprise of fire hazards of materials & processes employee is exposed to.	29CFR1910.134 29CFR1910.151 29CFR1910.156 29CFR1910.157 29CFR1910.165 29CFR1910.1200
29CFR1910.67 Vehicle-Mounted Elevating and Rotating Work Platforms	29CFR1910.67.(c)(2).(ii)	Employees who are to use this equipment	Not explicitly defined requirements. (Conversation with area OSHA office recommends initially & at periodic intervals such that the employee is knowledgable.	Specific training so the equipment may be operated knowledgeably & safely.	
29CFR1910.68 Manlifts	29CFR1910.68.(b).(1)	Employees who use this equipmnt.	Not explicitly defined. (See above explanation)	Equipment specific training for safe use.	

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
29CFR1910.94 Ventilation	29CFR1910.94.(d).(9).(i) and (vi)	All employees working in & around open tank operations.	Not explicitly defined—initally & periodically thereafter.	The hazards of the specific job; personal protection; first aid procedures applicable to the hazards.	29CFR1910.151 29CFR1910.134 29CFR1910.1200 29CFR1910.157
29CFR1910.95 Occupational Noise	29CFR1910.95.(k).(1)-(3) (1).(1)-(3)	All employees who are exposed to, or exceed an 8 hr TWA of 85 dBA on the A scale, or a 50% dose.	Upon initial assignment to the area, & at least annually thereafter.	To inform the employee of the effects of noise on hearing; purpose of hearing protectors; how to select, use & fit hearing protectors; purpose of audiometric testing & explanation of test procedures.	
29CFR1910.96 Ionizing Radiation	29CFR1910.96: (f).(3).(viii) & (i).(2)	Any employee working in, or frequenting any portion of the radiation area.	Not explicitly stated. (Upon initial assignment & periodically thereafter.	Inform employee of occurrence of radioactive materials or of radiation in area; instructed in safety problems associated with exposure; precautions needed to minimize exposure; reports of exposure. Inform employee of individual exposure level.	29CFR1910.1200 29CFR1910.20
	29CFR1910.96.(n).(1)		Annually		
29CFR1910.103 Hydrogen	29CFR1910.103.(c).(4).(ii)	Designated employee to be in attendance for unloading of of mobile hydrogen supply unit.	Not explicitly stated. (Upon initial assignment & periodically thereafter)	Attendant. A qualified person shall be in attendance at all times while mobile hydrogen supply unit is being unloaded. The person designated should be totally familiar with all piping valves & operation.	

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
29CFR1910.106 Flammable & Combustible Liquids	29CFR1910.106.(b).(5).(vi).(v).(2)&(3)	All operators & other employees depended upon to carry out emergency operations associated with flooding	Upon assignment, & periodically so that emergency operations can be carried out.	Detailed printed instructions of what to do in a flood emergency. Operators & others are thoroughly informed about locations & operations of valves & other equipment.	29CFR1910.1200
29CFR1910.110 Storage & Handling of Liquefied Petroleum Gases	29CFR1910.110.(b).(16)	All personnel performing maintenance or operating LPG equipment	Not explicitly stated. (Upon inital assignment, periodically to maintain working knowledge of processes & equipment.	Operations personnel must be trained & knowledgeable in proper operation of process equipment as well as loading/unloading duties. Maintenance personnel must be trained in such craft functions for the capacity in which they will perform.	29CFR1910.151 29CFR1910.252 29CFR1910.Sub Part S
	29CFR1910.110.(d).(12)(i)	Personnel on watch duty at location which includes LPG installation.	Not explicitly stated. (Upon assignment & periodically thereafter).	Personnel employed in standard watch service.	
	29CFR1910.110.(h).(11).(vii)	Personnel dispensing LPG into fuel container of a vehicle.	Not explicitly stated. (Upon assignment & periodically thereafter).	Training must be conducted to make attendant competent in these duties. He is also to remain in attendance during the dispensing operation.	
29CFR1910.111 Storage & Handling of Anhydrous Ammonia	29CFR1910.111: .(b).(iv) .(b).(12).(11) .(b).(13).(ii)	All employees required to handle ammonia.	Not explicitly stated. (Initially upon assignment & periodically thereafter.)	The proper loading, unloading, handling procedures; & proper action to take in the event of an emergency.	29CFR1910.1200 29CFR1910.134 29CFR1910.157 29CFR1910.156

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TING	CONTENT	CROSS REFERENCE
29CFR1910.120 Hazardous Waste Operations & Emergency Response (Interim Rule)	29CFR1910.120: .(b).(4) .(c).(6) .(e).(1)-(9) .(1).(2).(i) .(1).(3).(i) .(1).(4).(i)	All employees before permitted to engage in hazardous waste operations. All employees exposed to hazardous substances, health hazards, or safety hazards. Workers exposed to unique hazards. Supervisors of the area or site trainers. Those employees who respond to emergencies.	At the time of job assignment. All employes 40 hrs. off site & 3 days on-site. Supervisor at least 8 additional hrs. Refresher training to be provided annually.	Names of personnel responsible for site safety & health; safety & health hazards on site; PPE; work practices; Engr. controls; medical surveillance requirements. General knowledge of site safety plan; level of training shall be consistent with employee's job function. Supervisor shall receive instruction on managing the operation; trainers shall receive a level higher than the subject matter they are teaching.	29CFR1910.1200 29CFR1910.134 29CFR1910.151 29CFR1910.157 29CFR1910.156
29CFR1910.133 Eye & Face Protection	29CFR1910.133. (a).(5)	Those employees who must wear protection for the eyes & face.	Upon initial issue of equipment & as conditions change.	The limitations of the equipment as well as any precautions by the manufacturer, must be transmitted to the user.	29CFR1910.1200 29CFR1910.252
29CFR1910.134 Respiratory Protection	29CFR1910.134: .(a).(3) .(b).(3) .(e).(1).(3) .(e).(5).(i) .(f).(3)	All employees who use respirators.	Initially, & at lenst annually thereafter.	The proper selection use & care of the respirator. Also instruction should be provided for routine use as well as possible emergency uses. This includes the safe use of respirator in dangerous atmospheres that may be encountered. This training shall provide the employees the opportunity to handle, wear, be fitted and wear in test atmosphere. This includes how to wear, how to adjust the respirator. Briefed	29CFR1910.38 29CFR1910.120 29CFR1910.94 29CFR1910.156 29CFR1910.252 29CFR1910.1200 29CFR1910.Sub Part Z

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
29CFR1910.145 Specifications for Accident Prevention Signs & Tags	29CFR1910.145: .(c).(1).(ii) .(c).(2).(ii) .(f).(4).(ii)	All employees	Not explicitly stated. (Initially upon assignment & periodically thereafter.	Danger/caution signs & tags. The special precautions necessary to be taken when sign or tag encountered.	29CFR1910.1200
29CFR1910.151 Medical Services & First Aid	29CFR1910.151.(a) & (b)	Designated employees to render first aid.	Initially upon assignment & at periodical intervals to maintain competency based on expected performance.	General first aid skills & CPR (Qualifications & content of training & supplies should be determined by responsible medical consultant.)	29CFR1910.38 29CFR1910.156 29CFR1910.252
29CFR1910.156 Fire Brigades	29CFR1910.156.(b).(1) .(c).(1).-(4) (See Paragraph 5 Appendix A to Sub SubPart L)	All employees on fire brigade or emergency response teams. Fire brigade leaders & training instructors.	Frequently enough to insure that each team member is able to satisfactorily perform assigned duties. ALL fire brigade members must be trained at least annually. Those required to perform structural fire fighting at least quarterly.	The training should be of the same quality as fire training school (Texas A&M University) i.e. sound fire fighting principles. Inform members about special hazards will be exposed to. Brigade leaders & instructors must be trained more comprehensively than general members.	29CFR1910.38 29CFR1910.157 29CFR1910.1200 29CFR1910.Sub Part Z 29CFR1910.158 29CFR1910.160 29CFR1910.161 .162 .163 .164 .165
29CFR1910.157 Portable Fire Extinguishers	29CFR1910.157.(c).(3) & .(g).(1)-(4) (See Appendix A to SubPart L).	Those employees where fire extinguishers are for their use. And those designated to use fire fighting equipment as part of the emergency action plan.	Upon initial assignment & at least annually thereafter.	To recognize the type of fire, properly operate the appropriate fire extinguisher how to fight the fire & when to leave if the fire becomes uncontrollable.	29CFR1910.156

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
29CFR1910.158 Standpipe & Hose Systems	29CFR1910.158.(e).(2).(vi)	Those employees who conduct inspections of the systems.	To maintain competence & working knowledge. No explicit frequency given.	To be able to perform the required maintenance & inspections on system. (Commonly outlined by the manufacturer.)	
29CFR1910.160 Fixed Extinguishing Systems, General	29CFR1910.158.(b).(6) & .(b).(10)	Those employees who inspect, maintain, & operate the system.	Initially upon assignment & annually review their training to keep them up-to-date on the functions they must perform.	To be able to adequately inspect, maintain, operate repair system. (Manufacturer commonly outlines necessary skill levels.)	
29CFR1910.164 Fire Detection Systems	29CFR1910.164.(c).(4)	Those employees who service, maintain, or test the system.	Initially & of a frequency to ensure competence.	Specific system maintenance & testing requirements.	
29CFR1910.165 Employee Alarm Systems	29CFR1910.165.(b).(4) & (c).(5)	All employees.	Initially upon employment, or assignment to an area.	Inform employee of preferred means of reporting emergencies & how system priorities function.	29CFR1910.38 29CFR1910.1200
29CFR1910.177 Servicing Multi-Piece Rim Wheels	29CFR1910.177.(C).(1) (3) .(f)	All employees who service multi-piece rim wheels.	Upon assignment to this job duty & training as necessary to assure proficiency is maintained.	Trained in mounting, demounting, and all related service activities & safety precautions. As a minimum data on charts & contents of the standard.	
29CFR1910.178 Powered Industrial Trucks	29CFR1910.178.(1)	Those employees who are required to operate a powered industrial truck.	No explicit requirements. (Initially upon assignment & periodically to maintain satisfac-	The safe operation, fueling, & inspection of the truck. (Manufacturers & the Ohio Industrial Commission will provide training to qualify	

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
29CFR1910.179 Overhead & Gantry Cranes	29CFR1910.179.(b).(B) & .(n).(3).(ix) .(o).(3)	Personnel responsible for lifting materials with crane when two or more cranes are used to lift.	No explicit requirement. (Initially upon assignment & periodically to maintain satisfactory proficienty.	Instructed in the proper positioning, rigging of loads, & the movements to be made.	
29CFR1910.180 Crawler Locomotive & Truck Cranes	29CFR1910.180.(b).(3) & .(g).(1) & .(i).(5).(ii)	Those personnel who operate a crane.	Not explicitly stated. (Initially upon assignment & periodically thereafter.)	The safe operation of a crane & inspection of ropes. To include the general content of standard & specific piece of equipment.	
29CFR1910.181 Derricks	29CFR1910.181.(b).(3) .(j).(3).(ii)	Designated personnel.	Not explicitly stated. (Upon assignment & periodically thereafter.)	Only designated personnel shall operate a derrick covered by this section.	
29CFR1910.184 Slings	29CFR1910.184.(d) & .(e).(3).(iii)	Those employees designated by the employer.	Not explicitly stated. (Initially upon assignment & periodically thereafter.	Usually to manufacturer's specifications for inspecting for fitness, damage, or defects in the sling.	
29CFR1910.217 Mechanical Power Presses	29CFR1910.217.(e).(3) & .(f).(2)	Those employees who operate, or perform maintenance activities on the machine.	Initially - before starting work on the equipment, to maintain continuing competence on the machine.	Proper operation & safe work methods for the machine, also related maintenance and inspection activities. (Manufacturer's guidelines.)	
29CFR1910.218 Forging Machines	29CFR1910.218.(a).(2).(iii)	Those employees who operate, or maintain forge machinery or equipment	Not explicitly outlined. (Initially upon assignment & periodically thereafter.)	Proper inspection & maintenance techniques & activities for the specific equipment.	

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
29CFR1910.252 Welding, Cutting & Brazing	29CFR1910.252: .(b).(1).(iii) .(b).(4).(i)&(ix).(a) .(c).(1).(i)&(iii) .(c).(6) .(d).(2).(iii).(b) .(d).(2).(xiii).(c) .(f).(13)	Employees who weld, braze, or utilize torches. Employees servicing welding machines. Those employees who are designated as the fire watch. Welding supervisors.	Not explicitly stated, but referred to "ASME" welder qualifications for code welder, annual recertification & must maintain weld experience within every 90 days.	Welder must pass weld procedure specifications & weld performance specs. In compliance with ASME S.IX, ANSI S B31.1 & B31.3, St; Supv. must be trained in all safe uses of process & equipment. Fire watches must be trained in extinguishing methods. Welder able to address different atmospheres.	ASME Section IX - Welding & Brazing Quality ANSI S B31.1, B 31.3 Ohio Dept. Pub. Relations Pres. Pip. Sys. Cod. 4101.3 29CFR1910.157 29CFR1910.151 29CFR1910.134
29CFR1910.1001 Asbestos, Tremolite Anthophyllite & Actinolite	29CFR1910.1001.(j).(5) .(i)-(iii)	All employees who are exposed to airborne concentrations at or above the action level (0.1 f/cc BTWA)	Prior to or at the time of initial assignment & at least annually thereafter.	Health effects of asbestos; relationship to smoking, quantity, location, release & storage; specific nature of operations that could result in exposure; Engr. controls & work practices; specific procedures for protection, respirator training; purpose & description of medical surveillance program, review of the standard.	29CFR1910.134 29CFR1910.1200 29CFR1910.58 29CFR1910.157 40CFR61 Sub Part H
29CFR1910.1025 Lead	29CFR1910.1025.(1) .(1)-(2) (See Appendices)	All employees exposed at or above the action level or for whom the possibility of skin or eye irri-	Prior to, or at the time of inital assignment & at least annually thereafter.	The content of the standard & its appendices; specific operations that could result in exposure; respirator training; purpose & description of medical surveillance	29CFR1910.134 29CFR1910.1200

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TEST	CONTENT	CROSS REFERENCE
29CFR1910.1028 Benzene	29CFR1910.1028.(j).(3).(i).(iii) (This standard does not appear in the bound CFR29. It does appear in the Federal Register dated Fri., 9/11/87.)	All employees at their time of initial assignment to a work area where BZ is present. If exposures are at or above the action level, at least annually thereafter.	Initially, & annually thereafter if exposed above the action level.	Specific information can be in accordance with 29CFR1910.1200; Appendices A&B; medical surveillance description & appendix C.	29CFR1910.1200 29CFR1910.134 29CFR1910.151 29CFR1910.157 29CFR1910.156
29CFR1910.1045 Acrylonitrile (Vinyl Cyanide)	29CFR1910.1045.(o)(1)-(2) (See Appendices)	All employees exposed to AN at or above the action level; employees whose exposures are below AL by work practices or Engr. controls & all employees subject to potential skin & eye contact.	At the time of initial assignment & at least annually thereafter.	Appendices A&B of standard; respiratory training; quantity, location, manner of release of AN & specific nature of operations; protective clothing; medical surveillance; emergency procedures developed; Engr. controls & work practices; review of standard.	29CFR1910.134 29CFR1910.1200
29CFR1910.1047- Ethylene Oxide	29CFR1910.1047.(j).(3)(iii)	All potentially exposed personnel.	At the time of initial assignment & at least annually thereafter.	The requirements of this section, explanation of its contents, including Appendices A&B. Any operations where EtO is present. Location & availability of the written EtO final rule. The medical surveillance program with an explanation of Appendix C. Observations used to detect presence or release of EtO in work area. Physical & health hazards of EtO. Protective measures, & details of hazard communication program.	

SOURCE OF REGULATION	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
(OSHA General Industry Standards)					
29CFR1910.1200-Hazard Communication	29CFR1910.1200: .(e).(1).(ii)-(iii) .(h).(1)-(2)	All employees who work in areas containing hazardous chemicals.	Upon initial assignment & whenever a new hazard is introduced into the work area.	Any operations in their area where hazards are present; the standard, location & availability of written program; methods to detect chemicals; measures employees can use to protect themselves; emergency procedures; details of HC programs (i.e., labeling system, MSDS's etc.)	29CFR1910.134 29CFR1910.157 29CFR1910.165 29CFR1910.120 29CFR1910 Sub Part Z
29CFR1910.SubPart S-Electrical	29CFR1910.399.(a).(100)	Employees who are required to perform work activities on electrical systems.	Upon inital assignment & periodically to maintain competency & proficient work practices.	Such that the employee is familiar with the construction & operation of the electrical equipment & the hazards involved.	National Electrical Codes NFPA Codes ANSI Standards
(OSHA Construction Standards)					
29CFR1926.58-Asbestos, Tremolite, Anthophyllite, & Actinolite	29CFR1926.58: .(k).(3).(i)-(iii) .(k).(4)	All employees exposed at action level or above.	Prior to initial assignment & at least annually thereafter.	Methods of recognizing asbestos, health effects relationship to smoking; nature of operations that could result in exposure; necessary protective controls & practices; respiratory training, work practices; medical surveillance; review of standard & appendices.	29CFR910.1200 29CFR1910.1001 29CFR1910.134

SOURCE OF REGULATION (OSHA General Industry Standards)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
29CFR1910.1003 4 - Nitrobiphenyl	29CFR1910.1003.(e).(5) (i)-(iii)	General Statement All employees handling or working in the area who may be exposed to the specific agent.	Usually upon inital assignment & at least annually therenfter.	Specific nature of the operation where the agent may be encountered; purpose & function of medical surveillance program; special work practices; emergency procedure operations;respiratory training;PPE;first aid procedures; specific hazards of agent; review of the standard.	29CFR1910.1200 29CFR1910.120 29CFR1910.134 29CFR1910.151 29CFR1910.156 29CFR1910.157
29CFR1910.1004 alpha-Naphthylamine	29CFR1910.1004.(e).(5) (i)-(iii)				
29CFR1910.1006 Methyl Chloromethyl Ether	29CFR1910.1006.(e).(5) (i)-(iii)				
29CFR1910.1007-3,3' Dichlorobenzidine	29CFR1910.1007.(e).(5) (i)-(iii)				
29CFR1910.1008 bis-Chloromethyl Ether	29CFR1910.1008.(e).(5) (i)-(iii)				
29CFR1910.1009 beta-Naphthylamine	29CFR1910.1009.(e).(5) (i)-(iii)				
29CFR1910.1010 Benzidine	29CFR1910.1010.(e).(5) (i)-(iii)				
29CFR1910.1011 4-Aminodiphenyl	29CFR1910.1011.(e).(5) (i)-(iii)				
29CFR1910.1012 Ethyleneimine	29CFR1910.1012.(e).(5) (i)-(iii)				
29CFR1910.1013 beta-Propiolactone	29CFR1910.1013.(e).(5) (i)-(iii)				
29CFR1910.1014 2-Acetylaminofluorene	29CFR1910.1014.(e).(5) (i)-(iii)				
29CFR1910.1015 4-Dimethylaminoazo-benzene	29CFR1910.1015.(e).(5) (i)-(iii)				
29CFR1910.1016 N-Nitrosodimethylamine	29CFR1910.1016.(e).(5) (i)-(iii)				
29CFR1910.1017 Vinyl Chloride	29CFR1910.1017.(j).(1) (i)-(ix)				
29CFR1910.1018 Inorganic Arsenic	29CFR1910.1018.(0) (1)-(2)				
29CFR1910.1029 Coke Oven Emissions	29CFR1910.1029.(f).(7) &.(k).(1)-(2)				
29CFR1910.1044 1,2-Dibromo-3-Chloropropane	29CFR1910.1044.(n) (1)-(2)				

SOURCE OF REGULATION (Nuclear Regulatory Commission)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
10CFR19.12 - NRC Instructions to Workers	10CFRCH.119.12	All individuals working in or frequenting any portion of a restricted areas.	Not explicitly stated.	Kept informed of the storage transfer or use of radioactive materials; health protection problems; precautions or procedures to reduce exposure; instructed in commission's regulations; reporting procedures; instruction shall be commensurate with potential health problems.	29CFR1910.96
10CFR20.206 - Instruction of Personnel	10CFRCH.120.206	All personnel frequenting a restricted area.	Not explicitly stated.	See 10CFR19.12 above.	29CFR1910.96 10CFR19.12
10CFR30.33 - Licensing	10CFRCH.130.33(a).(3)	Persons designated by the company requesting use of the materials.	Initially & at such intervals to insure competency.	Applicant of license must be qualified by training & experience to use material for which license is requested. Health hazards, use of device, detection, etc. information may be imparted by manufacturer at time of installation, or start up, or at periodic manufacturer's training schools.	10CFR19.12 10CFR20.206
(EPA Regulations) 40CFR Subchapter D Water Programs, Oil Pollution Prevention	40CFR-112.7(e).(10)	Facility personnel who operate & maintain equipment who may discharge oil. Supervisors.	Not explicitly stated (Frequent enough to assure adequate understanding of SPCC plan for the facility.)	Proper operation & maintenance of process equipment; applicable pollution control laws; training for spill prevention, containment & control; appropriate procedures to clean up spill.	29CFR1910.120 29CFR1910.1200 29CFR1910.134 29CFR1910.151 29CFR1910.156 29CFR1910.157 29CFR1910.165

SOURCE OF REGULATION (EPA Regulations)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
40CFR-264.16 Resource Conservation & Recovery Act	40CFR-264.16.(a)-(e)	All employees who must work with hazardous waste materials. (i.e. those areas that generate or treat these materials.)	Upon initial assignment to the area (within 6 months). At least annually thereafter.	Teach personnel waste management procedures; train to be able to respond to emergencies; inspection & repair of emergency & monitoring equipment; communications & alarm fire training; shutdown operations.	29CFR1910.1200 29CFR1910.120 29CFR1910.134 29CFR1910.151 29CFR1910.165 29CFR1910.156 29CFR1910.157 OAC3745-54-16
(DOT Regulations)					
49CFR173.1 Shipper's General Requirements for Shipments & Packagings.	49CFR173.1.(b)	All officers, agents & employees having responsibility for preparing hazardous materials for shipment.	Not explicitly stated. (Upon assignment & periodically thereafter.)	The statement is very broad & says that responsible persons shall be instructed as to to applicable regulations in in this subchapter.	
49CFR177.816	49CFR177.816.(a)-(c)	Drivers of vehicles transporting a flammable cryogenic liquid.	Before a driver may drive a motor vehicle transporting a flammable cryogenic liquid in a cargo tank & at least once every 24 months therafter.	Requirements in the subchapter applicable to cryogenic liquids. Requirements in Federal Motor Carrier Safety Regulations, Parts 390-397. The properties & hazards of particular material transported. Safe operation of type of cargo tank, including handling characteristics, emergency features & loading limitations. Procedures to be followed in case of emergency.	

SOURCE OF REGULATION (DOT Regulations)	SPECIFIC CITATION	WHO IS INCLUDED	FREQUENCY OF TRNG	CONTENT	CROSS REFERENCE
49CFR SubPart B Welding of Steel in Pipelines	49CFR-192.223 -192.227 -192.229	Welders	Prior to initial assignment & at least annually thereafter (Must maintain weld experience within 90 day period.)	ASME Section IX. Section 3 API Std. 1104 (Identifies qualified welder).	29CFR1910.252
49CFR Part 195 SubPart F - Operation & Maintenance of Pipelines That Transport Hazardous Liquids	49CFR-195.402 .(c).(1)-(13) .(d) & (e) -195.403 .(a)-(c)	All operations & maintenance personnel associated with pipeline operation. Supervisor	Initially upon assignment, & maintain a continuing training program. Must review, not exceeding 15 months & at least once a year. Company is to review with personnel their performance in meeting the objectives of the training program.	Operating & maintenance procedures in 49CFR-195.402; characteristics & hazards of products; conditions likely to cause hazardous emergencies; steps to control a spill or release; fire fighting; respiratory training; safe repairs using SPL procedures.	29CFR1910.120 29CFR1910.134 29CFR1910.156 29CFR1910.157 29CFR1910.1200 40CFR Subch D

SAFETY AND HEALTH POLICY

SAFETY AND HEALTH POLICY

(Excerpted from the Ontario Ministry of Labor's Occupational Health and Safety Act, Appendix A)

_____ is vitally interested in the health and safety of its employees. Protection of employees from injury or occupational disease is a major, continuing objective. _____ will make every effort to provide a safe, healthy work environment. All supervisors and workers must be dedicated to the continuing objective of reducing risk of injury.

_____, as employer, is ultimately responsible for worker health and safety. As president or owner/operating chairperson, chief _____, I give you my personal promise that every reasonable precaution will be taken for the protection of workers.

Supervisors will be held accountable for the health and safety of workers under their supervision. Supervisors are responsible to ensure that machinery and equipment are safe and that workers are in compliance with established safe work practices and procedures. Workers must receive adequate training in their specific work tasks to protect their health and safety.

Every worker must protect his or her own health and safety by working in compliance with the law and with safe work practices and procedures established by the company.

It is in the best interest of all parties to consider health and safety in every activity. Commitment of health and safety must form an integral part of this organization, from the president to the workers.

_____

President

CONTRACTOR SAFETY AND HEALTH PROGRAM
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SAFETY HEALTH ENVIRONMENT

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CONTRACTOR REQUIREMENTS CONCERNING CONTROLLED SUBSTANCES

CONTRACTOR REQUIREMENTS CONCERNING CONTROLLED SUBSTANCES

Contractor shall advise its employees and the employees of its subcontractors and agents that (1) it is the policy of DuPont to prohibit use, possession, sale, manufacture, dispensing, and distribution of drugs or other controlled substances on its premises, and to prohibit the presence of an individual with such substances in the body for nonmedical reasons in the workplace; (2) entry onto DuPont property constitutes consent to an inspection of the Contractor employee's person, vehicle, and personal effects when entering, while on, or upon leaving DuPont property; and (3) any Contractor employee who is found in violation of the policy or who refuses to permit inspection may be removed/barred from DuPont property at the discretion of DuPont.

Contractor further agrees upon request of a DuPont site, to not assign (or reassign) any employee to those DuPont operations unless such employee has taken a dug test satisfactory to the DuPont site at which said operations take place, and the test has proven negative for those drugs identified in a list to be provided by DuPont.

Contractor also agrees upon request of a DuPont site, to develop and implement procedures satisfactory to the DuPont site to test its employees for drug and controlled substance use when Contractor suspects that a performance deviation, an incident, or unusual behavior of one of Contractor employees on a DuPont site is related to drug or controlled substance use.

In connection with the above drug testing requirements, Contractor agrees to secure the written consent of its employees to release results of such tests to DuPont. DuPont agrees to use such test results only in connection with its decision whether to permit a Contractor's employee to enter or remain on DuPont property, and to monitor Contract compliance.

RELATED SITE SAFETY PROCEDURES

RELATED SITE SAFETY PROCEDURES

Site Procedures

Personal Protection

1. Hard Hats _____
2. Eye Protection _____
3. Safety Toe Shoes _____
4. Gloves _____
5. Clothing Requirement _____
6. Respirator Use _____

Tools and Equipment

7. Ladder Use _____
8. Scaffold Use _____
9. Barricade Use _____
10. Hand Tools _____

Procedures and Practices

11. Hazardous Area Work _____
12. Electrical Safety _____
13. Excavation Standards _____
14. Hazard Communication _____
    a. MSDS Sheets location _____
    b. Site labeling system _____

	Site Procedures
15. Welding	_____
16. Roof Work	_____
17. Noise Control	_____
18. Hygiene & General	_____
19. Temporary Wiring	_____
20. Contractor Smoking	_____
21. Contractor Evacuation & Emergency Instruction	_____
22. Plant Traffic Rules	_____
23. Vehicular Safety	_____
24. Compressed Gas cylinders	_____
25. Asbestos, RCF & NARFS	_____
26. Environmental Waste Disposal	_____
27. Spills & Cleanup	_____
28. Overhead Lifting	_____
29. Contaminated Equipment	_____
30. Rigging	_____
31. Fall Protection	_____

Procedures and Permits

32. Locking and Tagging	_____
33. Work Permit System	_____
34. Burning Permit	_____
35. Scrap Removal	_____
36. Flammable Containers Disposal	_____
37. Confined Space entry	_____

CONTRACTOR'S JOB SAFETY AUDIT CHECKLIST

CONTRACTOR'S JOB SAFETY AUDIT CHECKLIST

CONTRACTOR'S COMPANY _____ PROJECT _____

This form serves as a guide for the DU PONT CONTRACT ADMINISTRATOR to discuss on-going job safety and related items with the CONTRACTOR'S REPRESENTATIVE.

A. USE OF PERSONAL PROTECTIVE EQUIPMENT

N/A	YES	NO		
[ ]	[ ]	[ ]	1.	EYE AND HEAD PROTECTION
[ ]	[ ]	[ ]	2.	FOOT AND HAND PROTECTION
[ ]	[ ]	[ ]	3.	RESPIRATORY PROTECTION
[ ]	[ ]	[ ]	4.	HEARING PROTECTION
[ ]	[ ]	[ ]	5.	SAFETY BELTS AND LIFE LINES
[ ]	[ ]	[ ]	6.	BODY PROTECTION - NOMEX, ACID SUITS, ETC.

UNSAFE ACTS OBSERVED AND ACTION TAKEN: _____

B. FOLLOWING SAFE WORK PRACTICES

N/A	YES	NO		
[ ]	[ ]	[ ]	1.	ALL APPROPRIATE PERMITS INPLACE AND IN COMPLIANCE
[ ]	[ ]	[ ]	2.	POWER DRIVEN EQUIPMENT PROPERLY DE-ENERGIZED
[ ]	[ ]	[ ]	3.	EQUIPMENT AND PROCESS LINES PROPERLY CLEARED & ISOLATED
[ ]	[ ]	[ ]	4.	ALL TRASH, HAZARDOUS LIQUID & SOLID WASTE DISPOSED OF PROPERLY
[ ]	[ ]	[ ]	5.	SCAFFOLD, LADDERS AND BARRICADES ADEQUATE AND BEING USED PROPERLY.

UNSAFE ACTS OBSERVED AND ACTION TAKEN: _____

C. TOOLS AND EQUIPMENT

N/A	YES	NO		
[ ]	[ ]	[ ]	1.	RIGHT FOR THE JOB
[ ]	[ ]	[ ]	2.	IN SAFE CONDITION

UNSAFE ACTS OBSERVED AND ACTION TAKEN: _____

CONTRACTOR'S JOB SAFETY AUDIT CHECKLIST

D. WORKER'S ACTIONS

N/A	YES	NO		
[ ]	[ ]	[ ]	1.	USING TOOLS AND EQUIPMENT PROPERLY
[ ]	[ ]	[ ]	2.	USING PROPER LIFTING TECHNIQUES
[ ]	[ ]	[ ]	3.	WORKING TOO CLOSE TO MOVING EQUIPMENT OR UNDER OVERHEAD WORK WHERE WORKER COULD BE STRUCK BY FALLING OR MOVING OBJECTS.

UNSAFE ACTS OBSERVED AND ACTION TAKEN: _____

_____

_____

E. HOUSEKEEPING

N/A	YES	NO		
[ ]	[ ]	[ ]	1.	TRIPPING HAZARDS
[ ]	[ ]	[ ]	2.	WORK AREA BARRICADED AND WARNING SIGNS IN PLACE
[ ]	[ ]	[ ]	3.	TOOLS STORED PROPERLY
[ ]	[ ]	[ ]	4.	TRASH DISPOSED OF PROPERLY

UNSAFE ACTS OBSERVED AND ACTION TAKEN: _____

_____

_____

NO. OF OBSERVED WORKERS _____

I HAVE DISCUSSED WITH THE CONTRACTOR'S REPRESENTATIVE ALL UNSAFE ACTS AND CONDITIONS CHECKED ON THIS LIST.

DU PONT CONTRACT ADMISTRATOR: _____ DATE: _____

CONTRACTOR REPRESENTATIVE: _____ DATE: _____

DECIDE - TO MAKE AN OBSERVATION; ITEMS TO OBSERVE
STOP - STOP AT JOB SITE TO EFFECTIVELY OBSERVE
OBSERVE- LOOK FOR UNSAFE ACTS
ACT - ACT TO IMMEDIATELY CORRECT ANY UNSAFE ACT
REPORT - REPORT ACTION TAKEN TO CORRECT AND PREVENT RECURRENCE

GUIDANCE FOR DETERMINING KEY FACTORS

Endorsement of "Root Cause" Analysis

Principles of "root cause" analysis endorsed by many safety and health professionals are useful in identifying areas for improvement (especially system improvements) that can help prevent recurrence of incidents. These principles are not designed to identify precise cause-effect relationships or to otherwise affix blame. Rather, they are designed to assist investigators in their efforts at identifying those factors that reasonably may have contributed to the occurrence of the event even though a precise, after-the-fact casual link cannot be determined. The investigators then examine those factors to determine what may have contributed, in turn, to their occurrence. This step-wise approach will ultimately lead to the identification of factors that may be at the "root" of other factors.

It is not recommended that the products of investigations be labeled as "causes" or "root causes" for the following two reasons:

- The inherent difficulties in accurately identifying actual cause-effect relationships in any after-the-fact investigation
- The significance that may be attached to these terms in civil courts, where the assessment of precise cause-effect relationships and/or the affixing of blame are of paramount concern

It is recommended that the following "root cause" method of analysis be used to maximize the learnings from incidents and to identify key factors.

As defined in the text of this document, key factors are those circumstances which may have contributed to the incident's occurrence, even though a clear casual connection cannot be found. These factors may include human, equipment, or management categories/systems that are found to be deficient or otherwise capable of being improved.

Examples of key factors include the following:

- An operator did not properly follow the operating procedures.
- The fire water pump bearings failed, causing a shutdown of the fire water pump during a fire. Pump bearings are not included in the site preventive or predictive maintenance programs.

- Operator procedures for nonroutine tasks are not included in the current operator training program.

After an incident occurs, an investigation is held as soon as possible to determine all the key factors. From the list of key factors, a list of recommendations, or follow-up actions, can be generated. When the recommendations are implemented, the possibility of the same incident recurring is reduced.

"Root Cause" Analysis

1. For each item that occurred, identify what events/situations may have caused or contributed to it ("causes").

2. Each of these can then be evaluated to identify what events/situations may have caused or contributed to it, for example by asking: "Why did this happen?"

3. For each "answer," again ask what events/situations may have caused or contributed to it. At some point the team needs to ask: "What management systems (e.g., training, auditing) were lacking or otherwise capable of being improved?"

4. Continue looking for the "cause" of each possible factor identified until the endpoint is reached—the most basic "cause" or "root cause." Often, the endpoint is one of the PSM elements (e.g., training, operating procedures) that needs to be improved. These endpoints are also considered to be key factors and should be noted as such in the report.

5. Another possible endpoint is when a point is reached where the event cannot be controlled internally by the location alone. In these cases, the investigation would involve outside organizations as appropriate. In addition, the investigation would look at how to reduce effects from external sources. (For example, a failure due to a defective part supplied by a vendor is not simply out of the control of the site. Actions, such as quality control, can be implemented to prevent this type of incident from occurring.)

6. After identifying all the key factors, the theories should be tested against the chronology and other pertinent facts. The team may need to modify its conclusions to fit the facts.

7. Finally, recommendations are developed based on the key factors identified.

Examples of a "Root Cause" Analysis

Example 1

Incident: An employee slipped on a wet spot on the floor and sprained his ankle. Questions asked by the team found the following:

- Why was the floor wet? Leak from pipe
- Why did pipe leak? Corrosion
- Why did it corrode? Wrong material of construction
- When was wrong material installed? Original installation
- Why was wrong material installed? Quality assurance (QA) procedures were not adequate. There is no requirement for inspection by qualified personnel.

The team then recommended modifying the site QA procedure to require inspection and documentation of the inspection of all new/modified equipment to ensure construction matches design specifications. Also, the site PSM audit protocol should be modified to verify that QA requirements are implemented.

Example 2

Incident: A forklift truck (FLT) began to leak oil. The investigation team found the following:

- Why did FLT leak? There was a bad seal.
- Seal was just replaced; why did new seal leak? Wrong seal was used.
- Where did incorrect seal come from? It was ordered by purchasing.
- Why did purchasing order the incorrect seal? Their specification was incorrect.
- Why was specification incorrect? Only had one specification for all FLTs and this brand of truck needed a different seal than the others.

The team recommended additional specifications for the different brand of truck. Additionally, when new equipment is brought on-site, verification is needed that correct specifications exist for replacement parts. The team also noted that although this was not a process incident, the PSM elements that applied are Process Technology and Quality Assurance.

GUIDANCE FOR DETERMINING PSM ELEMENTS THAT NEED STRENGTHENING

This guide may be used to aid in determining the Process Safety Management (PSM) elements(s) that need strengthening.

Check this element on the incident report	**If review of identified key factors indicates that:**
Process Technology	Improvements could be made in documentation and/or understanding of ❑ Hazards of materials ❑ Process design basis ❑ Equipment design basis
Process Hazards Analysis	Improvements could be made in ❑ Conducting and/or documenting the Process Hazards Analysis (PHA) ❑ Depth of the PHA ❑ Timeliness of addressing PHA recommendations
Operating Procedures and Safe Work Practices	Improvements could be made in the development, clarity, accessibility and/or approval of ❑ Operating procedures or safe work practices ❑ Maintenance procedures
Management of Change—Technology	❑ Improvements could be made in the development, approval and/or authorization of a COD (Change of design)/TA (Test authorization) for the change ❑ Improvements could be made in the documentation of some of these features in the COD/TA: • Purpose of the change • Technical basis for the change • Description of the change • Safety, health, and environmental impact, including acknowledgement of whether a PHR is required • Analysis of the change • Modifications to operating procedures • Training/communication to personnel • Limits for the change • Approval and authorization • "Face Sheet" controls: operating procedures, P&IDs, PHR

Check this element on the incident report	If review of identified key factors indicates that:
Personnel Training and Performance	Improvements could be made in ❑ Operating or maintenance personnel (includes initial or refresher training requirements) ❑ Personnel "fitness for duty" ❑ Operating excellence (discipline)
Contractor Safety and Performance	❑ Contractor personnel were involved in the incident ❑ Improvements could be made in how the site manages its PSM responsibilities for the safety of the contract personnel and/or in how the contractor manages its PSM responsibilities for the safety of site personnel
Incident Investigation and Communication	Improvements could be made in ❑ Thoroughness of the investigation of a previous similar incident ❑ Timeliness of completion of recommendation(s) from a previous similar incident ❑ Identifying appropriate key factors and developing recommendations from these in a previous incident ❑ Sharing of Incident Reports with potentially affected personnel
Emergency Planning and Response	Improvements could be made in ❑ Mitigation of impact on personnel, environment, and/or facilities ❑ Controlling the emergency situation promptly ❑ Emergency plans
Auditing	Improvements could be made in the conduct, depth, or follow-up of audit(s)
Quality Assurance	Improvements could be made in ❑ Developing or following procedures to ensure fabrication, delivery, assembly, and installation per design specifications ❑ Checking of received equipment or materials
Mechanical Integrity	An unexpected failure of a mechanical or instrument system occurred (for example, piping, equipment, relief device, or interlock failure) Improvements could be made in ❑ Conduct, timeliness, or documentation of equipment inspections and tests, including predictive and preventive maintenance

Check this element on the incident report	If review of identified key factors indicates that:
	❑ Involving technical resources to assist in assessing the reliability/integrity of equipment
Prestart-Up Safety Review	Improvements could be made in ❑ Conduct, depth, and/or documentation of Prestart-Up Safety Review (PSSR) ❑ Timeliness of completing recommendations from the PSSR (either prior to start-up or soon thereafter)
Management of "Subtle" Change	Improvements could be made in ❑ Completion of COD/Design Package ❑ Developing, approving, and/or authorizing per procedure of a "subtle change" COD

FORMAL INVESTIGATION REPORT
SAMPLE INCIDENT INVESTIGATION FORM

INCIDENT TITLE: **REPORT DATE:**

SITE SPECIFIC INFORMATION: (name, business, area, etc.)

DATE & TIME OF INCIDENT:

DATE & TIME INVESTIGATION BEGAN:

NATURE OF INJURY OR ILLNESS:

CLASSIFICATION: (Injury _____ Illness _____ Incident _____)

PSM: Point total _____, CMA reportable ___ (U.S. sites only)

ENVIRONMENTAL: A___ B___ C___

Chemical released and quantity _____

To what medium (e.g., air, water, ground) _____

OCCUPATIONAL HEALTH: Exposure _____ Potential for exposure _____

FIRE: Source of fuel: _____ Ignition _____;

Duration: _____

Autosuppression actuate (Y/N) ___ Property damage ___

DISTRIBUTION: Major _____; Minor _____; Informational ___

DESCRIPTION OF INCIDENT:

DETAILS/LEARNINGS OF THE INVESTIGATION:
(including chronology as appropriate)

KEY FACTORS:

SYSTEM ELEMENTS THAT NEED TO BE STRENGTHENED:

PSM ELEMENTS

TECHNOLOGY	
Process Technology ___	Operating Procedures and Safe Work Practices ___
Process Hazards Analysis ___	Management of Change—Technology ___
PERSONNEL	
Personnel Training & Performance ___	Incident Investigation & Communication ___
Contractor Safety & Performance ___	Emergency Planning & Response ___
Management of Change—Personnel ___	Auditing ___
FACILITIES	
Quality Assurance ___	Prestart-Up Safety Review ___
Mechanical Integrity ___	Management of "Subtle" Change ___
OTHER SYSTEM ELEMENTS:	

RECOMMENDATIONS: **RESPONSIBILITY:** **TIMING:**

INVESTIGATION BY:
APPROVED BY:

REPORT FORMAT

INITIAL/SHORT INCIDENT REPORT
Site/Area: Date and Time: What Happened: If Release, Also Note: Quantity released: Chemical released: To what medium (e.g., air, water, ground): Off-site and/or on-site impacts: Immediate Actions Taken: Investigation By:

PRELIMINARY INCIDENT REPORT

ITEMS

1. Date _____ Time _____ Location _____

2. What happened?

3. Immediate Action (Include steps taken to prevent further incidents)

4. Employee(s)

   Name _____

SAMPLE FORM

SERIOUS INCIDENT REPORT NO. _____

(SITE'S NAME)

To: *Distribution list* Date: *Today's date*

From:

Date: *Actual date incident occurred*
Time: *Actual time incident occurred*
Area: *Area name: e.g., Warehouse, Finishing, Pump*
Place: *Actual location*

DESCRIPTION OF INCIDENT

Describe clearly and precisely how the incident occurred. Use photos or sketches where appropriate.

RESULTS OF INVESTIGATION

Indicate the date and time the incident was investigated. List, in logical order, pertinent facts uncovered in the investigation.

BASIC CAUSE(S)

Specify the cause(s) of the incident and explain.

- ❑ *Personal protective equipment*
- ❑ *Positions of people*
- ❑ *Actions of people*
- ❑ *Tools and equipment*
- ❑ *Procedures and orderliness*
- ❑ *Safety management systems*

SERIOUS INCIDENT REPORT NO. _____
(Continued)

PSM ELEMENT THAT REQUIRES STRENGTHENING

___ Process Safety Info.
___ Operating Proced. & Safe Prac.
___ Management of Tech. Change
___ Process Hazards Analysis
___ Quality Assurance
___ Prestart-up Reviews
___ Mechanical Integrity
___ Management of facilities change
___ Training & Performance
___ Contractors
___ Incident Investigation & Reporting
___ Management of Personnel Change
___ Emergency Planning & Response
___ Auditing

RECOMMENDATIONS TO PREVENT RECURRENCE

Concisely list immediate and long-term actions. For each action, indicate the person responsible for the follow-up. Indicate an estimated completion date. Use names, not titles.

INVESTIGATED BY

List last name and full initials of investigating committee members.

PREPARED BY

Include names of the people preparing the report.

EXAMPLE

SERIOUS INCIDENT REPORT NO. 92-14
LITTLE SILVER POLYMER PLANT

To: *Distribution List* Date: May 7, 1992
From: S. Kenton
Date of Incident: May 4, 1992 Time: 2:45 A.M.
Area: Continuous Polymerization Place: Basement

DESCRIPTION OF INCIDENT

Two employees were sprayed with molten monomer while removing a pipe nipple from a vent tap. The employee doing the work received first-degree burns to the face, neck, and forearms and second-degree burns to the upper arms. The employee observing the work received first-degree burns to the right forearm.

RESULTS OF INVESTIGATION

- The crossover line (S-2 to Y-1) was being heated and was vented at the east outlet sample tap of Y-1 monomer unit.
- A 1/2-inch pipe nipple and elbow had been attached to the vent to connect a drain line for flushing glycol from the S-2 exchanger. The remainder of the drain line was connected to the recovery header but not to the vent line.
- A small amount of vapor and drops of low-grade monomer had been coming from the vent during the shift.
- The employee proceeded to remove the 1/2-inch nipple from the vent. As it was unscrewed, pressure that had built behind an undetected plug blew the nipple loose and a small amount of trapped monomer sprayed onto both the employee doing the work and an observer.
- The first employee was wearing goggles and had his sleeves rolled up to the elbow. The procedure requires a face shield and long-sleeved shirt worn properly. The second employee was not wearing any safety equipment other than safety glasses.

SERIOUS INCIDENT REPORT NO. 92-14
LITTLE SILVER POLYMER PLANT
(Continued)

BASIC CAUSES

- ❑ Procedures—The potential for trapped pressure was not anticipated, and the safeguards for opening a closed system were not followed.
- ❑ Personal Protective Equipment—The proper personal protective equipment as required by procedure was not utilized.
- ❑ Safety Audits—Safety audit review shows that employees routinely do not wear personal protective equipment other than goggles when opening lines.

PSM ELEMENTS THAT NEED STRENGTHENING
(See previous example)

___	Process Safety Info.	___	Management of facilities change
_X_	Operating Proced. & Safe Prac.	_X_	Training & Performance
___	Management of Tech. Change	___	Contractors
___	Process Hazards Analysis	___	Incident Investigation & Reporting
___	Quality Assurance	___	Management of Personnel Change
___	Prestart-up Reviews	___	Emergency Planning & Response
___	Mechanical Integrity	_X_	Auditing

RECOMMENDATIONS TO PREVENT RECURRENCE

1. Publicize incident. (CC 5/7)
2. Revise area safety rules requiring a barricade around work when a line is being broken. (SG 5/15)
3. Have individual contacts with supervisors and hourly employees in the area about following and enforcing safety rules. (SK 5/8)

INVESTIGATED BY

S. Kenton, S. Getz, C. Condoli, G. Verdi, J. Green, W. Herman, F. Rossolino, S. Manne

PREPARED BY

S. Kenton, P. Rugolo

SAFETY BULLETIN
A CLOSE CALL!

WHAT OCCURRED

WHAT RESULTED

SIGNIFICANT CAUSE(S)

PREVENTION STEPS

Area Reporting: _____

Date: _____

MISSES PREDICT INJURIES!

Date _____

TO: _____
(Division Head)

FROM: _____
(Area Head)

SERIOUS POTENTIAL INCIDENT RECOMMENDATION STATUS

On those incidents affecting my area, status of recommendations is as follows:

Incident No.	Recommendation No.	Status	Expected Completion Date

MANAGEMENT SUMMARY

President Reagan signed the Superfund Amendments and Reauthorization Act of 1986 (SARA) into law on October 17, 1986, completing a three-year effort by Congress to revise and extend Superfund, officially known as the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Early in 1985, Congress attached an emergency planning and community right-to-know proposal to SARA as a response to the Bhopal tragedy of December 1984. This proposal, which became Title III, the Emergency Planning and Community Right-to-Know Act of 1986, incorporates many elements of existing state law and industry initiative with emergency response and preparedness.

PURPOSE AND SCOPE

Title III is intended to encourage and support emergency planning efforts at the state and local level, and provide citizens and local agencies with information concerning potential chemical hazards in their communities. The Act establishes new federal initiatives under the EPA Administrator but does not preempt existing state or local laws. The major program elements of Title III:

- ☐ Establish a state organization for planning emergency action and receiving hazardous chemical information.
- ☐ Require community notification of emergency chemical releases.
- ☐ Require facilities to report hazardous chemical inventories and supply Material Safety Data Sheets.
- ☐ Provide for an annual inventory of hazardous chemical releases to the environment.

The Act requires most facilities that manufacture, use, or store hazardous chemicals to provide one or more reports to the community.

REGULATED CHEMICALS

The terminology in right-to-know laws is complicated by the varied terms which are used interchangeably to describe "hazardous." The same situation exists with Title III, which uses four terms for regulatory purposes: "Hazardous Chemical," "CERCLA Hazardous Substance," "Extremely Hazardous Substance," and "Toxic Chemical." The all-inclusive designation of Hazardous Chemical, defined by OSHA to include about 90 percent of all elements, compounds, and mixtures, describes the other three terms. CERCLA Hazardous Substance is the listing generated for Superfund, Extremely Hazardous Substance is a new listing developed by EPA, and Toxic Chemical is a listing adopted from a New Jersey list. For clarity, the term hazardous chemical is used for generic description. All other terms are used only when they apply to a specific provision of the Act.

EMERGENCY PLANNING ORGANIZATION

Title III programs are coordinated and managed by a State Emergency Response Commission and a Local Emergency Planning Committee, new organizations that the Governor of each State must establish by August 17, 1987. The Commission and Committee have broad authority to develop and implement an emergency plan and to collect and manage mandated information. They are also empowered to obtain additional information from area facilities upon the request of community groups or other agencies. The Act also requires facilities covered by the law to have a representative on the Committee. ("Facility" and "facilities," as used in this manual, have the same meaning as an owner or operator of a facility.)

SARA §*126* directs the Secretary of Labor to promulgate standards for employees engaged in hazardous waste operations, including training for both on-site and off-site emergency responders. Such standards are cited as Interim Final Rule 29 CFR 1910.120. When fully implemented by OSHA and EPA, all private and public emergency response personnel are to have monthly training totaling 24 hours annually; however, limited federal funds are provided for training. Joint training sessions for industry and local agency personnel could promote community outreach relationships.

EMERGENCY PLAN

Within recent years, publicized emergency releases have heightened concern for the health and safety of people living near chemical facilities. At the heart of Title III are mandates for creating an effective, coordinated emergency response organization and an emergency plan for each local district by October 17, 1988. While the concepts are familiar to the chemical industry through the Community Awareness and Emergency Response Program (CAER) and the Hazardous Materials Advisory Councils (HMAC), the Act introduces new terms and requirements. Industry needs to play a leading role in assuring the community that the required planning is effectively accomplished on schedule, and adequately demonstrated through scheduled drills. This communication requires extra effort by plant management, who must contact the appropriate community representatives, even if these officials do not realize their responsibilities under the Act.

EMERGENCY RELEASE NOTIFICATION

After May 22, 1987, facilities must notify the community, through the Commission and Committee, if an emergency release with the potential of affecting persons outside the plant occurs. This reporting requirement is similar to reporting releases for CERCLA Hazardous Substances, but expands the regulated chemicals to include the list of Extremely Hazardous Substances designated by EPA under Title III. The Act requires both an immediate and a written follow-up report to the Committee and Commission. To prevent misinterpretation and unnecessary response action, facilities need to make prior contact with these agencies.

HAZARDOUS CHEMICAL REPORTING

Manufacturing industries, which already prepare or maintain Material Safety Data Sheets for Hazardous Chemicals under OSHA, are required under Title III to submit MSDSs or lists and an annual inventory of the Hazardous Chemicals to the Commission, Committee, and Fire Department (with jurisdiction over the facility), beginning in October 1987. All other employers must start reporting by September 1988. These reports are at the core of the community right-to-know portion of the Act. How they are received and interpreted will depend on the groundwork done by industry within the community. EPA

estimates the cost of complying with this section of Title III is a minimum $708 million for industry and $178 million for state and local agencies over a 10-year period.

TOXIC CHEMICAL RELEASE INVENTORY

The most controversial part of Title III is the annual inventory of the total quantity of each Toxic Chemical entering each environmental medium: air, surface water, groundwater, land, and waste treatment systems, in the previous year. The Act allows reasonable estimates, permits confidential treatment for certain data, and limits general availability to EPA and a designated state official. EPA is required to establish a national data base to store data for general public and agency use. EPA is also directed to study "mass balance" data collection for five years to determine if the Toxic Chemical Inventory should involve "mass balance" reporting.

RELATIONSHIP TO STATE RIGHT-TO-KNOW LAWS

Title III does not preempt state or local law. Facilities in states with right-to-know laws must compare these laws with Title III to determine how to comply with both.

In summary, Title III mandates communication and cooperative action between industry and the community, which many facilities have already initiated. The Act imposes levels of authority and responsibility, makes it more difficult to withhold information, and introduces reporting forms and systems. Civil and criminal penalties are imposed for violations of reporting provisions. Title III permits civil actions against industry, the EPA Administrator, or the Governor, by any person or state or local agencies. The key to a successful transition lies at the local level, and success depends on a progressive proactive posture by far-sighted facilities. A communication bridge between the facility and the community must be established to meet the new challenges of the Act and further CAER initiatives.

SAMPLE AUDIT PROTOCOL

Prestart-up Safety Review [1910.119(i)]

Through discussions with management personnel and/or a review of site procedures, evaluate procedure for prestart-up safety reviews conducted on new or modified equipment or facilities.

Through field observation and/or discussion with employees, and/or a review of documents, review site prestart-up safety reviews to ensure that they are conducted prior to the introduction of highly hazardous chemicals into new or modified facilities that require a change in process safety information. These reviews should confirm that [29 CFR 1910.119Ii)]

a. The changed process safety information is incorporated into the appropriate documentation.

b. Construction is in accordance with design specifications.

c. Adequate safety, operating, maintenance, and emergency procedures are in place.

d. PHA recommendations necessary for start-up have been completed.

e. Employees have been adequately trained

    1. Prior to assignment to a job when highly hazardous chemicals are used in the process.

    2. On specific highly hazardous chemicals prior to introduction of those chemicals into the process.

f. Communicate pertinent new or modified chemical hazards to community support organizations, such as hospitals, police, and fire departments.