

10

NAVIGATING COATING SPECIFICATIONS

Introduction

The coatings specification is the inspector's "rule book" for a coatings project. It describes the scope of work and requirements of the project, and lists the inspection requirements that the inspector will be responsible for. The importance of a properly prepared coatings specification and the general format and components of a specification are described in this module. A sample specification is attached, which will be used for the Module 10 workshop, as well as Modules 11 and 12. Note that bolded information in areas demarcated by two rows of "*" should be disregarded. These are notes to the specification editor.

Learning Outcomes

Completion of Module 10 on navigating coating specifications will enable the coatings inspector to:

1. Describe the purpose and function of a coating specification
2. List the various methods in which coatings are specified for use
3. List the basic components of a coating specification
4. Locate inspection check points in a coatings specification

Purpose of a Coatings Specification

Independent of the type of industrial or marine coating project, a properly prepared specification is a key component to its success. A coatings specification describes the project and the objective of the coating system. It also describes the materials required to complete the work, the intended appearance of the completed work and lists the inspection hold points/check points to help assure that the work is done according to the requirements of the specification. A specification that is ambiguous, vague, or that references the use of incorrect materials will lead to problems, including job site disputes, litigation and possible coating failure. The coating specification for a project should be read and understood by all parties involved in the project (before the project begins), including the facility owner's representatives, the coating manufacturer, the inspector and the contractor personnel assigned to the project.

The facility owner typically prepares the project specification, or contracts an outside engineering firm to prepare it. The manufacturer(s) of the coatings that will be used on the project should be involved in the specification development process to ensure that the correct coatings are being specified and that the cleaning and painting requirements are suitable for their products.

A coating specification is a legally binding document. It is a contract between the owner and the contractor. When the project goes well, the legal aspects of a coatings specification rarely come into play. However, in the event that the project does not go well and legal actions are pursued, the specification becomes a critical document in the suit.

While a coatings specification is a legal document, it must be workable and understandable, with minimal use of "legalize" language. The legal aspects of the specification are important, but the specification should be written so that the project manager, foreman and workers can understand what is required. The best specifications use simple language and are well organized so that all involved parties can understand it.

A coating specification should be practical, so that the owner can effectively communicate the desired outcome, including the project schedule. The specification should not be unreasonably restrictive, but

should anticipate problem areas that the contractor may encounter and must overcome to successfully complete the contract. A well-prepared coating specification acts as a clearly written guidance document for both the facility owner and the contractor's crew, and is written in a non-adversarial tone to foster teamwork between the owner, contractor, material supplier and the inspector to achieve the end goal: corrosion protection, and perhaps aesthetics.

Many coating specifications are prescriptive in that they provide the contractor with the means and methods to accomplish the work, rather than simply indicating the desired end result. This can be a mistake, in that the contractor's hands are tied regarding the use of innovative methods in which to accomplish the work. While some directions are required (i.e., the contractor shall dry abrasive blast clean the steel using a recyclable abrasive to achieve SSPC-SP10, Near-white Blast and a 50-87 μm (2-2.5 mil) angular surface profile), the means and methods of achieving this level of surface preparation (abrasive size, nozzle size, air pressure, distance from nozzle to surface, blast nozzle angle, etc.) should be left to the contractor. Another risk in developing a prescriptive specification is that if the prescribed means and methods do not achieve the end result, claims against the owner and project cost overruns can occur.

The words "shall," "should," and "may" are all used in coating specifications, but infer different requirements. When the term "shall" is used, it indicates a requirement (e.g., "The contractor shall prepare the surfaces to a near white condition per SSPC-SP10."). The term "should" indicates a strong recommendation or preference (e.g., "The contractor should consider measurement of wet film thickness during application."). When the term "may" is used, it indicates an acceptable alternative (e.g., "The contractor may use hand or power tools to prepare the surfaces.").

There are two general types of specifications for coating work: those involved with new construction and those involved with maintenance painting of existing structures. The content of the specification documents will be different in both cases. Coating specifications for repairing or replacing an existing coating system can be quite complex, as the existing coating will likely be in varying states of deterioration, and cleaning of remnants from the service environment (e.g., chemical contamination, soluble salt contamination, oil/grease, etc.) must be addressed. Control of environmental emissions and protection of the

public must often be included in specifications for repainting existing structures. If the entire existing coating system will not be removed, then compatibility of the new system with the existing system must be carefully considered and addressed, including the level of cleaning necessary prior to application. In contrast, specifications for new construction do not have to address these complex issues.

It should be evident that the preparation of a well-written, thorough coating specification is not a simple task, and should be done with great care to avoid contract disputes and coating failure.

Inspecting Against a Poorly Prepared Specification

We are describing the content and purpose of a properly prepared coatings specification, and the workshop at the conclusion of this module represents a thorough, well-prepared project document. However, many project specifications are not clearly written, and may contain vague language, contradictory requirements and may even disregard key aspects of a coatings project. The question becomes, how does an inspector verify the quality of the work when the contract document does not contain or properly describe requirements? This can result in a very difficult situation, since the contractor has already bid the project based on the prevailing specification. When this occurs, it is not the role of the inspector to change the specification or enforce their own set of rules. Rather, the inspector should carefully review the specification and prepare a list of inquiries/clarifications that are needed in order for the inspector to do his/her job. These inquiries should be passed along to the facility owner/engineer for clarification prior to the pre-construction conference, then clarified during the conference. If there is no pre-construction conference, then the request for clarifications (and the resolutions) should be distributed to all parties involved in the project, including the contractor and coating material supplier before the project begins.

Inspecting When There is No Specification

Perhaps an even more challenging situation arises when there is no specification for a coatings project. Once again, the inspector cannot enforce their own set of acceptance criteria, but rather should ask the facility owner whether the coating manufacturer's

product data sheets should become the governing documents. This situation too is problematic, since a product data sheet is prepared to address many industries and service environments, and contains only recommendations for the user. However, in the absence of any project-specific contract documents relating to quality, the product data sheets become the best alternative. Similar to the process described above, the inspector should carefully review the product data sheets and prepare a list of inquiries/clarifications that are needed. These inquiries should be forwarded to the facility owner/engineer for clarification prior to the pre-construction conference, then clarified during the conference. If there is no pre-construction conference scheduled, then the request for clarifications (and the resolutions) should be distributed to all parties involved in the project **before** it begins.

Specifying Coating Systems

There are a number of ways that coating system can be specified for use on a project. Some specifications are written around specific product trade names, and some are written as “trade name or equal.” Others are based on a pre-established “Qualified Products Lists” (QPL), or are based on a set of performance standards. While infrequent, a coating system can also be specified based on a coating formulation or set of formulations. The principle advantages and limitations of each are listed below.

Specifying Coatings by “Trade Name”

Advantages:

- High rate of success if use is based on past experience and performance.
- Facility owner has full knowledge of the material based on past use.
- Manufacturer stands behind product and provides advice/guidance to help assure proper installation.

Limitations:

- Potentially high material costs (no competition).
- Problematic on projects involving public funding (government agencies), since sole sourcing is difficult to achieve.

Specifying Coatings by “Trade Name or Equal”

Advantages:

- If “or equal” product is truly equal in performance, competitive pricing can be established.

Limitations:

- Determining “or equal” should be based on performance testing or historical use of the product/system in the same/similar service environment. Acquiring this data can be time consuming and evaluating “or equal” status can be subjective.

Specifying Coatings by “Qualified Products Lists”

Advantages:

- Establishes “equivalent” performance based on successful field use and/or laboratory testing in advance.
- Competitive pricing established with little risk of acquiring sub-standard product.

Limitations:

- Time period required to establish a QPL.
- Cost of testing to attain QPL status may be passed on to facility owner by the coating manufacturer via higher material costs.

Specifying Coatings by “Performance”

Advantages:

- Any coating that meets/exceeds performance requirements can be selected for use. This avails the facility owner to potentially more options for corrosion prevention than the other methods.

- Specified performance standards are typically prepared by industry trade organizations as consensus standards (e.g., SSPC Paint 36), indicating that they have been developed by a mix of owners, vendors, engineers, and contractors across many industries.

Limitations:

- Testing prescribed by the performance standard may be short term laboratory testing and may not mimic the prevailing service environment.
- Field exposure testing of candidate coating systems to assess performance can be costly and time consuming.

Specifying Coatings by “Formulation”

Advantages:

- Formula specifications prepared by industry trade organizations as consensus standards (e.g., SSPC Paint 20), indicating that they have been developed by a mix of owners, vendors, engineers, and contractors across many industries.
- Various coating manufacturers can supply formula-based products conforming to pre-established industry standards, since the formula is published.
- Many formulas have a history of successful use in various service environments.

Limitations:

- Coating manufacturer follows formula and does not conduct performance evaluations to verify performance. Once the product passes to the facility owner, the manufacturer has no responsibility for performance provided it was formulated according to specification.
- Formulation may have been developed based on laboratory testing verses field performance.
- Formulations are antiquated and can not keep up with new technology or improved formulations – they do not take advantage of the R&D money being spent by coating manufacturers to improve products.

- Raw materials used to formulate coatings may be inferior, but still conform to the minimum requirements of the specification.

Components of a Coating Specification

There are a variety of formats that can be employed by the specification writer. The Construction Specifiers Institute (CSI) format is common. Some owners rely on “standard specifications” (that may remain unchanged for years) that are supplemented with Special Provisions or “Special Notes” that are specific to the project or structure being prepared and coated. In this manner, the specification can be customized to the project without needing to rewrite certain portions of the specification that are standard and remain in effect independent of the location of the structure and the scope of work. Many Departments of Transportation rely on standard specifications with special provisions supplements.

Most coating specifications contain three basic components: General; Products (materials); and Execution. One approach for addressing each of these sections is described below. It is based on the content of the NAVFAC coating specification attached to this module.

Part 1: General

The General section of a coating specification describes the project, the type(s) of structure(s) involved, the scope of the work required (e.g., abrasive blast cleaning and the installation of a three-coat system consisting of an organic zinc-rich primer, polyamide epoxy intermediate coat and aliphatic acrylic polyurethane finish), the service environment of the installed coating/lining system and the desired outcome. Surfaces to be prepared and coated (and surfaces NOT to be coated) should be clearly defined. For maintenance painting work, it is critical that the General section indicate whether the existing coatings contain toxic metals or other hazardous ingredients (e.g., asbestos), so that the contractor can address control of these hazards during surface preparation and coating installation activities.

The General section also lists any and all references in the coating specification, including references to ISO, ASTM, NACE, SSPC, etc., as well as any definitions used throughout the specification, such as the particular names of structural components involved in the project.

In most cases, a list of submittals required for the project is listed in the General section, although these may be listed in an Appendix to the project specification. Submittals include project schedules, the contractor's work plan, quality control plans, worker safety and health and environmental monitoring/protection plans, waste management plans, material certifications, and qualifications of various parties involved with the project, including contractor and inspector certifications, laboratory certifications, laborer certifications, etc.

The general section can also detail the quality assurance requirements of the project, including contract errors, omissions and other discrepancies, corrective action procedures, the coating work plan and design related information including access to the structure and methods for controlling the environment during surface preparation and coating application operations (as appropriate), quality test report requirements for the abrasive and/or coating materials, and the qualification requirements of various project personnel. The requirement and schedule of any pre-construction meetings are also described in the general section. Delivery and storage of products to be used on the project are described, as are the hazards and control requirements for the material storage area/facilities. The work sequence can be described in the general section, and any jobsite-specific references that are unique to a project should be indicated.

Part 2: Products

The specific products to be employed on the project are listed in the Products (materials) section of the specification. This includes any cleaners, abrasive media, caulking materials or sealants and the coating materials (each product that comprises the coating system). Any test kits that are required to test surfaces after surface preparation or coating installation should also be listed. The owner may elect to list the inspection equipment and supplies required for the project in the Products section, and should designate who is responsible for supplying the inspection equipment (and who will retain ownership once the project is completed).

Part 3: Execution

The Execution section of the specification is arguably the most important and most difficult to prepare. The content of the Execution section will vary considerably based on the scope and complexity of

the work to be performed and the procedures to be employed by the contractor to achieve the scope.

The Execution section may contain requirements for field sample collection of abrasive and coatings for batch verification testing by an approved laboratory prior to initiating work. This section may also address any specific procedures to prepare the structure for work, including tank cleaning, confined space clearance, containment and ventilation system installation, lighting installation, environmental control (temperature, dehumidification/humidification, air exchanges, etc.), and the use of protective coverings. The execution section should clearly identify the surface preparation requirements, including the level of surface cleanliness and surface profile depth required. The method of surface preparation should also be clearly identified, unless it is at the discretion of the contractor. The method may include pressure washing, solvent cleaning, hand tool cleaning, power tool cleaning (to various degrees), dry or wet abrasive blast cleaning, or non-traditional methods. If abrasive blast cleaning is specified, the type of abrasive should be indicated unless it is at the discretion of the contractor. If a specific type of abrasive is prohibited from use (e.g., silica sand), then the specification should so indicate. If interim-project testing of the abrasive is required, the testing protocol and frequency should be clearly defined. Finally, the surface preparation-to-primer application interval should be clearly defined, and the steps required if the window is exceeded, or if the surface deteriorates within the allotted window.

Requirements for mixing, thinning and application of each coat should be described in the Execution section, including minimum and maximum thickness requirements for each coat, measuring frequency (e.g., as described in SSPC-PA2), minimum and maximum recoat intervals and cleanliness between coats. The appearance of the finished coating system should be described, including limits on the type and amount of coating defects permitted (e.g., runs, sags, pinholes, etc.). Any requirements for post-application testing, such as holiday/pinhole detection, cure and others (prior to placing the coating system into service) should be listed. The time required for the coating to post-cure before being placed into service should be indicated, if appropriate. Some coating systems require an extended curing time before putting them into service (e.g., tank interior).

Requirements for inspection (quality control and quality assurance), the inspection hold points/check points, the frequency of testing and the methods and frequency of reporting are included in the execution section. Procedures for documenting non-conforming work and the resolution processes associated with non-conformities are frequently described.

Methods for identifying the level of surface preparation and the coating system installed on the structure (in the form of stenciling) are often described at the end the Execution section, as it is perhaps one of the last steps in the process. Site clean-up requirements and demobilization procedures may also be included.

Finally, if the existing coatings contain toxic metals or other hazardous ingredients, the specification will contain another part or parts describing worker protection, environmental emissions control requirements, and waste handling and disposal requirements. In some cases, this information is so lengthy and detailed that a separate environmental, safety and health and waste management specification is prepared and attached as a supplement to the coating specification.

Summary

A properly prepared specification is a key component to project success. A coatings specification describes the project and the objective of the coating system. It also describes the materials required to complete the work, the intended appearance of the completed work and lists the inspection hold points/check points to help assure that the work is done according to the requirements of the specification. Most coating specifications contain three basic components: General; Products (materials); and Execution.

A coating specification is a legally binding document. It is a contract between the owner and the contractor. While a coatings specification is a legal document, it must be workable and understandable. A coating specification should also be practical, so that the owner can effectively communicate the desired outcome, including the project schedule. The specification should not be unreasonably restrictive, but should anticipate problem areas that the contractor may encounter and must overcome to successfully complete the contract.

There are two general types of specifications for coating work: those involved with new construction and those involved with maintenance painting of existing structures. The content of the specification documents will be different in both cases.

There are a number of ways that coating system can be specified for use on a project. Some specifications are written around specific product trade names, and some are written as “trade name or equal.” Others are based on a pre-established “Qualified Products Lists” (QPL), or are based on a set of performance standards. While infrequent, a coating system can also be specified based on a coating formulation or set of formulations.

Module Ten

Navigating Coating Specifications

Introduction

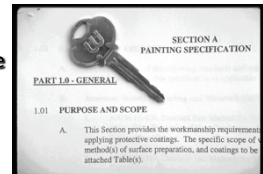
- Specification is inspector's project rulebook
- Specification describes work scope and contains inspection requirements

Module Ten Learning Outcomes

- Comprehension of Module Ten will enable the participant to:
 - Describe the purpose and function of a coating specification
 - List various methods in which coatings are specified for use
 - List basic components of a coating specification
 - Locate inspection checkpoints in a coating specification

Purpose of a Coatings Specification

- Key to project success
- Describes project and coating system objective
- Describes required materials and intended appearance
- Lists inspection requirements



Purpose of a Coatings Specification

- Jobsite disputes, litigation and coating failure caused by:
 - Ambiguous, vague, contradictory specification language
 - Specification of incorrect materials
 - Lack of a specification
- Specification should be understood by all parties (pre-project)



Purpose of a Coatings Specification

- Who prepares the specification?
 - Facility owner
 - Engineering firm
 - Coating manufacturer engaged in process of development

Purpose of a Coatings Specification	
■ Legal document ■ Contract between owner & contractor ■ Critical document when legal actions pursued	

Purpose of a Coatings Specification	
■ Specification should be workable/understandable (despite "legaleeze") ■ Good specifications use simple language and are well organized	

Purpose of a Coatings Specification	
■ Specification <u>should</u> be: ➢ Practical ➢ A useable document for facility owner and contractor ➢ Non-adversarial ➢ A document that fosters teamwork ➢ Focused on the goal (corrosion protection/aesthetics)	

Purpose of a Coatings Specification	
■ Specification <u>should not</u> be: ➢ Unreasonably restrictive (anticipate problem areas) ➢ Prescriptive - Specify end results, not means and methods of getting there - Some direction required - If prescribed methods don't work, claims can occur	

Purpose of a Coatings Specification	
■ Use of <u>Shall</u>, <u>Should</u> and <u>May</u> in coating specifications ➢ <u>Shall</u>: A requirement ➢ <u>Should</u>: A preference or strong recommendation ➢ <u>May</u>: An acceptable alternative	

Purpose of a Coatings Specification	
■ Two types of specifications for coating work ➢ New construction ➢ Maintenance painting of existing structures ■ Content different ➢ Maintenance painting specifications are more complex	

Inspecting Against a Poor Specification

- Many specifications are not well-prepared
- May contain vague or contradicting requirements
- Can be problematic for the inspector
- Review documents and list inquiries/clarifications
 - Forward to facility owner prior to pre-construction conference

Inspecting Without a Specification

- Inquire whether PDS become the governing documents
- Problematic since PDS are not industry-specific and contain *recommendations*
- Review PDS and list inquiries/clarifications
 - Forward to facility owner prior to pre-construction conference

Specifying Coating Systems

- Five ways of specifying coatings
 1. "Trade name"
 2. "Trade name or equal"
 3. "Qualified Products Lists"
 4. "Performance"
 5. "Formulation"
- Advantages and limitations to each

Components of a Coating Specification

- Specification Formats:
 - Construction Specifiers Institute (CSI)
 - Many others
 - Standard specifications
 - Special provisions/notes
- Common specification components
 - General
 - Products (materials)
 - Execution

Components of a Coating Specification

- General
 - Describes:
 - Project
 - Type of structure
 - Scope of work
 - Service environment
 - Desired outcome
 - Surfaces to be coated (and not to be coated)
 - Toxicity of existing coating (if applicable)



Components of a Coating Specification

- General, cont.
 - Lists:
 - References
 - Definitions
 - Submittal requirements
 - Project schedule
 - Work plan
 - QC plan
 - Safety plan
 - Environmental plan
 - Waste plan
 - Material certifications
 - Qualifications (company & personnel)
 - Qualifications of subcontractors



Components of a Coating Specification

■ General, con't

- Details:
 - QA requirements
 - Coating work plan
 - Work sequence
 - Structure access
 - Methods to control the environment
 - Test reports for materials
 - Preconstruction meetings
 - Delivery, storage and handling of products



Components of a Coating Specification

■ Products

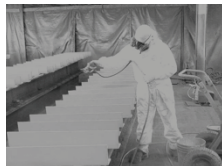
- Cleaners
- Abrasives
- Caulking/sealants
- Coating materials
- Test kits
- Inspection equipment



Components of a Coating Specification

■ Execution

- Field sample collection of materials
- Preparing structure for work
- Surface preparation requirements
- Mixing, thinning and application requirements
- Appearance of the finished system
- Post-application testing
- Cure-to-service time



Components of a Coating Specification

■ Execution, con't.

- Requirements for inspection
- List of hold points/check points
- Frequency of testing and reporting
- Procedure for recording non-conformities



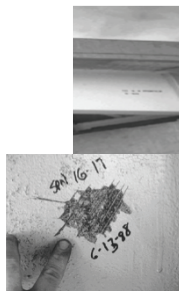
Components of a Coating Specification

■ Execution, con't.

- Stenciling requirements
- Site clean-up and demobilization

■ Separate component describing:

- Worker protection
- Environmental emissions control
- Waste management



Summary

- Properly prepared coating specifications are key to project success
- Coating specifications describe the project, coating system objective, required materials and intended appearance, and list inspection hold points/checkpoints
- Most specifications contain three parts: General; Products; and Execution

	Summary (con't.)
	■ Coatings specifications are legal documents ■ Coating specifications should be: ➢ Workable ➢ Understandable ➢ Practical ■ Coating specifications should not be: ➢ Unreasonably restrictive or too prescriptive ■ Inspecting against a vague, contradictory specification can be problematic ■ Inspecting without a specification can be problematic

	Summary (con't.)
	■ Coatings specifications are for new construction and maintenance painting projects ■ Coatings are specified by: ➢ Trade name ➢ Trade name or equal ➢ Qualified Products Lists ➢ Performance ➢ Formulation

	Module 10 Workshop
	■ Workshop 10 will require you to navigate through the Bottomless Tank Specification and Product Data Sheets to determine what the specification requirements are. The information needs to be documented by completing worksheets 1 and 2 in the workshop book.