

THE ROLES OF QA AND QC INSPECTION PERSONNEL ON A COATINGS PROJECT

2a

Quality Assurance vs. Quality Control

Defining the Difference

It is more and more common to encounter specification requirements for quality control (QC) and/or quality assurance (QA) on coatings projects. Unfortunately, it is less common for specifications to define the respective responsibilities of QC and QA personnel. All too often, the lines between QC and QA get blurred.



This module is designed to clarify the roles and responsibilities of the contractor's QC and the Owner's QA (sometimes called a third party inspector).

Quality Control (QC) is performing necessary observations, testing and documentation that verifies the work performed meets or exceeds some minimum standard as required by the project specification (also known as "in-process" inspection). Quality control is the contractor's responsibility. Quality

control involves the routine and systematic inspection and tests that

are conducted to verify that each phase of the work (hold point) is in compliance with the specification.

Quality Assurance (QA) is defined as the process to verify that the quality of work performed is actually what was reported by quality control. Quality assurance is typically performed by the Owner (e.g. facility project engineer) or a third party on behalf of the Owner. Quality assurance is more of an audit function, used to verify that the quality control is being performed, but may include conducting actual testing on a spot or periodic basis.

In simple terms, quality assurance by the Owner is meant to verify that the quality control implemented by the contractor meets the requirements of the specification.



Inspection of Dry Film Thickness

A coatings inspector can represent a variety of entities, and can serve different roles based on the contractual relationships listed below.

1. The coatings inspector can perform quality control for the painting contractor (hired as a consultant on a contract basis, or as an SSPC QP5 certified inspection agency hired on a contract basis). The QC inspector may not have the authority to direct the contractor employees, but may report nonconformities to the appropriate personnel for action.
2. The coatings inspector can perform quality control for the painting contractor, as a member of the contractor's staff.
3. The coatings inspector can perform quality assurance for the prime contractor who is subcontracting the painting work to one or more painting contractors.
4. The coatings inspector can perform independent, third party quality assurance for a facility owner.
5. The coatings inspector can perform independent, third party quality assurance for the coating supplier (e.g., single source responsibility projects or warranty work).

Authority Roles

The distinction between Owner QA and third party QA is critical. When the Owner performs his own QA (with direct staff), he has a contractual relationship with the contractor, and therefore can exert control through the contract (or by withholding payment) when the operations are out of compliance. However, when an Owner subcontracts third party QA, the third party QA does not have a contractual relationship with the contractor; therefore, third party QA typically can only advise and document the non-conformities of the contractor's operations and advise the contractor's QC, other contractor management staff, or the Owner. Both the Owner and the third party QA representatives must be careful not to unduly interrupt contractor operations due to potential legal liability or contract issues regarding control of the work and costs related to work stoppages (often referred to as delay or disruption).

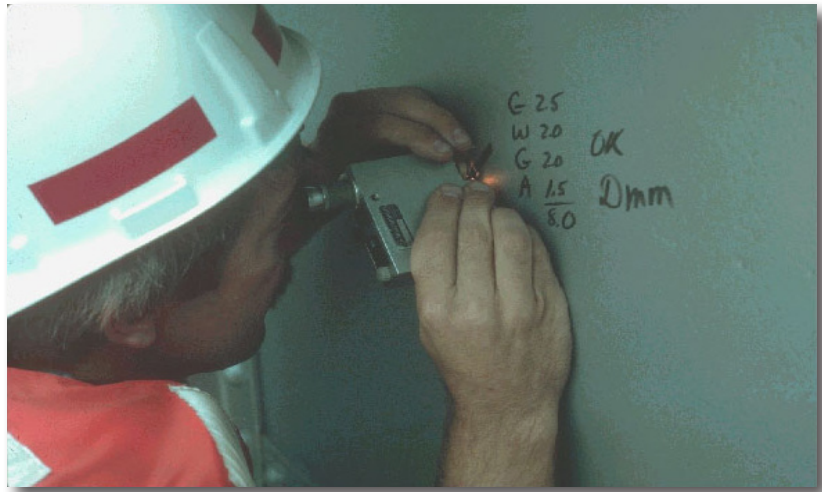
Both QC and QA are necessary components to verifying specification compliance. Most specifications and contract law make it clear that the Owner (or third party) performing QA on a project does not relieve the contractor of the responsibility of performing QC and meeting contract requirements.

The International Standards Organization (ISO) advocates the use of both QC and QA to achieve a total quality system.

Hold Point Inspection

The specific duties of the QC and the QA will vary from project to project. The coating inspection process typically dictates that after certain activities (e.g. surface preparation), work should be halted, inspected, rework performed as necessary and accepted by the QC and QA, before the contractor can move on to the next step of the painting process. These specific inspection items are typically referred to as "hold points." Hold point inspections can involve visual observations or tests and the results must be documented. In broad terms, hold point inspections are typically performed during:

1. pre-cleaning
2. surface preparation
3. primer application
4. intermediate coat application
5. top coat application
6. cure



Hold point inspections will be discussed in more detail later.

A rule of thumb is that the QC inspection should occur first and any non-conforming items identified by the QC should be corrected, re-inspected and accepted by the QC. The QA observations should only occur after the work (hold point) has been accepted by the QC. The QA should then verify that the work that the QC accepted meets the requirements of the specification. If the QA identifies non-conforming items, they should be repaired and re-inspected before the QA accepts the work and the contractor proceeds to the next step of the painting process. It is often helpful, if not necessary, to have the QC or foreman present during the QA observations, so that any deficiencies can be identified and confirmed by both parties. This also allows the contractor to clearly identify areas requiring rework to his workers.

The QA process typically includes both a review of tests or documentation provided by the QC and duplicate QA testing of certain hold points (e.g. dry film thickness measurements) as an audit function to verify that the results reported by the QC are accurately reflecting the conditions of the work. When results of QC and QA differ, the QA observations typically supersede those of the QC. The actual resolution of differing QC and QA observations should be discussed and agreed upon in the pre-construction conference.

Roles of QA and QC

Historically, when the coating inspection concept began to evolve in the 1970s, there was little distinction between the roles of QC and QA. Most early coating inspection was performed as a response

to the inspection parameters established in the nuclear power plant construction industry and ANSI/ASME N45.2.6, Qualification of Inspection, Examination and Testing Personnel for Construction Phase of Nuclear Power Plants. ANSI N45.2.6 defined the coating inspection tasks that were required during installation or maintenance of nuclear facilities. They specifically applied to third party inspectors retained by the Owner, performing hold point inspection of contractor activities. As coating inspection expanded beyond the nuclear arena and into other industry segments like transportation and water storage, most Owners continued to rely on a third party inspector to verify that contractor activities were performed according to the specification. That is, the Owner's representative performed all testing of the coating inspection hold points.

In the 1990s and 2000s, Owners began to recognize that while third party inspection was still desirable, it was not intended to replace QC by the contractor. With the increased recognition of ISO, SSPC QP1 and other certifications, more and more companies are moving to the concept of a total quality system involving a clear division between QC and QA responsibilities.

In many cases, although it is intended that Contractor's QC conduct first line inspections, Owners are not specifically establishing the QC requirements in the specifications, or are not enforcing the requirements when they do exist. As a result, QA is frequently faced with taking on the responsibility for inspecting and accepting the work. When the roles of QC and QA are not defined, this results in the loss of a critical component of a total quality system and often creates a confrontational position between the QA and the contractor. On the other hand, when the QC and QA both perform their respective roles during the painting process, the process results in a quality coatings project. Due to the improving understanding of quality systems, more and more organizations and end users are attempting to better define their expectations for both the QC and QA.

Organizations Defining QC and QA Responsibilities

There are several organizations that have established standards, minimum training and experience requirements, and certification for individuals and companies associated with the inspection (QC or QA) of coatings projects.

The Society for Protective Coatings (SSPC) Painting Contractor Certification Program (PCCP), specifically QP-1, establishes specific requirements for the qualifications and duties of the contractor's QC. While the specific duties of the QC are not specifically defined in the SSPC QP-1 standard, the supporting documentation required by the program (i.e., QC program, audit criterion) provides a framework for the required QC inspections.

The SSPC QP-1 program states that hold point inspections should be performed during six primary stages of the coatings project. That is pre-cleaning, surface preparation, primer application, intermediate application, top coat application and cure.

The SSPC QP-1 Annual Internal Audit Report / Checklist for SSPC Certified Contractors (Rev 02/04), specifically requires that the QC representative prepare daily reports that include the following information (at minimum):

1. compressed air cleanliness
2. dry film thickness
3. air temperature
4. humidity
5. dew point temperature
6. surface temperature
7. abrasive cleanliness
8. degree of cleanliness achieved
9. surface profile
10. batch numbers of paint used
11. batch numbers of thinner used
12. mixing according to specification

The SSPC Publication, "The Inspection of Coatings and Linings, A Handbook of Basic Practice for Inspectors, Owners, and Specifiers," 2nd Edition (SSPC 03-14), Chapter 3, Quality Control for Protective Coatings Projects, features a series of coating inspection forms. These help establish the inspections that should be performed and documented by the contractor's QC.

The SSPC QP-5 program, "Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies," establishes a certification for inspection companies whose focus is

the industrial coating and lining industry. It evaluates an inspection company's ability to provide consistent quality inspection of coatings & linings for its clients (typically QA). While it establishes the minimum training and experience requirements of third party inspectors, it does not delineate the specific duties of a QA inspector or inspection company providing third party inspection. Under this certification, the duties of the third party QA inspector are defined as those specified or contracted by the Owner.

ANSI/ASME N45 2.6 establishes criteria for companies to internally certify individual coatings inspectors through experience, education and testing as Level I, II, or III nuclear coating inspectors. The SSPC QP-5 program relies on similar levels of experience and training for confirming qualifications of third party inspectors.

Pre-construction (Pre-job) Conference

The pre-job conference typically occurs prior to project start-up and should be attended by representatives of the contractor, coatings suppliers, Owner's representatives and third party inspectors. If you are the QC or QA you should attend this meeting. Too often the pre-job conference is attended by management and the on-site QC and QA do not participate. If this is the case, make sure you identify any questions, unclear items or discrepancies with the person who will be attending the meeting. Obtain and review a copy of the pre-job conference meeting minutes to determine what, if any, clarification was agreed upon.

Prior to the pre-job conference, both the QC and QA should critically review the specification and be prepared to discuss any discrepancies,

missing, incomplete, unclear or ambiguous items in the specifications. When both QC and QA will be used on the project, the duties, responsibilities and reporting requirements should be clearly discussed and agreed upon by all parties.

The pre-job conference should provide a review for all parties on the organizational structure and representatives of each stakeholder (i.e., owner, contractor, third



party inspector, coating manufacturer's representatives). This should include the title and responsibilities of each person as well as their reporting relationship within the company or organization.

The pre-job conference should summarize the contractor's approach to the project including: schedule, location(s) of equipment, and manpower estimates.

The pre-job conference should review the specification and sequence of work, address any specification discrepancies, and discuss how QC and QA inspections will be coordinated and implemented. It should include discussion of preparation of test sections (i.e. job reference standards), if required; adequate lighting; inspector safe access; inaccessible areas; and other project-specific considerations.

The final phase of the pre-job conference should include a discussion of all required QC and QA documentation and submission schedules. The Owner should also address the procedure that should be followed if there are discrepancies in the QC and QA documentation.

A sample agenda for a pre-job conference is shown below.

1. Contractor's Proposed Operation, Including Equipment and Personnel
 - A. Compliance programs
 - i. QC program
 - ii. Worker Protection Program
 - iii. Environmental Protection Program
 - iv. Containment Program
 - v. Waste Management Program
 - B. Location of Equipment
 - i. Dust collector
 - ii. Hygiene facilities
 - iii. Recycling equipment (on or off site)
 - iv. Waste storage
 - C. Work schedule
2. Inspector Safety & Proper Access
 - A. Safety lines, lifts, ladders
 - B. Use of hygiene facilities

- C. Protective clothing & HEPA vacuum
- 3. Inspection & Measurement
 - A. Discuss inspection holdpoints
 - B. QC inspections
 - C. QA inspections
 - D. Procedures for resolving discrepancies
- 4. Inaccessible areas (identified and addressed)
- 5. Lighting
- 6. Product Information
 - A. Verify availability of PDS/MSDS
 - B. Review abrasive, coatings systems, mixing & thinning requirements
- 7. Visual Standard
 - A. Pre-blast standard (if specified)
 - B. Review SSPC VIS Standards and definitions for specified surface preparation

Attendees should be listed on a sign-in sheet circulated at the start of the meeting. All items discussed at the pre-job conference should be recorded in the form of minutes and distributed to all attendees of the meeting. Any specification clarifications should be transmitted to all affected parties. A pre-construction conference will be conducted later in this course.

Development of an Inspection Procedure (Plan)

Project specifications can often be complex and contain many details unrelated to surface preparation and painting. As a result, locating the inspection check points can be cumbersome and time consuming. More consequential, key inspection checkpoints may be overlooked. The development of an inspection procedure before the project begins can aid the inspector in identifying the inspection checkpoints and the associated acceptance criteria.

There is no standard format for an inspection procedure. A table or chart format is often the most effective and easiest to complete. A chart containing three columns is usually adequate. The header of the first column is “Inspection Checkpoint.” The column is populated by copying each inspection checkpoint associated with surface preparation and coating application listed in the project specification. The header of the middle column is “Inspection Method” and lists the inspection instruments, visual standards or other equipment needed to perform the inspection. Note that in some cases the word “visual” is used, since some coatings inspection is only done visually, with no specific instrumentation (for example, verifying proper installation of protective coverings). The final column header is “Acceptance Criteria” which is established by the project specification. An example of an inspection procedure chart is shown below, along with two sample entries. A complete inspection procedure will have many entries and may consume several pages. You will be developing a complete inspection procedure in Module 11 of this course.

Sample Inspection Procedure

Inspection Checkpoint	Inspection Method	Acceptance Criteria
Surface Profile	Testex Replica Tape	2.0-3.5 mils
Surface Cleanliness	SSPC VIS 1	SSPC-SP10

Forms containing additional columns to record the ASTM or SSPC standard or method employed to conduct the inspection checkpoint, the method used to verify instrument accuracy, the number of measurements required and the report form where the information should be recorded may be required on certain projects.

Work Plans and Process Control Procedures

Many specifications require the contractor to prepare project-specific work plans or process control procedures (PCPs) and submit them to the facility owner for review and approval prior to commencing work.

Work plans may be contract-specific or may be more general and used by the contractor to both plan and control the work process. A Work Plan covers all of the individual phases of a project, including both production and inspection. Ideally separate work plans should be developed for each phase of a project, if the scope of work differs. A Work Plan is merely a compilation of all of the individual processes

that make up the specified work. There is no prescribed format, as long as the plan is complete, accurate and useable. The work plan should include a description of the processes that will be employed, including any of the critical factors that have a direct bearing on quality and safety. They should reference the project specification and include acceptance/rejection criteria and the authority required for approval of non-conformities. The plan includes a project schedule based on major phases of the work scope, and lists the equipment, mobilization plans, work area layout, and the receipt, storage and control of materials. It should also describe the frequency and content of personnel meetings to be conducted throughout the project. A sample pipe line specification listing the content of a coating work plan (specifically section 1.4.2.1) is appended to this module.

Process Control Procedures or PCPs are contract-specific and require formal approval before work can begin. In some cases, the PCPs are required to be submitted in a pre-approved format. PCP's typically include the following items:

1. Date, Procedure No., Revision No. and Description of the Contract Work Item
2. List of contractors, subcontractors and attached documents/ references
3. Descriptions of qualifications and certificates to perform the work scope
4. Process descriptions and list of equipment required to conduct the work scope
5. Inspection plan, including instruments, calibration requirements, references to standards and acceptance criteria
6. Copies of forms/records to prove conformance
7. Authority required for approval of non-conformities
8. Worker safety requirements
9. Environmental protection controls and waste management procedures

The QA inspector may be asked to review the contractor's work plans or PCPs for completeness and conformance to the requirements of the project specification. Work Plans or PCPs should be submitted well in advance of the intended project start date, as they must typically be reviewed, approved (or revised, reviewed and approved) prior to commencement of any production activities. The PCP content for Navy/military contracts is appended to this module.

Documenting and Reporting Procedures

One of the most important responsibilities of a coatings inspector is to document the results of the inspections in a clear, concise, and timely manner. Oftentimes measurements and readings are recorded in an inspector logbook, then transferred onto inspection forms. Without timely, formal documentation, many of the key results may be lost or forgotten. It is acknowledged that few individuals enjoy paperwork. However, it is a necessary evil in today's litigious culture. Documentation of specific, key items as the work progresses may do nothing more than fill a file cabinet once the project is completed. However, in the event of a problem, it can provide key information for resolution of the problem. Documentation of the results of inspections can also be a key element in the event that the coating failure results in litigation against the coating contractor or the coating supplier. Just like homeowner or car insurance, you may never use it, but when you need it, you're glad you have it.

There is no "standard inspection form" that every inspector uses. The design and content of the documentation forms can vary, and may be customized to a project. It is important that the form ultimately used by the inspector address all of the inspection checkpoints included in the project specification and the precise location of the area inspected, and that the form allow ample space for commentary. Chapter 3, "Quality Control" of the SSPC Handbook: The Inspection of Coatings and Linings contains seven forms that may be adopted by inspection personnel. Copies of these forms are included at the end of this module; some will be used in the workshops later on in this training course.

Form 1: Documentation Acknowledgement

Documents an individual's acknowledged receipt of specifications, revisions to the specification, project correspondence, reports, test results, drawings and other written documents.

Form 2: Inspection Equipment Calibration Record

Documents that the calibration of inspection equipment was performed and is current.

Form 3: Inspection Equipment Issuance Record

Documents an inspector's receipt of inspection instruments and standards and acknowledges responsibility for maintenance and care of the equipment.

Form 4: Daily Coating Inspection Report

Documents the results of any QA and QC inspection checkpoints after a pre-surface preparation inspection, during and after surface preparation, ambient conditions, and during and after coating application. Dry film thickness values are recorded on Form 5.

Form 5: Dry Film Thickness (DFT) Measurement Worksheet

Documents the spot and area coating thickness measurements.

Form 6: Corrective Actions Report

Documents any nonconforming items and addresses proposed and required corrective actions for each nonconformance.

Form 7: Photographic Record

Documents the location and area of any photographs acquired during inspection of surface preparation and coating application. Note that the form currently reflects the use of print film. With the widespread use of digital photography, the form may be obsolete or even unnecessary.

In addition to inspection records, the inspector should maintain a project logbook or "diary" that contains narrative, daily entries regarding what operations were performed, progress, and any other project-related "events" that occurred.

Each entry should contain the date and start with, "The writer arrived on-site at (time)...." Note that the diary is "discoverable" during the litigation process.

SSPC QCS 2-01 Revision 1 09/2005

SSPC QCS 2-12 Revision 1 09/2005

Inspection Equipment Issuance Sheet

Project:		Case #:		Copy to: ☐ Office ☐ Inspector ☐ _____	
Location:				Attachments: ☐ Calibration Certificates ☐ Calibration Records	
Issued to:		Issued Date:			
Issued by:		Returned Date:			
Inspection Equipment					
Item	Model #	Serial #	Operation Procedure	Date of Calibration	Calibration Verification
Environmental Conditions					
Surface Preparation					
Application					
Standards and Specifications					
The following designated inspector has been issued the above listed inspection equipment, certifications, and calibration standards required to perform the intended inspection as required by contract. The inspector is required to keep all issued equipment in a safe place and in good working order. The inspector will document required calibrations and maintain all records per job specifications. Upon completion of the project, the inspector will return all equipment to the QC manager. The inspector is responsible for negligence and understands and accepts to replace damaged or stolen equipment.					
Issued by:		Issued to:			
QC Manager Signature:		Inspector Signature:			
Date:		Date:			

SSPC QCS 2-13 Revision 1 09/2005



Paint Inspection DFT Measurement Worksheet

Date: / / Su M Tu W Th F Sa Pg of																			
										Project #:									
										Inspector:									
Project/Client:										Copy to: ☐ QC Super ☐ Owner ☐ Contr ☐ _____									
Location:										Spec #:									
Description:										Revision #:									
Item:								Item:											
Location	Area	Spot Readings						Location	Area	Spot Readings									
		1	2	3	Total	% Min/Max	Avg			1	2	3	Total	% Min/Max	Avg				
	A								A										
	B								B										
	C								C										
	D								D										
	E								E										
Approx Sq Ft	Specified DFT					mils/μm		Approx Sq Ft	Specified DFT					mils/μm					
	Total avg					mils/μm			Total avg					mils/μm					
Reference Inspection Report #								Reference Inspection Report #											
for application record								for application record											
Item:								Item:											
Location	Area	Spot Readings						Location	Area	Spot Readings									
		1	2	3	Total	% Min/Max	Avg			1	2	3	Total	% Min/Max	Avg				
	A								A										
	B								B										
	C								C										
	D								D										
	E								E										
Approx Sq Ft	Specified DFT					mils/μm		Approx Sq Ft	Specified DFT					mils/μm					
	Total avg					mils/μm			Total avg					mils/μm					
Reference Inspection Report #								Reference Inspection Report #											
for application record								for application record											
Item:								Item:											
Location	Area	Spot Readings						Location	Area	Spot Readings									
		1	2	3	Total	% Min/Max	Avg			1	2	3	Total	% Min/Max	Avg				
	A								A										
	B								B										
	C								C										
	D								D										
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Approx Sq Ft	Specified DFT					mils/μm		Approx Sq Ft	Specified DFT					mils/μm					
	Total avg					mils/μm			Total avg					mils/μm					
Reference Inspection Report #								Reference Inspection Report #											
for application record								for application record											
Item:								Item:											
Location	Area	Spot Readings						Location	Area	Spot Readings									
		1	2	3	Total	% Min/Max	Avg			1	2	3	Total	% Min/Max	Avg				
	A								A										
	B								B										
	C								C										
	D								D										
	E								E										
Approx Sq Ft	Specified DFT					mils/μm		Approx Sq Ft	Specified DFT					mils/μm					
	Total avg					mils/μm			Total avg					mils/μm					
Reference Inspection Report #								Reference Inspection Report #											
for application record								for application record											
DFT Gage Calibration Record								Comments:											
Gage Type/Model	Gage Serial #	Plate/Shim Mils/μm		Gage Adj +/-	Spec Avg DFT	DFT Last Coat	DFT This Coat	Inspector Signature: _____ Date: _____											

Paint Inspection Corrective Actions Report

Date: / / Su M Tu W Th F Sa		Pg ____ of ____
Project #:		Copy to:
Inspector:		☐ QC Super ☐ Owner
		☐ Contr ☐ _____
Project/Client:		Attachments:
Location:		☐ Stop Work Order
Description:		☐ _____
Requirements:		
Contractor:	Spec #:	Revision #:
Time and Location	Name/Company/Title	
Description of Nonconformance Item	Description of Nonconformance	
Referenced Spec/Procedure/Standard	Action Level	
Discussion and Recommendations		
Approval and Corrective Actions		
Corrective Actions Follow-Up		
Final Approval		
Authorized Contractor Signature:	Inspector Signature:	
Title:	Date:	Date:

SSPC QCS 2-08 Revision 1 09/2005



Date: / / Su M Tu W Th F Sa	Pg ____ of ____
Project #:	Copy to:
Inspector:	☐ QC Super ☐ Client

SSPC QCS 2-10 Revision 1 09/2005

	Module Two
	The Roles of Quality Assurance and Quality Control Inspection Personnel on a Coatings Project

	Module Two Learning Outcomes
	Comprehension of Module Two will enable the participant to: ➢ Describe the differences between quality assurance and control ➢ Describe the common duties of quality assurance and control personnel ➢ Describe the purpose and content of a pre-job conference ➢ Explain the purpose of an inspection procedure/plan ➢ Explain the importance of ethics of inspection personnel

	Quality Assurance vs Quality Control
	■ Differences ➢ QA works for the facility owner ➢ QC works for the painting contractor 

	Quality Control
	■ Performs necessary observations, testing and documentation (routine, systematic inspection) ■ Verifies that each phase of the work is in compliance with the specification

	Quality Assurance
	■ QA by the facility owner verifies that the QC accurately inspects, reports and documents the work performed) ■ "Audit" function

	Coatings Inspector Representation and Roles
	■ Inspectors can represent various entities, ■ Inspectors can serve different roles based on the contractual relationship ➢ QC for the painting contractor (hired as a consultant on a contract basis) ➢ QC for the painting contractor ➢ QA for the prime contractor, subcontracting the painting work ➢ QA for a facility owner ➢ QA for a coating manufacturer

Distinctions Between QC and QA

- Authority Roles:
 - Directing operations
 - Exerting control (by withholding payment)
 - Advising contractor or owner
 - Documenting non-conformities
- QA does not relieve QC responsibilities

Caution Regarding QA

- Both owner's and third party QA must exercise care not to unduly interrupt contractor operations
- Potential legal liability

Total Quality System

The International Standards Organization (ISO) advocates the use of both QC and QA to achieve a total quality system.

Coatings Inspection Duties & Responsibilities

- Specific duties will vary from project to project based on the specification
- General duties are common to most projects
- Most specifications invoke inspection "Hold Points"

Hold Point Inspections

- Inspection checkpoints
 - Certain points during a coatings project will require visual observations and/or tests, and a record of the results
 - Work may be accepted or rejected on the basis of these inspections
 - Known as "in-process" inspection
 - Specific hold points discussed later in course

Hold Point Inspections

Typically performed after:

1. Pre-cleaning
2. Surface preparation
3. Primer application
4. Intermediate coat application
5. Topcoat application
6. Cure

	Rules of Thumb
	■ QC inspection should occur first ■ Non-conforming items identified by QC should be corrected, reinspected and accepted by QC ■ QA observations occur when the work has been completed and accepted by QC

	QA Process
	■ Typically a review of tests or documentation provided by the QC ■ Duplicate testing at certain hold points (i.e., DFT measurements...)

	The Evolving Roles of QA and QC
	■ Evolved in the 1970's ■ Nuclear power plant construction inspection process ■ Most manufacturing and other construction processes use QC and QA ■ Many companies moving to total quality systems, which include a clear distinction between QC and QA responsibilities

	Organizations Defining QC and QA Responsibilities
	■ The Society for Protective Coatings (SSPC) Painting Contractor Certification Program (PCCP) ■ Establishes specific requirements for the qualifications and duties of the contractor's QC

	SSPC-QP1 Certification Program
	■ For painting contractors ■ Hold points should be performed after: ➢ Pre-cleaning ➢ Surface Preparation ➢ Primer Application ➢ Intermediate Application ➢ Topcoat Application ➢ Cure

	SSPC-QP1 QC Reports
	■ QC is required to prepare daily reports on the following: 1. Compressed air cleanliness 2. Dry film thickness 3. Air temperature 4. Humidity 5. Dew point temperature

	SSPC-QP1 QC Reports (continued)
	6. Surface temperature 7. Abrasive cleanliness 8. Degree of cleanliness achieved 9. Surface profile 10. Batch numbers of paint used 11. Batch numbers of thinner used 12. Mixing according to specification

	Pre-Construction (Pre-Job) Conference
■ Occurs prior to project start-up ■ The facility owner, contractor, coating supplier and the inspector attend	

	Pre-Job Conference
■ Prior to Conference an inspector should: ➢ Critically review the specification ➢ Review the Product Data Sheets (PDS) ➢ Be prepared to discuss any discrepancies	

	Pre-Job Conference
■ An opportunity to partner and "get it right" ➢ Pre-production ➢ Attendance sheet circulated ➢ Meeting minutes kept, distributed and reviewed ➢ Questions, unclear items, and discrepancies are addressed and agreed upon	

	Pre-Job Conference
■ Example Items Discussed: ➢ Contractors proposed operation, equipment & personnel ➢ Inspector safety & access ➢ Inspection & measurement (QA vs. QC) ➢ Contractors schedule ➢ Difficult access/inaccessible areas ➢ Lighting ➢ Product information ➢ Jobsite visual standard	

	Inspection Procedures
■ Aids the inspector in identifying inspection check points and acceptance criteria ■ No standard format ■ "Three column" format common ■ Additional columns for listing: ➢ industry standard ➢ instrument verification procedures ➢ number of measurements required ➢ report form reference	

Inspection Procedures

Inspection Checkpoint	Inspection Method	Acceptance Criteria
Surface Profile	Testex X-Coarse Replica Tape	2.0-3.5 mils
Surface Cleanliness	SSPC VIS 1	SSPC-SP10

Work Plans & Process Control Procedures

- Specifications may require work plans or process control procedures (PCPs)
- Work Plans
 - Contract specific or general
 - Covers production & inspection
 - No prescribed format

Work Plans & Process Control Procedures

- Work Plans
 - Description of processes & critical factors affecting quality and safety
 - Reference project specification
 - Include accept/reject criteria & authority
 - Includes project schedule
 - Lists equipment, mobilization plans, control of materials
 - Indicate frequency of project meetings

Work Plans & Process Control Procedures

- Process Control Procedures (PCPs)
 - Contract-specific
 - Require formal approval process
 - May require pre-approved format

Work Plans & Process Control Procedures

- Process Control Procedures (PCPs)
 - Date, Procedure No., Rev. No., Description of Contract Item
 - List of contractors, subcontractors and references
 - Qualification and certifications to perform the scope of work
 - Process descriptions and equipment list

Work Plans & Process Control Procedures

- Process Control Procedures (PCPs)
 - Inspection plan, instruments, calibration requirements, standard references & acceptance criteria
 - Copies of records to prove conformance
 - Authority required for non-conformities
 - Worker safety requirements
 - Environmental protection controls and waste management procedures

	Work Plans & Process Control Procedures
	■ Work Plans and Process Control Procedures (PCPs) ➢ Submitted in advance of production ➢ QA may review for completeness and conformance to the specification ➢ May require revisions and re-approval

	Documenting & Reporting
	■ Critical responsibility of the coatings inspector ■ Must be timely and accurate ■ Can be key in problem solving or litigation if a failure occurs ■ No "standard" inspection form ■ Logbook or "diary" of daily, project-related events should also be maintained

	Documenting & Reporting
	■ SSPC Documentation Forms 1. Documentation Acknowledgement 2. Inspection Equipment Calibration Record 3. Inspection Equipment Issuance Record 4. Daily Coatings Inspection Report 5. DFT Measurement Worksheet 6. Corrective Actions Report 7. Photographic Record

	Attestations
	■ Many companies require inspectors to sign documents promising to uphold professional ethics on the job

	SSPC PCI Attestation
	■ Participants must read and sign prior to sitting for PCI Course Examinations ■ Indicates Protective Coating Inspector's acknowledgement of requirement for ethical behavior

	Summary
	■ QA inspection – facility owner ■ QC inspection – painting contractor ■ QC: Frequent, routine, systematic inspection ■ QA: Verification of QC (audit of QC) ■ QC inspection first, then QA inspection

	Summary, con't.
	■ Common Hold Points: ➢ After pre-cleaning ➢ After surface preparation ➢ After primer, mid-coat, topcoat applications ➢ After coating system cure ■ SSPC PCCP QP1 and QP3 invoke QC

	Summary, con't.
	■ Pre-job conferences: ➢ Occur prior to project start-up ➢ Enable discussion of specification, schedule, inspection points, etc. ➢ Attended by facility owner, contractor, coating manufacturer, QA and QC inspectors, others

	Summary, con't.
	■ Inspection Procedures ➢ Aid in identifying inspection checkpoints and acceptance criteria ➢ List inspection checkpoint, inspection methods and acceptance criteria ■ Documentation and Reporting ➢ Critical responsibility of a coatings inspector ➢ Key element in problem solving or litigation

	Summary, con't.
	■ QA and QC inspectors must be ethical ■ Ethical breaches may or may not be obvious ■ Signed attestation indicates inspector's acknowledgement of requirement for ethical behavior

	Module 2 Workshop
	■ Five "ethics scenarios" ■ Discuss in teams ■ Answer questions ■ Present and defend your answers 