MARSH

Energy & Power Practice

PRE-STARTUP SAFETY REVIEW

RISK ENGINEERING POSITION PAPER – 06

SOLUTIONS...DEFINED, DESIGNED, AND DELIVERED.

MARSH & McLENNAN COMPANIES

CONTENTS

1. OBJECTIVE

A pre-startup safety review (PSSR) is carried out to confirm that all appropriate elements of process safety management have been addressed satisfactorily and that the facility is safe to startup.

The objective of this position paper is to define the key attributes that would be rated by Marsh as very good for a PSSR in the oil, gas and petrochemical industry. The attributes demonstrated in this Position Paper can be used to support and define risk improvement recommendations and can also provide detailed advice to clients seeking to improve their management systems.

2. BACKGROUND

2.1 VALUE OF THE PSSR PROCESS

Startup of new or modified equipment is a particularly vulnerable time for safety incidents and other unplanned events which can cause significant loss, both financial loss and damage to human life and health. A number of elements of good process safety management practice and capital project design include measures to reduce the risk of loss on startup. Such losses include, but are not limited to, incidents involving fire, explosion, environmentally damaging spill or gaseous release, or incidents involving injury to employees or members of the public. Poorly planned or executed startups can result in loss or wastage of materials, and other inefficiencies which can damage profitability. Good management practices in this context include front end engineering design (FEED), construction practices, quality assurance, process hazard analysis (PHA), management of change (MoC) and PSSR.

The PSSR provides a **final** checkpoint to confirm all appropriate elements of process safety management have been addressed satisfactorily and that the facility is safe to startup. This includes checking that all the action items from other design and construction processes are complete.

Some projects may necessitate a number of PSSRs where different modules of process and utilities are brought into operation at different stages of commissioning.

2.2 HISTORICAL AND LEGAL SETTING

The need for a PSSR, in concept, is not limited to the process industry.

There are many instances where a handover, or transition between phases of a project or construction, require:

a. A formal point at which contractual or organizational responsibilities may be passed from one group to another.

b. Acknowledgement that due diligence has been carried out by both the issuer and receiver prior to handover.

c. Marking a critical milestone in determining the completion of work such that safe operations may commence.

The concept of handover is implicit in a pre-startup safety review, and it provides the team taking over the opportunity to accept or decline taking ownership until certain aspects are corrected.

The concept is formally recognized in the PSM regulations in the USA (ref 1,2). While the regulations of other countries e.g. Seveso III in Europe, do not necessarily recognize PSSR by name, PSSR is clearly a good practice which contributes to delivering the duty of care required by these regulations to prevent and mitigate major accident hazards.

2.3 RELEVANT INCIDENT SUMMARIES

Inadequate PSSR is often identified by incident investigators as a significant contributory cause. In the following summaries of two major incidents, PSSR was part of the parent companies procedures but was either not implemented or inadequately performed. The investigations found that had PSSR been carried out as intended the incidents would probably have been avoided.

INCIDENT SUMMARY #1
TEXAS CITY REFINERY FIRE AND EXPLOSION – 2005

In this incident 15 people were killed and 180 injured. Financial losses are reported to have exceeded USD 1.5 billion[6]. Houses were damaged as far away as 1.2 km from the refinery. The US Chemical Safety Board investigation noted that the company had a rigorous pre-startup procedure that required all startups, including after turnarounds, to go through a PSSR. However no PSSR was conducted, due to unfamiliarity by the process safety coordinator. The general PSSR procedure in place required that all non-essential personnel be removed from the unit during startup, but this was not considered and hence the 15 contractors who subsequently died were allowed to continue working from their trailer close to the raffinate splitter which was misoperated on startup.

The accident investigation identified the following deficiencies which should have been identified and corrected by application of an effective PSSR, each of which contributed to the extent of the disaster:

- Non-essential personnel were not withdrawn from the area.
- Key instrumentation and equipment was identified as malfunctioning but was not repaired.
- Insufficient training and review of startup procedures.
- Inadequate staffing, in particular in the control room during startup.

INCIDENT SUMMARY #2
PESTICIDE CHEMICAL RUNAWAY REACTION (WEST VIRGINIA) 2008

In this incident two people were killed and eight injured. The subsequent investigation by the US Chemical Safety Board concluded that, although a PSSR had been carried out, it was inadequate, and that this was a significant contributing factor in the incident.

Deficiencies which should have been identified and corrected by application of PSSR, each of which contributed to the extent of the disaster, included:

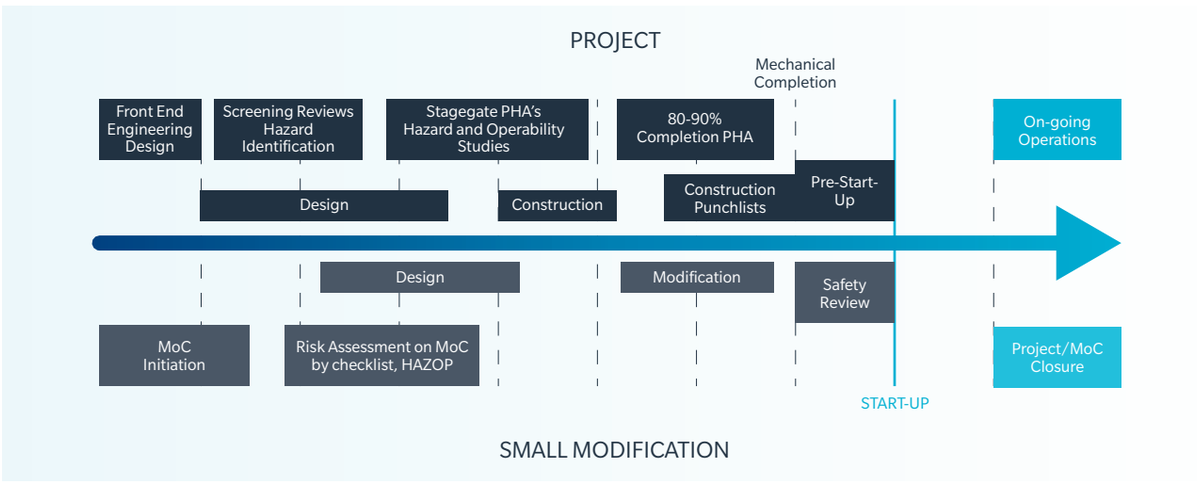
- New equipment was not tested and calibrated before startup.
- Inadequate training to operate the new unit and its distributed control system (DCS).
- Malfunctioning equipment and inadequate checking of DCS operation and displays.
- Standard operating practices not revised to address information specific to the new control system.
- Lack of sufficient technical coverage to support the startup.

3. WHEN TO DO A PSSR

3.1 WHERE PSSR FITS WITHIN THE PLANT MODIFICATION PROCESS

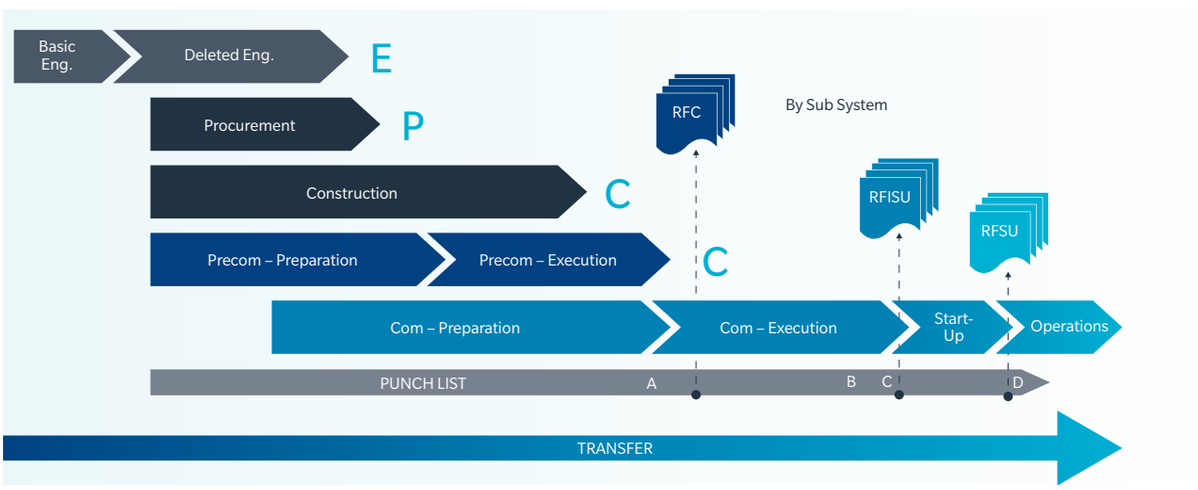
APPROACH FOR SIMPLER PROJECTS:

The PSSR "event" typically sits after construction completion and before the introduction of hazardous substances. Normally it is associated with "handover" from the construction organization to plant operations. However, where a period of commissioning activity not involving hazardous materials is anticipated, for example water testing, the site may choose to do the PSSR after the non-hazardous commissioning is completed.



APPROACH FOR COMPLEX PROJECTS:

Larger capital projects will require several PSSRs. For example a PSSR before commissioning ("RFC – readiness for commissioning"), between commissioning and startup ("RFISU – readiness for initial startup") and between startup and full hand over ("RFSU – readiness for startup").



For complex projects a PSSR should be carried out before utilities are allowed into the plant. Steam and electricity, for example, are both hazardous and sources of energy.

Organizations may choose to adopt two different scales of PSSR, a shorter form for smaller changes and modifications, and a longer form for larger projects involving a larger team to review.

3.2 CIRCUMSTANCES WHERE A PSSR IS APPROPRIATE

A PSSR is broadly beneficial where any change modifies the process safety information[1]. It is recommended that a PSSR be carried out prior to the commissioning or re-start step in the following circumstances:

a. Capital projects.

b. Modified equipment.

c. New valves or valve operation.

d. New or modified control system.

e. A new type of reactor or process vessel.

f. New feedstock or catalyst.

g. Startup after a turnaround (even if no modifications are involved).

h. Startup after an emergency shutdown involving complex issues such as reactants being abnormally distributed between equipment.

i. Significant process changes such as use of a new, different, catalyst.

j. Other changes involving a change in process safety information per the OSHA definition[2].

It can be beneficial to apply after emergency shutdowns and after routine maintenance where the process system involved is complex.

On many sites PSSR is a discrete step in the MoC process. Most cases of MoC will require a PSSR. However depending on how an organization practices MoC, there may be a need for PSSRs where an MoC has not been required, for example in re-starting after a turnaround where no plant design of process condition changes have been made other than extensive shutdown for inspection, catalyst replenishment, and repair. Conversely there can be MoCs where PSSR is not appropriate. Consider, for example, a change in operating conditions within the design parameters, in order to evaluate the effect on plant yield. This may well be covered by a MoC, but PSSR is not essential.

3.3 WHAT IS NOT A PSSR?

Excellent practices such as the process hazards analysis (PHA), MoC, construction checklists, punch lists, and operating procedures etc. do not comprise a PSSR, but they will contribute inputs to the PSSR.

The MoC is a “request” to make a change and the road map in how that change can be implemented safely. The PSSR is the verification step that the MoC, and other processes, were carried out as prescribed and that the recommendations from the MoC, and those other processes such as punch listing, have been completed.

The PSSR is not for the purpose of checking fundamental design parameters. It cannot be expected, for example, to answer the question “is fire protection adequate”. It can and should check that fire protection was considered in the design, that any recommendations made in respect of fire protection in previous design and process hazards reviews have been implemented, and it should sample the coverage and condition of fire protection as installed during the plant walkthrough.

4. WHO CARRIES OUT A PSSR?

4.1 ASSIGNING A PSSR LEADER

The head of the operations section who will be managing the plant in future is generally recommended as the most appropriate PSSR leader. An alternative approach is that the project engineer is the leader. For non-capital projects the MoC Coordinator or his delegate is normally the chairperson. It is essential that the leader have sufficient experience and leadership capability in process safety issues, and this aspect should determine the most appropriate person to lead the review.

Management should assign the PSSR leader and PSSR team after consideration of the complexity of the plant and the nature of the hazards involved.

4.2 ASSIGNING A PSSR TEAM

This must be a multi-disciplinary team.

ESSENTIAL ROLES WHO SHOULD PARTICIPATE:

- Engineer responsible for the design of the project.
- Representative of the operations department which will take over the facility.
- Representative of the maintenance department.
- Coordinator of the MoC process.
- Requestor of the change or project facilitator or his designee.

Optional participants, by title, depending on type of project and organizational structure:

- Instrumentation engineer.
- Process engineer.
- Industrial hygiene representative.
- Construction engineer.
- Safety department representative.
- Environmental specialist.
- Inspection department representative.
- Emergency response department representative.

One person can serve multiple roles. For efficiency reasons the team should comprise not less than three people and not more than eight people.

5. WHAT ARE THE KEY STEPS IN A PSSR?

An organization should develop a written PSSR procedure requiring the following steps:

5.1 Identification of the need for a PSSR, sometimes referred to as the trigger event, as identified in section 3.2 above.

5.2 Assignment of a PSSR leader and team as indicated in section 4.1 and 4.2 above.

5.3 The PSSR team meeting to discuss the purpose of the PSSR, and review all the items on the PSSR checklist. This meeting is the core of the PSSR process and leads to:

- A review of status of documentation on physical completion, procedures, training, piping and instrumentation diagrams (P&IDs) etc., as indicated in the example checklist in the appendices.
- A visit of the PSSR team to the actual installation to get visual confirmation of readiness for startup.
- A visit to the control room to get visual confirmation of the readiness of the control room for startup of the new parts of the installation.
- Completion of the PSSR checklist by the team (see section 7).
- Listing of action items which need correction before or potentially after startup.

5.4 **Team sign-off** for one of the following scenarios:

a. Facility is ready to startup, or move to next phase.

b. Facility may be started-up but there are some issues which need to be dealt with after startup. These issues will be listed in the PSSR checklist, with responsibilities.

c. Facility may not be started up until some issues are dealt with. These issues will be listed in the PSSR checklist with responsibilities.

5.5 **A managerial sign-off** that the plant is ready to startup, or move to next phase. The manager may or may not be part of the PSSR team, but the input from the PSSR team will be his/her primary source of advice that the facility is not ready to startup (see appendix A1 for suggested form).

5.6 **Action tracking** with regards to issues which need to be dealt with after the PSSR. For organizations with central action tracking systems, this central action tracking system should also be used for the PSSR actions.

6. STEWARDSHIP

The health of the PSSR process should be monitored by tracking the number of PSSRs and actions closed. There should be an audit process to ensure that PSSRs are being appropriately conducted.

6.1 PROCESS SAFETY PERFORMANCE INDICATORS

Typical indicators which can be used in the context of PSSR are:

- Number of PSSRs.
- Number of open actions and number of actions closed.

6.2 INTERNAL AUDIT

The audit would check, for example, that:

- There is a current PSSR procedure.
- PSSRs are being conducted as required.
- Actions generated by PSSRs are being completed and closed in a timely manner.

7. PSSR FORM CHECKLIST

7.1 CHECKLISTS

The PSSR Checklist used will depend on the nature of the site's processes and hazards. Typical examples, with a petrochemical plant in mind, are shown in appendix A. A long form is given in appendix A2 and a short form in appendix A3.

Key items in a checklist will include, but not limited to:

- All completions such as mechanical completion and punch lists have been completed and signed off.
- A punch list for items for completion before or for consideration for completion after startup.
- Completion of operator training.
- Standard operating procedures have been revised if required.
- Emergency operating procedures have been revised if required.
- Commissioning procedure for first startup including consideration of withdrawal of non-essential personnel, and additional personnel to be available, staffing of adjacent areas.
- Process hazards analysis including HAZOPs available, and requisite actions taken on the recommendations made in the PHA.
- Any regulatory issues such as flaring notified to the regulator accordingly.
- PPE requirement defined, understood and available.

It is recommended that the checklist items consist of items which it is reasonable for the PSSR team to verify. Checklist items such as "are all pressure relief valves adequately sized" or "has the consequences of back-flow been considered" are to be avoided in a PSSR checklist. The PSSR team can check that there are pressure relief valve design calculations, and they can check that there has been a process hazards analysis, and that all the recommendations have been addressed.

A separate form to be completed at the conclusion of the PSSR is recommended, whereby all outstanding actions are listed to be completed before and after startup, with managerial sign-off that it is "OK" or "not OK" to startup. An example is shown in appendix A1. This form may be integrated with the PSSR checklist.

7.2 SELECTION OF CHECKLIST TO BE USED

It should be the responsibility of the manager who will sign off the PSSR that the plant is ready to start, who decides whether the short form or long form is the most appropriate checklist to use. In deciding which approach is most appropriate the manager will consider the complexity of the plant, the nature of the hazards, and the experience and competence of the selected PSSR team.

7.3 MANAGERIAL SIGN OFF

The PSSR team will complete the checklist for the manager who will determine finally if the equipment is ready to startup. In doing this the PSSR team will list all the actions they consider necessary to be completed before startup, and those which can be completed afterwards.

The manager will then consider the findings of the pre-startup team and decide if the plant is ready for startup. An example form for this purpose is shown in appendix A1.

8. REFERENCES

1. Process Safety Management of Highly Hazardous Chemicals Standard, Title 29, Code of Federal Regulations (CFR) Part 1910.119 (FR 57(36):6356 - 6417, February 24, 1992). This contains the actual wording of the PSM rule.

2. OSHA 3132 – Process Safety Management – An information book supporting reference 1.

3. "Guidelines for Performing Effective Pre-Startup Safety Reviews", Center for Chemical Process Safety (CCPS). ISBN: 978-0-470-13403 - Wiley (April 2007).

4. CCPS Process Safety Beacon, December 2005, "Startup Hazards".

5. Implementation of Process Safety Management (PSM) in Capital Projects, C. Soczec, Du Pont Sustainable Solutions (2011).

6. Investigation Report: Refinery Explosion and Fire (15 killed, 180 injured) BP Texas City, March 23, 2005. US Chemical Safety and Hazard Investigation Board Report No. 2005-04-I-TX March 2007.

7. Investigation Report: Pesticide Chemical Runaway Reaction (two killed, eight injured) Bayer CropScience, Institute, West Virginia, August 28, 2008. US Chemical Safety and Hazard Investigation Board Report No. 2008-08-I-WV January 2011.

APPENDIX

APPENDIX A1 : EXAMPLE PSSR COMPLETION FORM

<table>
<tr><th colspan="3">PSSR Form</th></tr>
<tr><td>Date:</td><td colspan="2">PSSR Team Leader:</td></tr>
<tr><td colspan="3">Facility Process Equipment Reviewed:</td></tr>
<tr><td rowspan="6">Type of Startup:</td><td></td><td>Check One:</td></tr>
<tr><td>New Equipment</td><td></td></tr>
<tr><td>Modified Existing Equipment</td><td></td></tr>
<tr><td>Process Change</td><td></td></tr>
<tr><td>After Turnaround</td><td></td></tr>
<tr><td>After Emergency Shutdown</td><td></td></tr>
<tr><td>Recommendations essential to be completed before startup</td><td>Assigned Responsible:</td><td>Date Completed and Signature</td></tr>
<tr><td>Recommendations which may be completed after startup</td><td></td><td></td></tr>
<tr><td colspan="3">PSSR completion: Except as mentioned by recommendations above the PSSR team believes the process/facility is ready for startup</td></tr>
<tr><td></td><td colspan="2">• Construction and equipment meets design specifications.
• Safety, operating, maintenance, and emergency procedures are in place and are adequate.
• For new facilities a process hazards analysis has been performed and recommendations resolved.
• Training of each employee involved in the operating process is complete.
• Changes made to modify the process/facility have been reviewed and authorized by the facility management of change (MoC) program.</td></tr>
<tr><td>PSSR Team Members</td><td>Signatures:</td><td></td></tr>
<tr><td>Manager</td><td>Process/facility is authorised to startup.
Signature:</td><td></td></tr>
</table>

APPENDIX A2 : EXAMPLE PSSR CHECKLIST (LONG)

This checklist is given for example only. Individual sites will need to modify or add to it according to their local circumstances, process and terminology. Only sample checklist questions are shown here.

Ref :	Project / MoC title:
Site/area:	

IMPORTANT POINTS TO REMEMBER:

1. PSSR must be conducted after mechanical completion and before commissioning and startup.

2. Area owner representative shall lead the PSSR (unless otherwise assigned to project leader or MoC coordinator).

3. **If answer to any of the checklist items is "no", an action needs to be created for completion before or after startup.**

4. For temporary changes, a PSSR should be done before the change and again after restoration of the facility to its original state.

5. The PSSR team is not expected to review the plant design or process hazards reviews. In response to the following checklist items the PSSR team is expected to verify that the aspect was considered in the design, that any outstanding actions from the design and process hazards reviews have been completed, and to sample the facilities provided for their visual conformity to the needs described.

	Discipline Representative/ Engineer / Specialist / Inspector (note one person can fill multiple roles)	PSSR Team Names	SIGNATURE	DATE
2.1	Operations specialist designate (PSSR team leader unless otherwise assigned)			
2.2	Project engineer			
2.3	Mechanical maintenance			
2.3	Electrical maintenance			
2.4	Instrumententation and/or DCS specialist (if appropriate)			
2.5	Process engineer			
2.6	MoC coordinator (if MoC)			
2.7	Operations representative			
2.8	Initiator of the project or change			
2.8	Inspection (if appropriate)			
2.9	Construction engineer (if appropriate)			
2.10	Safety department representative (if appropriate)			
2.11	Environmental specialist (if appropriate)			
2.10	Industrial hygiene/ergonomics specialist (if appropriate)			
2.11	Others specify: _____			

Continues overleaf.

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
A	GENERAL	☐			
1.	Does equipment condition allow safe access for operation, inspection/ maintenance?	☐	☐	☐	
2.	Are pre-commissioning punch list items completed?	☐	☐	☐	
3	Have adequate provisions been made for the technical or supervisory support during initial operation?	☐	☐	☐	
4	Have spare parts been obtained?	☐	☐	☐	
.....					
10.	Have all unwanted scaffoldings been removed?	☐	☐	☐	
11.	Has availability of utilities been checked for safe startup?	☐	☐	☐	
12.	Has communication been done with other facilities/units to ensure that they are operating in a way that it does not affect safe startup (e.g. supply of feedstock, flaring, utilities, emergency operations)?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
B	DOCUMENTATION AND TRAINING	☐			
1	Have standard operating procedures been provided?	☐	☐	☐	
2.	Have any special procedures been provided (examples are sampling methods, equipment lubrication etc.)?	☐	☐	☐	
3.	Has standard operating procedure training been carried out?	☐	☐	☐	
4.	Have safe operating limits been determined and available?	☐	☐	☐	
.....					
9.	Have special procedures for commissioning or first-time startup been provided and reviewed?	☐	☐	☐	
10.	Has this change been adequately communicated to adjacent units or other affected groups?	☐	☐	☐	
11.	Has the plant plot plan been updated?	☐	☐	☐	
12.	Have P&IDs, process flow diagrams (PFDs) and other applicable process safety information key documents been "red-lined-marked" for changes?	☐	☐	☐	
13.	Have all inspection related documents/drawings, records and testing been updated (including positive materials identification)?	☐	☐	☐	
14.	Have all the red-lined drawings being handed over in turn-over packages for all relevant disciplines?	☐	☐	☐	
15.	Have training equipment needs been considered and purchased for this project?	☐	☐	☐	
16.	Has vendor literature on equipment been filed properly in operation, inspection/maintenance areas?	☐	☐	☐	
17.	Has the training been completed, documented, and input into the training records system?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
C	SAFETY, HEALTH AND FIRE PROTECTION	☐			
1.	Has safety equipment (e.g., fire extinguishers, fire detectors, eye baths, safety showers, breathing equipment, alarm boxes) been provided and located where needed? Have they been checked and are they operational?	☐	☐	☐	
2.	Is unobstructed access to safety and fire protection equipment provided?	☐	☐	☐	
3.	Is deluge water system provided, if required?	☐	☐	☐	
4.	Have areas with potential for exposure to high noise levels been identified and warning signs put in place?	☐	☐	☐	
.....					
19.	Have emergency response plans and scenarios been updated to reflect the new facilities, and available at both the new/modified installation and at the fire and emergency response centers?	☐	☐	☐	
20.	Is ventilation in working order and inspected?	☐	☐	☐	
21.	Have the abandoned foundations and supports been removed to prevent trip hazards?	☐	☐	☐	
22.	Are all openings in the platform adequately sized for pipe penetration and properly banded?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
D	WASTE STREAM AND ENVIRONMENT AND UTILITY SYSTEMS	☐	☐	☐	
1.	Are bunding, draining, and curbing provided in accordance with design?	☐	☐	☐	
2.	Have provisions been made for disposal of all wastes (i.e., drums, bags, filter elements, liquid residues)?	☐	☐	☐	
3.	Will runoff rainwater be contained if it becomes chemically contaminated?	☐	☐	☐	
.....					
13.	Have sewers been sealed correctly and vents adequately located?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
E	PIPING, HOSES, VALVES AND VESSELS	☐	☐	☐	
1.	Have piping, valves and vessels been pressure tested?	☐	☐	☐	
2.	Have cross-tied lines (pump headers, utility lines, etc.) been avoided where contamination, pressure, or temperature problems are likely?	☐	☐	☐	
3.	Has a line-by-line review been conducted to ensure that the piping is installed as specified?	☐	☐	☐	
.....					
37.	Have new fixed equipment such as pressure vessels, tanks, piping, hoses, injection points etc., been identified (tag numbered) and added to the inspection programs?	☐	☐	☐	
38.	Is cathodic protection information available to be used for relevant preventative maintenance and testing program?	☐	☐	☐	
39.	Are there any pipeline dead-legs which might lead to corrosion or freezing? Have these been put on the inspection register?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
F	SAFETY & RELIEF FACILITIES	☐	☐	☐	
1.	Have safety valves been inspected, tested and tagged?	☐	☐	☐	
2.	Are block and bypass valves of safety valves car sealed?	☐	☐	☐	
3.	Are relief devices directed away from personnel?	☐	☐	☐	
4.	Is safety valve inlet and outlet piping supported to avoid undue stress on the safety valve?	☐	☐	☐	
.....					
10.	Are rupture discs correctly tagged? Are they installed facing the correct direction with respect to flow?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
G	ROTATING AND MECHANICAL EQUIPMENT	☐	☐	☐	
1.	Have special precautions for safe operation been adequately specified?	☐	☐	☐	
.....					
8.	Is the drive unit grounded?	☐	☐	☐	
9.	Have the lubricants and seal fluids been properly charged?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
H	ELECTRICAL SYSTEMS	☐	☐	☐	
1.	Have start/stop switches and electrical switchgear/Motor Control Centre (MCC) been properly labeled?	☐	☐	☐	
2.	Can electrical equipment be isolated safely for repair work?	☐	☐	☐	
3.	Do lockout provisions exist both at the switchgear/MCC and at the start/stop switch?	☐	☐	☐	
4.	Have conduit fittings been properly sealed?	☐	☐	☐	
5.	Have electrical protective relays and safety devices been calibrated?	☐	☐	☐	
.....					
17.	Has electrical equipment been designed and selected to meet hazardous area classification requirements.	☐	☐	☐	
18.	Does the electrical construction meet the plant standards?	☐	☐	☐	

ITEM #	CHECK ITEMS	YES	NO	N/A	Note any action required
I	CONTROL SYSTEMS	☐	☐	☐	
1.	Has the fail-safe function of valves been properly installed? Are mechanical stops (if provided) are properly tested?	☐	☐	☐	
2.	Are interlocks, alarms and logic provided in accordance with approved specifications?	☐	☐	☐	
.....					
13.	Is instrument tubing adequately supported and leak tested?	☐	☐	☐	
14.	Have bolts on explosion proof enclosures and conduits seals and covers installed?	☐	☐	☐	
15.	Do all the control system equipment, instrumentation and analyzer construction meet the plant standards?	☐	☐	☐	

PRINT NAME:	JOB TITLE:	DATE:	SIGNATURE:

APPENDIX A3 EXAMPLE PSSR CHECKLIST (SHORT)

This checklist is given for example only. Individual sites will need to modify or add to it according to their local circumstances, process and terminology. Only sample checklist questions are shown here.

PRE-STARTUP PROJECT SAFETY REVIEW CHECKLIST/APPROVAL

Name of Dept.:		
Name of Project / MoC/ Project No.:		
Target Date for Startup:		
Name of Project Engineer/Manager:		Signature:
Name of Project Manufacturing Rep.:		Signature:
Name of Construction Engineer:		Signature:
Name of HSE Team Member		Signature:

REQUIRED			ACTION	BEFORE/ AFTER STARTUP	REQUIRED			ACTION	BEFORE/ AFTER STARTUP
N/A	YES				N/A	YES			
☐	☐	Operating procedures updated			☐	☐	All plant mechanically and electrically complete		
☐	☐	Operator training completed			☐	☐	Action items from PHAs completed		
☐	☐	PHA review completed			☐	☐	Process technology files updated including operating envelopes		
☐	☐	P&IDs marked up			☐	☐	Safety equipment in place		
☐	☐	MSDS book updated			☐	☐	Emergency response equipment and procedures in place		
☐	☐	Production training			☐	☐	Equipment files updated and spares available		
☐	☐	Mechanical procedures updated			☐	☐	Equipment, piping, safety valves etc. registered for inspection		
☐	☐	Mechanical training completed			☐	☐	Scaffolding and other temporary construction equipment removed.		
☐	☐	Instrument & electrical (I&E) procedures and documentation updated			☐	☐	PSSR Team walkthrough Completed		
☐	☐	I&E training completed							
☐	☐	Maximum intended inventory							
☐	☐	Emergency plan updated							
☐	☐	Electrical area classifications							
☐	☐	Action items from construction punch list completed							
Operations Manager					Date				

PSSR Title:

Date:

Location:

Attendees:

PRINT NAME:	JOB TITLE:	DATE:	SIGNATURE:

APPENDIX B: SELF-ASSESSMENT CHECKLIST

The following checklist is a quick tool that a site can use to test its existing processes against this good practice guide.

	Y	N	PARTIAL
1) SETUP AND APPLICABILITY			
Does the site have a formal, written PSSR procedure?			
Does it clearly define when it is and is not applicable?			
Does it cover capital projects and MoCs?			
Does the process recognize the potential need for multiple PSSRs according to project stage?			
2) STAFFING			
Does the process define which organizational positions perform the key roles of:			
– PSSR leader?			
– Discipline engineers, including maintenance, construction, instrumentation etc. as appropriate?			
– Future owner of the equipment being reviewed?			
– Managerial sign of that the plant is ready for startup?			
3) KEY STEPS			
Does the procedure:			
– Identify trigger events requiring a PSSR?			
– Cover the assignment of a PSSR leader?			
– Cover the assignment of PSSR team?			
– Give guidance on use of short form or long form PSSR checklist and indicate who should make this decision?			
Are PSSR checklists available?			
Does the process generate action items, and separate them into actions essential before startup and those which carried out after startup?			
Does the process include managerial sign off that the plant is ready to startup?			
Is action tracking of actions to be carried out before and after startup covered?			
4) Stewardship and Governance			
Are the number of PSSR's and action completions tracked?			
Is there an audit process to ensure that PSSR's are being appropriately conducted?			

MARSH

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GRAPHICS NO. 15-1231