

SPECIFICATIONS FOR **COATING STRUCTURAL STEEL**

1.0 DESCRIPTION

The Work shall consist of:

- .1 Surface preparation and application of a coating system on structural steel components in the fabrication shop or in the field as described in this Specification and shown on the Drawings;
- .2 Provision of environmental protection during surface preparation and coating of structural steel components in the field, including the necessary enclosure system(s); and
- .3 The quality control (QC) testing of all materials.

2.0 REFERENCES AND RELATED SPECIFICATIONS

All reference standards and related specifications shall be current issue or latest revision at the date of tender advertisement.

2.1 References

- SSPC – Steel Structures Painting Council
- AASHTO – American Association of State Highway and Transportation Officials
- ASTM – American Society for Testing and Materials

2.2 Related Specifications

- Specifications for Supply and Fabrication of Structural Steel
- Specifications for Erection of Structural Steel.

3.0 SUBMITTALS

The Contractor shall submit the following to the Engineer, in accordance with the Special Provisions:

- .1 Prior to abrasive blasting, the Contractor shall submit written certification from a certified laboratory, stating that the abrasive media meets the material requirements shown on the Drawings and described in this Specification.
- .2 Before commencing the application of the coating system, the Contractor shall submit written certification, from the coating manufacturer, stating that all materials supplied are as specified on the Drawings, described in this Specification and in accordance with the Manufacturer's current product data sheets.
- .3 Manufacturer's product data sheets describing the following:
 - Recommended maximum dry film thicknesses for each coating layer
 - Mixing and thinning directions
 - Recommended spray nozzles and pressures
 - Acceptable humidity level and temperature range for application

- Minimum acceptable recoat time period for temperatures between 5°C to 30°C in intervals of 5°C, including the acceptable range of relative humidity for each temperature interval.
- .4 Details of surface preparation and coating system application to areas difficult to access.
- .5 Proposed environmental protection measures to be taken during surface preparation and coating of structural steel in the field. The detailed submission shall include a description of the environmental protection measures to be undertaken so as to ensure complete containment, collection and disposal of spent blasting abrasives, removed paint, all other debris products from surface preparation as well as new coating system over spray. The detailed submission shall also include a detailed description of the proposed methods and procedures, sequence of operations, equipment, detailed drawings of the proposed enclosure system and all other applicable details relating to environmental protection measures during surface preparation and coating.
- The enclosure system shall be designed by a Professional Engineer registered or licensed to practice in the Province of Manitoba. The Contractor shall submit Shop Drawings of the enclosure system, prepared by and bearing the seal and signature of the Professional Engineer.
- The Contractor shall be responsible for ensuring that the enclosure system is constructed, installed and functions in accordance with the Shop Drawings. The Contractor shall provide the Engineer with proof that the enclosure system is constructed in accordance with the Shop Drawings. This proof shall be in the form of a letter bearing the seal and signature of the Professional Engineer who will be required to inspect the enclosure system installation(s) on site to ensure conformance with the Shop Drawings. The enclosure system shall be designed, constructed, erected, operated, maintained and removed in accordance with Workplace Safety and Health requirements.
- .6 A written guarantee from the supplier of the coating system within fourteen (14) days of completion of coating operations stating that the product will perform satisfactorily for a minimum period of five (5) years from the completion date, provided that both the surface preparation and application of the paint has been carried out in accordance with the Manufacturer's recommendations. The supplier shall state that they have reviewed this Specification and the surface preparation and application procedures and find them in accordance with their recommendations. The supplier shall guarantee the replacement of the coating, including any surface preparation, touch-ups, and final overcoats, at no cost to the Department in the event that the coating system does not perform satisfactorily over the five (5) year guaranteed time period.
- .7 The Contractor shall provide to the Engineer a guarantee in writing, stating that the coating system will perform satisfactorily for a period of five (5) years from the date of completion. The Contractor shall provide in the guarantee for the reapplication of the paint system at no cost to the Department in the event that the coating system does not perform satisfactorily. This shall include, but not necessarily be limited to: the supply and installation of the working platform, hoarding, scaffolding; removal, and disposal of the unacceptable coating system; surface preparation; coating; and all other items necessary to reapply a coating system.

4.0 MATERIALS

4.1 Water

Water used for high-pressure water washing shall be clean and free from oil, acid, alkali, organic matter or other deleterious substances. The water shall be equal to potable water in physical and chemical characteristics.

4.2 Abrasive Media

Blast abrasive media shall be free of corrosion producing contaminants and oil. The type of blast abrasive media, hardness and grit size shall be such so as to achieve a surface profile, onto which the paint system is to be applied, which is compatible with the requirements of the paint system to be used.

Abrasive media when tested in accordance with ASTM D 4940 shall have a conductivity not exceeding 1,000 microsiemens. The abrasive media shall have a hardness of 6 or greater on the Mohs scale. Testing for hardness and presence of oil shall be in accordance with SSPC-AB 1, Mineral and Slag Abrasives. The maximum moisture shall be 0.5% by weight when tested in accordance with ASTM C 566.

4.3 Coating System

The coating system shall be one of the following:

Prime Coat	Intermediate Coat	Top Coat
Amercoat 68HS	Amercoat 385	Amercoat 450H
Carbozinc 858 / 859	Carbocrylic 3358	Carbocrylic 3359
Carbozinc 858 / 859	Carboguard 893	Carbothane 134HG
Carbozinc 11HS	Carbocrylic 3358	Carbocrylic 3359
Carbozinc 11HS	Carboguard 893	Carbothane 134HG
MC-Miozinc	MC-Miomastic	MC-Ferrox A
Xymax Monozinc 390	Xymax MonoFerro Pur	Xymax MaxCoat A

Only coating systems contained in the original containers sealed by the Manufacturer shall be used.

The colour of the finish coat shall be green from the Manufacturer's colour charts as follows:

- 1) Ameron Coatings - Amercoat 450H Green 503-111
- 2) Carboline - Green Back (Reference No. 2394 from Utility Toolbox)
- 3) Wasser Coatings - ODOT Green (Reference No. F4272)
- 4) Polyval Coatings - To Be Determined

Each coat of the coating system shall be coloured such that each coat is distinguishable from the other. The variations in colour shall be such that the required dry film thickness of each successive coat subsequent to the first coat shall be achieved without over application. The Contractor shall supply a dry colour sample for the proposed coating system, a minimum of 300 mm x 300 mm in size, to the Engineer for verification and approval prior to commencing coating operations.

The prime coat of the coating system applied to faying surfaces at locations of bolted connections shall be qualified by test as a Class A coating as per the AASHTO LRFD Bridge Design Specifications.

4.4 Incidental Materials

Incidental materials needed to complete the surface preparation and coating works shall be strictly in accordance with the Manufacturer's guidelines and recommendations. This shall include paint additives, thinners, mineral spirits, solvent mixtures associated with cleaning operations and all other incidental materials required to complete the Work.

5.0 CONSTRUCTION METHODS

5.1 Environmental Protection During Surface Preparation and Application of Coating System in the Field

.1 General

The Contractor shall undertake measures to ensure that all debris, spent water from high pressure washing, spent blasting abrasives and removed paint from surface preparation as well as over spray from new coating system application will not result in harmful effects or nuisance to, or be deposited into the waterway or onto ground surfaces and all other areas in the vicinity of the Work. The Contractor shall undertake his operations during surface preparation and coating so as to ensure that contamination of the waterway, ground surfaces and all other areas in the vicinity of the Work does not occur.

The Contractor shall conduct his operations in accordance with all current Federal, Provincial, Municipal and other applicable laws, regulations and requirements with respect to environmental protection, disposal of materials and pollution control. It shall be the Contractor's responsibility to be familiar with all applicable laws, regulations and requirements, to obtain all necessary approvals and permits for his operations and to ensure that all applicable laws, regulations and requirements are met and adhered to.

.2 High Pressure Water Washing

The Contractor shall ensure that the amount of high pressure washing water is kept to the absolute minimum by conscientious efforts of the Contractor's workforce and by efficient use of equipment. The Contractor shall control and contain all spent water from high pressure washing so as to ensure that it is not deposited into the waterway or onto underlying ground surfaces and all other areas in the vicinity of the Work.

.3 Low Dust Generating and High Dust Generating Surface Preparation

Partial enclosures shall be used to contain and collect surface preparation debris products, including substrate material, removed paint and localized dust from low dust generating surface preparation methods such as hand tool cleaning or power tool cleaning.

Except as specified for vacuum abrasive blasting and filtration, a full enclosure with a negative pressure system shall be installed and maintained around all surface preparation locations where high dust generating surface preparation such as abrasive blasting is undertaken.

The Contractor shall ensure that the amount of spent blasting abrasive is kept to the absolute minimum by conscientious efforts of the Contractor's workforce and by efficient use of equipment.

.4 Vacuum Abrasive Blasting

For surface preparation locations where vacuum abrasive blasting equipment is used, a full enclosure with negative pressure may not be required provided that there is no escape of the products of surface preparation including spent blasting abrasives, removed paint and associated dust. At minimum, a partial enclosure with work platform floor covers and ground covers shall be provided to prevent incidental escape.

.5 Application of Coating System

When coating system application is undertaken without spray equipment, an enclosure is not required provided that escape of coating system material is prevented. The Contractor shall provide a method of containment that protects the waterway, underlying ground surfaces and all other areas in the vicinity of the Work from spills and drips of coating system materials.

The Contractor shall provide a full enclosure that prevents the escape of coating system material when coating system application is undertaken with spray equipment.

The amount of over spray from the application of new coating system shall be kept to the absolute minimum by conscientious efforts of the Contractor's workforce and by efficient use of equipment.

.6 Enclosures

.1 General

The Contractor shall supply, install, operate and maintain enclosures to contain spent blasting abrasives, removed paint, all other debris from surface preparation operations and new coating system over spray and to limit the random escape of material during surface preparation and coating operations. When no longer required, the enclosures shall be disassembled and removed from the site.

When openings or tears occur in the enclosure, surface preparation operations shall cease until repair is completed.

Existing bridge deck drains shall be temporarily extended or diverted to redirect run off and prevent it discharging into the enclosure.

Work platforms on the ground surface, where work is being undertaken from the ground, shall be covered with tarps with overlapping sealed edges or other means to protect the ground surface from contamination and to provide for containment and recovery of spent material.

Enclosures shall be designed and constructed to provide a safe working environment and access to the surface preparation and coating system application areas for the Contractor's personnel as well as for the Engineer and other personnel as designated by the Engineer.

The Contractor shall be responsible for monitoring the enclosure and verifying its safe and effective operation.

The Contractor shall ensure that there is no escape of dust or materials while dismantling, moving or otherwise handling the enclosure. Walls, floors and joints of the enclosure shall be cleaned by vacuuming prior to moving or dismantling it. All dust and material not previously accessible or found in cracks and joints during dismantling shall be immediately vacuumed.

.2 Partial Enclosures

Partial enclosure systems shall be installed to prevent the escape of all materials including localized dust. Partial enclosure systems shall not be used if significant dust is being generated, as determined by the Engineer. Partial enclosure systems may consist of vertical and floor tarps, provided the tarps are overlapped and securely fixed together at seams.

.3 Full Enclosures

Full enclosure systems shall be impervious to dust and wind and prevent the escape of all materials including dust. A full enclosure system on its own shall not be used for high dust generating surface preparation operations such as abrasive blast cleaning. Full enclosures shall be free of any openings and shall have joints, seams and overlaps fully sealed.

.4 Full Enclosures with Negative Pressure

Full enclosure systems with negative pressure shall consist of the full enclosure system, equipped with a negative pressure system to prevent the escape of all materials including dust from the abrasive blast cleaning. The negative pressure system shall be operated during abrasive blasting clean up activities and surface blow down, prior to coating system application.

The full enclosure with negative pressure shall be designed for complete containment while providing adequate ventilation.

.5 Dust Collector

Air evacuated from an enclosure system shall be conveyed in fully sealed conduits to a dust collector appropriately sized for the material and airflow. There shall be no escape of materials from conduits and dust collectors.

.7 Recycling Equipment

Where spent abrasive material is recycled, there shall be no escape of dust or material during the mobilization, operation, clean up or demobilization of abrasive recyclers, conduits, dust collectors and associated equipment. The collectors and filters shall arrive on site undamaged, empty and free of dust and debris.

.8 Handling and Storage of Spent Material

Spent material from an enclosure system shall be collected daily. Spent material from recycling equipment and dust collectors shall be collected on a regular basis to maintain the effective performance of the equipment. All spent material shall be collected and stored in containers which are sealed tight. The containers shall be intact and in sound condition. The containers shall be rigid steel or plastic with lids which can be sealed tight, or other types of containers specifically designed and intended for storage of spent material from such structural steel surface preparation and coating operations. The containers shall keep the material dry at all times and prevent their escape.

There shall be no escape of material during transfers to and from containers, enclosures, recycling equipment or dust collectors.

.9 Containment Around Equipment and Materials

All surfaces under the Contractor's equipment or materials located on the bridge deck, approaches or adjacent surfaces shall be covered with tarps to contain any spills or leaks from the equipment or materials. The tarps shall be sufficiently overlapped, impervious to water and free of holes and openings. All spills accumulated on this containment shall be prevented from escaping onto the surrounding surface and immediately cleaned up.

.10 Management of Spent Materials

The Contractor shall dispose of the contained and collected spent blasting abrasives, removed paint, all other debris products from surface preparation as well as new coating system over spray in accordance with all current Federal, Provincial, Municipal and other applicable laws, regulations and requirements with respect to environmental protection, disposal of materials and pollution control. It shall be the Contractor's responsibility to be familiar with all applicable environmental laws, regulations and requirements, to obtain all necessary approvals and permits for his operations and to ensure that all applicable environmental laws, regulations and requirements are met and adhered to.

5.2 Surface Preparation and Surface Profile

Surfaces adjacent to areas to be abrasive blast cleaned shall be protected from damage during surface preparation.

Fins, slivers, burred or sharp edges, weld splatter and slag shall be removed by power grinding prior to surface preparation.

All oil and grease shall be removed with solvent cleaning as specified in SSPC-SP1, Solvent Cleaning using a solvent that is compatible with the coating system to be utilized and as recommended by the coating system manufacturer. The solvent shall be an approved water based biodegradable dispersant formulated to remove hydrocarbon contaminants from painted and unpainted surfaces.

All existing structural steel surfaces to be surface prepared and painted shall be high pressure water washed with the water nozzle located not more than 300 mm from the surface. The water pressure shall be a minimum of 15 MPa. The high pressure water wash shall be undertaken to effectively dissolve and remove roadway deicing chemicals such that the level of chloride ion content of 30 mg/m² is not exceeded. The Contractor shall conduct tests on the cleaned surfaces to determine the chloride ion content. Paint shall not be applied to any surface on which the chloride ion content exceeds 30 mg/m². Any area exceeding this limit shall be high pressure water washed again and retested for chloride ion content until the acceptable level of chloride ion content is achieved.

Structural steel shall be abrasive blast cleaned to the requirements of SSPC-SP10 / NACE No. 2, Near-White Blast Cleaning providing a surface profile ranging between 25 µm and 75 µm, or better as required by the coating system manufacturer.

No rust scale shall remain within designated areas. Any areas shielded or hidden from the effects of abrasive blast cleaning shall be surface prepared manually or by other demonstrated practical means satisfactory to the Engineer. The abrasive blast cleaning shall be undertaken so as not to contaminate any previously painted areas. The edges of existing sound paint adjacent to abrasive blast cleaned surfaces shall be feathered and no loose or abrupt edges shall remain. The quality of blast cleaning shall be evaluated using the criteria provided in SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Abrasive Blast Cleaning. Freshly prepared steel surfaces shall be painted as quickly as possible, however, if the freshly prepared steel flash rusts, the steel shall be re-blasted to the requirements of SSPC-SP7 / NACE No. 4, Brush-Off Blast Cleaning.

Surface preparation of areas difficult to access, shall be carried out to the extent practical as detailed in the Contractor's submission for areas difficult to access. The surface preparation standard for these areas shall be based on reasonable effort demonstrated in the field and found to be acceptable by the Engineer.

Following all abrasive blast cleaning operations, all surfaces shall be blown off with compressed air or cleaned by vacuum so that all products of abrasive blast cleaning are removed from surfaces, pockets and corners.

5.3 Application of Coating System

.1 General

All coating systems shall be stored, thinned, handled, mixed and applied in accordance with SSPC-PA 1, Shop, Field and Maintenance Coating of Steel, and the recommendations on the Manufacturer's product data sheets.

When there is a drop in temperature after the coating is applied, the recoat time period shall be as per the Manufacturer's product data sheets for the lower temperature.

All bolts, nuts washers and pitted areas shall be given a prime coat and finish coat by brush in addition to the spray application. When organic zinc primer is used, the brush application shall be carried out with an epoxy-zinc primer from the same Manufacturer, after the spray application of the prime coat. The finish coat shall be brush applied prior to spray application of the finish coat.

For each application, the initial pass of the spray gun shall be directed at the outside edges of the steelwork prior to completely coating all surfaces.

All runs and sags shall be brushed as the application progresses.

Application related failures in coatings described in the chapter "Coating Failures" of the SSPC Coating Manual Vol.1, shall be corrected prior to application of a subsequent coat and after the application of the top coat.

Where excessive coating thickness produces "Mud Cracking" in zinc rich coating materials, the coating shall be scraped back and sanded to a soundly bonded coating and the area recoated to the required thickness.

Application of coating system onto areas difficult to access, shall be carried out to the extent practical as detailed in the Contractor's submission for areas difficult to access. The coating system application standard for these areas shall be based on reasonable effort demonstrated in the field and found to be acceptable by the Engineer. Where limited access precludes the successful use of spray equipment, all areas and edges of structural steel and fastener components shall be coated by brush or other application methods appropriate to the particular area as recommended by the coating system manufacturer.

All dry spray shall be removed by sanding and the coating reapplied as specified.

.2 New Structural Steel

The maximum time between final surface preparation and prime coat application inside the fabrication shop shall be 24 hours. Structural steel subjected to outdoor exposure after final surface preparation shall be prime coated within 10 hours.

All coats of the coating system shall be shop applied.

Faying surfaces of bolted connections shall have only the prime coat applied.

Prior to assembly, surfaces not in contact with other steel surfaces, but that will be inaccessible after assembly, shall have all coats applied.

Surfaces inaccessible for coating after erection shall be coated prior to erection.

At least 100 mm of bare steel and 100 mm of each coat of the new coating system shall be left exposed for lapping of subsequent coats, where the continuous application of paint or final surface preparation is interrupted in a section.

.3 Existing Structural Steel in the Field

The maximum time between final surface preparation and the prime coat application shall be 10 hours.

When tying into existing coatings, that portion of the existing coating within 300 mm of the edge of the new coating, shall be power washed using potable water to remove all contaminants. The edges of existing coating shall be feathered into areas cleaned to bare steel so that at least 4 mm of each coat of the existing coating is exposed.

Faying surfaces of bolted connections shall have only the prime coat applied.

.4 Slip Critical Bolted Connections

At slip critical bolted connections, the entire faying surface plus an area at least 50 mm beyond the faying surface shall be coated with only the prime coat prior to assembly and erection. Assembly and erection of joints at prime coated faying surface areas shall not commence until the prime coat has fully cured.

.5 Dry Film Thickness

The coating system shall consist of the following minimum dry film thickness, or as recommended by the coating system manufacturer, if thicker:

Coating System	Dry Film Thickness		
	Prime	Second	Third
Epoxy-zinc, Epoxy, Polyurethane	75µm	100µm	50µm
Epoxy-zinc, Water based acrylic, Water based acrylic	75µm	90µm	90µm
Inorganic-zinc, Water based acrylic, Water based acrylic	75µm	90µm	90µm
Inorganic-zinc, Epoxy, Polyurethane	75µm	75µm	75µm
Moisture cure urethane, Moisture cure urethane, Moisture cure urethane	80µm	80µm	80µm

.6 Repair of Coating Systems

Damaged areas of coated surfaces shall be prepared by removing rust, contaminants and by feathering. The prepared surfaces shall be recoated with the originally applied materials except for inorganic zinc primers, which shall be recoated with an epoxy zinc primer from the low volatile organic compound system. The minimum dry film thickness of the touch-up shall be 75 µm prior to the application of the second and third coats.

6.0 QUALITY MANAGEMENT

6.1 Quality Control and Quality Assurance

The Contractor shall be responsible for quality control testing required to ensure the Work meets the requirements shown on the Drawings and described in this Specification, including the required surface preparation.

The Contractor shall arrange for the coating system manufacturer to provide technical assistance prior to and during the coating system application operations. The Contractor shall arrange for a representative of the coating system supplier to visit the site during coating operations so as to ensure that the surface preparation and coating system application is in accordance with the Manufacturer's recommendations.

The Contractor shall record the quality of surface preparation and measurements of surface profile, temperature, humidity, dew point and dry film thickness. Written documentation of the results of quality control inspection shall be submitted to the Engineer on a daily basis.

Acceptability of surface preparation will be based on the applicable SSPC surface preparation specifications and pictorial standards given in SSPC-VIS 1 and SSPC-VIS 3. Surface profile measurements will be made using a spring micrometer and an extra coarse pressure sensitive replica tape in accordance with ASTM D 4417.

Testing of ambient and surface temperature, relative humidity and dew point will be done by means of thermometer, surface thermometer or recording hygro-thermograph and digital or sling psychrometer with recognized psychrometric tables.

Dry film thickness (dft) measurements shall be measured using Type 2 constant pressure probe magnetic gauges. Dry film thickness measurements shall be undertaken in accordance with SSPC-PA 2, Measurement of Dry Coating Thickness with Magnetic Gauges. Determination of the acceptability of the dft of each coat shall be made in accordance with SSPC-PA 2. The specified minimum and maximum dft used to determine acceptability of coating thickness according to SSPC-PA 2 shall be the Manufacturer's recommended minimum and maximum dft as shown on the submitted product data sheets. To facilitate the calibration procedure, the Contractor, at a location selected by the Engineer, shall mask off a 75mm x 75mm area of the prepared steel. After all tests are completed, this area shall be coated as specified for the coating system.

Adhesion of coating systems may be tested in accordance with ASTM D 4541 at the discretion of the Engineer.

6.2 Inspection Requirements for Coating Application Outside of the Province of Manitoba

Should all or any part of the coating application be undertaken at locations outside of the Province of Manitoba, expenses incurred by the Department and/or the Department's representative to carry out testing and inspection will be deducted as incurred by the Department from payments made to the Contractor.

Expenses will include, but are not necessarily limited to, all travel, boarding, lodging and the retention of services from a certified agency of the Department's choice for testing and inspection at the coating application location.

7.0 METHOD OF MEASUREMENT

Environmental protection during surface preparation and coating of structural steel will be paid for on a lump sum basis and no separate measurement will be made for this work.

The coating of structural steel will be paid for on a lump sum basis, and no separate measurement will be made for this work.

8.0 BASIS OF PAYMENT

Environmental protection during surface preparation and coating of structural steel will be paid for at the Contract Lump Sum Price for "Environmental Protection – Surface Preparation and Painting" measured as specified herein, and will be payment in full for performing all operations herein described and all other items incidental to the Work.

The coating of structural steel will be paid for at the Contract Lump Sum Price for "Surface Preparation and Painting of Structural Steel" measured as specified herein, and will be payment in full for performing all operations herein described and all other items incidental to the Work.