

Conduct an Effective Pre-Startup Safety Review

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This helpful guide provides tips and tools for ensuring operational readiness prior to process startup.

Pre-startup safety review (PSSR) as required by the U.S. Occupational Safety and Health Administration (OSHA) process safety management (PSM) regulation (1), or operational readiness (2), is a required element of a PSM program and is essential for preventing process-safety-related incidents and losses.

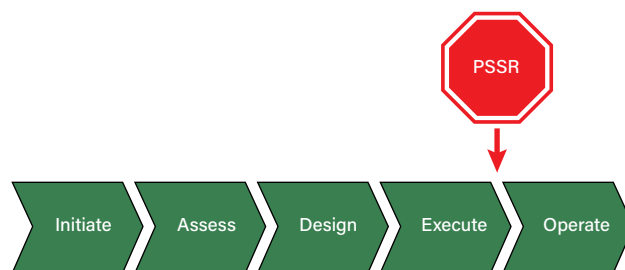
The PSSR process is intended to assure that modifications installed match the approved design, the system is mechanically complete, components have been functionally tested, and the system is ready to hand over to the operations team for operational pre-startup checks and startup procedures. This article addresses PSSR activities leading to turnover to operations.

Management of change (MOC) and PSSR processes are closely intertwined. PSSR occurs at a late stage of the project process as shown in Figure 1. Additionally, some form of PSSR, or operational readiness review, should occur on equipment returned to service following maintenance or replacement-in-kind (RIK) repair work.

An effective PSSR involves establishing a well-defined workflow, providing effective tools, ensuring follow-through, and continually improving the process through user and client feedback. Many of these concepts are described in general terms in various guidelines and reference materials. However, effective implementation cannot be achieved through generalities. The devil is in the detail

and the quality of the implementation.

This article describes several specific practices and tools that have been proven effective to drive better PSSR and project turnover. These practices may be scaled to apply to projects and modifications of any size as well as to procedure changes and maintenance restart applications. The article shares examples that demonstrate the importance of selecting the proper tools and resources to support the work, as well as highlights how successful practices tend to become self-reinforcing. In these examples, practices were continued, expanded, and improved based on the compounding effect of successful results. The ideas and anecdotes that follow offer some insights into better practices that may improve existing PSSR implementation.



▲ **Figure 1.** The pre-startup safety review (PSSR) takes place before the operate phase, as shown on this generic project management — or management of change (MOC) — workflow.

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Why conduct a PSSR?

Why we must conduct the PSSR process may be explained by highlighting industry experience and sharing major incidents that stemmed from inadequate review in advance of startup or restart activities. These events are the drivers for the regulatory requirements. The “Why?” can also be reinforced by emphasizing the value to the operations team of receiving a satisfactory turnover of new, modified, or repaired equipment. A PSSR is required by process safety regulation to assure that new or modified equipment may be operated safely. A PSSR also functions as the custody transfer process from project owners and implementers to operations.

Defining the workflow process

Having a well-defined and practicable workflow process is essential to implementing an effective PSSR. The workflow process defines what a PSSR is, who implements the PSSR, as well as when, where, and how a PSSR will be implemented.

What is a PSSR?

The PSSR process may be thought of as a combination of field inspection and testing along with administrative confirmation that documentation, data systems, procedures, training, and follow-up action items required for safe startup and operation are complete.

PSSR is an essential hold point for inspection and validation before custody transfer occurs. Readiness for custody transfer and confidence in safe operation is accomplished by:

1. Inspecting installed equipment to ensure that it matches the approved design. Identifying and addressing discrepancies between approved design and installed equipment, and documenting post-startup action items where closure may occur after the system is operational.
2. Testing installed equipment to ensure that it functions as intended.
3. Ensuring that accurate as-built drawings are available to operating, maintenance, and other key personnel.
4. Ensuring that other startup required process safety information (PSI) has been gathered and submitted to the appropriate, accessible place.
5. Ensuring that startup required procedures, such as operating and emergency procedures, are complete and available.
6. Ensuring that training on the new process, equipment, and procedures is complete.
7. Ensuring that all action items from the process hazard analysis (PHA), MOC technical reviews, MOC environmental, health, and safety (EHS) reviews, and PSSR inspection and testing are resolved and pre-startup requirements are complete.

8. Ensuring that the operations team is satisfied with the condition of the equipment being turned over to them.

The following sections provide more detail on each of the eight PSSR sub-elements just described.

1. Onsite inspection. The intent of the onsite inspection, also called walkdown, is to ensure that equipment has been installed to the standards expected by the operating company. A primary objective of the onsite inspection process is to ensure that the equipment and the process configuration are installed as shown on approved-for-construction drawings. Any discrepancies must be annotated to show as-built condition and reconciled.

When discrepancies are found between installed equipment and approved construction drawings, the process for addressing and reconciling those discrepancies must be defined and rigorous. These deviations are evidence that installed equipment may not have received PHA or other MOC reviews. Do not assume that the deviations found were properly approved or will be approved. Simply marking the change is not acceptable. When discrepancies are found, the following should occur:

- Ensure that all post-PHA changes received or receive a belated but thorough MOC review including process hazard review, technical review, and other requirements in advance of sign-off and startup.
- Reward discovery of unapproved changes and accept follow-on impacts to foster a fair, thorough review process.
- After startup, address the causes for unapproved changes through post-mortem root cause analysis, and implement corrective actions to prevent recurrence.

Figure 2 represents a typical workflow for projects that are small, involve no changes or impacts to automation or safeguards, and may involve equipment types more frequently inspected. This workflow diagram includes a single group walkdown and functional testing is not applicable.

2. Functional testing. For projects involving automation, controls, and safety devices, functional testing of the installed equipment and instrumentation typically occurs after confirmation of mechanical completeness and in advance of final system inspection. Safety valves, process control valves, instruments, and communications are tested to ensure the functionality of safety instrumented functions (SIFs), process control loops, and other alarm and indication instrumentation.

Functional testing is performed in the field by technicians trained for this activity. Testing results are documented and retained. These technicians may be employees or contractors associated with commissioning teams. The commissioning team representatives will generally work in conjunction with company instrumentation and controls technicians. Mechanical safety devices such as pressure safety valves (PSVs) and check valves should have been function- and

leak-tested before installation. Those records should be reviewed during the PSSR.

Rotating equipment, including drivers and associated controls and automation, will require inspection, functional testing, and commissioning that is specific to the equipment type. New, modified, or re-commissioned rotating equipment will have requirements such as alignment, checking for free rotation, and filling of lubrication and seal systems that occur during construction. Verification of rotation direction, *i.e.*, bump testing, should occur in conjunction with functional testing. These activities will also be performed by trained commissioning technicians with the support of plant operating and maintenance personnel.

Figure 3 shows a typical workflow for projects that are large, involve automation and safeguarding components, and may involve equipment types less frequently inspected. Figure 3 includes functional testing and two walkdown stages — individual and group. For larger projects or turnarounds, these PSSR activities are conducted multiple times on subsets of the entire project.

3. As-built drawings. Drawings such as piping and instrumentation diagrams (P&IDs) and/or process flow diagrams (PFDs) must be turned over and available to operations, maintenance, and other key personnel reflecting as-built condition, also called “as installed” or “redlined.” Drawings must be accurate, properly signed and approved, and available before startup.

4. Additional PSI, database, and automation updates. Additional process safety documentation including other drawings, shutdown matrices, equipment information (via digital database or PDF), engineering calculations, relief and ventilation system documentation, and various lists and logs

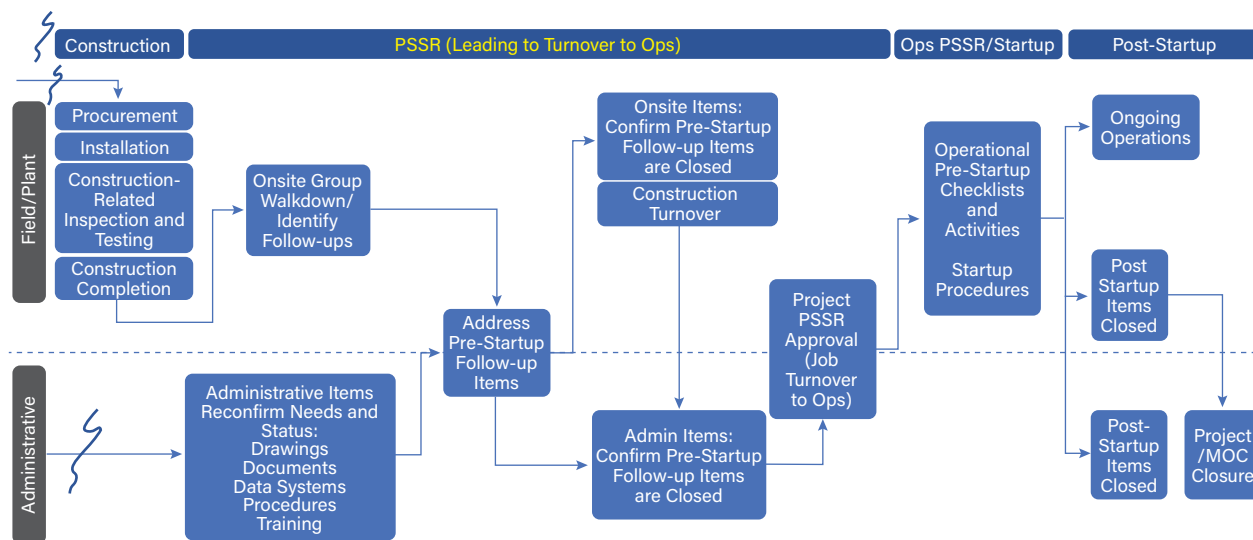
(such as car seal lists, dead leg lists, spare parts lists, etc.) must be updated to reflect as-built condition and be included in project turnover documentation. Data management systems may include computerized maintenance management systems (CMMS), equipment data systems, document management systems, or enterprise systems that encompass all data elements. The process and timing for uploading into final electronic systems will vary from company to company and may occur post-startup for certain items.

Automated human machine interface (HMI) screens must also be complete and current. Any programmable logic controller (PLC) interface updates that will impact the operation, control, and safety responses must be complete before startup.

5. Procedures. Certain procedures, including operating procedures for startup, shutdown, operating limits and responses, and troubleshooting, must be complete and available for all necessary personnel. Emergency response and other safety procedures must also be available.

Certain inspection, maintenance, and testing procedures that will not come due for months or years may not be required for safe startup. However, regulatory requirements may dictate that procedures, including maintenance procedures, be complete or “in place” (1) before startup. Be sure to consult the applicable regulation regarding compliance-related drivers.

Keep in mind that the initial version of startup procedures is not final or “etched-in-stone.” After first use, startup procedures should be reviewed to determine if a better approach exists and then revised, as needed. All procedures require review and revalidation on defined intervals as well as continual improvement, but a good time for initial review,



▲ **Figure 2.** At a high level, a PSSR consists of field inspection, as well as administrative confirmation that all necessary tasks for safe startup and operation are complete. This typical PSSR workflow shows a small project that requires no functional testing.

validation, and improvement of startup procedures is in advance of initial startup.

6. *Training.* Training should cover new or modified equipment, process flow, process technology, chemicals, and/or procedures. Training typically falls into one of several categories: either pre-startup required, post-startup required, or awareness-level training.

Pre-startup training is required for on-shift personnel in critical roles. Required training will need to be staged to address personnel as they cycle into the critical role from being off-shift, off-rotation, away from work, or for new incoming personnel. Mechanisms must be in place to track and maintain these training requirements and records. Tying new equipment or process training requirements into core operator competency training programs is equally important and frequently neglected. Post-startup required and awareness-level training should be prepared and distributed to other personnel. All records of training completion should also be tracked and retained.

7. *Action item reconciliation and closure.* Follow-up action items are developed and added throughout the project process. The MOC review process and the PHA, which occur before approval of construction and installation activities, will yield a list of follow-up recommendations and actions. Some of these action items must be completed before the final design is approved for construction. Other PHA or MOC review follow-up items may allow for completion during later stages of the project, including either before or after startup. Likewise, the PSSR process itself, through both the onsite inspection and testing process as well as the administrative reconciliation process, will yield a list of additional follow-up items.

8. *Turnover to the operations team.* The ultimate purpose of the PSSR process is to ensure that new or modified equipment is ready and safe to operate. The final step of a PSSR represents the point of custody transfer from the project or maintenance team to operations. Therefore, a PSSR is a joint effort that involves multiple groups and individuals.

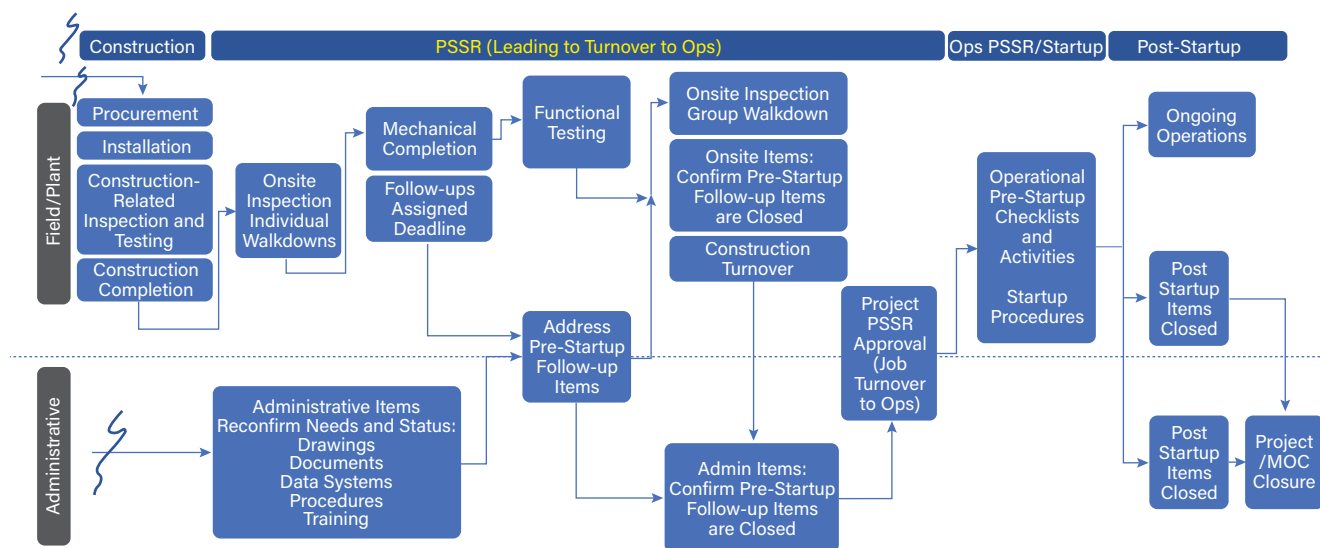
Who? Define participants and roles

In some instances, certain teams or team members may incorrectly believe that the PSSR or the wider MOC process is owned by one department or group. PSSRs cross boundaries between groups, and multidisciplinary collaboration is essential to success. Ensure that employees and contractors involved in a PSSR understand the cross-functional nature of the PSSR and recognize their role in the integrated process.

The list of participants should be site-specific and project-specific. Regarding the onsite equipment walkdown, the following participants should be included.

Operations. Ensuring that the operations team is satisfied with the condition of the equipment being turned over is a key element of a robust and self-sustaining PSSR process. The specific client that must be satisfied is the field or plant operator; thus, an experienced field or plant operator must be involved in final walkdowns and sign-off on the equipment being turned over. Ultimately, operators are the most routinely at-risk personnel that may be impacted by safety incidents. Therefore, operator involvement is important not only from an operational perspective but from a safety perspective, as well.

The lead operator or an operations foreman or supervisor may be an additional participant in the PSSR, but they should not replace the field or unit operator. The size, scope,



▲ **Figure 3.** This sample PSSR workflow for a large project includes functional testing and two walkdown steps.

and complexity of the project should govern the decision to involve the lead operator.

Inspection. The quality control (QC) representative or a third-party inspector with sufficient expertise regarding the equipment and process is an essential participant in the PSSR. Having an outside set of eyes that specializes in this type of work is critical for final inspection and unbiased interpretation of the findings. The qualifications and redundancy of QC personnel are dependent on the size, scope, and complexity of the project or job being turned over.

Construction/implementation. Construction or implementation personnel participation is required. The resource performing the construction or maintenance activity is commonly a contract resource but could be in-house personnel. At a minimum, the crew lead or foreman for the construction company or group that installed the equipment should participate. The preference would be for involvement from both a foreman-level lead for ownership and job-specific knowledge, as well as a superintendent, for consistency across jobs.

Engineering. Engineering involvement is essential. Engineering representation might include the project lead engineer, a technical design engineer, or a construction engineer. If the design deliverables were handed over to a construction group to manage implementation, the construction engineer should participate. It is important to note that intent may sometimes be lost in translation. Circling back to the design engineer and including more direct design engineer involvement in the PSSR may be important if deviations begin to creep into the process. Recognizing that those deviations exist may require design engineer involvement. Design engineers also learn from being involved in the inspection of the end product and gain a sense of ownership as well as insight into the realities of implementation. For specific equipment inspections, the engineer must be sufficiently qualified in the discipline necessary to review the installed equipment type.

PSSR or operational readiness lead. A PSSR lead should be established for projects of any size. The PSSR lead must understand the requirements for inspection and testing in the field, as well as the requirements for administrative information gathering, review, and approval. The PSSR lead must also have a complete understanding of the requirements for follow-up item prioritization, sign-off, and closure. For larger projects, the PSSR lead may be a member of the commissioning team. For smaller projects, the project lead engineer or another trained and qualified individual may fill the role. The PSSR lead should be a third-party representative not affiliated with the construction team or the operations team.

Operations management and leadership. Pressure to move quickly to startup often originates from the top. Man-

agement signature on the PSSR form assures that the manager has been held personally accountable for the PSSR process. Whether the supervisor or manager is a mid- or higher-level supervisor or manager would typically depend on the size or scope of the project being prepared for startup.

Recapping onsite inspection. To recap, the following participants are suggested as essential, recommended, or optional for equipment PSSR walkdowns:

- PSSR lead (essential)
- Operations: operator, unit or field (essential); lead operator (essential or optional, job dependent)
- Inspection: QC or third-party inspector (essential)
- Construction/implementation company representative, either contract or in-house: crew foreman (essential); superintendent (recommended)
- Engineering: project lead engineer and/or construction engineer (essential); design engineer (optional). Note: the project lead engineer may also serve as PSSR lead, if qualified. However, the construction engineer should not serve as PSSR lead.
- Operations manager or supervisor (sign-off required, but onsite review not necessary)

Always consider the job-specific and site-specific factors when defining the PSSR team. Figure 4 provides more details regarding the resources, personnel, and tools associated with each PSSR step.

When? Define work sequence

When does a PSSR occur? The simple answer is: before startup. But defining the workflow process means more than saying pre-startup safety review occurs before startup. The workflow process must establish expectations for the right level of inspection by the right people at the right time. Individual components that require testing must be inspected for mechanical completeness in advance of functional testing. Functional testing will occur before final group PSSR walkdowns. Field walkdowns should be scheduled to allow time for individual, detailed inspections in advance of final group walkdowns. Final walkdowns ensure concurrence on findings, approvals, and follow-up requirements.

Group walkdowns should be considered as a critical step for most PSSR processes, but be aware that group walkdowns may lead to group-think, time pressure, or peer pressure to wrap up the process. Group walkdowns may not allow adequate time for detailed field review and inspection.

A single group visit to the location may be appropriate for very simple or repetitive installations (as in Figure 2). But for more complex equipment or for installation types that are less frequently reviewed, inspectors, engineers, and/or operators should visit the location and perform their individual inspection in advance of the group walkdown (Figures 3 and 4).

Scheduling individual onsite inspections in advance of the group walkdown not only allocates time and space for both activities, but it also allows for follow-up items and functional testing to be addressed simultaneously.

Where?

Defining the workflow process includes identifying which portions of the process are conducted onsite in the field or plant. In general, all essential and recommended members of the PSSR team must complete a field walkdown to sign off for their position. The one exception would be the operations management or supervisory representative. This exception is based on their unique role as a higher-level accountable representative. Their signature assures their support of the process itself, rather than ensuring the integrity and completeness of the installation. Likewise, administrative activities such as compiling and submitting documents, data, and training records occur offsite. Figures 2, 3, and 4 show “swim lanes” to distinguish on-location vs. administrative activities.

How?

The PSSR process occurs at the final stages of the entire project process. The PSSR stands in the way of a startup that everyone wants to achieve. Just as it is difficult to pay close attention to the final afternoon speaker before happy hour begins or the last class before the semester is over, it is natural to want to “check boxes” and “power through” the

PSSR. Resist this inertia and the human desire to rush.

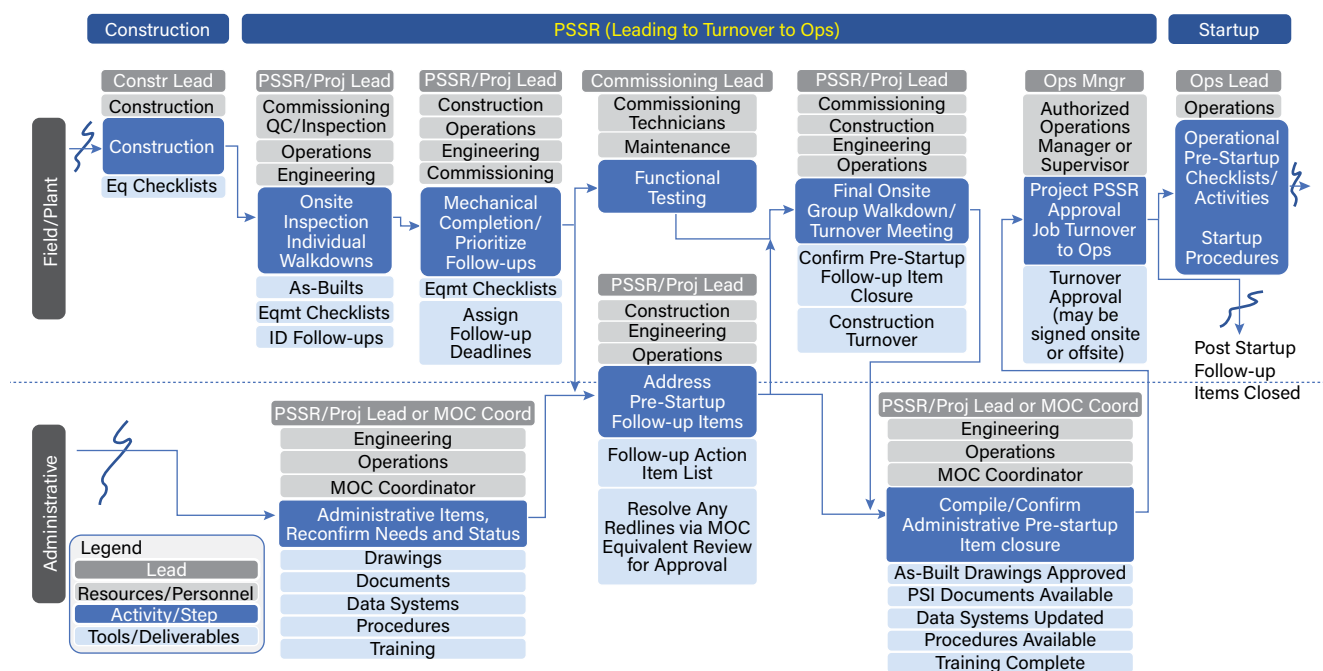
To counter this tendency to rush, find internal triggers and practices to resist the natural inclination to check boxes and move too quickly through the PSSR process. Ensure that personnel, such as QC inspectors, are brought in for this stage, where their sole responsibility and deliverable is this pre-startup inspection role. Hire detail-oriented people to perform inspections. Conduct internal audits that are quality-focused, not task-focused. Incentivize and reward findings of deviations and subsequent corrections of those deviations, even if, and particularly when, startup is delayed.

Effective tools

An important part of the PSSR process is implementing a workflow process that defines roles and activity sequencing. But creating and utilizing effective tools is an equally important part of the process. Those tools include: PSSR process checklists, PSSR equipment checklists, equipment testing procedures, and forms and database tools for capturing and managing inspection, testing, and follow-up findings. These tools may be created in-house or provided through vendors.

Checklists are an important tool for an effective PSSR. Checklists must be fit-for-purpose. The PSSR equipment checklist encompasses equipment requirements, project closeout requirements, and site-specific requirements.

Equipment category checklists. To be effective, checklists must be specific for a given equipment category. For example, a standard checklist for piping, fittings, and valve



▲ **Figure 4.** This sample PSSR workflow for a large project includes information on resources, personnel, and tools for each step.

components is appropriate to use for all projects that involve piping modifications or replacement. A project that includes a pump should include a checklist specific to pumps and include line items and acceptance criteria for the pump and the driver. As with all aspects of a PSSR, it is important to find an effective and functional balance between too many checklists and too few.

Standard sections for PSSR equipment checklists.

Several standard sections should be included in the PSSR checklist regardless of equipment category. Standard sections may include review of:

- construction- and commissioning-related inspection and testing records (e.g., non-destructive examination, hydrotesting, functional testing, etc.)

- bolt-up
- coatings
- insulation
- structural supports/bracing
- visual systems, signs, and labeling
- housekeeping
- drawings/documents, as-builts
- follow-up action item designation.

Other sections will be equipment-specific. The project should be handed over as a completed deliverable. Labeling and housekeeping in the final inspection and walkdown process should not be underemphasized. New projects should meet company requirements and an equivalent or better standard as compared to existing equipment.

Acceptance criteria. Walkdown effectiveness and PSSR practice consistency are directly related to checklist format and content. The checklist item description should include complete sentences that describe acceptance criteria. Single-word or phrase PSSR checklists are not

appropriate (Figure 5).

Combining related criteria on a single line is done for brevity of the checklist and for streamlining of the walk-down and records submittal process. If any item of several listed on the line does not meet the acceptance criteria, the line item is indicated as unacceptable. The action item will define the specific issue that is out-of-conformance.

Format considerations. All line items on the list should be addressed. Applicable items are indicated as Acceptable (“Yes” or “No”) and inapplicable items should be marked Not Applicable (“N/A”). Requiring each line item to be marked reduces the likelihood of skimming the list and missing the item altogether. Phrase the questions or statements so that “No” is always the unacceptable or undesirable response. All “No” responses require follow-up and closure.

Always allow space for comments. It is important to have a mechanism to capture field notes and clarifications. The signature and approval box on the equipment inspection form should include an indication of whether an onsite inspection was conducted by each signer.

Content considerations. Occasionally, PSSR checklists are created that include items that are design-related or items that must be completed during construction (Figure 6). These items should be removed from the PSSR checklist. All design-related issues should be included on design review checklists, which are completed during technical reviews in advance of project design approval. Design approval precedes the construction stage. The exception to this rule would be where latitude is given to specific placement or orientation of installed equipment in the field. Where construction or installation discretion is allowed or required, those items should be field-checked relative to acceptance criteria. Certain items cannot be visually checked in the field

Checklist Item	Item	Item Description/Acceptance Criteria ("Yes" indicates all criteria listed have been met. "N/A" indicates item not applicable)
Piping and Flanges	2.0	Bolted Pipe Fitting Connections
a. Gasket (type/grade)	✓ 2.1	All stud bolts are installed and centered. Verify proper thread engagement, a minimum of 1 thread visible beyond the bolt surface.
b. Bolt and Nut (type/grade)	2.2	Bolting materials are properly lubricated. Verify that there is no visible damage to bolt threads.
c. Thread Engagement ✗	2.3	Mating surfaces are aligned. Verify new gaskets were inserted.
d. Isolation Kits	2.4	Gaskets are properly centered in the flange by the stud bolts.
e. Bolts Torqued or Hammer Checked ✗	✓ 2.5	Flanges properly torqued. Torque sequence marked on flanges. Torque value is marked on tape. Flanges taped for leak sniffing. Nuts/bolts hammer checked and acceptable.
f. Piping Labeled ✗	4.0	Piping Construction/Installation
	4.1	Piping, flanges, and fittings are appropriate specification (materials and rating) as per approved package.
	✓ 4.11	Piping is labeled using proper color (per standard) with process fluid, flow direction, and line ID. Labels applied on all three branches of commingled points, on either side of wall/floor penetrations, at piping spec changes, and <50-ft straight runs.

✗ Inadequate acceptance criteria
✓ Improved specific acceptance criteria

◀ **Figure 5.** On the left is an excerpt from a PSSR checklist that contains only a few words for acceptance criteria. On the right, the same criteria are listed with more detail.

following installation. These items should be included on pre-construction or during-construction checklists.

Paper vs. e-tools. Paper checklists or electronic tablet checklists can be used. Choose whichever option is most functional, safe, and efficient for the application. The end users should be your guide in defining the best tool to use. If the tool is cumbersome and prevents a complete, high-quality inspection from occurring in the field, then consider another option. Always consider practical field constraints that impact usage and may compromise quality.

Follow-up action items

Reviews and checklists are only useful if the items found as unacceptable receive follow-up attention and are corrected before the designated deadline. Small jobs may incorporate follow-up item closure on the original PSSR form. For larger projects, follow-up items are often captured on a separate master list or in a separate database. This list may include follow-up items from other stages of the project including design reviews, technical reviews, EHS reviews, PHA reviews, as well as the PSSR. The PSSR process will contribute follow-up items through both onsite inspection and testing, as well as through reconciliation of administrative requirements.

Follow-up action item descriptions should be clear, complete, and standalone so other reference material is not required to understand the unresolved issue. Every follow-up item should be assigned a deadline, an owner, and closure requirements. It may also be advisable to indicate the driver for each action item, such as: safety, operability, compliance,

policy/procedure, and/or better practice. In many cases, multiple drivers may apply.

The deadline should be defined relative to project approval stages. For a PSSR, the deadlines will include before startup, during startup, or post-startup allowed. All items that are assigned a deadline of before startup, regardless of the project stage in which they were generated, must be reconciled, closed, and signed off before operational startup occurs. Items indicated as during startup must be acknowledged and addressed during startup. Post-startup items allow for closure during ongoing operation. Closure of all post-startup items allows for closure of the overall project and MOC process.

Each follow-up item should be assigned an owner with primary responsibility for addressing and completing the item. Each follow-up item must also define sign-off and approval requirements for closure, including if the item must be inspected in the field by operating company personnel. Indicating whether functional testing will be required for follow-up items is useful to note.

Critical items, including safety-related items, will require PSSR lead and operations validation and sign-off. Whereas less-critical items may allow for validation and sign-off by a construction team member or contract representative. Closure of follow-up items should be dated and indicate the name or initials of the approver and include closure comments. Any items considered for closure by dismissal must be closely scrutinized. To dismiss, the drivers for the follow-up item must be defined and PSSR team members that identified and prioritized the follow-up item should be consulted and in consensus on the decision to dismiss.

		Yes	No	N/A	
Relief Devices					
1	Relief devices and lines are adequately sized.				
2	Relief device calculations account for inlet and outlet piping.				
3	Relief devices relieve into a piping system or other containment.				
4	Relief devices relieving to atmosphere do not relieve in vicinity of personnel or equipment not designed to contain relief fluids.				
5	All installed relief lines drain as required, avoiding pockets or low points where fluids may collect in the line.				
6	Relief devices are secured as supported as per approved drawings.				
		Yes	No	N/A	
Piping/Valves					
1	Piping installed meets the approved-for-construction design criteria.				
2	Flanges installed meet the approved-for-construction design criteria.				
3	Gaskets installed meet the approved-for-construction design criteria.				
4	Gaskets installed were not reused or damaged.				

▲ **Figure 6.** Sometimes, PSSR checklists contain items that are design-related or must be completed during construction. These items should not be included in the PSSR checklist.

Continual improvement

Every aspect of the PSSR process must be reviewed, refreshed, and continually improved, including the workflow process, the role definitions, the tools (specifically the checklists), and the follow-up item categorization and management.

No tool or process is ever perfect, and every tool and process can be improved. These improvements are accomplished through end-user feedback, participant feedback, and auditing. Internal audits should be conducted to assess not only compliance, but effectiveness of the PSSR process. The focus of the internal audit should be on quality and assurance that the PSSR is serving the intended purpose.

Article continues on next page

Case study: Defining a standardized workflow process.

A company used two separate processes to complete PSSRs. One process was used for large projects and a separate process was used for small to mid-sized MOC projects. Neither PSSR process was functioning well. A cross-functional team was created to improve the overall PSSR process and create common standards and expectations.

The small and mid-sized MOC PSSR process had previously been updated in response to internal audit findings that indicated that PSSR was not being conducted sufficiently or was being missed. The requirement for a PSSR was added to the MOC procedure and several generalized equipment checklists were made available; however, no detail was provided regarding how the PSSR would be conducted. The generic checklists contained one-word item descriptions and included no acceptance criteria. No guidance was given regarding specifically who needed to conduct inspections or how the process would work.

The large project PSSR process stemmed from legacy processes carrying other names. These work processes were extremely complex. The processes did support functional testing of equipment, but the onsite inspection process was not defined or clear. A binder full of very specific equipment checklists existed, but none of those checklists were being used for the onsite inspections. Scheduling was insufficient to conduct individual inspections ahead of the turnover date. Expectations for these inspections were unclear.

The cross-functional improvement team defined a standard workflow process that could be scaled to projects of various sizes. The workflow process more clearly defined each element of the process, who needed to participate, and how the process would work. The team also generated replacement checklists that were more useable, complete, and contained acceptance criteria. The checklists were not specific to the project team who owned the work, but were specific to the equipment being inspected.

Although the equipment checklists that were improved were added as part of the MOC process toolkit, the QC department fully adopted the new checklists. QC touched a wide range of jobs and this new tool was applied broadly throughout the field. The QC department also adopted the practice of continually improving and updating the checklists.

A primary learning from this effort was to apply consistent standards regardless of the project group who owns the new installation, modification, or repair work. The

equipment, not the project team, governs the requirements. A secondary learning was to strive for balance between too much detail in processes or tools and not enough.

Conclusion

Success of the PSSR process will be achieved by using site-specific practices that find the right balance between too much information and not enough. The tools should be thorough but not cumbersome. Ensure that checklists are fit-for-purpose and are modified by end-users to meet site-specific needs. And, ensure that consistent standards are applied by equipment type regardless of the implementation team.

PSSR teams should include the required skilled resources without flooding the process with too many people. Team members must recognize that the process is cross-functional and requires participation and ownership by multiple groups and individuals. The process should also recognize the operator as the ultimate customer.

Committing to quality and follow-through is critical for the success of a PSSR. Ensuring quality requires resisting pressure to skim through the process to achieve an earlier startup. Implementing a successful PSSR is a combination of having strong processes, tools, resources, commitment, and follow-through. Failure of any of these components may cripple the overall PSSR process and potentially compromise the success and safety of an otherwise well-implemented project.

CEP

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