NAC Executive Insights

Supplier Quality

Key Points

- Supplier quality leadership must have the independence to assure the quality of the materials and equipment.
- Supplier quality must be part of the early planning of the project with the supply chain, engineering, risk, owner, project management, and construction stakeholders.
- The execution plan for inspections must begin early, in the planning stage.
- Supplier quality must focus on all materials; often the simple materials can cause problems with the quality of deliverables.

Introduction and Definition

This insight includes experiences, lessons learned, and recommendations accumulated over 45 years of working for a supplier of steel and fabrication and an engineering and construction firm on major projects as a manager of quality (inspection) and as a vice president professional. The emphasis of these experiences addressed here are from my 35 years with a major engineer-procure-construct (EPC) organization.

Supplier quality, sometimes known as supplier inspection or vendor inspection, is a discipline within the supply chain. It represents the function which ensures the supplies, materials, or equipment purchased are in compliance with the purchase order or the contract issued by the project procurement organization. This important function is performed by supplier inspection staff (inside of the organization) or project discipline engineers. It also could be subcontracted to outside inspection firms that specialize in this discipline. No matter what the name or who performs this work, it is extremely important to the success of the project.

This insight will not describe in detail the management and related processes, but will address the key important subjects required for a contractor or owner regarding the planning, staffing, logistics, and execution, starting at order entry through delivery to the construction site.

Critical Elements for Management of Supplier Quality

Organization and Management

Supplier quality leadership, whether in a contractor or owner organization, must be in a key position in the organization and project group to develop the strategy and processes relating to inspection of the goods. In some firms, this position reports to the senior manager of procurement; in other firms, the position reports to the director of quality. Regardless of where

this position is in the organization, the supplier quality leadership must have the independence to assure the quality of the materials and equipment.

To be successful, the organization must develop a global supplier quality team that has worldwide responsibility for supplier quality across the company. This ensures consistency of processes, qualification, planning, and execution across all projects. This is particularly important when organizations utilize outside firms (for example, inspection agencies) to perform supplier inspections. In such a global supplier market, inspections for one project could be conducted in numerous countries. When organizations are executing multiple projects, purchase orders from multiple projects could be placed with the same supplier. Although each project may have unique requirements, consistency in the contractor or owner supplier quality processes is paramount.

Similar to the recommended practice in the National Academy of Construction's "Procurement and Supply Chain" Executive Insight, contractors and owners must be aligned on the supplier quality strategy. This is true for the organization and on the project. Supplier quality must be part of the early planning of the project with the supply chain, engineering, risk, owner, project management, and construction stakeholders.

Qualification and Certification of Inspection Staff

The supplier quality inspection staff, whether staff or inspection agency personnel, must possess the requisite qualifications and appropriate industry-recognized certification.

Fundamentally, a difference exists between "qualification" and "certification." Certification and qualification models exist for most inspection disciplines, and these enable consistent methods to measure the knowledge of the equipment/material against an agreed norm. For purposes of this insight, *certification* is defined as "the ability to pass an examination administered by a national or international body external to the owner or contractor organization." AWS, NACE, ASME, ASNT, and API all have developed mature examination standards supplemented with fully developed training data. These are generally recognized as international standards by most contractor and owner organizations. Several owners and contractors have developed company standards that may be different or may supplement the above noted international standards. *Qualification* normally includes requirements on years of experience, physical capabilities, knowledge of fabrication techniques, reporting, and an ability to read and interpret standards, codes, and engineering data.

It is important to note that *certification* should be used in conjunction with a comprehensive *qualification* system.

Supplier Selection and Evaluation

Early in the project, a bid list is developed jointly with the owner and contractor utilizing each organization's experience and history with potential bidders. Mature organizations have fully developed selection criteria for evaluating the potential suppliers. Some have set criteria,

including past performance, organizational changes, safety statistics, nonconformance history, legal actions, schedule issues, and operational records.

Supplier selection is a joint effort with supply chain management (procurement), owner, engineering, and supplier quality. Visits to the potential supplier(s) are common on major equipment and materials.

These workshop-type visits include assessing capability, shop backlog, safety practices, and supplier organization. In Construction Industry Institute (CII) Implementation Resource 308-3, "Achieving Zero Rework through Effective Supplier Evaluation and Selection," a best practice is described on effective supplier evaluation and selection (see Table 2.3 from that CII publication below). It includes nine selection categories, calculated variables, and results that owners and contractors can utilize as part of their selection process.

Table 2.3. The Supplier Evaluation Criteria and Their Technical Attributes*

Supplier Evaluation Criteria	Technical Attributes
1. Plant Operations/Building and Infrastructure	Top-level management assigned to this facility (e.g., president, sales manager, production manager, QA/QC manager) Site supervision Number of employees at this facility Capability, communication, and consistency of local representative Certifications of QMS (e.g., ISO, nuclear, other) Export capability Storage and shipping Structure for QA/QC personnel and records Examination and testing Non-destructive testing and inspection capability and quality Calibration records and procedures Maintenance plans/records Pre-test of new and second-hand machines used for fabrication Housekeeping procedures
2. Manufacturing Capability	Machining capability Fabrication capability Welding capability Shop fabrication quality Capability to manufacture per user requirements Coatings capability Calibration records and procedures Non-destructive testing and inspection capability and quality
3. Experience and Qualifications	Geographical areas in which supplier is qualified to work Countries in which supplier has had extensive experience Familiarity with codes specific to certain geographic regions Certifications (e.g., ASME, API) Work history Contingency plans Schedule adherence track record Responsiveness to client's requests Reputation References
4. Workforce	Documented training of the workforce Craft types available at location Qualifications of the workforce Source of back-up workers

Supplier Evaluation Criteria	Technical Attributes
5. Engineering Capability	Professional/technical specialties held in-house Professional licenses Compliance with documents and specifications Responsiveness and cooperation
6. Material Control	QA/QC manual for material control Definition of how substitutions are handled Material verification Prevention of counterfeit materials Material certification
7. Adherence to Procedures and Standards	Timely handling of requests for documentation Accuracy Adherence to codes and specifications Existence of a QMS Quality and completeness of documentation Non-conformance control Handling of change orders Handling of RFIs Handling of superseded documents Handling of reports Management of documents QMS definition of document control process Definition of inspection and hold points Calibration Internal audits Final inspections Identification of parts – traceability Implementation of corrective action/plan
8. Safety Adherence and Record	Existence of written safety health and environment report Safety reports Safety meetings Toolbox safety meetings Safety inspections Orientation for new hires Written hazard communication program Material safety data sheets Number of hours worked Number of lost workday cases Number of restricted workday cases Number of fatalities Number of cases with medical attention only
9. Handling of Subcontractors/Sub-suppliers	Outsourced/subcontracted product/service control Procedure to check subcontractor compliance with quality requirements Documented evidence of compliance Auditing subcontractors

**** from CII IR 308-3***

Methodology

The activities necessary to execute the inspections begin in the planning stage, specifically when the purchase order is being developed. Contractors and owners generally have checklists prescribing what inspections and tests will be observed during the fabrication and testing at the supplier workshops. This author's experience indicates it is key to use checklists as a guide and utilize the organizations risk assessment process. A risk review or assessment conducted with representatives from the owner and contractor engineering, procurement, supplier quality, and construction groups will identify critical points requiring special attention during fabrication and testing.

Based on lessons learned from projects, the emphasis is usually on *major equipment*. The author's personal experience, however, has proven that many problems occur with *simple materials*. Piping, fasteners (bolting), and similar pieces of simple material have caused problems with the quality of the deliverables. An often forgotten or overlooked item is final documentation. Final documentation frequently drags on, and persistence is required to ensure the correct material is in-place. Suppliers have already created documentation or reports for examinations that are in process and final testing. Most of these documents are necessary evidence that the work was properly completed. Some reports are mandatory records needed for construction completions and commissioning.

References

"Achieving Zero Rework through Effective Supplier Evaluation and Selection, Implementation Resource 308-3, Construction Industry Institute, January 2019.

About the Author

William Beck was elected to the National Academy of Construction in 2019. He is a retired executive vice president and was responsible for quality assurance, supplier quality, and construction quality for WorleyParsons. With over 25 years serving on multiple committees with CII, he received the Richard Tucker Award in 2017. While working with CII, he chaired the Implementation Strategy Committee, served as a member or co-chair on seven CII Research Teams, and was a member of the CII Executive Committee.

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