



INTRODUCTION TO PAINTS AND COATINGS

For the Facilities and Infrastructure Professional

Paints & Coatings for DOD F&I



- Department of Defense (DOD) manages 555,000 structures
 - Buildings, structures, pipelines, pavement and port facilities
 - Broad range of environmental severity zones (desert to marine)
 - Millions of Square Feet of painted steel, wood, aluminum & concrete.
 - Costs over \$100 Million per year to maintain the exterior of DOD's building
- Paints & Coatings are addressed by numerous UFGS and UFC 3-190-06

**hover over the underlined items for more details*

Introduction to Paints & Coatings



Paint can be defined as a mixture or dispersion of opaque pigments or powders in a liquid or vehicle.

Coatings include other materials that can be considered paint-like in their use such as varnishes and inorganic binders.

Modern classifications of paints:

- **Architectural/Trade Sales** - commonly recognized latex and alkyd paints sold in retail stores.
- **Industrial/Maintenance** – may include anti-corrosive primers, machinery and industrial enamels and other products that require more specialized application equipment. Some trade sales type paints are also used in Industrial situations (i.e. High Performance Architectural Coatings).
- **Specialty** – are generally very specific in their use, application and resistance properties such as plastics coatings, coil coatings, and resistive coatings.



- Review fundamentals of coatings by focusing on:
 - Types of coatings
 - Surface preparation
 - Application of coatings
 - Inspection
 - Defects and failures





Mechanisms of Corrosion Control by Coatings

- Barrier protection
- Chemical inhibitors
 - Inhibitive Pigments
- Galvanic (cathodic) protection
 - Zinc
 - Galvanizing
 - Metallizing

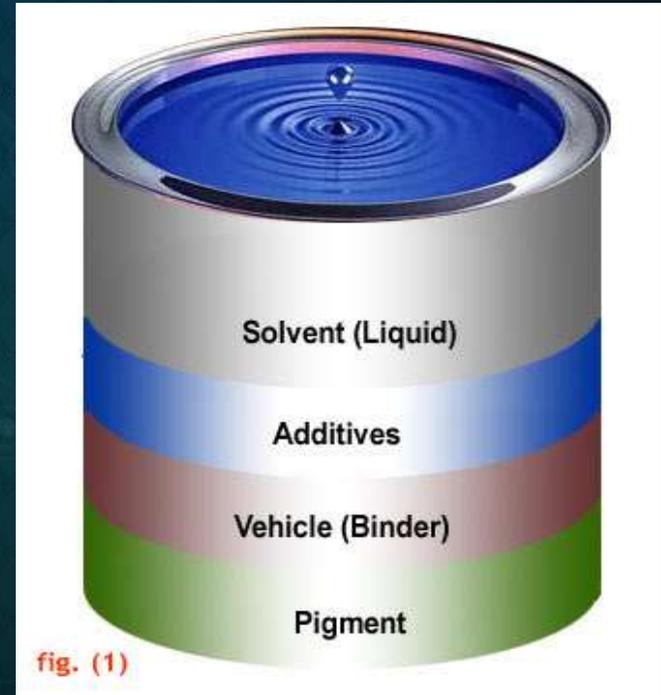
**hover over the underlined items for more details*

What's in the Can?



Basic components of a paint or coating include:

- **Binders** – also known as the resin, polymer or vehicle.
- **Pigments** – include the coloring and filling materials.
- **Solvents** – are the volatile thinners or diluents that evaporate.
- **Additives** – are materials that are added to modify or improve specific properties related to processing, appearance or performance.



Generic Coating Types



- Alkyds
- Bituminous coatings
- Coal tar epoxies
- Epoxies
- Fluoropolymers
- Inorganic zinc-rich coatings
- Lacquers
- Moisture curing polyurethanes (MCU)
- Organic zinc-rich coatings
- Phenolic and phenolic epoxy coatings



Generic Coating Types (cont.)



- Polyaspartic
- Polyesters/vinyl esters
- Polysiloxane
- Polysulfides modified with novolac epoxy resin
- Polyurea
- Powder coatings
- Silicones
- Thermal spray metallics
- Water-borne acrylics



**hover over the photos for more details*

Important Factors in Coating Selection

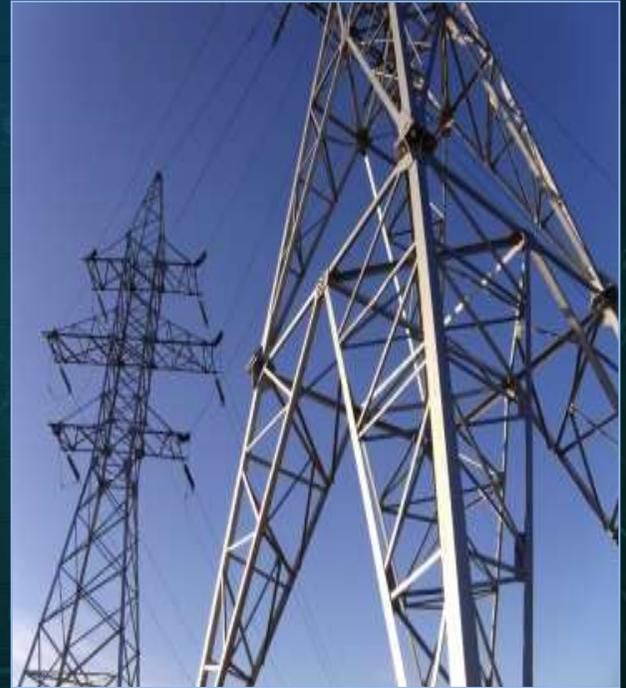


- Mission/operational needs
- Exterior weathering
- Water, fuel, solvent, or chemical resistance
- Abrasion, heat, or mildew resistance
- Appearance
- Drying time
- Ease of application and maintenance

When Specifying a Coating Application Consider:



- Severity of environment
- Surface preparation
- Access to work
- Drying time
- Applicator skills
- Scaffolding
- Safety and environmental requirements



Surface Preparation



The life of any coating system is directly impacted by the quality of the prepared surface. The better the surface preparation, the longer the life of the coating system

- Treatment of Surface Irregularities
- Pre-cleaning to remove surface contaminants
- Cleaning surfaces to desired levels
- Producing a surface profile (texture)

**hover over the underlined items for more details*

Surface Contaminants Causing Early Coating Deterioration



- Rust
- Mill scale
- Grease and oil
- Dirt and dust
- Soluble salts
- Water
- Paint chalk
- Loose, cracked, or peeling paint



**hover over the photos for more details*

SSPC Standards for Mechanical Cleaning



SSPC Standard

- SP 2 Hand tool cleaning
- SP 3 Power tool cleaning
- SP 15 Commercial grade power tool cleaning
- SP 11 Power tool cleaning to bare metal
- SP 10 Abrasive blast to near-white metal
- SP 5 Abrasive blast to white metal

Extent of Removal of Contaminants

- Removes all loose mill scale, rust, and paint
- Removes all loose mill scale, rust, and paint
- Removes all visible contaminants for stains up to 33%; minimum 1 mil profile*
- Removes all visible contaminants; minimum 1 mil profile*
- Removes all visible contaminants except for staining limited to no more than 5 percent
- Removes all visible contaminants

*SP 15 and 11 allow some contamination to remain in the bottom of pits

Methods of Application: General Factors



- Suitability for the particular coating and structural components
- Desired appearance
- Speed, ease, and economics of application method
- Simplicity of equipment/necessary applicator skills
- Safety/environmental requirements
- Weather
- Transfer Efficiency
- Coverage Rates

Methods of Application



- Manual (brush or roller)
- High-volume, low-pressure (HVLP) spray
- Airless spray
- Plural component spray
- Conventional air spray





Quality Assurance (QA)

- Planned and systematic actions to provide confidence that a system will perform satisfactorily

Quality Control (QC)

- The portion of QA that ensures that materials, methods, workmanship, and the final product meet specified requirements

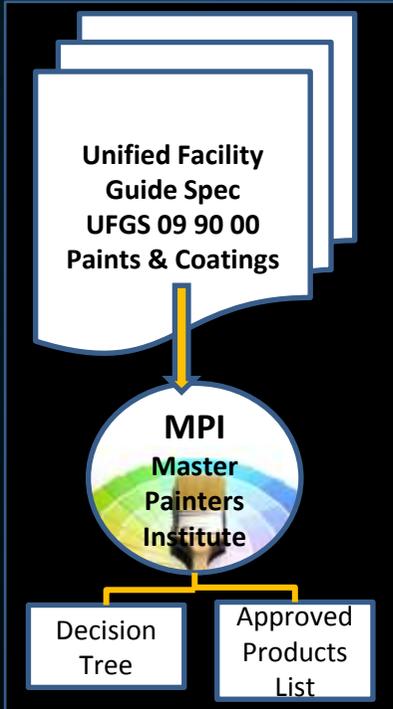
Purposes of the Specification



- To obtain a specific desired product
- To assure quality materials and workmanship
- To make sure the work is completed on time
- 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



Paints and Coatings: Criteria and Tools



Architectural Painting Specification Decision Tree

<http://www.wbdg.org/tools/apsdt.php?c=5>

UFC 3-190-06 Protective Coatings and Paints

http://www.wbdg.org/ccb/DOD/UFC/ufc_3_190_06.pdf

UFGS http://www.wbdg.org/ccb/browse_cat.php?c=3

UFGS 09 90 00 Paints and Coatings

UFGS 09 96 00 High-Performance Coatings

UFGS 09 96 59 High-Build Glaze Coatings

UFGS 09 97 01.00 10 Metallizing: Hydraulic Structures

UFGS 09 97 02 Painting: Hydraulic Structures

UFGS 09 97 13.00 40 Steel Coatings

UFGS 09 97 13.15 Epoxy/Fluoropolyurethane Interior Coating of Steel Petroleum Fuel Tanks

UFGS 09 97 13.16 Interior Coating of Welded Steel Water Tanks

UFGS 09 97 13.17 Three Coat Epoxy Interior Coating of Welded Steel Petroleum Fuel Tanks

UFGS 09 97 13.25 Maintenance, Repair, and Coating of Tall Antenna Towers

UFGS 09 97 13.26 Coating of Steel Waterfront Structures

UFGS 09 97 13.27 Exterior Coating of Steel Structures

UFGS 09 97 13.28 Protection of Buried Steel Piping and Steel Bulkhead Tie Rods

UFGS 09 97 23.13 Interior Lining For Concrete Storage Tanks (For Petroleum Fuels)

UFGS 09 97 23.16 Linseed Oil Protection of Concrete Surfaces

UFGS 09 97 23 Metallic Type Conductive/Spark Resistant Concrete Floor Finish

UFGS 09 97 30 Preparation of Historic Wood and Metal Surfaces for Painting



Common Inspection Hold Points or Check Points



- Pre-Cleaning
 - SSPC-SP 1
- Surface Preparation
 - SSPC/NACE blast standards
- Primer, Intermediate and Top Coat Application
 - SSPC-PA 1
- Dry Film Thickness
 - SSPC-PA 2
- Cure
 - Solvent rub test, organic coatings
 - ASTM D5402
- Post-Cure Film Integrity
 - Holiday detection
 - NACE SP 0188

Factors Accelerating Deterioration



- Structural design
- Substrate properties
- Materials deficiencies
- Surface preparation deficiencies
- Application deficiencies
- Curing deficiencies

**hover over the underlined items for more details*



Surface Preparation Deficiencies

- Incompatible coatings
- Low quality material
- Error in manufacture
- Expired shelf life
- Wrong coating for the wrong service

Surface Preparation Deficiencies

- Insufficient cleaning level
- Contaminated surfaces
- Profile too low or too high

Application Deficiencies



- Equipment inadequate or not functioning properly
- Ambient conditions outside recommended range
- Mixing, thinning, or straining inadequate
- Film thickness too low or high
- Inadequate induction time, expired pot life and recoat window
- Unskilled applicator

Coating Incompatibilities



- Solvent in topcoat attacks undercoat
- Coating solvent causes bleeding of bituminous product
- Rigid topcoat applied over flexible undercoat
- Water-borne product does not adhere to smooth undercoat

Paints & Coatings in F&I



- Address coatings requirements early in the design process
- Understand the environmental stressors
- Get help with the Specification
 - Selection of Paint
 - Surface Prep
 - Application
 - Inspection
- Adopt a QA/QC program throughout the Build Process
- Create a Sustainment Program that includes Monitoring and Maintenance
- Know where to get help from Service and DOD resources

Where to go for help



CorrDefense.org





This training is provided by the Office of the Secretary Defense (OSD), Corrosion Policy and Oversight Office (CPO)

References



- Corrosion Prevention and Control: A Program Management Guide for Selecting Materials, Spiral 2 (2nd Edition), AMMTIAC, Sept 2006
- Master Painters Institute (MPI)
- NACE
- SSPC
- FICES Report, July 2013