

SECTION 560
SHOP, FIELD, AND MAINTENANCE
PAINTING OF STRUCTURAL STEEL

560-1 Description.

Perform the shop, field, and maintenance painting of structural steel surfaces in accordance with this Section.

560-2 Definitions.

(a) Shop, Field, and Maintenance Painting: The various painting operations which include the surface preparation and the application of paints to structural steel surfaces, whether in the shop or in the field, including all labor, materials and equipment, and extending to the drying and protection of the painted surfaces; also including the protection of property and traffic.

(b) Paint: When used in the general sense, this term includes paints, varnishes, emulsions, bituminous coatings, and other coatings, inorganic as well as organic.

(c) Shop Painting: The painting which is done at the shop or plant before shipment to the site.

(d) Field Painting: The painting of new or rebuilt steel structures at the site of erection, either before or after erection, and the repainting of existing structures where the original paint has been entirely removed to base metal.

(e) Maintenance Painting: The painting of in service structures that have previously been completely painted and require repainting.

560-3 Surfaces Not to be Painted.

(a) Do not paint machine finished surfaces. (Coat machine finished surfaces as provided in 560-11.3.)

(b) Do not paint galvanized surfaces except where painting of such surfaces is specifically required.

(c) Do not paint the areas of contact surfaces of steel to be encased or embedded in concrete, or coated with concrete, unless otherwise specified. However, when steel surfaces are to be painted with an inorganic zinc paint coating system, paint the areas of contact surfaces embedded in concrete or coated in concrete with the inorganic zinc prime coat in accordance with the same requirements as other steel surfaces to be painted with inorganic zinc prime coat. As an exception, surfaces of shear connectors may or may not be painted. When surfaces of shear connectors are painted, the requirements for surface cleaning and minimum film thickness will not apply; however, remove runs, sags and cracks in the paint film.

(d) Keep contact surfaces of members to be joined by high-strength bolts in friction-type joints free of paint, lacquer, or other coatings other than the following:

(1) Hot dip galvanizing, if contact surfaces are scored by wire brushing or blasting, after galvanizing and prior to assembly.

(2) Inorganic zinc rich paints when such paints are specified.

560-4 Storage of Paint.

Do not open containers of paint until required for use. Use any open containers first. In general, open and use the oldest paint of each kind first.

Store all paint and thinner in an area that is well ventilated and is protected from sparks, flame, direct rays of the sun, and excessive heat.

Do not use paint that has livered, gelled, or otherwise deteriorated during storage. The Engineer will accept thixotropic materials that the Contractor can bring to normal consistency by stirring.

In closed or recirculating paint systems where gas under pressure is used over the liquid, use only an inert gas (such as nitrogen) for such purpose.

560-5 Mixing and Thinning.

560-5.1 General: Thoroughly mix all ingredients in any container before use, and repeatedly agitate them during application as necessary to keep the paint in a uniform, homogeneous condition.

The Contractor may mix by hand for containers of up to 5 gallons [20 L]. For larger containers, mix by mechanical methods.

560-5.2 Dry Pigments and Pastes:

(a) Mix in dry pigments that are separately packaged in a manner that thoroughly and uniformly blends the pigments and wets all particles of the dry powder.

(b) Incorporate pastes into the paint in a manner that uniformly blends the pastes and breaks up all lumps and particles to provide a homogeneous solution.

(c) Add a small amount of thinner, vehicle, or paint to tinting pastes or colors and thoroughly mix. Strain the thinned mixture, and then add it to the large container of paint and mix until the paint color is uniform.

(d) Add thinner to the paint only as necessary for proper application. Do not add more than 1 pint [0.13 L] of thinner per gallon [liter] of paint except where the paint is intentionally formulated by the manufacturer for such greater thinning. Use a type of thinner conforming to the paint specification or the manufacturer's instructions.

560-6 Cleaning Surface.

Clean surfaces to be painted in accordance with the Surface Preparation Specifications of SSPC. Protect adjacent surfaces in accordance with 560-7.2.

Remove any oil, grease, soil, dust, or other foreign matter that becomes deposited on the surface after the surface preparation has been completed. In the event that any rusting occurs after the completion of the surface preparation, clean the surfaces again in accordance with SSPC-SP 1.

560-7 Application of Paint.

560-7.1 Methods of Application: Apply paint by the following methods, except where another particular method is specified in the Contract Documents:

(1) Brushing.

(2) Air spraying.

(3) Airless spraying.

(4) Any combination of methods (1), (2), and (3) above.

(5) Use daubers or sheepskins where none of the above methods is practical for proper application to surfaces difficult to access.

(6) Use roller coat application on flat or slightly curved surfaces, blast-cleaned or pickled surfaces, or primed or striped portions of surfaces. Unless specifically authorized by the Department, or unless the paint over such areas is subsequently brushed out, do not use roller coat application to apply primer over hand tool cleaned, or power tool cleaned irregular surfaces such as rivets, bolts, crevices, welds, corners, and edges.

(7) Use dipping or flow coating methods only when specifically authorized by the Department.

560-7.2 Protection of Adjacent Surfaces: Consider wind direction, velocity and geographic location as having a major impact on all cleaning and painting operations. If conditions are such that material is dispersed to areas where vehicles or other property may be damaged, suspend operations until conditions improve enough to permit work without damage. Protect all surfaces not intended to be painted, which are adjacent to, or in close proximity to the surfaces to be painted, during the application of paint. Clean surfaces other than those intended to be painted until all traces of paint have been removed

and the surface has an acceptable appearance. Use all necessary precautions to prevent material from cleaning and painting operations from being dispersed outside the work site.

560-7.3 Weather and Temperature Limitations:

(a) Temperature: Do not apply paint when the temperature of either the steel or the paint is below 40°F [4°C]. As an exception, the Contractor may apply paints which dry solely by the evaporation of the solvent as long as the temperature is not below 35°F [2°C]. Do not apply paint when expecting the surface temperature to drop to 32°F [0°C] before the paint has dried.

With chemically cured coatings, exercise particular care to follow manufacturer's special temperature requirements (usually 55°F [13°C] or above).

(b) Weather Conditions: Do not apply paint in rain, wind, fog, or mist, or when the steel surface temperature is below the dew point, resulting in condensation of moisture. Do not apply paint to wet or damp surfaces unless the paint is of the water thinned type. Do not apply paint on frosted or ice coated surfaces.

(c) Painting Under Cover in Inclement Weather: When paint must be applied in damp or cold weather, paint the steel under cover or otherwise protect and shelter it, or heat the surrounding air and the steel to the specified temperature. Keep such steel under cover or protected until dry or until weather conditions permit its exposure.

(d) Repairing Damaged Areas: Allow all wet paint exposed to freezing, excess humidity, rain, or condensation to dry before removing damaged areas of paint. Prepare the surface again, and repaint it with the same number of coats of paint of the same kind as the undamaged areas.

560-7.4 Striping of Irregular Surfaces: Stripe paint all edges, corners, crevices, rivets, bolts, welds, and sharp edges with the priming paint before the steel receives its first full prime coat of paint. Extend such striping at least 1 inch [25 mm] from the edge. When practicable, allow this stripe coat to dry before applying the prime coat; otherwise allow the stripe coat to set to touch before applying the full prime coat. However, do not allow the stripe coat to dry for a period long enough to allow rusting of the unprimed steel. When desired, the Contractor may apply the stripe coat after a complete prime coat.

560-7.5 Requirements for Individual Coats: To the maximum extent practical, apply each coat of paint as a continuous film, of uniform thickness, free of pores. Repaint all thin spots or areas missed in the application, and allow them to dry before applying the next coat of paint.

560-7.6 Thickness of Coats: Unless specified otherwise by the specification covering the paint or the paint systems, apply the prime coat(s) of paint and the first field coat of primer, when specified, each at least 1.5 and up to 2.25 mils [40 µm and up to 60 µm] thick when dry. Apply each intermediate coat of paint at least 2.0 and up to 2.5 mils [50 µm and up to 65 µm] thick when dry. Do not allow any portion of the paint films to be less than the specified minimum film thicknesses. Ensure that the total minimum film thickness for any combination of coats equals the sum total of the averages of the specified thickness range of the individual coats. Achieve the total minimum film thickness before the application of the finish coat. (vinyls, lacquers, emulsions, and bituminous coatings usually deviate from this thickness. Apply finish coats at the specified thickness for the individual material.)

After application of the first 3 coats of paint on structural steel, the Engineer will thoroughly inspect the surfaces. Obtain the approval of the Engineer before applying the final coat. The Engineer will take film thickness measurements at the approximate rate of one for each 25 ft² [2.25 m²] of area unless deficient thickness is found, in which case the Engineer will increase the rate of sub-measurements as required to determine the extent of the deficient areas. Provide the necessary ladders or scaffolds for making the inspection.

When a paint or coating different than those specified in 560-11 through 560-13 is required, use the thickness specified for the particular paint or coating required in lieu of the thickness requirements stipulated above.

560-7.7 Tinting (For Color Differential): When successive coats of paint of the same color have been specified, sufficiently tint alternate coats of paint, when practical, to produce enough contrast to

indicate complete coverage of the surface. Use a tinting material that is compatible with the paint and not detrimental to its service life.

560-7.8 Recoating: When recoating is required, allow each coat of paint to dry for at least 48 hours before applying the succeeding coat.

560-7.9 Inaccessible Surfaces: Provide steel surfaces, except contact surfaces inaccessible after assembly, with either the full specified paint system or three shop coats of the specified primer before assembly.

560-7.10 Timing Requirements: Immediately following the cleaning of the surface, apply the prime coat and apply succeeding coats before allowing any contamination of the previous coats to occur. In the event that such timing of the application is not possible or is impractical, make any required modifications as approved by the Engineer.

560-8 Specific Requirements for Brush Application.

(a) **Brushes:** Use brushes of a style and quality that will enable proper application of paint. Provide round or oval brushes for rivets, bolts, irregular surfaces, and rough or pitted steel. Use flat brushes, 5 inches [125 mm] wide or less, for large flat areas.

(b) **Painting:** Brush to obtain a smooth coat as nearly uniform in thickness as possible. Work paint into all crevices and corners where possible. Paint surfaces not accessible to brushes by spray or by daubers or sheepskins.

560-9 Specific Requirements for Spray Painting.

560-9.1 General: Perform all spray application of paint, whether air spray, airless, or hot spray, in accordance with 560-7. Also meet the following additional specific requirements for each such type.

560-9.2 Equipment: Use spray equipment suitable for the specific purpose, capable of properly atomizing the paint, and equipped with suitable pressure regulators and gauges.

Keep the spray equipment clean. Completely remove any solvents left in the equipment before use.

560-9.3 Pressure: Adjust the pressure on the material in the pot and of the air at the gun as necessary to maintain optimum spraying effectiveness. Adjust the pressure on the material in the pot, when necessary, for changes in elevation of the gun above the pot. Keep the atomizing air pressure at the gun high enough to properly atomize the paint, but not so high as to cause excessive fogging of paint, excessive evaporation of solvent, or loss by overspray.

560-9.4 Airless (or High-Pressure) Spraying: For this type of spray-painting, meet the following requirements (in addition to those specified above).

(1) Use fluid tips of proper orifice size and fan angle and a fluid control gun of proper construction, as the manufacturer of the material being sprayed and the equipment being used recommends.

(2) Adjust the regulated air pressure to the paint pump so that the paint pressure to the gun is proper for optimum spraying effectiveness. Ensure that this pressure is sufficiently high to properly atomize the paint.

(3) Provide spraying equipment with proper filters in the high pressure line to keep dirt, dry paint, and other foreign materials out of the paint film. Pump paint through the system to completely remove any solvents left in the equipment before applying paint to the surface being painted.

(4) Provide airless paint spray equipment with an electric ground wire in the high pressure line between the gun and the pumping equipment. Ground the pumping equipment to avoid the build-up of any electrostatic charge on the gun.

560-10 Other Types of Application.

The Contractor may use roller application at the locations, and under the provisions, specified in 560-7.1(6). If used, perform roller application in accordance with the recommendations of the

manufacturer of the paint and of the rollers. Use paint rollers of a design and quality which will enable proper application of paint, with the continuity and thickness required in 560-7.5 and 560-7.6.

Refer to the limitations for the use of dip and flow methods specified in 560-7.1(7).

560-11 Shop Painting.

560-11.1 General: Paint all fabricated steel with at least one coat of primer in the shop where such fabrication is done. Apply this paint during or after fabrication and before allowing any damage to the surface to occur from weather or other exposure. If unavoidable exposure occurs which detrimentally affects the condition of the steel, the Department and the fabricator will agree on the procedure to follow. If the shop coat is damaged in fabrication, ensure that it is repaired before leaving the shop. Unless otherwise provided in the plans, use Code Z-C primer for the shop coats as specified in 971-5.

560-11.2 Contact Surfaces and Painting Welds: Paint contact surfaces (or leave them unpainted) as required in 560-3. When painting contact surfaces, apply the first coat required thereunder in the shop. Apply subsequent coats in the field, but while the surfaces are still accessible. Do not apply the finish coat of paint to contact surfaces.

Do not paint surfaces within 2 inches [50 mm] of field welds until after completing welding. Complete all other welding in the shop before applying the shop coat.

Clean shop welds and areas within 2 inches [50 mm] of such welds in the shop before painting, using surface preparation methods at least as effective as those specified for the structure itself. All welds shall either be blast cleaned, power wire brushed, chemically scrubbed, or water scrubbed of all detrimental welding deposits.

560-11.3 Machine Finished Surfaces: Protect machine finished or similar surfaces that should not be painted with a coating of rust inhibitive petrolatum conforming to requirements of Type B, "Medium," of U.S. Maritime Administration Specification 52-MA-602a, "Compounds; Rust Inhibitive," or with other coatings (such as "blue lacquer") that may be more suitable for special conditions.

560-11.4 Markings and Tags: Copy erection marks and weight marks on areas that have been previously painted with the shop coat, or attach markers or tags.

560-12 Field Painting.

560-12.1 General: Apply the following specific provisions to field painting.

560-12.2 Types of Paint: Unless otherwise provided in the plans or herein, apply four coats of paint to all new structural steel and castings. For the first two coats (prime coats), use Code Z-C as specified in 971-5. Unless otherwise shown in the plans or herein, for the third coat (intermediate coat), use Code B-8 as specified in 971-6, and for the fourth coat (finish coat), use Code B-A as specified in 971-7.

560-12.3 Sequence of Painting: Field paint shop-coated steel members after completing erection of such members. The Contractor may field paint steel members on the ground before erection provided he touches up such painting where damaged, with the same number of coats and kinds of paint, after erection, and provided he applies the last complete coat of paint after erection.

560-12.4 Touch Up: Touch up steel that has been shop coated with the same type of paint as used for the shop coat. Include in this touch-up cleaning and painting of field connections, welds or rivets, and bolts, and all damaged or defective paint and rusted areas. Clean areas requiring touch up in the same manner as that required for the paint system specified. The Contractor may clean and apply an overall coat of primer for each shop coat, in place of touch up or spot painting. Apply a touch up of shop coat paint to structural steel, particularly field connections, as it is erected in its permanent position.

560-12.5 Surfaces Not Shop Coated: Clean and prime steel which has not been shop coated before application of intermediate and finish coats and before any damage to the surface from contaminants, weather, or other exposure occurs.

560-12.6 Contact Surfaces: While the surfaces are still accessible, apply all of the required coats except the finish coats to those contact surfaces which require painting under 560-3.

560-12.7 Surfaces Which Will Become Inaccessible: For surfaces, other than contact surfaces, that are accessible before erection but which will not be accessible after erection, apply all field coats of paint before erection.

560-12.8 Cracks and Crevices: Fill all cracks and crevices with paint as far as practicable. Seal off crevices with a caulking compound as the paint manufacturer recommends.

560-12.9 Final Coats and Cleaning: Do not apply the final coat of paint until finishing all concrete work. In addition to the cleaning specified in 560-6, remove all cement or concrete spatter and drippings before applying paint. If concreting or other operations damage any paint, clean and repaint the damaged surface.

560-12.10 Areas of Welds: Clean all welds in accordance with the requirements of 560-11.2.

560-13 Maintenance Painting.

560-13.1 General: In addition to the applicable provisions of 560-11 and 560-12, apply the following provisions to maintenance painting, except as may be otherwise specified in the plans.

560-13.2 Sequence of Painting: Paint (spot paint) all surfaces from which paint and rust have been removed by cleaning with a coat of Code Z-C, as specified in 971-5. After spot painting, apply to all surfaces one full coat of Code B-8, as specified in 971-6, and one finish coat of Code B-A, as specified in 971-7.

While cleaning, remove only loose, cracked, brittle or nonadherent paint, unless otherwise specified. Where the remaining paint is thick, feather all exposed edges. Conduct spot cleaning in a manner which will minimize damage to sound paint. Clean rust spots thoroughly, and scrape the edges of all old paint back to sound material.

Remove paint that curls or lifts after application of the spot or priming paint, and repaint the area.

560-14 Drying of Painted Steel.

Do not apply any coats of paint until the preceding coat has dried. Allow each coat of paint to dry a minimum of 48 hours before applying a succeeding coat of paint.

560-15 Method of Measurement.

The quantities to be paid for will be determined under one of the following conditions:

(a) When no pay item for painting structural steel is included in the proposal, the work specified in this Section will not be paid for directly but will be considered as subsidiary work pertaining to the various items of construction on which paint is applied.

(b) When a pay item for painting structural steel is included in the proposal, the work specified under this Section will be paid for at the Contract lump sum price, or the Contract price per ton [metric ton], for Painting Structural Steel. The quantity will be either (1) the lump sum quantity painted and accepted, or (2) the plan quantity, in tons [metric tons] of structural steel, actually painted and accepted.

560-16 Basis of Payment.

When no item for painting structural steel is included in the proposal, the work specified in this Section will be included in the payment for the applicable items under Section 460.

When an item for painting structural steel is included in the proposal, price and payment will be full compensation for all work specified in this Section, including painting of all ferrous metals and machinery and castings.

Payment will be made under:

Item No.	560- 1-	Painting Structural Steel - lump sum.
Item No.	2560- 1-	Painting Structural Steel - lump sum.
Item No.	560- 2-	Painting Structural Steel - per ton.

Item No. 2560- 2- Painting Structural Steel - per metric ton.