

SUPPLEMENTAL SPECIFICATION

SECTION 513 - PROTECTIVE COATINGS

513.01, DESCRIPTION. Work under this item shall consist of preparing surfaces to receive protective coatings, containment and environmental protection as well as application of the protective coatings specified in the Contract or directed by the Engineer.

513.02, MATERIALS.

- (a) General. The Contractor may select any one of the approved systems listed under the appropriate category for application; however, components from one system may not be intermixed with components from another system. The approved systems are listed on a Qualified Products List (QPL) kept at the Agency's Materials and Research Laboratory.

Regardless of the paint system selected, the Contractor shall provide the Engineer with one copy each of all "product data sheets" published by the coating manufacturer for each and every coating applied, to be retained with the project records.

A yearly Type A certification from each manufacturer shall be submitted to the Materials and Research Laboratory, in accordance with subsection 700.02.

When specified in the Contract or required by the Engineer, the manufacturer shall submit certified test results for each batch of material supplied.

Intermediate coats shall be a contrasting color. The color of the final coat shall be green unless otherwise specified in the contract or directed by the Engineer. Colors shall conform to federal standard No. 595:

<u>COLOR</u>	<u>COLOR CHIP NO.</u>
Green	14062
Black	27038
Brown	20059

Primer coatings shall be applied to all bare metal surfaces. Faying surfaces for both new and shop rehabilitated steel connections shall receive a primer coating that will remain in the assembled connection. Tops of beams or other areas designated to be in contact with concrete shall receive a thin coating [less than 0.038 mm (1.5 mils)] of primer.

Unless otherwise specified, all coatings covered under sections (b) and (c) shall be shop applied. Intermediate and top coats shall be staggered a minimum of 12 mm (1/2 inches) from the faying surfaces and each other.

Shop applied systems may have isolated areas where the coatings were damaged during shipping or erection and will have areas around faying surfaces that may need field applied primer, intermediate and top coatings. The Contractor shall collaborate with the manufacturer of the coating system used in the shop to determine if the same system will be acceptable for the field conditions that are expected to be encountered or if the manufacturer recommends adjustments for field applications of specific coatings. The Contractor shall submit, in writing, any recommended adjustments in the coating system to the Engineer for approval. Any coating system to be used for field application on shop

applied coating systems must be approved by the Engineer prior to application.

- 1) Minimum Time Between Coatings. The minimum time between application of additional coatings is referenced in the Qualified Products List. Each coating system will have a different cure time for recoat applications dependent on temperature (both ambient & steel surface temperatures) and the thickness of the applied coating. Reference must be made to the manufacturer's instructions and charts for time frame adjustments to accommodate temperatures above and below 24°C (75° F) for each specific coating.
 - 2) Minimum Application Temperatures. The minimum application temperatures apply to the ambient temperature, the steel surface temperature and the temperature of the liquid coating being applied. Application of protective coatings shall be terminated whenever the temperature of the steel, temperature of the coating or ambient temperature have lowered to 10°C (50 °F). Application of any coating at temperatures less than 10°C (50°F) will require prior written authorization from the Engineer.
- (b) Shop Applied Paint Systems for New Steel. For shop applied painting of new steel, a coating system shall be selected from the Qualified Products List.

All coatings shall be applied within the dry film thickness limits specified and in no case shall the zinc primer exceed the specified thickness within the areas of faying contact surfaces (bolted joint connections).

On bolted connections, zinc primers within their specified thicknesses shall meet the Class B slip coefficient value of not less than 0.50 as specified by AASHTO.

- (c) Shop Applied Paint Systems for Rehabilitated Steel. For shop applied painting of rehabilitated steel, a coating system shall be selected from the Qualified Products List.

Unless otherwise specified, all steel being rehabilitated in a shop shall be cleaned to SSPC-SP6 to permit complete overall coverage by a new protective coating system.

- (d) Field Applied Paint Systems. Materials covered under this section are intended for application to structural components being rehabilitated.

Field applied protective coatings to rehabilitated steel shall be a system selected from the Qualified Products List for recoating old steel with a new paint system or for a primer coating of bare steel with overall grease coating. Coating systems in the Qualified Products List are designed for protecting weathered steel, weathered galvanizing or for upgrading old, deteriorated coatings by application over materials such as lead pigments, basic lead silico-chromates, inorganic zincs, alkyd resins, or aluminum paints.

Prior to selecting a paint system, the Contractor shall perform a patch test to verify its compatibility with the existing coating. Patch tests shall be performed by applying a sample of the primer and the intermediate coating of the system selected to 0.09 m² (1 square foot) areas on the existing coating.

The basis for compatibility of the two systems will be:

- (1) There is no wrinkling or lifting of the existing coating within a 24 hour period, and
- (2) A satisfactory adhesion test in accordance with ASTM D3359, Method A, is performed between 24 and 48 hours (water-based zincs may take two weeks to fully cure), and
- (3) Observance and acceptance of the test and its results by the Engineer.

For field applications where only selected areas of an existing system are to be cleaned to bare steel, application of the new coating system shall include:

- (1) Coating of primer on all areas cleaned to bare steel.
- (2) An overall intermediate coating applied to the entire surface being coated.
- (3) An overall top coating applied to the entire surface being coated.

New structural steel components necessary for rehabilitating an existing structure covered under this section shall be shop painted with a system from the Qualified Products List.

Intermediate and top coats necessary for completing areas around faying surfaces shall be with a system selected from the Qualified Products List which is compatible with the coating being covered and the field conditions which exist.

- (e) Grease Rustproofing Compound. Grease rustproofing compound shall be a soft film type material made from petroleum combined with special additives to enhance its moisture displacing capabilities. It shall contain effective rust inhibitors and conform to the following:

Appearance (color)	Brown Green
Flash, COC, °C(°F) min.	66°C 150°F)
Undist. (D-217)	280 (+ 30 units)
Melting Point °C(°F) min.	63°C (145°F)
Thinner, % by Wt. max	20
Kg/L (Lbs./gal.) at 16°C (60°F) min.	0.84 (7.00)
Approx. NLGI Grease Grade	No. 2 before solvent evaporation and No. 5 after solvent evaporation.

513.03, PROTECTION

- (a) General: The Contractor shall contact the appropriate regulating agencies to ascertain the current requirements in order to comply with all federal, state and local air, ground and water pollution control regulations and all worker health and safety requirements.

During cleaning and painting operations, the Contractor shall take necessary precautions to fully protect the environment, the workers, traffic, parked vehicles, adjacent property, and other portions of the structure on which the operations are being performed, from damage by

cleaning debris, blast cleaning materials, dirt, dust, equipment, oils, solvents, acids, burning matter and paint drift, drops, spray or spatter.

The Contractor shall protect and maintain the painted surfaces until acceptance of the project.

The Contractor shall make the decontamination facilities on the project available for use by Agency personnel and other Agency representatives assigned to the project.

The furnishing of protective equipment and clothing and cleaning of clothing for Agency personnel will not be the responsibility of the Contractor.

(b) Containment and Environmental Protection.

Structures designated for rehabilitation painting may presently have one or more coats of paint containing lead that may be classified as a hazardous waste when removed. The following requirements are intended to ensure that existing paint being removed, and any abrasive or other material used to accomplish the removal, will be contained and disposed of properly.

The surface preparation (paint removal) options allowed under this specification are described in subsection 513.04(b).

All waste material generated from surface preparation options 1, 2 & 4 shall be disposed of as hazardous waste regardless of its leachate test value. The lead abatement abrasive material described under option 3 is considered the only acceptable technique that will render waste material acceptable for landfill disposal or recycling.

The Contractor shall use whatever means necessary to prevent new pollution of the environment (air, soil and water) in the project area and to prevent aggravating any pre-existing pollution that may be present in the project area. The Contractor will not be held responsible for the abatement of any pre-existing conditions unless specified otherwise.

- 1) Containment Proposal Requirements. At least ten working days prior to starting the surface preparation and/or painting of structures, the Contractor or Fabricator of shop rehabilitated steel shall submit a proposal for containment and environmental protection measures in writing for review and acceptance of the Director of Construction and Maintenance. The proposal shall be sufficiently detailed to show that conformance with the requirements specified herein or elsewhere in the contract will be achieved.

The containment proposal shall, as a minimum, include the following information:

1. Name of firm responsible for surface preparation.
2. Name of individual responsible and accountable for the surface preparation activities and the storage and disposal of waste material.
3. Name and telephone number of individual(s) to contact during non-working periods.

4. Beginning date and anticipated completion date of surface preparation activities.
5. Names of individuals who will perform the surface preparation and related activities.
6. Types of equipment to be used for surface preparation and related activities.
7. Details of how paint chips, dust, abrasive particles or related debris will be contained.
8. Types of containers that will be used to store any solids or waste material.
9. Location(s) where containers of waste material will be stored prior to disposal.
10. Method for protecting the containers against vandalism.
11. Name of organization that will be responsible for transporting waste material.
12. Expected final destination of the waste material.
13. The proposal shall include a Hazardous Waste Management Plan in compliance with Vermont Agency of Natural Resources (ANR) requirements.

When the selected method of surface preparation is expected to result in the dispersion of paint chips, abrasive particles or related debris, the containment proposal shall include, as a minimum, the following information:

14. Plan and elevation views of the containment system.
15. The commercial brand name, description and dimensions of material to be used for vertical curtains.
16. The method and materials to be used to retain or anchor the vertical curtains, both top and bottom, and the means of reinforcing the curtains to prevent billowing or displacement due to wind loads.
17. The commercial brand name, description and dimensions of the material to be used for ground cloths.
18. When a temporary platform is used, the description shall include the type, size and method of support.
19. The commercial brand name, description, dimensions and location of skimming booms to be placed in waterways.
20. The information and details to verify that the proposed containment system will not create an overstressed condition or otherwise induce undesirable effects on the structure. In the event that the containment system could induce a significant increase in dead load or wind load to the structure, a loading analysis performed and stamped by a registered professional engineer shall be provided as part of

the required information.

Acceptance by the Director of Construction and Maintenance of the containment proposal shall in no way relieve the Contractor of any responsibility to perform additional work or otherwise modify the containment procedure to ensure compliance with all applicable laws and regulations.

- 2) Blast Cleaning Containment Requirements. When abrasive blast cleaning is the selected method of preparing steel surfaces, the Contractor shall contain the paint chips, abrasive particles, and debris resulting from the operation by means of totally enclosing the portion(s) of the structure being cleaned with tarpaulins or other approved containment screens. The materials used for vertical curtains shall be designed specifically for the purpose of containing and facilitating collection of blasting and painting debris. If woven screens are used, the material shall contain not more than 15% voids with a mesh opening not exceeding 0.5 mm (20 mils).

All materials used for vertical curtains shall be adequately reinforced to prevent tearing or displacement when subjected to wind loads and related conditions. The reinforcement shall include belt webbing and rings along the perimeter and at internal points for the purpose of tying down the curtains.

The enclosure shall extend from the bottom of the deck down to the ground level or to the level of a temporary work platform and shall be fastened securely to prevent lifting or opening. Seams and laps between tarpaulins or screens shall be clamped together along the length of the seams or laps to prevent material from escaping the enclosed area. Auxiliary lighting shall be made available and used to improve visibility where necessary within the enclosure.

Enclosures for truss type members shall extend above and/or below the deck to prevent material from escaping during surface preparation and application of protective coatings. The scope of encapsulating members will depend on the size and type of the truss as well as the equipment and procedures selected to perform the work.

Where a temporary work platform is not used, tarpaulins or ground cloths composed of an air-tight material shall be placed under the enclosed area and shall extend at least ten feet beyond the enclosure ends (but shall not be extended into a lane open to traffic). These ground cloths shall be continuous within the enclosure with all seams or laps sealed and shall be used to collect all the spent materials, dust or debris that settles to the ground.

If the wind velocity is too high to effectively contain the blast debris within the enclosure, the Contractor shall suspend blast cleaning operations.

The Contractor shall take whatever measures are necessary to prevent the release of dust or spent material from the ground tarpaulins and

other components of the containment enclosure during its moving or removal.

Debris collected on temporary work platforms or ground cloths shall be removed each work day with a vacuum system equipped with high-efficiency particulate air (HEPA) filters adequately sized to collect all spent material.

Where bridges extend over waterways, the Contractor shall contain all debris and waste materials as described herein and shall also provide a temporary platform located directly underneath the area enclosed for surface preparation cleaning, power tool cleaning, or blast cleaning and paint application. The platform shall be adequately sized to contain and/or filter debris, wash water and paint during cleaning or application operations. The containment enclosure shall extend down to the level of the platform and shall be secured to prevent release other than filtered material. The surface of the platform shall be constructed to ensure collection and filtration of spent waste materials or shall be designed to collect, funnel and discharge the spent waste materials into waste containers.

The Contractor shall provide a floating boom across the waterway on the downstream and/or down-wind side of the work area. In still water locations the boom shall be on site and ready for immediate deployment in the event of an accident or as directed by the Engineer. The float shall consist of a mesh bag filled with expanded polystyrene beads or a similar material, which will collect floating waste that might escape from the containment enclosure. The boom shall be emptied or cleaned at the end of each working day, or more frequently if necessary, to prevent the loss of collected residue.

When the work involves bridges located over navigable waterways, the location of platforms, scaffolding, floating booms or other equipment shall not interfere with navigation.

Prior to commencing work at each bridge site, the Contractor may request the approval and use of other methods or modifications for ground and waterway protection that will accomplish or exceed the results required by this specification. The suggested modifications must be submitted in writing to the Engineer for approval.

The containment system must be properly maintained while work is in progress and shall not deviate from the approved working drawings without prior approval of the Engineer. If, at any time during execution of the work, the containment system fails to function properly, the Contractor shall immediately suspend operations until modifications can be made to correct the problem(s).

- 3) Lead Abatement Abrasive Additive. The Contractor is encouraged to use recyclable abrasives to reduce the volume of hazardous waste generated during blasting operations.

On structures where non-reclaimable abrasives such as coal slag are selected for use to prepare the steel, the Contractor may be required to use an abrasive additive which will render the lead contaminated abrasive debris immobile and safe for landfill disposal or recycling.

The selected blast abrasive shall include a pre-blended chemical additive known as BLASTOX TM III/BLEND or approved equal.

- 4) Collection, Storage and Disposal of Waste Residue. All waste residue collected during the surface preparation process shall be stored at the site in approved gondolas, roll-off boxes or barrels. The waste containers shall be stored in an approved area and shall be protected at all times with waterproof covers. Waste residues collected and stored in the waste containers may be sampled and tested by the Agency in accordance with the Environmental Protection Agency's Toxic Characteristic Leachate Procedure (TCLP) test. The test results will characterize the waste residue as a hazardous or non-hazardous material and the Contractor shall appropriately dispose of the blast residue.

It shall be the Contractor's responsibility to provide documentation to the Engineer that all hazardous waste was disposed of in conformance with all applicable regulations governing the disposal of such materials.

Acceptable documentation shall consist of truck manifests, way-bills, and other information necessary to clearly document the final disposal method, site used and the quantity of material so disposed.

The Contractor shall be responsible for all costs related to the disposal of waste residues generated on the project.

(c) Worker Health and Protection

- 1) Lead Health and Safety Plan. When work involves disruption of lead paint on structures, the Contractor and/or Fabricator, as applicable, shall comply with the Interim Standard for Lead Exposure in Construction, 29 CFR 1926.62 and any other applicable regulations.

The Contractor shall submit a copy of their proposed Lead Health and Safety Plan (LHASP) to the Director of Construction and Maintenance for review at least ten (10) working days prior to beginning any work involving lead paint. The Contractor is fully responsible for their LHASP and its implementation. The VAOT will only monitor the activities.

The LHASP must include, but is not limited to:

1. General Instructions
2. Lead Health and Safety Organization and Responsibilities
3. Exposure Monitoring for Lead and Other Known Hazards. This shall include, but not be limited to, monitoring Air and Soil Contamination Air Monitoring and analysis shall be performed in accordance with National Institute for Occupational Safety

and Health (NIOSH) methods.

4. Engineering and Administrative Controls
 5. Respiratory Protection
 6. Protective Work Clothing and Equipment
 7. Hygiene Facilities and Practices
 8. Housekeeping
 9. Medical Surveillance Program, including Medical Removal Protection and Appropriate Worker Notification Procedures
 10. Decontamination Procedures
 - a. All projects with work activities that involve lead abatement must provide workers with hand wash facilities, separate clean areas for eating and for changing clothing.
 - b. Projects that involve any form of blast cleaning shall provide shower facilities that have clean room and dirty room units connected by a pre-engineered air lock, facilities for cleaning and maintenance inspection and issuing of respirators.
 - c. Hand wash facilities shall be self contained and allow the workers to wash both hands and face at the same time. All facilities shall provide hot and cold running water and storage containment of contaminated wastewater.
 11. Employee Information and Training Procedures
 12. Record Keeping - The Contractor is responsible for maintaining records related to all activities associated with Health and Safety for the project.
2. Worker Protection Program. The Contractor is required to implement a workers' protection program to prevent lead contamination and poisoning of employees performing the work. The program shall meet the requirements of OSHA Construction Industry Standard 29 CFR 1926. Specific points shall include the following requirements when the method of paint removal exposes employees to airborne concentrations of lead:
- a) Training: The Contractor shall inform employees assigned work tasks that may result in exposure to lead of the hazards involved by training these employees in the precautions to take when working around it. The training shall include but not be limited to the proper work practices, personal hygiene procedures, and the use and limitations of protective equipment such as eye and face protection, head protection, coveralls and respirators.

Prior to beginning work, the Contractor shall provide the Engineer with a certification identifying the names of every person who will perform removal or application activities

including the training each has received and the date(s) of that training and certifying that all persons identified have been properly trained and instructed in the above functions.

- b) Medical Monitoring: The Contractor shall provide the Resident Engineer a written record of each and every employee involved in tasks posing exposure risks to airborne lead particulate or vapor within their work site. These tasks include, but are not limited to, welding, flame cutting, abrasive blasting, abrasive blast debris cleanup, power tool cleaning and paint removal debris cleanup.

The designated employees shall be included in a blood level medical surveillance program that includes pre-project employment testing, exit testing and intermediate testing as deemed necessary, based upon work task exposure and their prior blood level.

Workers with pre-project employment blood levels exceeding 30 micrograms per 100 grams of whole blood (30 ug/100 g) shall immediately have another blood level test performed for verification. Workers so confirmed shall be monitored monthly until their level drops below 30 ug/100 g. Workers with pre-project employment blood lead levels greater than 50 ug/100 g shall be prohibited from working on tasks that may expose them to lead particles or vapors.

Should an employee's blood level test result equal or exceed 50 ug/100 g, the employee shall immediately be removed, under medical protection, from any work activity having an exposure to lead and not returned to any work activity having an exposure to lead until test results indicate that their blood lead level has dropped below 40 ug/100 g.

Upon completion of work activities under this Contract, where an employee was exposed to lead particles, the Contractor shall have the employee retested for his exit blood lead level.

The Contractor shall provide the Resident Engineer copies of all medical surveillance test results as soon as they are available.

The Contractor shall inform State personnel assigned to the project of the methods and procedures the Contractor selects for removing and cleaning any existing coating material or for application of any new coating system. This will allow the Agency to determine the degree of protective equipment required to protect the Agency's personnel.

- c) Respiratory Protection: The respiratory protection shall conform to all procedures stated in OSHA General Industry Standard 29 CFR 1910.134, Respiratory Protection.

- d) Medical Monitoring: The Contractor shall provide the Resident Engineer a written record of each and every employee involved in tasks posing exposure risks to airborne lead particulate or vapor within their work site. These tasks include, but are not limited to, welding, flame cutting, abrasive blasting, abrasive blast debris cleanup, power tool cleaning and paint removal debris cleanup.
- e) Protective Equipment: Employees who are potentially exposed to lead shall be provided clean, dry, protective work clothing and equipment, and appropriate changing facilities. Appropriate protective work clothing and equipment may include coveralls or similar full body work clothing, gloves, hats, shoes or disposable shoe coverlets, face shields or vented goggles and, if applicable, blasting helmets.

Contaminated clothing that needs to be cleaned, laundered or disposed of shall be placed in closed containers. Persons responsible for handling contaminated clothing shall be informed of the potential hazards. Lead shall not be removed from protective clothing or equipment by any means that increase lead in the work area, such as brushing, shaking, blowing, or using a regular vacuum cleaner. Workers shall not be allowed to leave the work site wearing lead contaminated clothing and equipment.

513.04, SURFACE PREPARATION.

(a) General

All compressed air sources shall have oil and moisture separators to allow delivered air at the nozzle to be free of oil and moisture. The tanks on the air compressor and moisture separator shall be drained at the end of each working day. Prior to abrasive blast cleaning, the Contractor shall demonstrate to the Engineer that the air is moisture free.

On the majority of Vermont bridges, beam ends have been treated with a grease protective coating.

Prior to performing any surface preparation by power tools or blast cleaning, the surfaces to be coated shall be cleaned of all visible foreign matter. Areas such as beam ends, which had previously received applications of grease rustproofing compounds, shall be cleaned with scrapers or similar hand tools. The remaining grease, oil and foreign matter shall be removed by solvent or steam cleaning and rinsing in accordance with the provisions of SSPC-SP1 - "Surface Preparation Specification No. 1".

Prior to application of any protective coating, surfaces visibly contaminated with foreign material shall be cleaned by the specific methods described in the latest edition of SSPC - SP1. High pressure water wash will be allowed providing the pressure is between 17.2 MPa and 20.7 MPa (2500 and 3000 psi) and the type of nozzle, its distance from the surface and the angle of blast prove to effectively clean the surface to a sound substrate.

Any remaining contaminants shall be removed by an appropriate procedure covered under SSPC-SP1. The method selected and the results obtained must be compatible with the coating system selected

for application and, prior to implementation, accepted in writing by the manufacturer of the selected coating.

Any rust, mill scale, paint or other debris dislodged under a cleaning process conforming to SSPC-SP1 shall be contained or filtered by an approved procedure under the same guidelines referenced herein for other methods of cleaning. Wash water may be filtered through a woven screen material containing not more than 15% voids with a mesh opening not exceeding 0.5 mm (20 mils). No restrictions will be imposed on disposal of water passing through a woven screen meeting the above requirements.

Unless otherwise stated, the surface roughness (profile) shall be within the range of 0.025 to 0.114 mm (1.0 to 4.5 mils). If the prepared surface exceeds the maximum limits, the surface may either be reworked to produce a profile within the specified limits or additional primer may be used to provide a minimum coverage thickness of 0.025 mm (1.0 mils) greater than the maximum measured profile. In addition to meeting the specified profile height limits, the profile texture must be sharp enough to meet any specific requirements for the coating system selected (e.g. some systems will not permit application of their primer over a shot blast prepared surface).

Final surface appearance of rehabilitated or reconditioned steel when the surface is cleaned to a bare steel condition shall be equivalent to either surface preparation grade SSPC-SP6 (commercial blast cleaning) or SSPC-SP11 (power tool cleaning to bare metal).

Surface preparation shall not be performed when the relative humidity is above 85%, when rain is falling, or when the surface temperature of the steel is less than -15°C (5°F) above the dew point temperature as determined by a psychrometer and surface thermometer.

Surface preparation using blast cleaning shall be performed within an enclosure approved under the proposal for Containment and Environmental Protection described in subsection 513.03(b).

The Contractor shall remove any additional surface contamination that may occur after initial surface preparation prior to the application of each coating.

(b) Preparation Methods. Unless otherwise specified, the Contractor may select one of the following surface preparation options:

- 1) Power and/or hand tool cleaning in conformance with SSPC-SP2, SP3 or SP11. All power tools shall be equipped with a functional vacuum recovery system.
- 2) Blast cleaning using recyclable abrasive in conformance with SPCC- SP6, SP7 or SP10.
- 3) Blast cleaning using lead abatement abrasive material described in subsection 513.03 (b) 3 in conformance with SSPC-SP6, SP7 or SP10.
- 4) Non reclaimable abrasives, subject to total containment, in conformance with SSPC - SP6, SP7 or SP10.

Approval of option 3 will be contingent on the ability of the Contractor to execute an agreement with the manufacturer of the lead abatement abrasive additive to recycle the blast residue in compliance with EPA RCRA beneficial reuse regulations.

Approval of option 4 will, in general, be limited since it is the Agency's intent to reduce the volume of hazardous waste during blasting operations.

- (c) Testing Equipment. The Contractor shall provide, for the use of Agency inspectors the equipment as specified in Section 631.09 of the Special Provisions, Testing Equipment - Protective Coatings.
- (d) Fabrication Facility or Shop Environment. A shop type environment will be considered an enclosed area that is protected from weather and can be climatically controlled.

The cleaned surface shall meet inspection requirements of the applicable SSPC specification and the approval of the Engineer prior to application of any protective coating as follows:

1. Shop Preparation For New Steel: Final surface appearance of new steel, prior to application of any primer, shall be at least equivalent to a "near white" surface preparation grade SSPC-SP10 (ASTM D2200 grade Sa 2-1/2). The surface roughness (profile) shall be within the range of 0.038 mm to 0.064 mm (1.5 to 2.5 mils).
2. Shop Preparation For Rehabilitated or Reconditioned Steel: Final surface appearance of rehabilitated or reconditioned steel, prior to application of any primer, shall be a "commercial blast" cleaning at least equivalent to surface preparation grade SSPC-SP6. The surface roughness (profile) shall be within the range of 0.038 mm to 0.076 mm (1.5 to 3.0 mils).
3. Surfaces to be Painted: Surfaces may be blast cleaned either before or after fabrication. All welds and areas within 50 mm (2 inches) of a weld shall be blast cleaned after fabrication.

The maximum time lapse between surface preparation and application of a prime coat shall not be greater than eight hours. Should any "rust back" occur prior to application of a prime coat, the surface shall be recleaned to the "near white" or "commercial blast" condition specified.

All fins, tears, slivers and burrs on steel members that are to be painted, or that appear during the blasting operation, shall be removed by grinding and the area reblasted to achieve the required surface profile.

- (e) Field Environment.

Field Preparation for Rehabilitated or Reconditioned Steel: Unless the Contract specifies otherwise, 100% of all existing coatings will be removed.

When a portion of the existing coating is to remain, the approximate

amount of removal required on each beam and any support members will be detailed in the Plans. Partial removal shall consist of removing rust, mill scale, and any non-tightly adhered or excessively thick or inflexible existing coatings. Areas that have non-tightly adhered primer shall be cleaned to bare steel. Areas that have non-tightly adhered intermediate or top coatings shall be cleaned to the layer of coating that is tightly adhered. Following surface cleaning under SSPC-SP1, any intermediate or top coatings of the existing system that are not tightly adhered shall be removed following any of the surface preparation procedures outlined under SSPC-SP3 (power tool cleaning) or SSPC-SP7 (brush-off blast cleaning).

Unless otherwise specified, total removal of existing coatings will be required for a minimum distance of 0.9 m (3 feet) from both ends of all beams.

The Engineer shall determine the acceptability or integrity of any paint to remain.

- (f) Weathered Galvanized Surfaces. Unless these preparation procedures conflict with the coating manufacturer's recommendations, galvanized surfaces to be coated with additional protective coatings listed in the Qualified Products List shall be prepared according to the following directions.

Prior to application of any coating over a surface that has been hot-dipped galvanized, surface preparation may be either:

1. Blast cleaning the surface to a preparation grade equivalent to SSPC-SP7.
2. Treating the surface with a solution of 57 g (2 ounce) each of copper chloride, copper nitrate and sal ammoniac dissolved in 3.78 l (1 gallon) of soft water to which 57 g (2 ounce) of commercial muriatic acid is then added. The solution shall be mixed in an earthen or glass vessel (never tin or metallic). The solution shall be applied with a wide flat brush. The galvanized surface will assume a dark (almost black) color and when dried will become a grayish film. The protective coating shall be applied without removing the film.

513.05, SEASONAL LIMITATIONS.

Field application of any paint system between October 15th and May 1st must be authorized in writing by the Engineer.

Unless designated herein or authorized in writing by the Engineer (at the recommendation of the manufacturer), paint shall not be field applied:

1. When the surface to be coated is damp, frosted or has condensation.
2. When the surface temperature exceeds 38°C (100°F).
3. When conditions are otherwise unsatisfactory for the work.
4. When the surface temperature is less than -15 °C (5°F) above the Dew Point.

513.06, APPLICATION

- (a) General. Painting shall be done in a neat, professional manner. Each coat shall be smoothly and uniformly spread.

The Contractor shall select a coating system that will be tolerant of the seasonal conditions under which it will be applied. The Engineer will verify that the manufacturer endorses application of any particular coating below the 10°C (50°F) temperature restriction set forth in subsection 513.02 - Materials Subsection (a) paragraph 2 - Minimum Application Temperatures.

The Fabricator or Contractor applying the protective coating shall be responsible to ensure that personnel performing the work are properly trained and adequately protected for applying the selected system without detrimental health effects. Prior to application of any protective coating the Contractor or Fabricator shall arrange to have a qualified technical advisor employed by the coating manufacturer instruct involved personnel in the proper procedures for mixing, application and health protection for the system being applied.

All systems shall be mixed and applied in accordance with the Manufacturer's recommendations. Unless otherwise recommended by the Manufacturer, coating components shall be mixed with a high shear mixer (such as Jiffy Mixer) in accordance with directions to a smooth, lump-free consistency. Paddle mixers or paint shakers will not be permitted. During application, the paint shall be continuously agitated by a method that will insure a homogeneous consistency.

When a two or three component system is selected for application, each component shall be thoroughly mixed prior to combining them together. Components shall be combined at the ratios specified using suitable measuring devices to ensure accuracy and agitated to a smooth uniform consistency. The volume of each batch mixed should not exceed the pot life (adjusted for ambient temperature) available for the anticipated time of application.

Each coat shall be thoroughly dry and approved by the Engineer prior to beginning application of any subsequent coatings.

Areas cleaned to bare steel must be primed within eight hours of surface preparation.

Each coating shall be applied to produce a smooth, uniform, and even coating including all corners, edges and crevices. During application, coatings shall exhibit no running, streaking, sagging, wrinkling, topcoat color variations, gloss variation or other film defects.

Any coating that is improperly applied, or which results in an unsatisfactory application, shall be removed and the affected surface thoroughly cleaned to bare steel and recoated at no additional cost to the Agency. Coating applications which are affected or damaged due to erection of steel or concrete placement shall be repaired at no cost to the Agency.

Unless otherwise designated on the Plans or in the Contract or authorized by the Engineer in writing, all surfaces to be coated

shall receive the number of coats specified for the coating system selected.

- (b) Shop Application. Applications in an enclosed environment (fabrication plant, shop or enclosed area where vapors, spray, temperature and humidity can be controlled) may be by spray, brush or roller.

If at any time during execution of the work the enclosure system fails to properly contain paint particles, the Contractor shall immediately suspend painting operations until modifications can effectively correct the problem(s).

For shop applied systems, the edges of plates and other shapes with sharp discontinuities shall be striped with an initial coating applied prior to the application of the overall coating. Strict attention must be paid to the recoat times of all applied materials when coating these discontinuities. Bolted connections shall also have all bolt heads and nuts striped in a circular motion following the same procedure. For rehabilitation applications, striping of the edges of plates, other shapes, bolt heads or nuts will not be required if the method of application provides adequate coverage (thickness) on the edges.

Surfaces which will be inaccessible after erection shall be coated prior to erection with all the coats specified for the system used.

- (c) Field Application. All field connections for new or shop rehabilitated steel members, whether bolted or welded, shall be satisfactorily cleaned and coated with the same system applied to the overall structure unless otherwise authorized by the Engineer as set forth in 513.02(a).

For field applied systems, the edges of plates and other shapes with sharp discontinuities shall be striped with an initial coating applied prior to application of the overall coatings.

The first field coat shall not be applied until the erection work including all riveting, bolting, welding, and straightening of bent metal is completed.

No field coats shall be applied until adjoining concrete work has been completed and forms removed. Whenever concrete operations have damaged or covered the shop paint, the surface shall be cleaned and repainted.

When the steel has been erected and conditions are favorable, the surfaces where shop applied paint has been damaged or is defective shall be cleaned and repainted. Each damaged coat shall be repainted with the same system applied to the overall structure.

All costs relative to cleaning, furnishing and application of repaired coatings and other incidentals necessary for this work shall be solely at the Contractor's expense.

Applications of protective coatings in an open field environment (open area where vapors, spray, temperature and humidity are not controlled) shall be limited to brush or roller. Spray application

for difficult and/or inaccessible areas may be considered under these conditions providing an acceptable proposal is authorized in writing by the Engineer.

Spray applications will be permitted when applied within an enclosed area that will meet environmental regulations, provided temperature and humidity requirements are met for the coating system being applied and it is approved under the proposal for Containment and Environmental Protection described in subsection 513.03(b). Woven screens will be permitted for an enclosure providing the material contains not more than 15% voids with a mesh opening not exceeding 0.5 mm (20 mils) and it creates an environment acceptable for the coating system being applied.

The Contractor shall provide all necessary dust control with water or calcium chloride, and take whatever precautions are necessary to insure that any dust and dirt resulting from contract operations do not come in contact with the freshly painted surfaces or surfaces to be painted. Painting will only be allowed by the Engineer when surface conditions are dust free.

In field applications the Contractor shall use inorganic primers only when 100% removal of an existing coating system has been required.

At the completion of the work, the Contractor shall stencil (in contrasting colors) the date of painting on the inside of a fascia beam near each abutment of the bridge. The letters shall be 50 mm (2 inch) in height, and shall consist of the word "PAINTED" followed by the month and year of completion of the painting. (EXAMPLE: PAINTED 9/92).

(d) Grease Coating

1. General. A coat of grease rustproofing compound shall be uniformly applied by brush or spray at an approximate rate of 1.86 m² per 3.785 l (20 square feet per gallon) after the final coat of paint has fully cured. A fully cured condition has occurred when a thumbnail driven into the coating surface does not leave an impression and when a thumb firmly pushed against the surface and twisted does not disturb the coating.

Unless otherwise specified in the Contract, the length of beams or girders to be grease coated (at the ends) shall be equal to the end depth of the member [e.g., a 1.2 m (4 feet) deep girder shall be coated from its end to a length of 1.2 m (4 feet) from the point of bearing] and shall include all exposed surface areas of attachments or members within this distance.

Surfaces adjacent to areas being grease coated shall be protected against over-spray. Non-metallic and stainless steel surfaces shall not be coated.

Unless otherwise designated, the color of the grease coating shall be green on painted steel and brown on weathered steel.

2. Grease Used As An Overall Protective Coating. When specified in the Contract or directed by the Engineer, a grease coating shall be applied as an overall protective coating.

The entire area to be protected shall be cleaned in accordance with Section 513.04(a).

Areas cleaned to bare steel shall be coated with a primer selected from the Qualified Products List.

When the primer has thoroughly dried, the entire surface shall be uniformly covered with a coat of grease rustproofing compound 3.785 l/1.9 m² (1 gallon/ 20 square feet).

The color of the grease coating shall be the color of the final paint coat.

- (e) Weathered Galvanized Surfaces. When specified in the Contract, areas to receive paint shall be cleaned in accordance with Section 513.04 (e) and coated with a system listed in the Qualified Products List.
- (f) New Galvanized Surface. All steel requiring coating after it has been hot dip galvanized shall be coated by the galvanizer in his own plant within twelve (12) hours after galvanizing.

All surfaces of the galvanized steel shall have all nibs, protrusions and sharp points of zinc resulting from the galvanizing process removed before proceeding with the coating operations.

All surfaces to be coated shall have oils, grease, dirt and other contaminants removed by solvent cleaning in accordance with SSPC SP-1.

The material to be coated must have been hot dip galvanized in accordance with AASHTO M111M / M111 or, when applicable, AASHTO M232M / M232 and must have a minimum coating of 65.2 g of zinc/0.09 m² of surface area (2.3 ounce/square foot).

The coating material for painting of hot dip galvanized steel shall consist of two (2) systems; a base coat of a two-component polyamide epoxy coating and a top coat of a two-component aliphatic polyurethane coating.

The base coat shall have a dry film thickness of 0.064 mm (2.5 mils) or greater while the top coat shall have a dry film thickness of 0.038 mm (1.5 mils) or greater.

Paint applications will be completed in an environmentally controlled atmosphere (spray booth) with a minimum air and steel surface temperature of 16°C (60°F), a minimum coating temperature of 21°C (70°F), a maximum relative humidity of 70%, and a dew point at least -15° C (5°F) below the air temperature.

Application shall be made by airless spray only in a smooth, unbroken film free of excessive runs and sags. The designated dry film thickness shall be maintained on edges as well as on flat surfaces.

All areas which are not to be painted shall be properly masked. Masking materials shall be removed immediately after painting to avoid damage to the dried coating.

The color of the coating material shall match that specified in the Plans except that when the color is to approximate the color of weathered AASHTO M270M / M270, Grade 345W steel, the color shall be bronze, and shall be an acceptable match to Federal Color Standard 30045.

All items shall be handled, loaded for shipment, delivered and installed in such a manner as to reduce abrading the coatings. Wood padded blocks and nylon slings are recommended for securing, loading, hoisting, erecting or storing members. Steel chains, binders, wire rope slings and/or chokers shall not be directly attached to any coated member unless there exists a lifting lug for that express purpose.

Touch-up after erection shall consist of smoothing all abraded areas and building back each coat damaged to original condition and thickness. Where damage exists through the galvanized layer, appropriate touch-up in conformance with ASTM A760/ A760M shall be performed prior to coating application. Paint coating shall be readily available from the galvanizer and shall be applied in strict conformance with the supplier's instructions.

The coating material furnished under this Specification shall be covered by a Type A certification in accordance with subsection 700.02.

513.07, METHOD OF MEASUREMENT.

The quantity to be measured for payment will be on a unit lump sum basis for each item included in the Contract.

513.08, BASIS OF PAYMENT.

Surface Preparation, Protective Coatings, and Containment and Environmental Protection will be paid for at the Contract lump sum price bid, which price shall be full compensation for cleaning, surface preparation, furnishing, transporting, handling and applying the material specified and/or the furnishing of all labor, tools, equipment, cleaning materials, containment and environmental protection, worker protection, medical testing, scaffolds, rigging, waste storage, waste disposal and incidentals necessary to complete the work.

Testing equipment required under 513.04 is described in 631.09 and will be paid for under the appropriate section 631 pay item.

When a Contract contains an item for Containment and Environmental Protection but does not include an item for Surface Preparation, all costs related to surface preparation shall be included in the unit price bid for Item 513.35 - Containment and Environmental Protection.

The item of Surface Preparation includes the surface preparation of new steel which is to receive a protective coating, the surface preparation of galvanized steel which is to receive an additional protective coating, and the surface preparation of rehabilitated or reconditioned steel whether it is to receive a protective coating or it is to remain uncoated. Surface preparation of new steel which is to remain unpainted or which is to be galvanized or metalized is not included in the pay item for Surface

Preparation; it is included in the pay items of Section 506.

When the Contract contains the item of Containment and Environmental Protection, and Structural Painting, Shop Applied is specified for rehabilitated or reconditioned steel, the steel to be reconditioned or rehabilitated shall have all surface preparation performed under shop conditions and all costs of proper waste containment and environmental protection, worker protection, medical testing, waste storage, and waste disposal including proper documentation, shall be included by the Contractor in the price bid for the item of Containment and Environmental Protection, which price shall be full compensation for such protection, testing, storage and disposal.

When ordered by the Engineer, dust control required for reasons not due to the Contractor's operations will be paid for as provided in Section 609, Dust and Ice Control, under the appropriate dust control item in the contract. When dust control is not part of the Contract, the costs of controlling dust will not be paid for directly, but will be included in the price bid for structure painting.

Payment will be made under:

	<u>Pay Item</u>	<u>Pay Unit</u>
513.25	Structural Painting, Shop Applied	Lump Sum
513.30	Structural Painting, Field Applied	Lump Sum
513.35	Containment & Environmental Protection, Shop	Lump Sum
513.36	Containment & Environmental Protection, Field	Lump Sum
513.40	Surface Preparation, Shop	Lump Sum
513.41	Surface Preparation, Field	Lump Sum