Chapter 10.4
Preparing a Specification for a Coating Project

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Introduction

Purpose of Specification

A job specification is defined as a written, legal document, usually part of a contract, that precisely describes an item of work that is to be accomplished.[1] It defines the quality of materials, mode of construction, and desired amount of work. There are many purposes for a specification:

- To obtain a specific desired product
- To assure quality materials and work
- To assure completion of work
- To avoid delays and disputes
- To obtain minimum or reasonable costs
- To avoid costly change orders and claims
- To meet all safety, environmental, and legal requirements

In addition to making bidding fair, government job specifications usually have the additional requirement of making it available to as many contractors as possible.

Types of Specification

The term "job specification" is used in this chapter to avoid confusion with other types specifications used in the coatings industry. Many technical organizations prepare documents called specifications that describe products, procedures, or conditions. *SSPC Painting Manual Volume 2, Systems and Specifications* includes dozens of specifications covering surface preparation, abrasives, paints and paint systems, and paint application.

Background

Earlier Practices

At one time, previously used painting specifications were kept on file and used over and over again. This did not permit the incorporation of new technologies, new governmental requirements, and recent structural changes, or the correction of errors in earlier documents. Specifiers with limited time or experience often followed the bad practice of "cutting and pasting" previous specifications. This is much easier to do today using computer programs with standard forms and/or recommendations. The Construction Specifications Institute (CSI), the American Institute of Architects (AIA), and several commercial firms have such programs. Although they can be very helpful, none of them will tailor a specification to a particular job or convert novices instantly into professional specifiers.

Often, painting comprises only a small part of construction work. Since structural aspects of construction projects are stressed, the painting portion frequently receives less time or consideration than is necessary to describe its requirements satisfactorily.

Another approach still used occasionally today, especially on smaller jobs, is to have suppliers prepare specifications for painting. As might be expected, the supplier's products were required by the document. Problems frequently arise from this approach because few suppliers are skilled in preparing specifications.

Results from Specification Deficiencies

Poorly or incompletely prepared specifications can result in bidding concerns that may require cancellation of the bid invitation and rewriting the specification for a new bid invitation. Some of the more common bidding concerns are:

- Bids from unqualified contractors
- Fewer bids from qualified contractors
- Unrealistically high or low bids

Job specifications are further complicated in that they are legal documents and must contain the legal as well as the technical requirements. Inadequacies in paint specifications, or other specifications, may permit bidders to interpret the described requirements to their advantage to provide lesser work or use cheaper materials. This, in turn, may give rise to disputes and litigation. Thus, it is extremely important that painting job specifications or other construction

specifications be prepared systematically and thoroughly and conform to all applicable regulations.

Basics of Contracting

An understanding of the general nature of contracting is necessary to achieve an understanding of how specifications are used because most painting and other construction work is accomplished by contract. Thus, participants in the contracting process and types of contracting will be discussed briefly. The types of payment will also be discussed because of possible confusion between types of contracting and types of payment.

Contract Participants

A contact is a written agreement between an owner and a contractor. However, other personnel are usually involved in the contracting process. An owner can be an individual or an organization. The owner may be from the private sector or be a governmental organization. It is the responsibility of the owner to initiate the project and secure sufficient funding for all phases of it. The owner may also have an office-based project manager, who is responsible for most of the planning, and a field manager who oversees work at the job site.

Contractor and owner agree to complete the specified work with the contractor's workforce or subcontracted forces in a specified time for a particular amount of money. Materials and equipment suppliers are often involved through contracts with the contractors or subcontractors. However, in all cases the responsibility for successful completion of the contract work resides with the contractor.

The specifier (specification writer) is usually an architect/engineer (in-house or contracted) used by the owner to design the project work and to prepare job specifications and related documents. This person may in turn hire coating consultants or other specialists to assist with special phases of the work. Because of the nature of specifications, the specifier must have a combination of skills:

• Proficiency in use of language. Ability to produce clear, precisely worded documents.
• Research and reading skills. Ability to work with voluminous quantities of information to procure precise data.
• Ability to work with others, consulting and coordinating with other specialists.
• Knowledge of coatings operations, including an understanding of and ability to generate cleaning/coating requirements.
• Legal knowledge. A clear fundamental understanding of the legal principles involved in specifications and the contracting procedure.

The specifier's selection of coating systems should based on how well they satisfy the owner's requirements. Four important factors in their selection are:

• **System Properties.** Is it adequate for the specific needs? How does it compare to alternative systems? What service life can be expected? What are its limitations? Does it meet all local regulations? Is it readily available and in the desired color?
• **Manufacturer.** Is the manufacturer's product on a "Qualified Products" list? Is the manufacturer reputable? Does this manufacturer provide field service for product use? How well does the manufacturer respond to field problems?
• **Application.** Do the manufacturer's data sheets provide all necessary information for proper application? Should alternative application methods be described? Are special workers or equipment required for successful application? Do workers require certification?
• **Costs.** What long-term (life cycle) costs will be associated with the system? What maintenance costs can be expected with the system?

Coating inspectors are usually required to monitor the work and conduct testing to establish and document whether all specification requirements have been met. They may be employees of the owner or contractor or preferably certified specialists hired from an independent inspection firm.

Contracting and Payment Methods

There are two general types of construction contracts: competitive bidding and direct selection. Each type has its own advantages and limitations. The competitive bidding method is used to determine the least cost for accomplishing the work defined by the specification. A bid, also called a proposal, states the price that the bidder will charge to accomplish the work. Bids are prepared in confidence and submitted in sealed envelopes for the owner to examine and compare with other bids. The owner usually selects the lowest qualified bidder to do the work.

In the direct selection (also called negotiated) method, the owner, usually with the advice of the specifier, selects the prospective contractor from a pre-qualified list based upon experience, dependability, financial stability, and necessary skills. This method is not normally allowed for projects in the public sector. There are several bases of payment for contract work. These include but are not limited to stipulated or lump sum, unit price, cost plus fee, and guaranteed maximum price.

In the stipulated or lump sum method of stating the cost, a specified amount is quoted for completing all the described work. In competitive bidding, lump sums are quoted by the bidders; in direct selection, the lump sum is negotiated between the owner and the contractor. The stipulated or lump sum method is used when all items of work can be accurately defined.

The unit price method is used when the items of work cannot be accurately defined in advance. A price is quoted for each unit measure of each portion of work to be done. After completing each portion of work, the actual amount of work done is measured and recorded by the contractor who is paid according to the agreed upon unit price. This payment method is appropriate for both competitive bidding and direct selection contracts.

In the cost-plus-fee method of payment, the contractor is paid for the actual materials and labor plus an additional amount for profit and overhead. This additional amount may be an agreed upon percent of the actual costs or a fixed amount. This method is used almost exclusively for direct selection contracts. Tight management is necessary because there is no incentive to control costs. To control costs, the bidder may be required to state a guaranteed maximum price that will not be exceeded.

Contracts may include incentive clauses that provide additional payment for early completion of work or good performance or penalty clauses for late completion of work. Such clauses are included when a timely completion is very important.

Job Specification Format

Field problems with painting contracts can best be avoided with a systematically prepared specification that uses a standard format. This makes it easier to avoid overlooking any important item. A standard format also makes it easier for those preparing bids or executing the contract to accomplish their work, because all the requirements can be found in the same part of the document, as in all previous documents from the organization.

The format of the Construction Specifications Institute (CSI) is used by the federal and many state governments, as well as private industry.[2-4] The CSI format divides all construction work into 16 divisions by the building trade involved with the work. Finishes are always in Division 9 and paints and protective coatings in section 09900 of Division 9. All sections have five digit numbers. Each CSI section is divided into three basic parts:

- Part 1. General
- Part 2. Products
- Part 3. Execution

Part 1. General

The following sections are listed under headings in broad agreement with the CSI specification format. They are defined and discussed from a coatings viewpoint. It is not necessary to use those sections that are not applicable for a particular job specification. Additional sections may be added to include appropriate general information that does not fit into other sections.

- Summary (Introduction)
- References
- Definitions
- Submittals
- Quality assurance
- Delivery, storage, and handling
- Project/Site conditions
- Sequencing and scheduling
- Warranty

Summary (Optional)

A summary or introduction section at the start may present the scope and purpose of the work. Care must be taken to avoid inclusion of any requirements described elsewhere in the document, because slightly differing descriptions can result in problems of interpretation. Thus, many organizations prefer to use only the title of the specification to introduce the document.

References

The reference section, sometimes called "Applicable Documents," should include a listing of all documents used in the specification and no others.

Others included only for general information may be interpreted as requirements. Listed references form a part of the specification to the extent indicated.

All standards referenced in the document should be complete with designations and titles. Any test variations and compliance requirements should be listed elsewhere in the specification. Industry specifications and standards such as those of SSPC are preferred to government standards for equivalent products or processes. In all cases, issuing organization, number, and latest issue are normally listed. Unless otherwise indicated, the issue in effect on the day of invitation for bids applies. Where alternative standards occur, the normal order of precedence is:

1. Industry Documents
2. Federal Documents
3. Military Documents

This should not be confused with the order in which they are normally sequenced in the specification reference listing—alphabetically by organization name, or by document category name. For example:

1. American Society for Testing and Materials (ASTM)
2. Federal Specifications
3. Society for Protective Coatings (SSPC)

Within each of the above categories, individual documents are listed numerically. References should be listed only for items described in the body of the specification to minimize error. Where alternative standards or practices are available, only one of them should be used. Thus, both SSPC-PA 2, *Measurement of Dry Coating Thickness with Magnetic Gages* and ASTM D 1186, *Standard Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base* should not be referenced in a specification.

Definitions

The definition section is used when necessary to define unusual terms or unique methods of using them. An understanding of terms used in painting operations may vary widely in different geographical locations and even between different people in the same location. Definitions for such words may prevent costly disputes over different interpretations.

Submittals

Specification submittals are documents or samples to be provided by the contractor to the owner. They are provided to assure the owner that specific requirements will be met. Submittals may be required before, during, or upon completion of the work. They may include:

- Samples of coatings to be used
- Drawdown coating films (cured films of uniform thicknesses applied to cardboard or other substrates)
- Blast-cleaned reference panels
- Laboratory test results
- Certificates of conformance
- Product data sheets
- Material safety data sheets
- Manufacturer's instructions
- Supplier's field reports
- Shop drawings
- Warranties

Complete laboratory testing of paint for conformance to specification can be very expensive and thus is not often done except where very large areas are coated or where the coating provides a critical function. More often, the owner accepts certificates of conformance. These are basically statements that a previous representative batch of the same formulation has met specification requirements, and a few quick laboratory tests by the supplier indicate that the present batch does also.

Sometimes, authenticated wet samples of coating are retained for later laboratory testing should early failure occur. They are normally retained for only one year, the normal warranty period. The specification should also permit field sampling of coatings being applied.

For large or critical batches of paint, factory-witnessed manufacture or testing is sometimes done. These and first article (pre-production) tests can be very expensive and so should be used only where the expense is justified. Manufacturer's data sheets and instructions may be used to define under what conditions and by what methods their products can be successfully applied to produce a quality film. Inspection and safety procedures may be required in order to obtain information on how these aspects will be handled.[5]

Quality Assurance

The quality assurance part includes prerequisites, standards, limitations, and criteria that define the

quality of materials and work. They may include the following:

- Qualifications
- Certifications
- Regulatory requirements
- Field sampling requirements
- Pre-construction conference

Qualification or certification statements may be requested to establish the capabilities of the contractor and those employed by the contractor. SSPC-QP 1, *Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)* may help assess a contractor's ability to complete the work in a satisfactory and timely manner. Additional certification may also be required, e.g., if asbestos or lead-based paint complicate the work.

It is desirable to include a clause permitting the contracting officer to procure at any time a sample of the paint being applied. Local air pollution personnel usually have this authority. All prevailing regulations should be included in the submittals, so that they are on-site. The contractor must be familiar with all of them. Material Safety Data Sheets for all paints, solvents, and other materials to be used should also be submitted and kept on site.

A pre-construction conference of owner and contractor personnel should be held before the work begins. At this time, any differences of opinion or uncertainties should be resolved. Any agreements reached that affect the specification should be written down and signed by both parties so that it becomes a part of the contract. Any differences not resolved may result in costly change orders.

Delivery, Storage, Handling, and Disposal

Special requirements for packing and shipping of products, equipment, and components should be stated here. Conditions for acceptance of these items at the project site should also be included. Special storage and handling requirements necessary to prevent contamination or damage to products during storage or use should also be included. Spill kits and procedures established to clean up spills may be required.

Project Site Conditions

Any physical or environmental limitations or criteria at the project site should be stated. These may include temperature, weather, humidity, or ventilation. The site conditions must be completely and correctly defined. Existing structural and geophysical reports should be referenced.

Variations from the description of the site conditions may cause costly modifications to the specification. They may concern the size or scope of the work, the extent of corrosion or coating deterioration, the construction or coating materials, or other things that affect the work to be done.

Some specifiers do not examine the job site but rely on drawings on file that may not be current. Structural additions or changes significantly increasing the level of effort may have occurred since the drawing was made. Another common error is to underestimate the amount of loose, deteriorated coating that must be removed in maintenance painting. Loose paint is generally not well defined. The best definition is probably paint that can be readily removed with a dull putty knife.

Sequencing and Scheduling

The requirements for coordinating work that must be done in special sequence with, or at the same time as, work with other trades should be clearly stated. Any other special scheduling requirements should also be stated.

Warranty

Special or extended warranty or bonding covering the conformance or performance of the work should be stated. Warranties for coating work are typically for one year.

Maintenance (Optional)

Provisions for maintenance service, if any, should be listed. These should include items difficult to obtain such as matching colors.

Part 2. Products

This part provides information about all products to be used. These products include:

- Cleaning materials
- Coating materials, including thinners
- Support materials
- Equipment

Products may be named in Division 9 or other divisions of the specification.

Materials

All materials to be utilized on a job must be well defined. These include cleaning, coating, and support materials such as scaffolding and other systems required for safety.

Paint products can be specified by several options:

- By government or industry specification
- By qualified products list
- By brand name
- By properties

Federal, military, state, and industry coating specifications can often provide the best source of information concerning a particular generic coating system. They are usually based upon materials with well-documented performances. These specifications often have qualified product lists of materials that have been tested in the laboratory and field and have been found to perform well for the intended service. Names and addresses of manufacturers are listed for each listed product. The names of products that have the capability to supply the desired properties can be listed and supplemented by brand names or other proprietary designations. It is especially wise to specify products that have provided previous good service on the actual structures or equipment to be coated. Specifying “Brand X or equal” is another dangerous method of describing a product. There is no specific definition of “equal” or procedure to determine such equality.

If commercial products are specified, their colors should be selected from the manufacturer’s list of available colors. Whatever the method of specifying products, it is best to require that all products for a multiple-coat system be procured from the same supplier. This will avoid compatibility problems and eliminate disputes as to which manufacturer may be liable for coating defects. Products used to coat items in a fabrication shop offsite should be specified as fully as those to be applied onsite.

Substitution products are frequently requested by a contractor, subcontractor, or material manufacturer during the bidding, before beginning the work, or while doing it. Some of the reasons for considering substitutions are:

- To encourage a more open and competitive bidding process
- To allow the use of products that the contractor is more familiar with or from a manufacturer that provides field support
- To allow the contractor to procure more readily available products
- To use cheaper products to reduce work costs

Some of the concerns about substitute products include:

- Substitution products may be inferior to the specified products
- Some aspects of the substitute product may not be suitable (e.g., loss of gloss, color fading, ease of maintenance etc.)
- Significant time may be required for the specifier to evaluate the substitution product
- Significant time may be required for accelerated testing of the substituted product.

Equipment

Information describing the function, operation, and other important aspects of required equipment should be included. Each article of required equipment should be specifically named in this part of the specification and this name used throughout.

Part 3. Execution

The execution part of the specification describes the use of the materials described in the products part. It should include sufficient sections and subsections to adequately describe all the work to be accomplished.

Much of the detailed information for execution of a specification may be found in drawings or other referenced documents that form a part of the specification. Drawings are used to provide a graphic representation of the work to be done. They define the areas to be coated and provide a schedule of coating systems and colors to be used. To prevent problems resulting from variations between descriptions found in the body of the specification and those found in associated documents, it should be stated that where such duplication occurs, requirements found in the body of the specification pre-empt those found elsewhere. It is always best to describe a desired product rather than tell how to achieve it. It is sometimes advantageous to permit a contractor to use creativity and experience to determine the best means to meet a requirement.

It is usually very difficult to define the desired quality of the work. Quality requirements should be readily attainable and measurable and never greater

than is actually needed for the particular service. Ambiguous statements such as “best quality work” should be avoided. It is better to refer to refer to trade or industry standards such as SSPC-PA 1, *Shop, Field, and Maintenance Painting of Steel*.

Examination

Before actually beginning the work, the contractor should be required to examine the work site to determine that all prevailing conditions are acceptable for the specified coating operations. Even if the contractor had examined the site before bidding, it is necessary to conduct a more detailed examination. Variations from expected conditions can prove to be very costly. Requirements should be stated for actions to be taken to prevent coating overspray onto structures or equipment that are not intended to be coated.

The contractor’s examination of the work site may also reveal any apparent deviations from the written description of the work to be done. If the inspection reveals that more work is required than initially believed from simply reading the specification, or if the specified work will not adequately meet the owner’s needs, these concerns should be resolved before beginning the work.

Pre-Surface Preparation

The requirements for preparing the facility or equipment for surface preparation and coating should be stated. These include structural modifications (e.g., grinding of welds, rounding of sharp edges, etc.) as well as masking and containment work.

Surface Preparation

Surface preparation requirements should be well defined. They should include immediate priming of metal surfaces after acceptance of cleaned surfaces and require reblasting when flash rusting occurs.

As discussed earlier in this (Execution) part, it is illegal to both describe a product and how it is to be achieved. Thus, if the specification calls for a specific abrasive be used to blast clean steel by holding a venturi nozzle with 90 to 100 psi 8 inches from the surface and slowly moving it across the surface, there can be no requirement for the resulting degree of cleanliness (e.g., SSPC-SP 6/NACE 3, *Commercial Blast Cleaning*).

Application

All application requirements for primary products (e.g., coatings) should be stated. Permitted variations in tolerance (e.g., ranges of wet and/or dry film thickness) should be specified. Specifications may permit the use of brush, roller, or spray to apply coatings, as the contractor prefers. However, some materials can only be applied satisfactorily by one or two of these methods. Thus, zinc-rich coatings should be applied by spray equipment using an agitated pot and following the instructions of the coating supplier. The specification should state that any thinning of coatings should be limited to the thinner type and the amount specified. Thinning should also be specified as being within the limits set by local air pollution authorities.

Field Quality Control (Inspection)

All test and inspection requirements before, during, and upon completion of work must be defined completely. The individual or firm responsible for this work must also be specified. While use of an independent inspection firm is typical for large or critical jobs, material suppliers often provide field service instruction, supervision, or training in use of their products.

Industry standard test procedures should be described whenever possible. For example, SSPC-PA 2, *Measurement of Dry Coating Thickness with Magnetic Gages*, should be used to determine whether dry film thickness requirements have been met.

Site Clean-Up

Requirements for the final actions for completed work should be fully described. This includes clean-up of waste products and proper disposal of hazardous materials. Requirements for collecting, handling, and storing these materials during their generation should also be specified.

Changes to Specification

Addenda

Addenda are additions made to the documents during the bidding period to correct errors or omissions, clarify questions made by bidders, or issue new requirements, including the scope of the work. Typical addenda items:

- Change time, date, or location for receipt of bids
- Change the quality of the work

• Change the method of work sequence
• Add, delete, or revise the bidding documents
• Include additional qualified products

Before making addenda, the value of the work should be considered. It may be more advantageous to defer non-critical items until after completion of the contract.

Contract Modifications

Contract modifications are additions, deletions, or changes of the work requirements after the contract agreement has been assigned. This can be accomplished by change order, supplemental instruction, or field order at any time after the contract signing.

Language To Be Used In Specifications

For a specification to result in all needs being met, it must be:
• Clear—Use correct wording and grammar to avoid ambiguity or confusion
• Correct—Write accurately and precisely
• Complete—Do not omit any important items
• Concise—Eliminate unnecessary words without sacrificing clarity, completeness, or correctness

The language of a specification must describe exactly the product that is desired. The contractor is required to provide only the product described and no more. Thus, the specification writer must be very precise describing contractor requirements. The following recommendations should be helpful:
• Use short, specific words (avoid vague terms)
• Use short sentences
• Use common words that are clearly understood
• Place the action words at the beginning
• Use strong verbs
• Use the imperative (preferred) or indicative mood
• Do not repeat descriptions or requirements

Concise Words and Sentences

Words in the specification should be relatively short, specific, and easily understood. Avoid words that are ambiguous, vague, or otherwise not readily understood. Such expressions as “high-performance coatings” and “quality work” are too vague to be of any value.

Short sentences are more readily understood than longer ones. Also, the action words (subject and verb) should go up front. Thus, do not write: “After the steel has been properly cleaned and after the weather conditions have been verified to be acceptable, apply one coat of the specified primer.” Instead, write: “Apply one coat of the specified primer after . . .” Strong verbs such as “blast,” “clean,” and “prime” are more precise than weaker verbs such as “make,” “build,” and “establish.” Strong verbs are also more easily understood.

Grammar

Either the imperative or the indicative mode can be used to prepare specifications. The same mode should be used throughout the document. Use of the imperative is preferred to the indicative, because it is more direct, concise, and less likely to be misinterpreted. Examples of the imperative are:
• Blast clean the steel to SSPC-SP 10/NACE 2.
• Apply two coats of SSPC-Paint 16; each coat at 7 to 9 mils dry film thickness.
• Determine coating dry film thickness by method described in SSPC-PA 2.

The same examples in the also acceptable indicative mode are:
• The steel shall be blast cleaned to SSPC-SP 10/NACE 2.
• Two coats of SSPC Paint 16 shall be applied; each at 7 to 9 mils dry film thickness.
• The coating dry film thickness shall be determined by the method described in SSPC-PA 2.

Parallel construction should be used. Good and bad examples are shown below:
• **Incorrect:** Conduct tests to determine adhesion and measuring dry film thickness.
• **Correct:** Conduct tests to determine adhesion and measure dry film thickness.
• **Incorrect:** Cleaning, application, and inspection
• **Correct:** Cleaning, applying, and inspecting

Unnecessary Words

Unnecessary words such as “the,” “a,” and “all” should be avoided, as indicated below:
• **Poor:** Apply the epoxy primer with a spray gun to the concrete wall.
• **Better:** Apply epoxy primer with spray gun to concrete wall.

• **Poor:** Coat all metal components protected from the weather.
• **Better:** Coat metal components protected from the weather.

The word “contractor” should not be the subject of a sentence. It is better to say “The zinc-rich coating shall be applied by airless spray” rather than “Contractor shall apply zinc-rich coating by airless spray.” It should be noted that imperative mode automatically eliminates the use of the word “contractor” as the expressed subject of a sentence, although it is implied.

No information in the specification should be repeated in a second place because of the greater possibility of errors or because slight differences in description may receive different interpretations.

Vocabulary

Care must also be taken to use only standard terms such as “Brush-Off Blast Cleaning” (SSPC-SP 7/ NACE 4), rather than “brush blast,” “sweep blast,” “shower blast,” or some other undefined term.

Summary

Every painting job to be done by a contractor or in-house should be written up as a specification. This will avoid disputes and result in the desired product. The specification should be clear, correct, complete, and concise. Otherwise some of these deficiencies may occur:
• Variation in site conditions
• Vague or incomplete wording of requirements
• Portions not legal or readily achievable

This, in turn, may result in the following work or working problems:
• Lower quality products than desired
• Lower quality work than desired
• Less work than desired
• Change orders
• Disputes
• Defaulted contracts
• Claims
• Litigation

By using a standard format and proper language and by including all the necessary information, problems with contract painting will be greatly reduced.

References

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4. CSI MP-2-2. *Three-Part Section Format for Construction Specifications;* Construction Specifications Institute: Alexandria, VA.
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About the Author

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Dr. Richard W. Drisko has been the senior technical advisor to SSPC: The Society for Protective Coatings since January 1995. Prior to this, he was employed for over 40 years at the Naval Civil Engineering Laboratory, Port Hueneme, California, where he conducted research, evaluation, and testing, and served as the Navy’s center of expertise on coatings for shore structures. He is a professional corrosion engineer in the state of California, an SSPC certified protective coatings specialist (PCS), and a NACE International certificated corrosion specialist. Dr. Drisko received his BS, MS, and PhD degrees from Stanford.