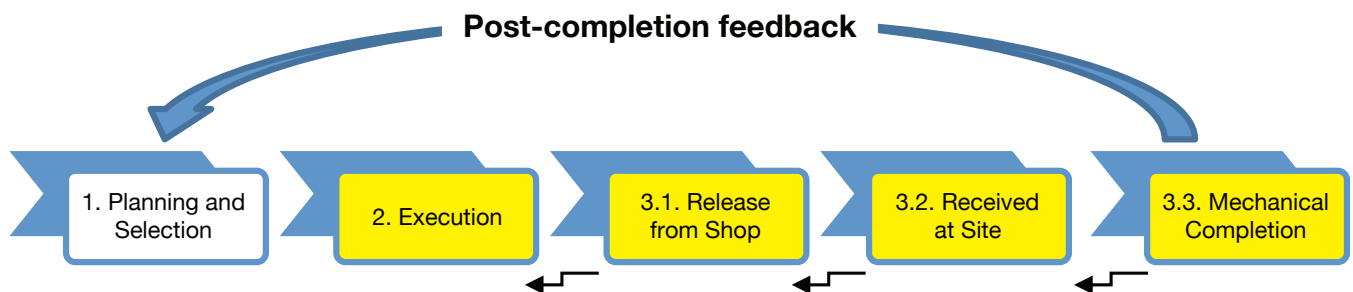


Achieving Zero Rework through Effective Supplier Quality Practices



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*Research Team 308, Achieving Zero Rework through
Effective Supplier Quality Practices*

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Introduction

In its research, Research Team (RT) 308, Achieving Zero Rework through Effective Supplier Quality Practices, identified a set of distinct industry processes to ensure that suppliers provide contractors and owners with the highest level of quality, while minimizing costly rework on finished products. (See Figure 1.) This chapter summarizes the key elements in these five distinct processes. Chapter 2 discusses each of the processes, describing the specific recommended actions for their implementation. Chapter 3 explains how to project the cost of the impact of non-quality in the supplier quality process, introducing a tool based on a total landed cost philosophy during the procurement process. Together these chapters constitute a toolkit for implementing effective practices to ensure high-quality finished products in the capital facilities delivery industry.

Figure 1 introduces the terminology the research team uses consistently throughout this document. It also presents a simplified version of the team's Supplier Quality Process (SQP) Map. (Appendix 1 contains the complete version of the SQP map.) Following are summaries of each of the map's distinct processes.

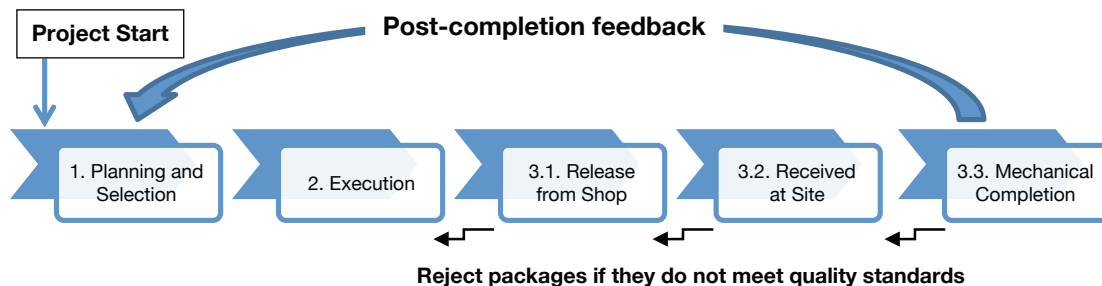


Figure 1. Supplier Quality Process Map

1. Planning and Selection

The planning and selection process asks users to determine the criteria for selecting suppliers for a given project. It also explains how to plan the selection of suppliers. Users will find that the initial planning for the selection and use of a supplier may be the most important part of the supplier quality process.

2. Execution

The execution process includes the actual fabrication or manufacture of the product being purchased. After the supplier has been evaluated and selected, the owner, contractor, and supplier work together to develop a supplier quality plan (SQP). Additionally, they create an inspection and test plan (ITP) to layout the specific processes each of the three parties will deploy during the execution phase. This phase also requires the documentation of all inspections, tests, and observations, as stipulated by the ITP. These documents may include daily reports, test reports, non-conformance reports, among others. They become part of the permanent records for the finished product.

3. Measurement at Project Stages

3.1 Release from Shop

At this stage of the process, quality personnel conduct the final inspection and release from the shop. The final inspection can produce three possible outcomes: 1) approve for delivery; 2) conditional release; or 3) correct identified problems. Products with problems or products receiving conditional approval will trigger corrective actions or decisions to correct the problems at site. Chapter 2 will discuss this phase in greater detail.

3.2 Received at Site

At this inspection point, quality personnel assess overages, shortages, or damages (OSD), and take one of three possible actions: 1) approve for installation in facility; 2) correct problems at site; or 3) reject the package and ship it back to the supplier for correction. Often problems identified at this stage are the result of improper handling or incomplete or missing documentation.

3.3 Mechanical Completion

As this stage of this three-part product delivery surveillance process, the finished product has been installed in the facility, is physically connected and wired, and is ready for use. As in Stage 3.2, a quality inspection loop has to assess the product and determine whether it is approved for use in the facility, correct any problems onsite, or reject the product and ship it back to the supplier to correct any problems identified. During this mechanical completion process, a package may be subjected to testing prior to being commissioned.

Feedback Loop

The planning and selection process depends on the movement of a feedback loop that gives project procurement personnel data on supplier performance, from purchase order release to mechanical completion.

Estimating the Impact of the Cost of Non-quality

Chapter 3 provides results of a simulation model for estimating the costs associated with identifying and correcting non-conformances (non-quality) at each stage of the SQP map. It explains how project teams can use the simulation results during the planning and selection process to evaluate differently rated suppliers; specifically, this evaluation includes the cost of resourcing the inspection effort during execution, as well as the cost of generating probabilistic estimates of the potential costs of non-quality (i.e. rework).

By utilizing the formulas and tables provided in Chapter 3, companies in the capital facilities delivery (EPC) industry can project where inspection dollars can be spent efficiently. These companies can further optimize their expenditures on supplier quality, by using the simulation results to quantify risk during supplier selection—since having more reliable suppliers prevents costly rework and subsequent supplier-quality-related delays.

Appendix A: Glossary of Terms and Acronyms

The glossary in Appendix A compiles terms, acronyms, and references related to the supplier quality field within the capital facilities delivery industry. This glossary can promote consistent terminology and alignment when owners, contractors, and suppliers discuss supplier quality.

Appendix B: Total Landed Cost Discussion

Appendix B discusses total landed cost, which should be included in bid tabulations when several suppliers are in competition for a single purchase order and have drastically differing situations, such as varying distances from project site or different levels of performance capability.

Appendix C: Detailed Process Map

Appendix C provides the complete SQP map, presenting specific details within each process.

2

Supplier Quality Process Map

This chapter addresses the supplier quality process in detail, using the Responsible, Accountable, Consulted, and Informed (RACI) tool to make assignments to the different parties involved in the distinct stages of the process. Additionally, it presents best practices in supplier quality processes within and outside the construction sector of the industry, and those within highly effective companies in the engineer-procure-construct (EPC) sector. The chapter closes with a supplier “wish list,” developed from supplier focus groups, and a discussion of effective practices for improving the quality of deliverables.

To enable the most efficient and effective use of the SQP processes, and to give the three primary project parties—owners, contractors, and suppliers—clear guidance on their roles and responsibilities, the team developed an SQP RACI matrix. The matrix uses the following definitions of its four terms:

Responsible: These are the individuals who actually complete the task or activity and are responsible for action and/or implementation.

Accountable: This is the individual who carries “yes” or “no” authority and has full veto power for an activity.

Consult: These are the individuals who must be consulted prior to a final decision or action. “Consult” implies two-way communication, in which stake holders are identified and their buy-in is sought.

Inform: These are the individuals who must be informed after a decision or action is taken because they, in turn, may take action or make a decision based on the result. “Inform” means to supply information in an FYI-format, and implies only one-way communication.

In the following sections, the RACI matrix is applied to the individual sections of the process map.

1. Planning and Selection

Once a project team has made a criticality assessment for a bid package, it can determine the available supply base for the bid package. If the team deems the supply base large enough, it can then move forward with the selection process. This would occur when the contractor has experience with a sufficient number of suppliers deemed capable of providing that package at an acceptable level of quality. In this context, project teams generally determine the sufficient number (of suppliers) on the basis of its likelihood to generate competition among them and push down costs.

If the supply base is not large enough, then new suppliers must be qualified. The team should review prospective suppliers' financials to protect the project from any potential business failure in the suppliers' organization; this is important, since such a failure could cause a supply chain interruption or make the supplier unable to warrant a package. The project team should also assess potential suppliers' quality control practices, to determine whether they are capable of achieving the quality needed. Table 1 presents the RACI matrix for the supplier planning and selection process.

Table 1. Planning and Selection RACI

	Task	Owner	Contractor	Supplier
1	Planning and Selection	A	R	C,I
	Sufficient Number of Suppliers	A	R	C,I
	Qualification of Suppliers	A	R	C,I
	Selection	A	R	C,I

Responsible, Accountable, Consult, Inform

2. Execution

Once a project team has selected a supplier for a given package, the contractor and the supplier work together to develop a supplier quality plan (SQP) for use in project execution. The more critical the package, the more time it may take to develop the SQP. The team should also develop an inspection and testing plan (ITP) to lay out the specific processes the two parties will deploy to ensure satisfactory supplier quality surveillance (SQS). Non-conformance reports (NCRs) document in detail any non-conformances identified during the production process. A non-conformance is any defect, imperfection, or nonfulfillment of specified requirements. NCRs often trigger a

corrective action report (CAR), which explains how the non-conformance was resolved and, if appropriate, suggests changes to the production process to prevent recurrence of the problem. Table 2 provides the RACI matrix for the execution process.

Table 2. Execution RACI

Task		Owner	Contractor	Supplier
2	Execution			
	Supplier Quality Plan	I	A,R	R
	Inspection and Testing Plan	C,I	A,C	R
	Non-conformance	C,I	A,R	R

Responsible, Accountable, Consult, Inform

3. Measurement at Project Stages

In the project process there are three stages of inspection: 1) release from shop (also known as final inspection); 2) received at site; and 3) mechanical completion. For this part of the process, the RACI matrix changes to meet the needs of the distinct process at each stage.

3.1 Release from Shop (*Final Inspection*)

Quality personnel conducted a release-from-shop/final inspection, with three possible results: 1) approve for delivery to site; 2) approve conditionally; or 3) correct problems. When production is complete and the ITP is fulfilled, the package is approved for release, prepared for shipping, and delivered to site. The RACI matrix in Table 3 presents the necessary engagements at this stage of the process.

Table 3. Release from Shop RACI

Task		Owner	Contractor	Supplier
3.1	Release from Shop			
	Final Inspection			
	Approval	C,I	A,R	R
	Conditional Release	C,I	A,R	C,I
	Correct Problems	C,I	A	R

Responsible, Accountable, Consult, Inform

3.2 Received at Site

When a finished product arrives at the receipt inspection point, possible damage or problems can have occurred during shipping; or it can become apparent that issues were missed at final inspection. At this inspection point, quality personnel will assess overage, shortage, or damage (OSD), with three possible results: 1) approve for installation in facility; 2) correct any problems on site; or 3) reject the package and ship it back to the shop for correction. Table 4 shows the RACI matrix for this process stage.

Table 4. Received at Site RACI

Task		Owner	Contractor	Supplier
3.2	Received at Site			
	Install	I	A,R	
	Correct at Site	C,I	A,R	C,R
	Return to Supplier	C,I	A,C	R

Responsible, Accountable, Consult, Inform

3.3 Mechanical Completion

In the mechanical completion stage, the finished product has already been installed in the facility, is physically connected and wired, and is ready for use. Just as in the received-at-site phase, a quality inspection loop has to assess the finished package and approve it for use in the facility, correct any problems on site, or reject it and ship it back to the shop for correction. During the mechanical inspection, quality personnel may test some finished products before commissioning. A finished product with minor deviations can be acceptable and, if it receives an engineering exception, can be approved for use in the facility. Table 5 provides the RACI Matrix for the mechanical completion stage.

Table 5. Mechanical Completion RACI

Task		Owner	Contractor	Supplier
3.3	Mechanical Completion			
	Accept	I	A,R	
	Correct at Site	C,I	A,R	C,R
	Return to Supplier	C,I	A,C	R

Responsible, Accountable, Consult, Inform

Table 6 presents a complete RACI matrix for all the processes within the SQP map.

Table 6. RACI Matrix for the Supplier Quality Process

Task		Owner	Contractor	Supplier
1	Planning and Selection	A	R	C,I
	Sufficient Number of Suppliers	A	R	C,I
	Qualification of Suppliers	A	R	C,I
	Selection	A	R	C,I
2	Execution			
	Supplier Quality Plan	I	A,R	R
	Inspection and Testing Plan	C,I	A,C	R
	Non-conformance	C,I	A,R	R
3.1	Release from Shop			
	Final Inspection			
	Approval	C,I	A,R	R
	Conditional Release	C,I	A,R	C,I
	Correct Problems	C,I	A	R
3.2	Received at Site			
	Install	I	A,R	
	Correct at Site	C,I	A,R	C,R
	Return to Supplier	C,I	A,C	R
3.3	Mechanical Completion			
	Accept	I	A,R	
	Correct at Site	C,I	A,R	C,R
	Return to Supplier	C,I	A,C	R

Responsible, Accountable, Consult, Inform