

PSSR Checklist Example A-1

Description of System/Area Under Review	Date	Time

List of Participants	Circulation: those present plus...

Comments

Item No.	Recommendation (Type Action Below or 'not applicable')	Department / Responsible Person	Completed Date
1.	Review HAZOP list for applicable actions		
2.	Review CHAZOP list for applicable actions		
3.	Review punch list for applicable actions.		
4.	Noise level monitoring (document)		
5.	Exposure monitoring (document)		
6.	Emissions permits		
7.	Other operating permits		
	System Checkout Items		
8.	Complete/document quality assurance program:		
	a) Received equipment=purchased		
	b) Adherence to design drawings/specifications		
	c) Materials of construction		
	d) Workmanship		
	Equipment components checkout/commissioning (document)		
9.	Loop and interlock/permissive/alarm: set point adjustment and testing (document results)		
10.	Instrument calibrations done and documented		
11.	Validation protocol developed, approved and executed		
12.	Pressure testing done and documented		

Item No.	Recommendation (Type Action Below or 'not applicable')	Department / Responsible Person	Completed Date
13.	System cleaned and flushed		
14.	Fire protections systems inspected, acceptance-tested documentation provided		
15.	Ventilation systems balanced		
16.	Performance checkout of local exhaust systems		
17.	Vibration measurements/documentation		
18.	Field radiography done and documented as required		
19.	Baseline data, such as thickness readings for pressure vessels/piping		
20.	Other baseline data		
21.	NDT reports		
22.	Water batching (document)		
	Engineering Design Documentation		
23.	Narrative of control philosophy/Sequence of operations documentation		
24.	Instrument index		
25.	Instrument loop diagrams		
26.	Interlock (safety & non-safety) descriptions		
27.	As-built drawings: P&IDs, electrical, piping, mechanical		
28.	Tabulation of process alarms, interlocks/permissive descriptions and trips with settings (P&ID)		
29.	Review and approval of fire protections systems design		
30.	Piping specifications (P&I/mechanical drawings)		
31.	Pressure relief device sizing calculations		
32.	ASME code pressure vessels U-1 data sheets (to Maintenance)		
33.	Reference codes/standards for facility design		
34.	Reference codes/standards for facility installation		
35.	Design codes for specific equipment		
36.	Welder certification		
37.	NDT certification		
38.	Electrical classification drawings		
39.	Electrician certification for classified areas		
	Maintenance Items		

Item No.	Recommendation (Type Action Below or 'not applicable')	Department / Responsible Person	Completed Date
40.	Spare parts lists developed <i>List equipment:</i>		
41.	Stock required spare parts		
42.	Equipment manuals/specifications to Maintenance and Operating Department		
43.	Vendor prints		
44.	Submit Preventive Maintenance requests (PMs)		
45.	Service contracts in place		
46.	Train maintenance personnel and document		
	Operational Items		
47.	Develop SOP and special procedures – incorporate safety and operational issues:		
48.	Complete change control authorizations		
49.	Develop/issue operating procedures:		
	a) Initial start-up		
	b) Normal start-up		
	c) Normal operation		
	d) Normal shutdown		
	e) Emergency operations including emergency shutdown		
	f) Start-up following emergency shutdown		
	g) Start-up following turnaround		
	h) Non-routine procedures (equipment clean-out, equipment preparation for maintenance)		
	i) Auxiliary equipment operation		
50.	Train operating personnel and document		
51.	Provide technical coverage		
52.	What is the probability of containment failure? What are the subsequent consequences? Review spill containment, rainwater runoff, and fire water containment.		
	- Electrical Issues		
53.	Panel access, clearance around panel, keys, etc.		
54.	Cable entry section – glanding, housekeeping and other issues		

Item No.	Recommendation (Type Action Below or 'not applicable')	Department / Responsible Person	Completed Date
55.	Panel power source identified? Multiple feeds?		
56.	Space heaters required?		
57.	Lighting in panels		
58.	Canopies etc. for outdoor panels		
59.	Protection settings available?		
60.	Panel board schedules		
61.	Spare capacity available?		
62.	PPE available? HV mats, gloves		
63.	Emergency/Standby power required?		
64.	VSD settings available – factory/commissioning		
65.	Room access, permitting, maintainability, ingress/egress of equipment		
66.	Pockets for drawings in panels?		
67.	Voltage warning labels?		
68.	Ventilation sufficient?		
69.	Suitability for area - IP rating, GMP suitability, hazardous area classification.		
	- Relief Devices		
70.	Are there standard markings on the P&ID?		
71.	Do relief lines vent to a safe location?		
72.	Are relief lines and relief devices secured and adequately sized?		
73.	Are there any isolation valves which will inhibit operation of relief valves if closed? If YES, nominate Operations to monitor. If NO, record no.		
74.	Is there a standard operating procedure for relief devices in place?		
	- For Field Verification		
75.	Is lighting sufficient?		
76.	Is emergency lighting sufficient?		
77.	Are steam pipes, valves, or traps situated within proximity of people insulated?		
78.	Is all instrumentation identified and tagged?		
79.	Is there any rusted or damaged equipment?		
80.	Are swing gates installed on top of ladders or on access platforms?		

Item No.	Recommendation (Type Action Below or 'not applicable')	Department / Responsible Person	Completed Date
81.	Review edge protection on platforms and heights. Will it protect personnel and equipment? Is access adequate?		
82.	Do safety showers provide a hazard to people (slips), product (contamination of systems), or ingress to electrical switchgear or equipment?		
83.	Are safety showers supplied from tempered water?		
84.	Is chemical dosing within a safe proximity of people and product?		
85.	Label all pipe lines		
86.	Label all electric switches, disconnects, MCCs, control panels, cables, etc.		
87.	Label vessels (material, hazard warnings) List:		
88.	Seal wall penetrations		
89.	Pour conduit seals		
90.	Install fire extinguishers		
91.	Evacuation routes posted		
92.	Install appropriate area signs		
93.	Is all scaffolding and equipment removed; is general housekeeping acceptable?		
94.	If there is potential for entrapment or exposure, has an E-Stop been provided?		
95.	If full guarding is in place, has a lockable isolation device been provided?		
96.	Pest control required in room/building?		
97.	MSDS sheets required?		
98.	Sprinklers in rooms?		
99.	Single point of failure condition? Has it been identified? – Record.		

PSSR Checklist Example A-2

Pre-startup Safety Review Checklist	
Inspection Date:	
Department/Area:	
Project Number:	
Title/Equipment:	

<i>Signatures below indicate acceptance that the equipment or project is safe and satisfactory to start-up with the exceptions noted.</i>	
Engineering / Maintenance	Date
EHS Group	Date
QA Group	Date
Manufacturing / Operations	Date
Project Engineer	Date
Process Engineering	Date

Checklist Item No.	Details (reference category/item no.)	Responsibility	Complete Sign & Date
Category A Action Items - <i>Items to be completed BEFORE authorization and start-up</i>			
1.			
2.			
3.			
4.			
5.			
Category B Action Items - <i>Items to be completed AFTER start-up</i>			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
<i>Sign below only when all punch list "before start-up" items are completed</i>			
Authorized:	Facility/Equipment Owner Signature:		Date

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
1.1	GENERAL SAFETY	
1.1.1	Have <i>ALL</i> appropriate personnel (Operations, Maintenance, Technical, and Supervision) received adequate and appropriate training on the equipment and operating procedures?	
1.1.2	Has adequate and appropriate <i>PPE</i> (Personal Protective Equipment) been specified in the Work Procedures and/or Standard Operating Procedures. Has the PPE been provided? Have the PPE users been trained in the use of the PPE? Is the training documented?	
1.1.3	Have measures been taken to adequately guard all dangerous parts of this equipment?	
1.1.4	Has sufficient provision been made for the electrical and/or mechanical isolation of the equipment?	
1.1.5	Are points of isolation clearly marked/labeled and readily accessible?	
1.1.6	Have bump/trip hazards been properly identified and adequately marked? Have all sharp edges been removed?	
1.1.7	Has proper guarding, handrails/barriers, been provided to prevent falls?	
1.1.8	Have all hot/cold surfaces been adequately guarded to prevent burns? Are all cold surfaces adequately insulated to prevent condensation drips (slip hazards)?	
1.1.9	Are Safety Showers and Eye Wash facilities provided and adequately marked? Are the Safety Showers and Eye Wash facilities routinely inspected? Do the Safety Showers and Eye Wash facilities locations comply with Corporate guidelines? Are the Safety Showers and Eye Wash facilities readily visible and accessible?	
1.1.10	Has sufficient lighting been provided so that operation, servicing, maintenance, and repair of the facilities can be carried out safely?	
1.1.11	Are notices, dials, screens, etc. for providing operational instructions, safety warnings, and emergency information provided, if required, and positioned so that they are clearly visible and easily read?	
1.1.12	Have all overhead fixtures, for example, pipe-hangers, pipe sleeves, pipe sleeve covers, valve handles, floor opening covers, etc., which could fall or be dislodged, been properly secured?	
1.1.13	Are all of the applicable Work Permit Procedures (Confined Space Entry, Lock Out/Tag Out, Hot Work, High Work, etc.) in place? Have the Operating, Maintenance, and Supervisory personnel been properly trained on the Work Permit Procedures?	
1.1.14	Has the fire protection systems been inspected by the insurance company? Has acceptance testing been completed and documented? Is there an agreed on test and inspection program for the fire protection systems (including alarm systems)?	

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
1.2	MACHINERY/EQUIPMENT SAFETY	
1.2.1	Has the machinery/equipment been installed so that it will be stable and secure during operation?	
1.2.2	Has all access to dangerous moving parts, or danger zones created by the equipment, been prevented by the provision of the correct guards, interlocks (both safety & non-safety) and/or barriers?	
1.2.3	Have the correct safety measures been taken to prevent any risk from hot/cold surfaces, ejection of material, failure of parts and their ejection, overheating/fire?	
1.2.4	Has safe access been provided to the equipment that requires operator and calibration and maintenance personnel access for normal operations, adjustments, service, calibration, maintenance, or repair? Have slip, trip, trap, crush, entanglement, fall, bump, and cut hazards been minimized?	
1.2.5	Is the equipment provided with the properly identified <i>START/STOP</i> and <i>EMERGENCY</i> controls that are positioned for safe operation without hesitation, or loss of time, and without ambiguity?	
1.2.6	Is the equipment provided with a clearly identified means to securely isolate it from <i>ALL</i> energy sources?	
1.3	ERGONOMICS	
1.3.1	Have the workstations, workplace, or equipment been constructed so that need for stooping, bending stretching, over-reaching and working over-head during operation has been eliminated or minimized?	
1.3.2	Has the need to lift, carry, push or pull heavy loads, or parts, been eliminated to the extent possible?	
1.3.3	Are all display screens, dials and <i>START/STOP/EMERGENCY</i> buttons positioned so that they are readily visible and accessible by the operating personnel?	
1.3.4	Have Visual Display Screens been positioned so that interference from glare is reduced to the minimum?	
1.3.5	Have workstations been designed and equipped so that the operator can adopt a comfortable position? (<i>That is, able to stand, or change position and sit upright, angle at elbows and knees 90°, feet on floor.</i>)	
1.3.6	Does the operation of this equipment increase the risk of Upper Limb Disorder; for example, repetitive tasks, handling operations, machine paced work and prolonged operation?	
1.4	OCCUPATIONAL HEALTH	
1.4.1	Have all health risks arising from the gases, liquids, dusts, mists, biological hazards or vapors used by, contained in or emitted by this equipment been assessed? Have the health risks been eliminated or are adequate engineering controls utilized to minimize the risks?	
1.4.2	Has adequate <i>RPE</i> (Respiratory Protective Equipment) been specified in the Operating Procedures?	
1.4.3	Has the need for an Occupational Health Monitoring Programme been assessed? Has a Monitoring Programme been scheduled?	
1.4.4	Have the Operating Procedures been reviewed to take into account any additional "health hazards" which may arise from operation or maintenance of this equipment?	

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
1.4.5	Has adequate <i>LEV</i> (Local Exhaust Ventilation) been installed, tested, balanced, and entered on an Inspection Schedule?	
1.4.6	Have adequate inspection/cleaning ports been provided on ductwork?	
1.4.7	Are relief facilities directed to a safe place away from the workplace?	
1.4.8	Has a Noise Survey been considered and a Noise Compliance Plan prepared, if required?	
1.4.9	Has all insulation been identified?	
1.4.10	Has all pipe work, tanks, and equipment containing hazardous materials been adequately labeled?	
2.0	PROCESS SAFETY	
2.1	PROCESS TECHNOLOGY	
2.1.1	Are up-to-date Material Safety Data Sheets available?	
2.1.2	Have the hazardous effects of inadvertent mixing of different materials been considered (that is, has a chemical interaction matrix been prepared/updated)?	
2.1.3	Has the process design basis been documented or updated? Has the control philosophy and sequence of operations been documented?	
2.1.4	Has the equipment design basis (for example, BPF's/P&IDs) been documented/updated?	
2.1.5	Have the recommendations from safety reviews, Process Hazards Analysis (PHA), Hazards and Operability Reviews (HAZOP), CHAZOP, or others, been implemented? Record any incomplete items.	
2.1.6	Are all relief devices shown on the P&IDs? Are standard markings used on the relief devices? Are the relief/rupture pressures included on the P&IDs?	
2.1.7	Have the pressure relief device calculations been provided? Was DIERS technology utilized to size the pressure relief devices for all pressure vessels? Does the sizing of pressure relief devices agreed with the calculated sizes? Do the calculations take into the downstream piping?	
2.1.8	Do the relief devices vent to safe locations? Is containment provided for liquids and solids released from pressure relief devices?	
2.1.9	Are there isolation valves that, if closed, will inhibit the operation of pressure relief devices? If yes, Operations must establish control plans to insure that the isolation valves cannot inhibit the operation of the pressure relief devices.	
2.1.10	Are all pressure relief devices included in the Preventive Maintenance Program? Are the inspection and testing of relief devices in accordance with local regulations?	
2.2	MANAGEMENT OF CHANGE – TECHNOLOGY/ MANAGEMENT OF SUBTLE CHANGE	

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
2.2.1	Has a management of change – technology/subtle change document (for example, Change of Design - COD) been approved?	
2.2.2	Has a test authorization been approved?	
2.2.3	Are all action items, arising from the COD, that were deemed necessary for start-up, complete?	
2.2.4	Have all changes made during construction been recorded and authorized? Have hazards evaluations (PHAs, HAZOP, or CHAZOP) been done on all the changes made during construction?	
2.3	PROCESS HAZARDS ANALYSIS	
2.3.1	Have project PHAs been approved and a final project safety report been prepared?	
2.3.2	Are all action items, deemed necessary by the PHA team for start-up, complete?	
2.3.3	Has the project been approved as “Safe to proceed with” by the PHA team?	
2.4	QUALITY ASSURANCE	
2.4.1	Have checks and inspections been made to ensure that critical equipment is installed properly and is consistent with design specifications and vendor’s recommendations (for example, alarm and interlock (safety & non-safety) tests; equipment alignment and service to process inter-connections)?	
2.4.2	Have quality assurance inspection reports, covering fabrication, assembly, and installation, been completed in accordance with the project’s quality assurance plan and reports filed with the equipment and design basis documentation?	
2.4.3	List specific items field checked as part of this Pre-Start-up Safety Review to ensure that:	
	The construction meets the design specifications.	
	The construction matches the drawings.	
2.4.4	Have the following documented been provided and approved: Instrument indexes and instrument loop diagrams? A tabulation, including settings, of interlocks (both safety & non-safety) and trips (hardwire and software), process alarms and permissive descriptions? As-built drawings covering P&IDs, electrical, piping, and mechanical? Data sheets for pressure equipment built to ASME or equivalent codes? Welder certification? Non-destructive test (NDT) certifications? Electrical certification for classified areas?	
2.5	MECHANICAL INTEGRITY	
2.5.1	Have maintenance procedures been approved?	
2.5.2	Have maintenance personnel been trained?	
2.5.3	Have spare parts listed been developed and entered into the parts ordering software program? Are there adequate inventories of spare parts, operating supplies and maintenance materials?	
2.5.3	Have quality control procedures been approved for maintenance materials and spare parts?	

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
2.5.4	Have inspections and tests, including regulatory requirements) for the following equipment been included in a maintenance schedule?	
	Pressure vessels and storage tanks?	
	Pressure relief systems, vent systems, and devices?	
	Critical controls, interlocks (both safety & non-safety), alarms and instruments?	
	Emergency devices (including shutdown systems and isolation systems)?	
	Fire protection equipment?	
	Piping systems (incl. Components, for example, valves, excess flow valves, expansion bellows) in critical service?	
	Key process-to-service tie-ins?	
	Electrical earthing, grounding, bonding?	
	MCC starters?	
	Emergency alarm and communication system?	
	Monitoring devices and sensors?	
	Pumps?	
	Lifting equipment?	
2.5.5	Has a reliability engineering analysis been considered/ completed for critical process safety equipment?	
2.5.6	Is the equipment inspected by any outside body and are the certificates on file (for example, CE marking, lifting equipment test certificates, pressure systems regulations, and other items)?	
2.5.7	Have all commissioning tests or inspections been identified (for example, pressure, or leak tests, passivating procedures)?	
2.6	OPERATING PROCEDURES AND SAFE WORK PRACTICES	
2.6.1	Have standard operating procedures been prepared/updated and approved? Do the operating procedures cover:	
	Initial start-up? Normal start-up? Normal operations? Normal shutdowns? Emergency operations including emergency shutdowns? Start-up after emergency shutdowns? Start-up following turnarounds/prolonged shutdowns?	
	Non-routine procedures such as equipment clean-outs and preparation of equipment for maintenance? Auxiliary equipment operations including as examples; LEV and Ventilation Systems, Heat/Cool Skids, Water (Soft, RO, WFI, Tower, etc.) Systems, Instrument and Process Air Systems, Waste Treatment Systems, Cooling (Glycol Refrigeration) Systems, Steam Generation, and others? Safety and operational issues? Change control procedures?	
2.7	TRAINING AND PERFORMANCE	
2.7.1	Has specific process (or job task) training been given to personnel?	

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
2.7.2.	Have training records been updated?	
2.8	CONTRACTOR SAFETY	
2.8.1.	Have all contract personnel been adequately trained in appropriate: chemical awareness, maintenance, and operating activities and evacuation procedures?	
2.9	INTERLOCKS AND ALARMS	
2.9.1	Has the alarm/interlock (safety & non-safety) been classified and designed by the Project Team? Did the Project Team include members of the PHA team?	
2.9.2	Did the loop testing confirm that the alarm/interlock (safety & non-safety) action proved, under all conceivable failure conditions, to be fail-safe?	
2.9.3.	Prior to this PSSR, has an interlock/critical alarm Standard Operating Procedure for testing, through to the final element, been prepared and reviewed/authorized by a competent person for each new or upgraded control system?	
2.9.4.	For alarms/interlocks (both safety & non-safety) with more than one software or hardware circuit, have all possible interlock routes been tested?	
2.9.5	Has all appropriate process technology been updated (for example, interlock lists, P&IDs, logic drawings, etc.)?	
2.9.6	Does your Control System documentation adequately specify:	
	All major components and their model and serial numbers?	
	All communication cables layout and configuration?	
	Any configurable or custom settings and set-up?	
2.9.7	Has consideration been given to suitable fire detection and prevention systems for the equipment?	
2.9.8	Do you have an appropriate procedure to ensure that your software is protected (for example, routinely archived, key/password protected, etc.)?	
2.9.9	Has the software been properly documented and filed (for example, logic drawings, schematics, sequence/batch descriptions)?	
2.9.10	Has all software been properly validated and tested?	
2.9.11	Is there verification that the equipment does not re-start, either on the re-setting of a protective device such as an interlock (safety & non-safety), or the re-establishment of power after an outage?	
3.0	ENVIRONMENTAL	
3.1	Are all secondary containment/bonding facilities adequate?	
3.2	Are all material storage facilities adequate and appropriately labeled?	
3.3	Have adequate arrangements been made, prior to start-up, for the identification, classification, and safe disposal of all waste materials?	
3.4	Have all materials, used in the system, been entered on the Area Chemicals Inventory List (or equivalent)?	
3.5	Are updated Area Spill Procedures available?	
3.6	Are material Unloading Facilities adequate and constructed in accordance with Corporate Safety, Health, and Environmental Standards? Is there adequate containment (110% of truck volume) in the unloading areas for bulk liquid chemicals?	

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
3.7	Have the Corporate Environmental Guidelines been followed during the design stage of this project?	
3.8	Have all waste streams been identified, quantified, analyzed and minimized?	
3.9	Are all of the applicable Construction, Environmental and Operating Permits up to-date and approved?	
4.0	CAER	
4.1	Have all necessary precautions been taken to ensure that the equipment is not a source of ignition to any flammable materials, irrespective of their source?	
4.2	Are fire protection facilities adequate for example, fire extinguishers, fire walls, sprinkler systems, Alarm Boxes, etc.)?	
4.3	Are Emergency Escape Routes, including ladders, adequate and properly signposted?	
4.4	Is emergency lighting adequate?	
4.5	Is sufficient Respiratory Protective Equipment, such as Escape Sets or Self-Contained Breathing Apparatus (SCBA) available?	
4.6	Have Emergency Procedures been prepared and relevant personnel trained?	
4.7	Is the Community Panel advised of proposed new major projects?	
5.1	Has an Electrical Safety Checklist (Acceptance of Electrical Installations) been completed by a competent personnel?	
5.2	Has the equipment been properly installed and constructed to Corporate guidelines and local legislation, and does it meet any special installation requirements noted on the manufacturer's certificate?	
5.3	Has equipment been designed and purchased for the conditions under which it will operate (for example, hazardous areas)?	
5.4	Are all live parts adequately enclosed to prevent access?	
5.5	Does grounding and bonding comply with corporate and local standards/legislation?	
5.6	Have fuses or circuit breakers been provided which will automatically disconnect the supply?	
5.7	Are First Aid Stations, single line drawings and PPE requirements available in Motor Control Centers (MCC), Electrical Control Rooms (ECR)/Sub-stations, as appropriate?	
5.8	Have all relevant documentation and drawings (for example, P&IDs, SLDs, Schematics, equipment arrangement, I/O, logic, electrical classification and Panel Schedule drawings) been updated to reflect the current installation?	
5.9	Have all new Sub-station Breakers, MCC isolators, starters or other appropriate equipment been registered on to the Site Inspection Schedule?	
5.10	Have any electrical circuits, made redundant by this installation, been properly D&R'd?	
6.0	FIELD VERIFICATION	
6.1	Is the normal lighting adequate for normal and maintenance operations?	
6.2	Is emergency lighting sufficient?	

PSSR ITEM NO.	CATEGORY/ITEM TO ASSESS	Not Applicable
6.3	Are all hot and cold surfaces, which may cause burns, in the proximity of personnel insulated?	
6.4	Are all instruments, equipment and piping adequately labeled?	
6.5	Is there any rusted and/or damaged equipment?	
6.6	Are swing gates or chains installed at the top of ladders and/or on access platforms?	
6.7	Are there any gaps between platforms and equipment that could create a foot hazard?	
6.8	Is equipment and platform access adequate?	
6.9	Do safety showers/eye wash stations create a hazard to personnel (slips), potential for contamination of product (entry to equipment) or ingress to electrical equipment?	
6.10	Are safety showers and eye wash stations adequately marked and readily visible? Is the access to the safety showers and eye wash stations uninhibited?	
6.11	Are all pipelines labeled?	
6.12	Are all electrical switches, disconnects, MCCs, control panels, cables, etc labeled?	
6.13	Is all the equipment clearly labeled? Where required are the materials and hazards included on the labeling?	
6.14	Are wall penetrations adequately sealed?	
6.15	Are electrical conduits sealed in accordance with code requirements?	
6.16	Are evacuation routes clearly marked?	
6.17	Are fire extinguishers installed properly?	
6.18	Has the required signage been posted?	
6.19	Are emergency stops provided where there is a potential for entrapment or exposure?	
6.20	Has all scaffolding and construction equipment been removed? Is housekeeping acceptable?	
6.21	Is all required equipment guarding installed	
6.22	Does all the applicable equipment have the required CE marking displayed? Does all the applicable equipment have the required UL listing/labeling?	
6.23	Have noise-monitoring evaluations been completed? Have signs been posted where noise levels excess 85dB? Are ear-plugs available near areas exceeding 85 dB?	

PSSR Checklist Example A-3

ATTACHMENT A - PROCESS PRE-STARTUP SAFETY REVIEW CHECKLIST

AREA OR PLANT UNDER REVIEW:

DATE:

LIST OF PSSR TEAM MEMBERS:

Instructions for using this form:

1. Review the entire checklist and mark a check in column A to indicate an item or area to be included in the review.
2. If there are issues to be resolved after the initial review, complete Attachment B - *PSSR Potential Issue – Finding Form*
3. For each item or area with a check in column A, place a check in column B when the item or area has been satisfactorily reviewed or a potential problem has been resolved.

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Location and layout
		Site Conditions
		Drainage
		Flood control/protection
		Prevailing wind
		Air or water pollution exposures
		Other site conditions requiring attention
		Soil protection in storage, materials handling & process areas
		Nearby operations
		Hazards from
		Hazards to
		Traffic
		Vehicular/railroad/pedestrian
		Clearances, hazards
		Adequacy of traffic signs
		Security
		Special requirements imposed by new facility
		Storage and handling of chemicals
		Buried pipes, tanks or chemical sewer
		Leak detection and containment
		Above ground storage tanks
		Adequate secondary containment provided
		Operating and maintenance access adequate and safe
		Adequate and accessible manways
		Unobstructed pressure/vacuum relief vents
		Manifolding of vents reviewed
		Documented vent sizing basis (process safety manuals)

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		<p>Winterization (including instrument connections)</p> <p>Adequate lighting</p> <p>Labeling, placarding of hazards</p> <p>Other installation details</p> <p>Flammable and combustible liquids</p> <p>Tank placement and spacing adequate</p> <p>Steel supports requiring fireproofing</p> <p>Flammable liquid breather vents provided with flame arrestors or conservation vents</p> <p>No flame arrestors on emergency relief vents</p> <p>Safe vent discharge locations</p> <p>Vapor-space ignitions hazards</p> <p>Corporate recommended/approved fire protection systems in place</p> <p>Flammable gases or liquefied flammable gasses</p> <p>Corporate recommended/approved fire protection systems in place</p>
		<p>Bulk dry chemicals</p> <p>Dust explosion potential addressed</p>
		<p>Tanks truck and railcar unloading and loading stations</p> <p>Spill containment and safe impounding</p> <p>Access platform safety</p> <p>Lighting adequate</p> <p>Grounding cables</p> <p>Fixed unloading pump and backflow preventer</p> <p>Emergency stop button location</p> <p>Connections lockable and closed</p> <p>Placarding of hazards</p> <p>Remotely operated emergency stop valve for vehicles carrying hazardous materials</p> <p>Fusible-link fire valve on vehicles with bottom unloading of flammable</p> <p>Portable fire extinguisher at ground level or flammable</p> <p>Safety shower and eyewash units</p> <p>Recommended fire protection systems in place</p> <p>Electrical</p>
		<p>Process</p> <p>General workplace</p> <p>Safe operator access</p> <p>Building exits marked</p> <p>Lighting adequate</p> <p>Safety shower and eyewash units</p> <p>Accessible</p> <p>Located on each deck</p> <p>Located in control room</p> <p>Portable fire extinguishers</p>

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Accessible
		Located on each deck
		Located in control room
		Human Factors
		Labeling of equipment, piping, critical valves, field instruments, switches
		Location of field instruments
		Sampling points
		Operator task safety
		Operator task ergonomics
		Opportunities for operator error
		Non-routine tasks
		Chemical Exposure Hazards
		Potential exposures
		Engineering controls adequate
		Building ventilation/fresh air intakes
		Toxic gas monitors, alarms
		Protective equipment location
		Placarding
		Process Piping
		Construction appropriate for duty
		Materials quality assurance (including flange bolts), if critical, during construction
		Workmanship (for example, no short flange bolts)
		Routing satisfactory
		Adequately supported and guided
		Allowance for thermal expansion/no references
		No small diameter connections vulnerable to breakage/failure
		Expansion bellows properly installed/piping not able to move sideways/bellowed
		Undamaged during installation
		Flexible piping connectors correctly installed/undamaged (for example, kinked) during installation
		Necessary drains provided
		Hazardous outlets plugged closed
		Thermal (hydrostatic) pressure relief (including heat-traced sections)
		Sight glasses and gauge glasses
		External corrosion protection
		Freeze protection
		Insulation adequate for personal protection
		Protective flange covers
		Approved hoses and hose and connectors (no improvisations)
		Process Vents

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		<p>Flammable liquid breather vents provided with flame arrestors or conservation vents</p> <p>Telltale pressure gauge or other indicator provided between rupture disc and relief valve where a disc is installed below a relief valve</p> <p>Discharge piping from emergency pressure relief devices unrestricted by 90 degree ells,</p> <p>Excessive length or flame arrestors</p> <p>Provisions such as drain holes to prevent accumulation of rainwater in discharge piping</p> <p>Discharge piping adequately supported to withstand reactive forces of pressure venting</p> <p>Safe vent discharge locations</p> <p>Manifolding of vents reviewed</p> <p>Vent sizing basis; documentation</p>
		<p>Ductwork</p> <p>Cleanouts</p>
		<p>Heat Exchangers, Jackets</p> <p>Vent, drains</p> <p>Thermal (hydrostatic) pressure relief</p> <p>Maintenance access (tube bundle)</p>
		<p>Machinery</p> <p>Guarding</p> <p>Local emergency stop button</p> <p>Emergency lubrication of critical machinery</p> <p>Maintenance provisions</p> <p>Local exhaust ventilation required for shaft seals</p>
		<p>Pumps</p> <p>Backflow prevention</p> <p>Connecting piping adequately supported to limit forces on casings</p> <p>Seal spray protection</p> <p>Isolation for maintenance</p> <p>Preparation for maintenance (drain and vent provided)</p>
		<p>Containment</p> <p>Spill containment</p> <p>Fire water runoff</p>
		<p>Process Controls/Control Room</p> <p>Control room inherent safety (vs. process hazards)</p> <p>Ventilation</p> <p>Emergency lighting</p> <p>Fire protection</p> <p>Field wiring security</p> <p>System cable security</p> <p>Power supply</p> <p>Operator interface(s)</p> <p>Alarm systems</p>

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Emergency shutdown
		Communications - normal and emergency
		Software access/security
		Software back-up
		Utilities Water Supply
		No municipal /potable water connections to the process
		Steam Boilers and Distribution
		Feedwater treatment chemicals handling
		Gas piping routing
		Combustion controls
		High and low drum water level alarms provided
		Bypass around Feedwater regulator accessible from operating level and located where
		Drum level gauge glass can be seen
		Two independent low water level trips provided for unattended boilers
		Dual safety relief valves in service
		Relief discharge piping adequately supported and drained
		Non-return valve on steam outlet
		Distribution piping – see Process piping
		Condensate drainage adequate
		Compressed Air Systems
		Non-lubricated construction or non-flammable synthetic lubricants used for compressor
		Discharge pressures above 100 psig
		Electrical
		Transformer location
		Motor control center(s)
		Standby Emergency Utility Systems
		Review provisions to satisfy proceeds safety requirements
		Waste Handling/Treatment
		Inspect new facilities in the same manner as process facilities
		Warehouse
		Flammable and combustible liquids
		Forklifts and Motorized Hand Trucks
		Traffic safety
		Non combustible fuel
		Recommended Fire-Protection Systems in Place
		Maintenance Area and Shop
		General
		Local exhaust ventilation provided for welding
		Locker Room and Lunch Room
		Adequate space

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Provisions to protect contamination of food by chemicals
		Process Safety General
		Employee Participation Statement
		Process Safety Information
		Review of highly hazardous chemicals (HHC) and MSDSs
		Block flow diagram
		Maximum inventories
		Operating limits
		Equipment Information
		P&IDs
		Process Hazard Analysis (PHA) report(s)
		All PHA action items completed
		Training plan
		Contractor work rules
		Pre-Startup Safety Review plan
		Mechanical Integrity plan
		List of critical equipment
		Testing program with schedule
		Hot Work Permit System
		Site Management of Change Procedure
		Incident Investigation Plan
		Emergency Action Plan (EAP)
		Facility EAP written
		Are new chemical or process hazards or risks such that changes to existing EAP are required?
		Do new facilities create any new transportation emergency response needs and are such needs in place? (Chemtrec update)
		Audit Schedule
		Operating Instructions
		Operating instructions clear and easily understood
		Instructions adequate (complete)
		Material hazards adequately covered for raw materials, catalysts, intermediates,
		Products and by-products
		Health hazards and permissible exposure levels (PELs)
		Physical hazards
		Handling precautions and safe handling procedures including Personal
		Protective equipment (PPE) requirements
		Corrective respiratory protection specified
		Process hazards adequately described
		Thermal hazards
		Any other hazards

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		<p>Tabulation of process alarms, interlocks (both safety & non-safety) and trips included</p> <p>Alarm and trip settings given</p> <p>Specific instruction included, or reference made to separate instructions, for</p> <ul style="list-style-type: none"> Unloading and loading of bulk materials Step-by-step process procedures provided for each operating phase including: <ul style="list-style-type: none"> Initial start-up Normal start-up Normal operation Normal shutdown Emergency operations including emergency shutdown Start-up following emergency shutdown Start-up following a turnaround Non-routine procedures (for example, equipment clean-out, equipment preparation for maintenance) Auxiliary equipment operation Operating limits clearly defined in step-by-step procedures Control ranges/limits specified Consequences of deviations given Responses to deviations/abnormal conditions specified Safe hold points specified PPE caution statements incorporated in step-by-step procedures Use of checklists as appropriate Up-to-date All pages show revision number and date Reviewed for correctness Approved / signed by Department Manager <p>Responsible Care</p> <p>Community Awareness and Emergency Response</p> <ul style="list-style-type: none"> Communications training for key employees Education of employees on EAP, safety, health, and environmental Education of community on new process or change Outreach to educate responders, government officials, EAP Assessment of potential risks to employees from accidents Communication of emergency planning information to LEPC Facility tours for emergency responders

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		<p>Process Safety</p> <ul style="list-style-type: none"> Current, complete documentation of process design and operating parameters Current, complete documentation of hazards of materials and process Use of site management of change procedure Use of site incident investigation procedure Documented sound engineering practices consistent with recognized codes and standards Mechanical integrity program implemented for new unit or process change
		<p>Employee Health and Safety</p> <ul style="list-style-type: none"> Medical surveillance program tailored to meet needs of new process or change Personnel change to Central Safety Committee needed
		<p>Pollution Prevention</p> <ul style="list-style-type: none"> A quantitative inventory of wastes generated and releases to air, water and land Education of employees and public about the inventory and impact evaluation Documentation that waste generation is not increased by, or is minimized in, the change or new process Documentation that waste and release prevention objectives were included the design of the new modified process & products
		<p>Distribution</p> <ul style="list-style-type: none"> Review and training of distribution hazards with distributors Review of transportation routing to minimized potential risks Review with corporate transportation department
		<p>Industrial Hygiene</p> <ul style="list-style-type: none"> New substances Health care Toxicity data available Accident treatment plan Need for change in periodic medical exam Occupational hygiene Inventory of possible sources of exposure Inventory means to restrict exposure Methods available to monitor exposure Suitable personal protection equipment available

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Hearing Conservation
		Noise level monitoring needed/arranged for new operations
		Engineering and administrative controls adequate
		Permissible exposure limits for chemical substances
		Appropriate exposure monitoring and evaluation arranged to determine compliance with applicable PELs
		PELs for mixtures applied when two or more hazardous substances present
		Engineering and administrative controls adequate
		Local exhaust ventilation systems
		Performance of local exhaust ventilation systems
		Local exhaust ventilation systems placed on inspection and maintenance program
		Control of chemical substances posing a potential occupational mutagenic or carcinogenic risk
		Are materials used having control levels A, B, C, or D?
		In the plant
		In the laboratory
		Hazard Communication Program
		Location inventory of chemicals updated
		Hazardous materials identified in accordance with definitions
		MSDSs on file and available to all employees
		Chemical containers labeled (or alternate means of label information provided)
		Piping labeled
		Training
		Respiratory protection
		Review/confirm conformance with Corporate Industrial Hygiene Program
		Respirator selection in accordance with selection charts and specified in writing
		Pressure-demand SCBAs
		Emergency "escape only" respirators
		User medical clearance
		Facial hair policy
		Initial issues verified by supervision
		Fit testing
		Replacement of cartridges and canisters
		Inspection and maintenance
		Breathing air tested/tagged
		Training
		Smoking policy established
		Laboratory Control
		Process Laboratory Support Plan communicated

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Staffing adequate
		Laboratory facilities adequate
		General
		Emergency exits marked
		Emergency lighting
		Safety shower & eyewash
		Fire protection
		Laboratory equipment
		Suitable and adequate
		Maintenance provisions needed
		Storage and handling of chemicals
		Reagent storage
		Segregation adequate (oxidizers, acids)
		Flammable liquid storage
		Refrigerator for flammables explosion-proof
		Sample storage
		Sample and waste disposal
		Compressed gases
		Cylinder location safe (for example, away from heat sources)
		Quantities limited to immediate requirements
		Separation of flammable and oxidizers
		Toxic gas use limited to small cylinders
		Local exhaust ventilation for toxic gases
		SCBAs available for toxic gases
		Personnel trained in SCBA use as needed
		Laboratory procedures
		Analytical procedures written and verified
		Sampling procedures included
		PPE requirements specified
		Training completed
		Industrial hygiene
		Maintenance
		Necessary maintenance information in place
		Design drawings: for example as-built P&IDs, electrical schematics, isometric piping drawing
		Piping specifications
		Equipment purchase orders
		Equipment manuals
		Vendor prints
		Initial inspection and test results
		Resources adequate
		Needs communicated
		Plant personnel

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Contract maintenance (arrangements completed) Shop facilities Specialized requirements Requirements defined Skills available Equipment available Procedures developed Training completed Certificate obtained and documented Maintenance management Service contracts arranged Maintenance management system in place Spare parts Requirements defined by maintenance department Procurement complete Start-up needs on hand Storage security Quality assurance program in place for critical equipment Materials of construction/quality of maintenance materials and parts Workmanship Preventive maintenance/mechanical integrity program developed
		Machinery Boilers and pressure vessels Critical equipment, vessels, piping, check valves, expansion bellows, flexible piping connectors, hoses defined Critical equipment inspection and test methods and frequencies defined Conservation vents, flame arrestors, PSEs, PSVs inspection and test methods and frequencies Critical instruments defined Proof-testing frequency Proof-testing procedures, validity Maintenance of combustion safety controls on direct-fired equipment Inspection and testing acceptance criteria developed and documented
		Training Operations and Maintenance Initial qualifications of personnel (knowledge and skills) Training program content vs. needs Safety orientation for new employees General safety training Job-specific training

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		<ul style="list-style-type: none"> Basic knowledge and skills Specialized knowledge and skills General process knowledge Material hazards, MSDSs Process hazards Process procedures Operating limits Consequences of deviations Responses to deviations/abnormal conditions Emergency procedures Field training Location of: <ul style="list-style-type: none"> Emergency equipment, showers, alarms Fire-fighting equipment Leak/spill prevention Reporting, mitigation Emergency drills Compliance with OSHA 1910.120 for hazardous waste operations New emergency response training requirements Measurement of training Effectiveness/certification (when applicable) Formal documentation of training Team assessment of training effectiveness
		<p>Commissioning</p> <ul style="list-style-type: none"> Commissioning plan and schedule <ul style="list-style-type: none"> Detailed, step-by-step plan written Plan adequately reviewed Responsibilities clearly defined and understood Plant verification of any equipment and systems check-out done by contractor Construction inspection by plant Confirm line-by-line conformity to P&IDs verified by plant, including: <ul style="list-style-type: none"> Materials of construction Location of instrument elements/connections Orifice plate specifications and orientation Ranges of local PIs and TIs All local TIs have thermowells Identifies and relief pressure of PSEs & PSVs Actuated valve failure modes Equipment internals
		<p>Vessels and piping</p> <ul style="list-style-type: none"> Stress relieving done and documented as required Field radiography done and documented as required Pressure/Leak testing done and documented

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		<p>Cleaned and flushed (instruments, control valves, check valves protected)</p> <p>Special commissioning requirements (such as chemical cleaning, passivating, or testing)</p> <p>Vents and pressure relief valves</p> <p>Shipping supports removed from conservation vents</p> <p>Relief pressure of PSVs verified by test</p>
		<p>Fire protection systems</p> <p>Fire water systems inspection and commissioned</p> <p>Fire water pump acceptance test(s) completed and witnessed</p> <p>Other non-water fire protection system acceptance test(s) completed and witnessed (for example, CO2 or dry chemical)</p> <p>New fire protection signaling systems and alarms commissioned</p> <p>Copies of completed test forms forwarded to insurance carrier and Corporate Risk Department</p> <p>New fire protection equipment, signaling systems and alarms placed on regular inspection and testing programs</p>
		<p>Electrical grounding</p> <p>Resistance of building and equipment and grounding systems measured <5 ohms</p> <p>Resistance to ground of all piping sections carrying flammable liquids and combustible powders measured <5 ohms</p>
		<p>Ventilation systems</p> <p>Ventilation systems balanced</p> <p>Performance of local exhaust ventilation systems checked for conformance</p>
		<p>Machinery</p> <p>Alignment checked</p> <p>Absence of excessive forces on pump casings and other equipment from connected piping</p> <p>Pre-startup screens installed in pump suctions</p> <p>Agitator impeller security</p> <p>Lubrication systems functional</p> <p>Cooling systems functional</p> <p>Seal flush systems functional</p> <p>Rotation checked</p> <p>Vibration measurements</p> <p>Performance tests</p> <p>Other baseline data collection</p>
		<p>Instruments and control systems</p> <p>Program software checked</p> <p>Instrument loop sheet index available</p> <p>Pneumatic lines blown clean</p> <p>Loop checking done and documented</p>

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Instrument calibrations done and documented review methods
		Alarm and trip points set and documented
		Interlocks (both safety & non-safety) tested
		Digital control system review and tests
		Combustion safety controls on direct-fired equipment
		Equipment inspection, adjustment and testing documented
		Punch list
		Review status
		Daily update
		Priorities with respect to start-up acceptable
		Water batching
		Plan developed
		Start-up
		Start-up plan and schedule
		Written and reviewed
		Procedures for initial start-up specifically covered in the operating
		Instruction manual or under separate cover
		Reviewed and approved if separate
		Raw materials supply
		Technical support
		Adequate
		Lines and limits of authority clear
		Maintenance support
		Industrial hygiene monitoring
		Equipment monitoring
		Performance measurements and tests
		Regulatory Compliance
		New Substances
		Review of toxicity to environment
		Persistency in the environment
		Prevention of exposure to environment
		Destruction of substance when necessary
		Toxic Substances Control Act (TSCA)
		Project reviewed for any new requirements which might be imposed on the plant location under TSCA
		Transportation
		New transport operations adequately reviewed for compliance with all applicable DOT (or equivalent) regulations
		Emissions

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Operating permits obtained as directed by the site or corporate environmental departments
		Effluents
		New operations covered within the present NPDES permit or a new permit has been obtained
		Hazardous wastes
		Determined whether particular wastes qualify as hazardous wastes under federal, state and/or local laws and regulations
		On-site storage, treatment and/or disposal of hazardous wastes
		Reviewed for compliance with applicable laws and regulations, documentation?
		Off-site transportation and disposal of hazardous wastes reviewed with waste coordinator, documentation?
		PCBs
		Review equipment for PCB hazardous properties

Supplementary Checklist for New Plant Sites

- Plant Security
- Access
- Fencing
- Visitor controls
- Vehicle controls
- Restrictions posted
- Communications
- Normal
- Emergency back-up
- Safety program
 - Accountability
 - Program conformance with Corporate Safety Standards
 - Conformance with group safety standards
 - First aid and emergency medical response
 - Location procedures written
 - Training conducted
 - Industrial hygiene program
 - Accountability
 - Program conformance with Corporate Industrial Hygiene Standards
- Fire protection organization
 - Location organization
 - Level of protection established in accordance with insurance requirement and Corporate Risk Department

Column A Include	Column B Completed	Category/PSSR Item to Evaluate
		Training conducted in accordance with standard
		Equipment provided in accordance with standard
		Municipal fire department (or equivalent)
		Response time and capabilities consistent with location needs and fire protection organization
		Liaison established
		Familiarization
		Drills
		Process Safety Management
		Location coordinator appointed
		Program
		Training conducted

ATTACHMENT B - PSSR Potential Issue - Finding Form

Area under review:

Date of Review:

List of Sub-Team Members:

Instructions for using this form: For each issue, complete the information below. Electronically copy the blank fields as needed for each issue identified in Attachment A - *Process PSSR checklist*.

Description of potential issue or area of concern

Additional information (for example, the issue's criticality or a recommended solution)

PSSR Checklist Example A-4

DESIGN SAFETY REVIEW CHECKLIST

Dept.:

MOC ID#:

DATE:

Project ID:

INSTRUCTIONS: Check each question on the Yes or No line, or mark it N/A if not applicable. If an entire section of the checklist is not applicable, mark that section as N/A and no questions in that section need to be answered. No answers are considered deficiencies and must be reported in writing to the Department Manager or designee and the change originator. This checklist is a guide to help identify possible deficiencies. All questions refer to the results, design, and impact of the change, not broadly or in general to the system unaffected by the change. The reviewer is encouraged to look beyond the checklist for concerns that may be unique to the change and which may not be addressed here.

YES NO N/A

DSR CATEGORY SECTION / ITEM

A. ADMINISTRATION

1. Based on the current design, is the proposed change consistent with the original Process Hazard Analysis (PHA) assessment?
2. Does the design comply with corporate standards?
3. Has the impact of the change on existing buildings been considered? (That is, the design and location of new or modified equipment near occupied buildings, occupying a previously unoccupied building, and others.)
4. Has any impact, beyond unit boundaries, associated with this change been properly dealt with and/or communicated?
5. Have exposures to existing buildings (including pipe racks and cable trays) been considered when siting new vessels, utilities, temporary/permanent buildings or sheds, and others?
6. Have noncombustible materials or construction been used?

B. MATERIAL SAFETY/REGULATORY STATUS

Have the following change scenarios been considered for possible Toxic Substance Control Act (TSCA) applicability?

- a. Previously non-isolated intermediates being temporarily isolated and/or held even for a short time, in non-hard-piped process equipment or in storage vessels (for example, drums).
 - b. Previously non-isolated intermediates being held for an extensive period (for example, 24 hours or longer) in hard piped process equipment.
 - c. Material previously burned or disposed of as a waste is reprocessed or sold.
 - d. Different reactants or catalysts or different feed ratios are being used, thus producing different reaction products for TSCA purposes.
 - e. Change in the components or reactants in a polymer from < 2 % to > 2 % of the dry weight of the polymer produced.
 - f. The TSCA Inventory status of different catalysts or reactants is unknown. If any of the above change scenarios are about to happen, contact the plant TSCA Coordinator immediately for an in-depth station of TSCA issues. Provide documentation of any concerns and their resolution.
2. Have Material Safety Data Sheets (MSDS) or Preliminary Product Safety Data Sheets (PPSDS) been obtained for all chemicals to be handled, including isolated intermediates? (Consider changes in minor components of products and by-products)

YES NO N/A

DSR CATEGORY SECTION / ITEM

3. Has the potential for a hazardous chemical reaction in sumps and sewers been considered?

4. Have all other potential product regulatory issues been addressed, for example, Department of Transportation (DOT), Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Bureau of Alcohol, Tobacco, and Firearms (BATF), Food and Drug Administration (FDA) and ISO 9001?

C. PRESSURE/VACUUM RELIEF

(No relief devices in this project)

1. Have new or modified safety relief device(s) or vent system(s) been designed in accordance with Plant Engineering and Site requirements?

2. Has potential for external pressure (vacuum) from sudden cooling, condensing, pump-out, during clean-up or preparation of equipment for maintenance, or potentially submerged overflow line been addressed?

3. Have only full-port valves been specified for use at the inlet and outlet of pressure/vacuum relief devices?

4. Have any changes to safety relief device inlet or outlet piping been properly reviewed?

5. Will adequate facilities (alarms, detectors, redundancy, and others.) be provided to minimize the risk of a relief device actuating due to equipment, instrumentation, or utility failure?

6. Have the discharges of safety relief devices been located so as to avoid potential personnel injury and damage to associated equipment?

7. Has the design included installation of the safety relief valve vertically?

D. TEMPERATURE/REACTION

1. Has potential for formation of unwanted by-products been adequately addressed?

2. Has potential for loss of flow or reverse flow been adequately addressed?

3. Have adequate provisions been made so that normally dilute but reactive materials CANNOT be concentrated or accumulated in unexpected areas (stagnant pipe/valves; utility systems; feed or reaction vessels, sewers, and others)?

4. Is adequate freeze protection provided?

E. VALVES AND PIPING

1. Have the proper valve and piping specifications been used?

2. Have cross-tied lines (pump headers, utility lines, between high/low pressures, and others.) been reviewed to minimize contamination potential and eliminate mixing of reactive chemicals?

3. Have test methods and documentation requirements been specified to ensure the integrity of new and revised piping systems?

4. Will sample points be properly configured for safe sampling of hazardous chemicals?

5. Have all open ended valves and hand-operated ball valves been designed in accordance with environmental requirements (that is, NESHAPS covered materials such as benzene and formaldehyde) or plant standards?

6. Have hot-taps been reviewed and eliminated where possible?

7. Will necessary excess flow and back-flow prevention measures be provided?

YES NO N/A

DSR CATEGORY SECTION / ITEM

8. Has line expansion and vibration during startup, shutdown, cleaning, normal operation, and others, been considered, and, if appropriate, analyzed in detail?

9. Has the potential risk and consequences of hydraulic hammering been considered?

10. Have appropriate materials of construction been considered for compatibility, corrosion resistance and GMP requirements? (Consider O-rings, gaskets, diaphragms, and others.)

11. Have the temporary start-up strainers been identified to ensure removal for normal operation?

12. Has the design included the proper encasing of underground piping at stress points (for example, roadways, railroads, and others.)?

F. ROTATING AND MECHANICAL EQUIPMENT

1. Have special precautions for safe operation of equipment been considered? (Reverse flow, minimum flow, maximum head, sudden flow increase during startup, total recycle, vapor locking, volute drainage, Emergency Shutdown Device(s) (ESD), and others.)

2. Do new and revised pumps and/or pump seals meet and GMP requirements and corporate standards?

3. Have lubricants and buffer fluids been properly selected to meet any GMP requirements (that is, food grade) such that leakage into the process will not result in undesired chemical reactions or product contamination?

4. Will moving parts on machinery be properly guarded?

5. Will pumps be located in accordance with corporate standards?

6. Are the emergency shutdown systems (over speed, ground fault, high temperature, vibration, and others.) adequate?

7. Have appropriate materials of construction been considered for compatibility, corrosion resistance and GMP requirements? (Consider O-rings, gaskets, diaphragms, and others.)

8. Will adequate pressure relief be provided for new or modified pump systems?

G. INSTRUMENTATION

1. Has the potential for instrument failure been adequately addressed?

2. Have all new shutdown devices been designed to permit testing.

3. Have potential consequences of instrument or computer failure (redundancy, backup power supply, or others) been considered?

4. Has control valve fail-safe position on loss of electric power or air/nitrogen been properly specified to minimize the impact of failure?

5. Have provisions been made to safeguard against risks associated with control valves going full open or closed (mechanical stops, limit switches, and others.)?

6. If the change affects a shutdown or ESD system, have issues been addressed?

7. Will the alarms associated with critical instruments be clearly displayed in the control room?

8. Have any special concerns with regard to response time or sequencing been adequately addressed? (Consider over speed trips, hydraulic hammer, surge control, and others.)

9. Have process changes (capacity change, density, viscosity, vapor pressure, and others) been considered in the design of new and existing instrumentation?

YES NO N/A

DSR CATEGORY SECTION / ITEM

10. Has ESD control logic been reviewed?

11. Will temperature elements be mounted in thermo wells?

12. Have appropriate materials of construction been considered for compatibility, corrosion resistance and any GMP requirements? (Consider O-rings, gaskets, diaphragms, and others.)

13. Has adequate local instrumentation been addressed for safety and trouble-shooting purposes?

14. Is the location of sensing elements proper to ensure that they are actually measuring what you want measured?

H. ELECTRICAL SYSTEMS

1. Have instrumentation and electrical equipment enclosures been specified to meet the electrical classification of the area?

2. Have wire gauges, starters, and overloads been properly sized in accordance with the National Electric Code (NEC)?

3. Has the design considered the requirements of electrical hot work and cranes near power lines such that outage requirements and variances will be minimized?

4. Has the design included adequate room for ventilation of transformers, motors, and other similar equipment?

I. FIRE PROTECTION

1. Has the potential for static electricity buildup been adequately addressed?

2. Has proper grounding of all electrical and process equipment (including piping and shipping containers) been specified?

3. Will fire containment be adequate where hazardous or reactive chemicals are present which can result in high energy release when mixed, contaminated, heated, or otherwise mishandled?

4. Has spontaneous heating of leakage into insulation been adequately considered?

5. Are provisions made for safe handling of flammable or potentially explosive materials? Consider materials of construction, cleanup, and preparation of equipment for maintenance.

6. Are all fire water spray-system modifications being designed (including flow calculations) and installed by qualified personnel or contractor?

7. Have modifications or additions to fire protection systems been reviewed or accepted by the safety department or property insurance carrier?

8. Will vents potentially containing flammables be provided with adequate safety equipment (flame arrestors or inert gas purge system)?

9. Will an adequate detection (vapor or explosive gas detectors) and response system be provided where a vapor cloud is likely?

10. Have the risks associated with any ignition source or explosive gas mixture been adequately dealt with?

11. Has adequate fire safety equipment been specified and located where needed?

12. Has deluge water overflow from containment systems been determined and reviewed properly?

13. Is diking, curbing, or drainage adequate to contain spills and contaminated rainwater? [Resource Conservation and Recovery Act (RCRA)]

J. PERSONNEL HEALTH & INDUSTRIAL HYGIENE

1. Does the design adequately consider medical, industrial hygiene, ergonomic and GMP

YES NO N/A

DSR CATEGORY SECTION / ITEM

factors (heat stress, biological stress, high noise level, poor lighting, adequate ventilation, potential of oxygen deficient atmosphere, difficult tasks, repetitive motion tasks, poor equipment access or egress, exposure to hot surface [> 140°F], dust hazards, and others.)?

2. Have adequate provisions been specified for the safe handling and sampling of corrosive, toxic, carcinogenic, teratogenic, or otherwise hazardous materials?

3. Have personnel safety devices (showers, eye baths, fall prevention, breathing air systems) been specified?

4. Will all asbestos-containing insulation be removed/repaired in accordance with plant requirements?

5. Will secondary surfaces (grating, slip protection coatings) be provided where freezing or slippery materials are handled?

6. Has confined space entry (including electrical equipment) been adequately addressed in this design?

7. Has the design included adequate walking/working surfaces in accordance with OSHA standards and plant requirements?

8. Is potable water kept physically separated from process usage?

K. WASTE WATER TREATMENT & SPILL PREVENTION

1. Does this design address the potential for spills, releases, compatibility, and flammability?

2. Has the Environmental Health and Safety Department (EHS) been notified of any new waste stream sources or increased quantities from existing sources?

3. Has EHS evaluated waste streams for impact on Plant Waste Water Treatment Facilities? (Compatibility with existing plant waste treatment system capabilities, required provisions for RCRA hazardous waste chemicals, proper notification of governmental agencies, and effect on EHS operations personnel, effect on discharges to the Publicly Owned Treatment Work(s) (POTW) or river, and others.)

4. Will diking, draining, curbing, and special protective surface coatings be adequate to contain leaks and the worst case spill scenario?

L. SOLID & LIQUID WASTE

1. Has at-source waste minimization been adequately addressed?

2. Have adequate provisions been made for disposal of all wastes (including drums, bags, filter elements, liquid residues, asbestos-containing insulation, PCBs, contaminated soil, demolition rubble, and processing equipment)?

3. Have waste streams intended for disposal in the boilers been reviewed by the EHS department?

4. Have the following change scenarios been considered for possible RCRA applicability?

a. Creation of a new hazardous waste.

b. Change in composition of an existing hazardous waste.

c. Modifications of a facility in hazardous or solid waste service. If any of the above change scenarios are about to happen, contact the plant EHS department immediately for an in-depth examination of RCRA issues. Provide documentation of any concerns and their resolution.

M. AIR EMISSIONS

1. Have the following change scenarios been considered for possible air emission applicability?

a. Increase in potential emissions of volatile organic compound

YES NO N/A

DSR CATEGORY SECTION / ITEM

- b. New emissions of hazardous air pollutants
 - c. Increase in potential emissions of hazardous air pollutants
 - d. Change of service for equipment
 - e. Composition change in existing emissions
 - f. Addition of new emission points (including fugitive sources such as valves and relief devices) or physical change in existing emission points or monitored points. If any of the above change scenarios are about to happen, contact the plant EHS department immediately for an in-depth examination of permit issues. Provide documentation of any concerns and their resolution.
2. Have any increases in air emissions of flammable, toxic, corrosive, reactive or otherwise hazardous chemicals been identified, quantified and communicated to the plant EHS department (to obtain necessary permitting, identify control devices being used, and others)?
3. Has the change been reviewed to determine if it is subject to any requirements to recalculate Toxic Release Inventory (TRI), re-evaluate control device efficiency, or otherwise manage the change under state or federal requirements?

N. PROCESS EQUIPMENT

- 1. Has a pressure vessel engineer reviewed the design/repair specifications and considerations for new, altered, or repaired equipment?
- 2. Have the appropriate welding procedure(s) been identified?
- 3. Has spare equipment been provided where needed for safety?
- 4. Have appropriate materials of construction been considered for compatibility, corrosion resistance, and any GMP requirements? (Consider O-rings, gaskets, diaphragms, and others.)
- 5. Has the documentation for piping and equipment been appropriately updated?

O. COMPUTER SOFTWARE AND SYSTEMS

- 1. Are adequate safeguards in place to ensure the process is controlled within the safe operating envelope?
- 2. Is the fail-safe condition of controllers adequate?

P. OTHER SAFETY CONSIDERATIONS

- 1. Will adequate design provisions exist for cleanup and preparation of equipment for maintenance of equipment/piping/control systems (including lockout of all energy sources and double isolation where required)?
- 2. Have the consequences of loss of any utility been adequately addressed?
- 3. Has cathodic protection, electrical continuity and electronic grounding been adequately addressed?
- 4. Has necessary structural analysis been performed?
- 5. Will adequate provisions be made to ensure equipment idled by this change is maintained in a safe condition?
- 6. Has a change in utility consumption been properly communicated?
- 7. Has the design included the need for labeling including equipment apparatus numbers, identity, content, direction of flow, and others?
- 8. Has the design included requirements for adequate area lighting?
- 9. Has the design of the equipment included adequate room and clearance for proper maintenance?

