Section 2508. Removal of Paint and Painting Steel Bridge Structures

2508.01 REMOVAL OF PAINT.

A. Non-Hazardous Paint Removal.

1. General.

a. Apply Article 2508.01, A, only to structures previously painted with "non-lead based" paints and to structures with scratch tests indicating a non-hazardous waste (as identified in 40 CFR 261) is expected to be generated during the project. OSHA may regulate other issues. Take whatever precautions are necessary to comply with Federal and State safety and health regulations.

b. To comply with Iowa Code Section 89 B.8, 1, scratch tests are provided elsewhere in the contract documents for information.

2. Bridge Cleaning.

This work involves removing accumulated foreign material and loose paint. It also involves water washing areas designated elsewhere in the contract documents.

a. Removal of Accumulated Foreign Material.

1) Prior to water washing, remove all accumulated foreign material from:

- Beams, member flanges, and gusset plates,
- Abutment bridge seats, pier tops, truss joints, and deck drains, and
- Other locations the Engineer orders.

2) Remove the accumulated foreign material using hand brooms, hand shovels, vacuum cleaners or other methods the Engineer considers acceptable. Collect the removed material and dispose of at an approved waste area according to Federal, State, and local regulations. Apply appropriate measures to ensure that at no time does removed material fall or be disposed in the water or on the land below the bridge.

b. Loosely Adherent Paint.

Prior to water washing, use hand tool methods, complying with SSPC-SP2, to remove loosely adherent paint in areas designated for painting. All paint removal operations will require containment as specified in Article 2508.01, A, 4.

c. Water Washing.

1) Prior to abrasive blast cleaning, use high-pressure water to wash steel surfaces to be repainted, abutment seats, pier caps, and other surfaces that may be designated elsewhere in the contract documents. Limit water pressure so that no paint is removed.

2) Ensure salt contaminants, dirt, bird excrement, and other detrimental foreign material are removed. Detergents or cleaners and scrubbing may be needed in conjunction with water washing. Use clear fresh water that is free of sediments and salt contaminants. After water cleaning, remove all oily or greasy residues using solvent according to SSPC-SP1.

3) Remove chalking from existing painted surfaces onto which paint is to be applied. Examples are transition zones for spot or zone painting and surfaces that will receive a top coat over an existing prime or top coat. In those areas, remove the chalked pigment by water washing.

4) Detergents or cleaners and scrubbing may be needed in conjunction with water washing. Use detergents or cleaners that are compatible with the existing paint system and pre-approved by the new paint manufacturer. Apply according to the product manufacturer's recommendations.

5) Submit MSDS and any technical field guides for any detergent or cleaner to the Engineer for review and approval before using. If detergents or cleaners are used, thoroughly rinse the surface with water to remove all residue prior to painting.

3. Blast Cleaning and Surface Preparation.

a. Abrasive Blast Cleaning.

1) This work involves preparing all designated surfaces to be painted by either:

- abrasive blasting using conventional equipment, and/or
- vacuum blasting equipment.

2) Some hand-tool and/or power-tool cleaning may be required in areas not fully accessible to the other methods.

3) Use an abrasive blasting system that incorporates abrasive recycling in order to reduce waste volume to the greatest extent possible.

b. Standards For Surface Preparation.

1) Abrasive Blasting.

a) Prepare areas to be painted using a dry abrasive blast method to a level (SSPC-SP6 and/or SSPC-SP10) as designated elsewhere in the contract documents. The current SSPC-VIS1, Visual Standard for Abrasive Blast Cleaned Steel, will be used in conjunction with the appropriate written SSPC Standard for acceptance of final surface preparation. Prepare the surface profile (etched height) to be 1.5 to 2.5 mils (25 µm to 50 µm) as measured by replica tape or surface profile comparator.

b) Use hand-tool or power-tool methods, or both, to prepare small areas that cannot be cleaned using abrasive blasting equipment. SSPC Standards applicable to the method(s) applied will be used to evaluate surface preparation.

c) After blasting or mechanical preparation, thoroughly clean the surface to be painted with either HEPA vacuums or dry, oil free, compressed air, or both, to remove all adhering blast residue. Remove all oily or greasy residues with solvent complying with SSPC-SP1, Solvent Cleaning.

2) Removal of Existing Deteriorated Paint by Mechanical Methods.

a) The contract documents may designate areas to be painted which are to be cleaned by mechanical methods. These will be:

(1) Areas of deteriorated paint where the existing top coat is peeled or deteriorated and the underlying existing primer is in sound condition. In these cases, remove only the existing top coat by manual methods complying with SSPC-SP2 so the underlying existing primer is left in place. Remove the deteriorated top coat back to the boundary of soundly adhering top coat. A soundly adhering top coat is defined as that which cannot be lifted from the primer with a putty knife.

(2) Spot areas deemed too small to be effectively prepared by abrasive blasting.

b) Remove the deteriorated paint back to the boundary of soundly adhering existing primer. Regardless of the method used for cleaning, feather all edges of sites cleaned to a smooth transition between the existing paint and the cleaned area.

c) Use mechanical methods of surface preparation complying with SSPC-SP2 or SSPC-SP3, or both, as modified below.

d) Replace Article 3.5 of SP2, Hand Tool Cleaning, with the following:

3.5 SSPC-VIS3, Visual Standards for Power and Hand-Tool Cleaned Steel, shall be used to evaluate the degree of cleaning.

e) Replace Articles 2.2, 2.3, and 5.3 of SSPC-SP3, Power Tool Cleaning, with the following:

2.2 It is intended that power tool cleaning remove rust, deteriorated paint, detrimental foreign material, and loose mill scale that can be removed by vigorous use of the power tools.

2.3 SSPC-VIS3, Visual Standard for Power and Hand-Tool Cleaned Steel, shall be used to evaluate the degree of cleaning.

5.3 Use power wire brushing, power abrading, power impact, or other power rotary tools to remove rust, deteriorated paint, and loose mill scale. Do not burnish the surface.

f) After mechanical preparation, thoroughly clean the surface to be painted with either HEPA Vacuums or dry, oil free, compressed air, or both, to remove all adhering blast residue. Remove all oily or greasy residues with solvent complying with SSPC-SP1, Solvent Cleaning.

3) Galvanized Elements.

Protect galvanized elements such as deck drain pipes and bearings. Blast clean only if directed by the Engineer. All galvanized elements which are to be cleaned and painted will be paid for as extra work according to Article 1109.03B.

4) **Rust Blume or Flash Rust.**
Rust blume or flash rust is defined as the development of visible rust on bare metal surfaces after cleaning. Reblast the surface, or brush blast the surface and blow it down, just prior to the application of the first coat of paint if:
- Flash rust or rust blume occurs after removal of existing paint, or
- A surface is cleaned and left unpainted for more than 24 hours

5) **Pin Hole Rusting.**
a) Pinhole rust areas may be designated for painting in the contract documents. In areas where there is pin hole rusting and associated staining, abrasive blasting may not be required if the existing paint is sound other than at the pin holes. Mechanical cleaning, according to SSPC-SP2, may be used in these areas prior to applying the spot primer.
b) If the mechanical methods do not remove heavy staining of sound paint adjacent to the pinholes, remove the stain to the degree recommended by the manufacturer of the primer. Use methods of removal recommended by the manufacturer. Provide a written copy of the recommendations to the Engineer prior to performing the work.

6) **Feathering of Repair Areas.**
For spot and zone painting work, feather the existing coating surrounding each repair location. A smooth, tapered transition of 1 to 2 inches (25 mm to 50 mm) onto the existing intact coating is required around each repair area. Roughen the existing coating by hand sanding or a solvent wipe in the feathered area to assure proper adhesion for the new paint. Verify soundness of the existing paint by probing the edges of coating around the periphery of the repair areas with a putty knife, according to the requirements of SSPC-SP3.

7) **Protection of Unpainted Surfaces.**
a) Use whatever precaution is necessary to ensure vehicular traffic, equipment, hardware, fixtures, concrete, and other surfaces are protected against abrasive impact, paint spillage, over-spray, and other damage during the project.
b) For spot or zone painting work, use protective coverings, shields, or masking as necessary to protect surfaces that are outside the designated painting areas. Maintain protection during the entire period work is being performed which could damage those surfaces.
c) Exercise extra care to avoid over-blast damage to the existing coating in non-designated areas. Correct damage to non-designated areas by cleaning, repairing, and repainting at no additional cost to the Contracting Authority. Repair procedures will be approved by the coating manufacturer's technical representative. Submit the manufacturer’s approval to the Engineer for review and approval before the repair work is started.

8) Abrasives.

a) Use steel shot and/or grit, aluminum oxide, or garnet abrasives. This is to ensure hard durable abrasives are used, to encourage abrasive recycling, and to minimize waste generated by the project. Use clean, dry abrasives that are free from contamination. Do not use sand or coal slag.

b) If blasting with previously used or recycled abrasive:

- Obtain a representative sample of that abrasive,
- Have that sample analyzed for TCLP leachable levels of arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, and
- Submit the laboratory's analytical report to the Engineer for approval prior to use.

c) The Engineer will accept used or recycled abrasives only if the leachable quantity of each metal tested is equal to, or less than, one part per million (1 ppm).

d) Clean and recycle abrasive used during this project to the greatest extent possible. Provide a written abrasive recycling workplan to the Engineer for approval. In this proposal list the equipment and process used for recycling and recovery of the abrasive and monitoring air dispelled from the recycling process.

e) Employ a method to monitor dispelled air from the recycling system that samples and tests for total lead and particulate matter of 0.4 mils (10 µm) and smaller (PM_{10}). Blasting will be suspended immediately if the Engineer deems visible dust or particulate matter is in the air expelled from recycling equipment.

9) Chloride Testing.

a) The Engineer reserves the option to test the blasted surface(s) for residual chloride ions. Chloride ions after blasting and blow down shall be less than 15 µg of chloride per 100 mm^2. Areas that are not equal to, or below, these criteria will need to be re-washed, brush blasted, and retested.

b) The Engineer will measure chloride contamination by using a Surface Contamination Analysis Kit, marketed by KTA-Tator Inc. or an equivalent analytical process.

4. Containment.

a. General.

1) Abrasive blasting using conventional equipment will require a system for total containment of the blast area. Containment includes all containment enclosures (where applicable), monitoring, recovery, and temporary storage of waste. For vacuum blasting, the "contained area" is defined as the area around the blast nozzle and any other connections or equipment where waste, dust, or exhausted air may exit into the environment.

2) Submit to the Engineer a plan for containment enclosures, an analytical report of the abrasives to be used, and a plan for

monitoring air quality prior to starting work. A general guideline for containment evaluation abrasive blasting and/or vacuum blasting will be:

No visual or noticeable dust is to be observed escaping into the atmosphere or onto the ground from the contained area during blasting, blow down, or prior to the daily clean-up operations.

3) Suspend blasting if the Engineer determines that air expelled from containment or from the vacuum nozzle has noticeable dust or particulate matter. If the Engineer determines the containment measures are inadequate, alter the removal operation or the containment to meet the Engineer's requirement.

b. Abrasive Blast Cleaning.

1) Use a system which ensures total containment and recovery of the material removed from the structure. Construct bridge containment enclosures over other roadways to allow traffic to be maintained on the bridge being cleaned as well as on the road under the bridge, according to traffic control requirements in the contract documents.

2) Removed material will be defined as paint chips, abrasive particles, and other blasting residues. Ensure the containment prevents removed material and abrasive from drifting or being deposited, or both, other than within the containment enclosure. The blasting operation will be suspended immediately if the Engineer deems waste cleanup or house keeping measures, or both, to be inadequate. If the Engineer rules the containment measures inadequate, alter the operation or the containment to meet the Engineer's requirement.

3) Use impermeable cover materials, such as tarpaulins, drop cloths, or other approved materials, on or above the ground, waterways, and other surfaces. Recover removed material from the covering materials. Highway pavements and paved surfaces under a structure may be used as a portion of the collection cover for that area providing traffic is maintained on the bridge and on the pavement under the bridge according to traffic control requirements in the contract documents.

4) All areas used for containment and recovery shall be thoroughly cleaned of all debris before work is begun. Close containment areas to the public. If paved surfaces are used for recovery areas, use only areas that are continuous and free of open cracks. Seal cracks to prevent infiltration of blast residue prior to commencing any blasting in that area.

5) Turn the edges of the impermeable cover material upward 1 foot (300 mm) to minimize loss of waste materials. Ensure covers on or over roadways, railways, or waterways do not present a hazard nor remain in place overnight without the Engineer’s written permission. Fasten the edges of the impermeable cover to the vertical drapes to ensure no loss of waste materials. Ensure overlaps of the cover material are a

minimum of 3 feet (1 m), securely tied together, and continuously taped to prevent loss of removed material.

6) Extend vertical drapes from above the blasting area to the bottom of the enclosure. Securely anchor them top and bottom and at the laps to prevent spilling or loss of removed material. Use material capable of withstanding wind forces without tearing or having a breach of integrity.

7) Containment enclosures shall be anchored to prohibit enclosure encroachment on open traffic lanes, railroad lanes, and waterways. Ensure removed material will not fall on to surface waters.

c. Monitoring.

1) During abrasive blasting, monitor air quality by conducting air sampling and testing. Perform this work under the direction of a certified Industrial Hygienist. Use a minimum sampling frequency of one sample of 8 hour duration per week.

2) One purpose of the sampling is to allow for the Engineer to determine the effectiveness of the containment. Samples will be obtained from at least two locations outside and immediately down wind from the containment, according to 40 CFR, Part 50.

3) Employ an air monitoring that identifies total lead and total suspended particulate (TSP) to evaluate site compliance with the requirements of Title 40 Code of Federal Regulations. Provide the results of this monitoring to the Engineer as soon as they become available. Abrasive blasting will be suspended immediately if the Engineer determines expelled air quality measures to be above EPA standards for particulate matter.

4) Air quality sampling and testing will not be required for small localized containments when:

- Blasting operations have an expected duration of less than approximately 3 hours, or
- The expected duration of the total amount of blasting on the project is less than approximately 8 hours.

d. Cleaning by Other Methods.

1) At locations where abrasive blasting is not used, use a waste collection system that ensures containment and collection of the material removed from the structure. Removed material will be defined as paint chips and other residues. Ensure the containment prevents removed material from drifting or being deposited, or both, other than on the containment portion provided.

2) Use impermeable cover materials, such as tarpaulins or drop cloths, on or above the ground, waterways, surface waters, and other surfaces. Use these covering materials to recover removed material.

e. Clean-up Contingency.

1) Clean up any spills that result from the operations at no additional cost to the Contracting Authority. Provide a written plan for clean up of spills to the Engineer prior to removing paint.

2) For removal activities over water, have floating boom devices in place during removal operations. Ensure these devices are capable of preventing waste material from moving away from the site in the event of a breach in the containment system.

f. Recovery and Temporary Storage of Waste.

1) Deposit accumulated bridge cleaning waste in appropriately sized clean new or reconditioned containers with securely sealed lids meeting the requirements of Title 49 Code of Federal Regulations. Recover wastes daily and deposit the wastes into these temporary storage containers. Securely seal the containers to shield the contents from the elements at all times. Consolidate all waste material to a minimum number of containers.

2) Recover all residues and carefully transfer, ensuring no release of residues into the air or contamination of surrounding surfaces. Keep all containers containing residue closed and secured, except during the addition of waste. Ensure residues do not remain on bridge surfaces or on the containment material overnight.

3) Clearly mark all bridge cleaning waste containers in no less than 1 1/2 inch (40 mm) block letters stating:

PAINT WASTE
NONHAZARDOUS
(Date)

The date shall indicate when waste was first put into the container.

4) Construct or furnish a secured temporary storage area of sufficient size for the contained waste material. Enclose temporary storage areas with an 8 foot (2.4 m) chain link fence or a roll-off box with a lockable cover. Plans for other secured temporary storage areas may be submitted to the Engineer for approval.

5) Locate the temporary storage area within the right-of-way of the Contracting Authority at a location the Engineer approves. Ensure the base for waste storage is above the extreme high water elevation, if constructed within a flood plain.

6) For projects that will generate less than 55 gallons (208 L) of waste, the fenced temporary storage area or roll-off box will not be required and the Contractor is responsible for securely storing the paint waste containers on-site during the project.

7) At, or prior to the conclusion of the work, obtain one representative sample of the waste material from each container. Combine samples so that one representative composite sample is made for every 5 waste containers. Submit composite sample(s) to a lab for a Toxic Character Leachate Procedure (TCLP) test for the 8 priority metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Provide the results of this analysis to the Engineer upon receipt. Maintain wastes on site and do not dispose of them until the Engineer has reviewed analytical data and approved of the disposal method.

g. Disposal of Removed Material (Waste).

1) Transport waste materials in approved containers from temporary storage to a lined Subtitle D landfill (for non-hazardous wastes) or Subtitle C, Treatment, Storage, and Disposal Facility (TSDF for hazardous wastes) which accepts bridge painting wastes. Transport the wastes to the landfill facility within 5 calendar days of completion of surface preparation operations.

2) Provide the Engineer with copies of delivery tickets and landfill invoices for all waste material generated by this project.

3) Dispose of all bridge cleaning wastes according to Federal, State, and local regulations.

4) This project is based on the best information available that wastes generated will be non-hazardous for disposal per 40 CFR 261. Disposal of hazardous bridge cleaning wastes will be by extra work according to Article 1109.03.

h. Final Clean up.

1) Apply Article 1104.08.

2) In no case allow any foreign material or other painting related wastes to mix with the wastes generated from abrasive blast cleaning or paint cleaning by other methods.

5. Protection and Clean up.

a. For all work, use every reasonable means to protect the environment, human health and safety, adjacent property, and vehicles from damage resulting from the paint removal operations, according to Article 1107.07. Keep the project site in a neat, clean, and safe working condition.

b. At the end of each working day, clean up and properly containerize all waste material. Special attention is drawn to steel abrasive and its preponderancy to rust and stain surfaces where material is allowed to accumulate.

c. Clean up abrasive on a daily basis and remove any staining which occurs.

d. Protection and clean up will not be measured for payment, but will be considered incidental to all other pay items in this specification.

B. Hazardous Paint Removal.

1. General.

a. Apply Article 2508.01, B, only to structures previously painted with lead based paints and for structures with Scratch Tests indicating a hazardous waste is expected to be generated during the project. Scratch tests are provided elsewhere in the contract documents for information per Iowa Code Section 89B.8, Subsection 1.

b. Take responsibility for whatever precautions are necessary, to comply with Federal and State safety and health regulations.

2. Bridge Cleaning.

Apply Article 2508.01, A, 2.

3. Blast Cleaning of Structural Steel.

a. Waste Notification.

1) This structure has previously been painted with coating materials which contained lead pigments or chromium pigments, or both. Analytical results from scrape tests of the existing paint system are provided elsewhere in the contract documents.

2) The waste produced is expected to contain paint chips with heavy metal constituents, spent abrasive, rust, and possible mill scale. Take whatever measures are deemed necessary to assure protection for human health and the environment.

b. Preconstruction Sampling and Testing.

1) Obtain representative waste samples from the existing paint system using the selected production blasting system and equipment. Have an accredited laboratory test waste material with the Toxic Characteristic Leachate Procedure (TCLP) using EPA test method SW-6010B, TCLP; or an approved equal. Laboratories accredited by the American Industrial Hygiene Association of National Environmental Laboratory Accreditation Program, or any EPA certified laboratory may perform the paint waste testing.

2) Have waste samples analyzed for, at a minimum, the 8 priority metals. These metals are: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. No later than 12 calendar days following the first day of production blasting, provide the Engineer with analytical results of these tests as well as reasonable estimated quantities of waste that are expected to be generated per month.

3) Conduct preconstruction and post-construction soil and river sediment sampling in the areas potentially impacted by blasting activities. At least 3 weeks prior to commencing work, provide a written program for sampling to the Engineer for review and comment. On the program, identify the number of samples proposed, the sampling locations, and sampling procedure to ensure all areas of potential impact are evaluated and that a statistical basis has been developed.

4) All sampling should be tested for total lead and chromium content using EPA Method SW-6010B, Totals, or approved equal. Locations where it is recommended to take samples include:

- At locations under and within the shadow of the structure,
- Storm sewer intakes and curb drains,
- Areas where ditches could carry debris laden storm water run-off to the river,
- Locations of equipment and waste storage, and
- Sediments along the bank and in water less than 5 feet (1.5 m) deep.

5) Preconstruction sampling locations need to be marked and resampled at the same location upon completion of work. Refer to Article 2508.01, B, 6, for additional information.

6) Provide the Engineer with preconstruction analytical results from soil and sediment sampling at least 3 weeks prior to commencing production blasting or other paint removing activities. After final clean up, but before final acceptance of the project, provide the Engineer with post-construction analytical results from soil and sediment sampling.

c. Environmental Regulatory Permits.

1) The Contracting Authority will obtain and provide an EPA hazardous waste identification number for this project if project specific waste sampling and testing indicate a hazardous waste will be generated.

2) The Engineer will use actual waste analytical results and estimated waste quantity data received from the Preconstruction Sampling and Testing to identify which type of identification number, if any, is required.

3) Obtain all other permits including any required for waste disposal. Apply Article 1107.03.

d. Site Working Documents.

Submit to the Engineer, for review and comment, three copies of all site working documents required in this section. Write each site working document to be specific for the issues associated with the blast cleaning alternatives selected. Revise any indicated sections of the site working documents to comply with the Engineer's comments and resubmit, if necessary.

1) Site Work Plan.

A minimum of 3 weeks prior to commencing work, provide a written site work plan to the Engineer for review and comment. On the site work plan include, at a minimum, a complete description of:

a) Paint removal methods selected, refer to Article 2508.01, B, 3, e.

b) The equipment and processes to be used including equipment catalog information from the manufacturers for major pieces of equipment.

c) The environmental protection plan including waste sampling procedures and methods used to control emissions into the air, water, and onto the soil.

d) Waste handling, storage, and disposal plan.

e) A preconstruction soil and river sediment sampling plan, refer to Article 2508.01, B, 3, b.

f) The Site Air Monitoring Plan. In this plan, describe the air sampling protocol and analytical procedures, sampling locations, frequency of sampling, and equipment, refer to Article 2508.01, B, 4, c. Use Title 40 Code of Federal Regulations, Part 50 (40 CFR, 50) as guidance when locating air monitoring equipment. Use a minimum frequency for sampling and monitoring that is in accordance with Federal and State requirements, and this specification.

2) Site Health and Safety Plan.

a) A minimum of 3 weeks prior to commencing work, provide a written Health and Safety Plan (H&SP) to the Engineer

for review and comment. In this plan detail the compliance program with regulatory requirements including, but not limited to:

- OSHA 29 CFR, 1910 and 1926,
- Resource Conservation Recovery Act (RCRA) and CERCLA 40 CFR, 261 through 300,
- TSCA 40 CFR, 700 – end, and
- Transportation 49 CFR, 100 through 199.

b) Give attention to 29 CFR, Section 1926.62, Lead in Construction Standard. In addition, ensure the H&SP specifically identifies:

(1) The Project Site Safety Officer who is to be on site at all times when work is in progress, and who has the Contractor's authority to effect an immediate operational change or to shut down production until a specification, regulatory, or safety deficiency is corrected. The Project Site Safety Officer has continuous site responsibility for assuring that worker health, safety, and U.S. EPA regulatory requirements are being met. This includes the duties of the "competent person" as required by 29 CFR, Section 1926.62.

(2) The compliance program as required by 29 CFR, Section 1926.62 which includes the following at a minimum:

(a) A description of each activity in which lead and/or chromium is emitted including the equipment and processes involved,

(b) Standard operating procedures for activities involving hazardous constituents,

(c) Maintenance schedules of equipment utilized for filtration of potentially hazardous constituents,

(d) Crew size and responsibilities,

(e) Description of engineering controls and processes used to control lead exposure or chromium exposure, or both,

(f) A report of the technology considered in meeting the Personal Exposure Limit (PEL),

(g) Air monitoring protocol which will be used to document personnel exposure,

(h) Schedule for implementing the program,

(i) Work practice program including the personal protective equipment,

(j) Housekeeping and hygiene practices,

(k) An administrative control (job rotation) schedule if used, and

(l) A description of H&SP compliance arrangements made between the Contractor and their subcontractors.

(3) Hazardous substances, that are expected to be encountered, PELs for these substances, and site personnel medical monitoring expected.

(4) The levels of personnel training, protection, and protective equipment required for different tasks performed at the site.

(5) Site control and restricted access policy to ensure unauthorized personnel or untrained personnel, or both, are not exposed to unnecessary risks.

c) The signature of a Certified Industrial Hygienist trained in worker environmental health and safety issues is required on the H&SP.

3) Site Contingency Plan.

a) A minimum of 3 weeks prior to commencing work, provide, for the Engineer's review and comment, a written Site Contingency Plan (SCP). In this plan:

(1) Detail the procedures that will be implemented and corrective action that will be taken, should an emergency or unforeseen situation arise.

(2) Specify procedures to minimize hazards to human health and the environment should there be fires, explosions, vandalism, or any other unplanned sudden or non-sudden release of hazardous waste or hazardous constituents to the air, soil, or surface water.

(3) Detail contingency measures that will be available on site to prevent accidental releases and provide safety to the general public. For example: Security, preventative, and containment measures which will be used to prevent and/or contain:

(a) Spillage or loss of paint wastes.

(b) Spillage of bulk paint, solvents, and thinners during the painting operations,

(c) Spillage or leakage of equipment fuel, oil, or other fluids,

(d) River traffic from encountering floating booms or barge mounted equipment,

(e) Inadvertent public exposure to job site hazards, and

(f) Waste material, or spills on water, from migrating off site and to contain that material until it is cleaned up.

b) Follow current Federal and State regulations in preparing this plan. Have it on file in the locations specified by regulation.

e. Paint Removal.

1) Submit to the Engineer in writing the type of blasting equipment that will be used for the paint removal operations before starting work. Achieve the level of surface preparation specified. In no case will unproven technology or untested technology, or both, be allowed without prior review, testing, and written approval from the Engineer.

2) The blasting process and equipment is required to be part of the Site Work Plan, and the plan shall describe in detail the:

- Method of blasting,
- Work procedures and tasks for this removal method,
- The estimated production rate, in other words, square foot (square meter) per hour,
- Estimated quantity of blasting abrasive utilized per production rate (hour or square foot (square meter)), and
- Procedure and protocols for abrasive recycling.

3) Contain and collect all waste material generated during blast cleaning. Contain any fugitive emissions (solid particulate, fugitive dust). Protect the health and welfare of the public. Protect the environment. Employ adequate administrative and engineering controls to reduce worker exposures to all hazardous constituents present at the site to levels as low as feasible according to industry standards. Refer to Article 2508.01, B, 4, b for additional details.

f. Standards For Surface Preparation.

Apply Article 2508.01, A, 3, b.

4. Containment.

a. General.

1) This work includes the design, erection, maintenance, and removal of the enclosure or containment used to contain wastes generated during the surface preparation. The work also includes characterizing, collecting, and containing wastes generated during the project.

2) Ensure any enclosure complying with, or comparable to, an SSPC Class 3 or better is designed and sealed by a Professional Engineer licensed in the State of Iowa who is qualified in structures. Ensure ventilation in a Class 2 or better containment is designed and sealed by a Professional Engineer licensed in the State of Iowa who is qualified in ventilation.

3) Work required to decontaminate, clean, and test equipment and non-expendable materials or supplies shall be included in this section. Ensure, at a minimum, decontamination and cleaning do not allow debris or dust, or both, to be dislodged by winds or physical contact during handling and movement of a containment structure. In addition, establish a procedure to ensure all equipment and materials are essentially free from hazardous substances when delivered to and removed from the project site.

b. Enclosure.

1) Perform paint removal activities, except for vacuum blasting, within a full enclosure. Design the full enclosure as a system including:

- The frame work and outer covering,
- Attachments to the structure and supporting foundations,
- Waste handling, and
- Ventilation, if required.

2) Include in the enclosure submittal a method or process to catch, accumulate, and ultimately contain all spent abrasive and all paint waste. Include in the enclosure details a description and catalogue cuts of:

- Containment materials and equipment used,
- Material strengths, permeability, and necessary seam closure details,
- Drawings of attachments to the bridge including abutments, piers, deck, parapet rails, and beams, and
- Calculations of superimposed dead and wind loadings.

3) Submit three copies of this design to the Engineer for review and approval at least 3 weeks prior to erecting the enclosure. Use an enclosure that is:

a) Designed to transfer added wind and static loading safely to the bridge. Analyze the structure for gravity and wind loadings from the containment. Provide a copy of this analysis and all supporting calculations in the submittal. If the Engineer determines that the proposed enclosure could have detrimental effects on the structural integrity of the bridge, modify the design of the enclosure at no additional cost to the Contracting Authority. A copy of the existing bridge plan is available from the Contracting Authority.

b) Designed and constructed to maintain negative pressures inside the enclosure during production blasting and to include an air filtering and dust collection system for all exhausted air, unless site specific data collected during actual blasting operations conclusively show a tight containment with negative air is not required.

c) Designed to employ adequate engineering controls, including ventilation, to reduce airborne contamination to levels as low as feasible.

d) Equal to, or comparable with, SSPC Class 2 or better for Conventional Open Abrasive Blasting.

4) Contamination of the ground, water, or river sediment from project activities is strictly prohibited. Project activities that shall be carefully monitored and controlled to avoid environmental contamination include, but are not limited to:

- The containment,
- Dust collector,
- Abrasive reclaimer,
- Waste accumulation points (storage areas),
- Satellite accumulation points,
- Refueling locations,
- Boat or barge access points, and
- Paint handling, transfer, and mixing operations.

5) Uncontrolled dumping of wastes is strictly prohibited. Immediately clean up spills at no additional cost to the Contracting Authority.

c. Air Emissions and Monitoring.

1) General.

a) Monitor air quality by using high-volume air monitoring equipment. Perform sampling protocol according to the provisions of 40 CFR, Part 50 and its appendices. At a minimum, perform monitoring for total lead and total suspended particulate (TSP) and particulate matter 0.4 mils (10 µm) and smaller (PM_{10}).

b) Use properly calibrated high-volume air sampling equipment at locations of maximum potential impact to the public plus at areas to provide background ambient samples.

c) Identify anticipated monitoring locations and monitoring protocol in the Site Air Monitoring Plan.

d) Have an American Industrial Hygiene Association (AIHA) accredited laboratory analyze all air samples collected.

e) Filter all containment and process air exhausted from air handling equipment or the abrasive recycling process, or both, to remove particulates and regulated constituents to a level below current air quality standards.

f) Capture and contain filtered material using a system designed for this purpose.

g) Establish regulated areas around the dust collector, abrasive reclaimer, containment, and other operations that potentially generate lead emissions or chromium emissions, or both.

h) Properly identify, post, and establish the perimeter of the regulated areas at the OSHA Action Level of 30 $\mu g/m^3$. Limit access within these areas to only those personnel who are properly trained and monitored according to the site Health and Safety Plan.

2) Site Air Monitoring Plan.

a) Ensure compliance with 29 CFR, 1926; 40 CFR, 50; 40 CFR, 60; and 567 IAC, Chapters 22 and 23, by including nomenclature in the plan for:

- Sampling equipment,
- Sampling procedure and protocol,
- Sampling frequency,
- Locating criteria, and
- Laboratory analysis of air samples.

b) Submit analytical results to the Engineer within 1 week of being received from the testing laboratory. An electronically generated version containing, at a minimum, the information on the standard laboratory reporting form will be an acceptable substitute.

3) Containment Efficiency.

a) The Engineer will not routinely use opacity testing to evaluate a containment's efficiency, but will generally use a "no visible dust or blast media is to be observed escaping into the atmosphere or onto the ground from the contained area during blasting, cleaning, or blow down" criteria.

b) The Engineer may conduct random opacity tests or use high volume or personal cassette samplers for verification monitoring. This monitoring, positioning of equipment, and times are at the discretion of the Engineer. Verification monitoring will be outside of the Contractor's regulated areas and involve the Engineer's sampling equipment. The Engineer's sampling equipment will not be made available for the Contractor's use.

c) Ensure the National Ambient Air Quality Standards for lead or PM_{10} or visible dust are not violated. If it is violated, an issuance of a Suspension of Work notice will be used until appropriate corrective action is taken.

d) Shut downs for noncompliance with environmental regulations or standards will not be cause for extensions in time, or considered for delay costs.

d. Paint Waste.

1) Paint wastes include all wastes generated by the project. These wastes include, but are not limited to:

- Blast waste,
- Material accumulated from filtering exhausted air,
- Spent abrasive,
- Containment material that cannot be decontaminated for reuse,
- Material containers such as paint and solvent containers, and
- Other wastes that fail the TCLP test as modified below and are categorized as a RCRA hazardous waste.

2) Consider all paint wastes as hazardous until after appropriate analytical data or Materials Safety Data Sheets are available showing conclusive evidence that the waste is below any regulated level for hazardous constituents, or is not initially regulated. Further reduce any waste regulatory value listed in the CFRs by a factor of 20%. For example: 40 CFR, 261.24, identifies lead (D008) as a characteristic hazardous waste if the toxic characteristic is equal to, or greater than, 5.0 mg/L. Wastes containing lead that have leachable levels greater than 4.0 mg/L are considered hazardous and are to be disposed of in a Subtitle C landfill.

3) During generation, accumulate all paint wastes and segregate by individual waste stream. Place in properly labeled storage containers. Use containers that comply with Federal DOT 49 CFR requirements. Follow the handling and storage requirements of 40 CFR, 262 and 40 CFR, 265. Waste streams may be combined after each has been sampled, tested, and characterized, provided combining is acceptable to the disposal facility.

4) As required by the Site Contingency Plan, have a designated, responsible, and trained person available for emergency response around the clock any time wastes are stored on the project. It is recommended the Site Health and Safety Officer be so designated. Ensure this person is available during non-

working hours and work shutdowns within a reasonable response time whenever wastes are being stored. Post this person and an alternate's name, telephone numbers, and other required information on the accumulation point's fence and list in the Site Contingency Plan.

a) Accumulation Point.

(1) Erect and maintain an accumulation point, or storage area, sized to accommodate the accumulation of wastes awaiting shipment to a disposal facility. Enclose the accumulation point with an 8 foot (2.4 m) high chain link security fence with barbed wire top, lockable access gates, bermed sides, and properly posted warning signs. Obtain the Engineer's approval for the location of this accumulation point. Construct it within the existing right-of-way at the project, but out of areas prone to flooding.

(2) For projects that will generate minimal quantities of waste, make a detailed written request to modify this storage security requirement. Submit all requests to modify the security requirement to the Engineer a minimum of 3 weeks prior to commencing production blasting. The Engineer will respond to the Contractor within two weeks following the request. The Engineer will evaluate the proposal based on:

- The Contractor's estimated waste quantities,
- The proposal's intent to comply with storage regulations and these specifications,
- Expected waste classification (i.e., hazardous or non-hazardous), and
- Other site specific considerations and details which the Contractor provides.

b) Satellite Accumulation Point.

(1) If the Contractor requests in writing, the Engineer will consider a small satellite accumulation point, or points, in the work zone. Properly label containers stored in any satellite area. Tightly close containers to the elements and secure to prevent accidental spillage or loss. At the conclusion of any working day, remove all containers containing accumulated wastes from any satellite accumulation point and place in the accumulation point storage area.

(2) Equipment which incorporates temporary storage of accumulation of wastes during operation will be considered a satellite accumulation point. As such, the equipment will be subject to proper labeling requirements. Waste materials contained within this type of equipment will not be subject to the requirement for daily transfer to the accumulation point storage area.

(3) Secure all materials stored at the accumulation point and satellite accumulation points to prevent spillage

or vandalism. Securely cover to protect from the elements. Ensure the Site Health and Safety Officer maintains a permanent record to account for the accumulation of all waste materials and to report the cumulative weekly volumes at the project's progress meetings. Ensure the volume of materials located in the accumulation points and the condition of the storage containers are recorded weekly in the log.

(4) Remove accumulation point and satellite accumulation points (if used) when the Engineer orders, or at the end of the project. Apply Article 2508.01, B, 6.

e. Decontamination Plan.

1) Provide the Engineer with a written Decontamination Plan a minimum of 3 weeks prior to commencing work. In this plan, outline procedures to follow to ensure non-expendable materials and equipment have been properly decontaminated prior to arriving on the project and before being demobilized from the site. Prior to in-bound mobilization, provide the Engineer with a written statement which includes the following:

a) Identification of project, location, owner reference, and contact information and type of wastes generated (hazardous or non-hazardous) at the previous project.

b) Certification that all equipment and non-expendable materials have been decontaminated and are clean. In this certification include analytical data verifying items have been decontaminated and are clean.

2) Before off-loading (or allowing in the right-of-way) equipment or non-expendable material, or both, that: 1) is mobilized to the site without being included in the certification; or 2) arrives at the site in an unacceptable condition, ensure it is:

- Decontaminated,
- Adequately sampled and tested, and
- Accepted as clean by the Engineer.

3) Evaluation of equipment and non-expendable material clean-up used on projects that generate hazardous wastes should include sampling (swipe or destructive) and TCLP testing as an integral part of this plan. It is recommended to follow OSHA's Field Operation's Manual, CPL 2.0 - 2.58 and HUD's Clearance Criteria for Post Abatement Clean-up when developing sampling procedures and protocol for a decontamination plan.

4) For projects that generate no hazardous waste, use equipment that is, at a minimum, judged as visually clean. In addition, perform non-expendable material cleanup in a manner that is, at a minimum, judged as visually clean. No special testing will be required. Sample and test, or dispose of, items that cannot be visually evaluated.

5) If a particular waste stream can be identified as the sole source of hazardous materials, in an otherwise non-hazardous project, the Engineer has the discretion to:

- Separate out that process for a higher level of evaluation (for example sampling and testing), and
- Minimize visual evaluation on the other non-hazardous processes.

5. Paint Waste Transport and Disposal.

a. Waste Sampling and Testing.

1) Sample each waste stream during the project to ensure project goals are being maintained and that a disposal facility's need for waste characterization is being met.

2) Obtain all samples properly, prepare for shipment, and offer for transport using Chain-of-Custody procedures and protocol. Have an accredited laboratory, or a laboratory that participates in EPA's Contract Laboratory program, analyze all samples. Refer to Article 2508.01, B, 3, b, for additional information.

3) Provide all laboratory results to the Engineer as soon as they are received. Obtain an adequate number of samples and analyze them to ensure any waste stream generated during this contract is fully characterized.

4) Sample solid wastes and analyze using TCLP test for the 8 priority metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Perform any additional analytical methods required by the disposal facility.

b. Disposal.

1) A minimum of 3 weeks prior to commencing production blasting, provide the Engineer with a written request to approve a designated disposal facility. Determine which of the following options or combinations are applicable to the job and selected removal process, or processes:

a) Permitted, Subtitle C, Treatment, Storage, and Disposal Facility (TSDF) for any hazardous waste generated at the site.

b) Permitted, geosynthetic lined, Subtitle D landfill for non-hazardous waste generated at the site.

c) Treatment and disposal facility for waste water generated from personal decontamination wash water.

2) With this request include a letter of tentative commitment from the facility to accept and dispose of the project's waste or selected waste streams. Dispose of hazardous waste only in a permitted TSDF that has obtained and currently holds an EPA, TSDF identification number. The Engineer will evaluate any facility submitted by conducting an environmental audit, records review, and reference check of that facility.

3) After receiving the Engineer's approval of the facility (or facilities), begin the formal process of obtaining final disposal permits which may be required by that facility. Provide the Engineer with copies of all final documents pertaining to the disposal permit. Obtain a signed contract with the approved TSDF or other facility for wastes produced at the site before accumulating waste (hazardous or non-hazardous) in the amount of 1000 pounds (450 kg) or within 1 month of beginning paint removal operations.

4) Clean all shipping containers for regulated raw materials or consumable supplies received at the project to "RCRA empty". Properly recycle or dispose of at the appropriate disposal facility.

5) The Engineer, on a case-by-case basis, will consider proposals for beneficial reuse, reclamation, or recycling of waste products generated during the course of the project. A minimum of 3 weeks prior to commencing work, provide a written Value Engineering Incentive Proposal, according to Article 1105.15, identifying a waste recycling program to the Engineer for consideration. In the submittal, provide the Engineer with ample detail to thoroughly and completely review and research the proposal.

c. Transportation and Manifesting.

1) Ensure that no waste leaves the site without a properly prepared waste manifest. Manifest all hazardous waste shipments using a Uniform Hazardous Waste Manifest, obtainable from EPA or the approved disposal facility. For all shipments of non-hazardous waste, propose a manifest. Obtain the Engineer's approval for the manifest.

2) Have the Site Health and Safety Officer sign the manifest prior to shipment. Signatures will be on behalf of the Contracting Authority, according to 40 CFR, 262. At the conclusion of each shipment, have the Site Health and Safety Officer deliver to the Engineer and appropriate agencies, copies of the required pages from the Uniform Hazardous Waste Manifests, according to the instructions included on the manifest.

3) When material is being transported or readied for transport, ensure all waste containers are properly labeled and marked according to Federal regulations (40 CFR, 262 and 49 CFR, 172). Ship all wastes with a permitted transporter holding a current EPA transporters identification number. Provide the Engineer with the required emergency response telephone number for the Uniform Hazardous Waste Manifest.

4) Maintain a file of all waste shipped for disposal or recycling. Have the Site Health and Safety Officer immediately notify the Engineer if a waste shipment (hazardous or non-hazardous) does not reach the designated facility. Further, have the Site Health and Safety Officer coordinate with the Engineer to assure that the signed original of each Uniform Hazardous Waste Manifest is received from the designated facility by the Engineer within 35 calendar days of the date the waste was accepted by the initial transporter. For shipments of hazardous waste, if the signed TSDF copy is not received in 10 additional calendar days (45 calendar days total) have the Site Health and Safety Officer immediately:

a) Prepare and submit an Exception Report to the EPA Region VII Administrator, 901 North 5th Street, Kansas City, KS 66101-2728. Provide a copy of this report to the Engineer.

b) Initiate actions to track and locate that shipment (applicable for both hazardous and non-hazardous waste shipments).

5) Provide the Engineer with a photocopy of:

- The signed Generator Copy page from the Uniform Hazardous Waste Manifest on the day of waste shipment, and
- The fully signed Return to Generator page from the Uniform Hazardous Waste Manifest on the day it is received from the disposal facility.

6. Protection and Clean-up.

a. General.

1) For all work, use every reasonable means to protect the environment, human health and safety, adjacent property, and vehicles from damage resulting from the paint removal operations, according to Article 1107.07.

2) Keep the project site in a neat, clean, and safe working condition.

3) At the end of each working day, clean up and properly containerize all waste material. Special attention is drawn to steel abrasive and its preponderancy to rust and stain surfaces where material is allowed to accumulate.

4) Clean up abrasive on a daily basis and remove any staining which occurs.

b. Site Environmental Evaluation.

1) Do not contaminate the soil or bodies of water with lead or other hazardous materials.

2) Soil or river sediments are considered to have been contaminated with lead or chromium from the project if either of the following two conditions occurs. Return the soil or river sediments to back-ground levels by methods acceptable to the Engineer and all applicable regulatory authorities (at no additional cost to the Contracting Authority).

a) If the geometric mean pre-project level is less than or equal to 200 ppm (totals), and an increase in the post-geometric mean total content of 100 ppm or more occurs.

b) If the geometric mean pre-project level is greater than 200 ppm, and the post-geometric mean concentration exceeds the pre-job geometric mean plus two standard deviations, or increases in the post-geometric mean level of 100 ppm occurs, whichever is greater.

c. Final Clean-up.

1) Perform final cleanup of all work on this project according to Article 1104.08 and procedures established in Article 2508.01, B, 4.

2) No separate payment will be made for furnishing protection and cleanup. The costs for protection and cleanup are included in the contract unit prices bid for the various items of work in the contract.

7. Project Submittals and Written Plans.

The Contractor and Engineer shall adhere to the following requirements to ensure appropriate project paper work is submitted in a timely manner. No work will be allowed or progress payments made unless these items have been submitted, reviewed, corrected, and approved as necessary.

a. Three weeks prior to commencing work.

1) Site Soil and River Sediment Sampling Program, as described in Article 2508.01, B, 3, b.

2) Site Work Plan, as described in Article 2508.01, B, 3, d.

a) Environmental Protection Plan.

b) Waste Handling, Storage, and Disposal Plan.

c) Site Air Monitoring Plan.

3) Site Health and Safety Plan.

4) Site Contingency Plan.

5) Decontamination Plan, as described in Article 2508.01, B, 4, e.

6) Written proposal for Beneficial Waste Reuse, as described in Article 2508.01, B, 5, b.

b. Prior to in-bound mobilization.

Certification of Equipment Decontamination, as described in Article 2508.01, B, 4, e.

c. Three weeks prior to erecting containment.

Containment Design, as described in Article 2508.01, B, 4, b.

d. Three weeks prior to commencing production blasting.

1) Analytical results from soil and river sediment sampling, as described in Article 2508.01, B, 4, b.

2) Request to Modify Accumulation Point Security, if applicable, as described in Article 2508.01, B, 4, d.

3) Written request for Disposal Facility Approval, as described in Article 2508.01, B, 5, b.

e. Twelve calendar days following 1st day of production blasting.

1) Furnish analytical data from project sampling paint waste, as described in Article 2508.01, B, 3, b.

2) Furnish estimated waste production quantities.

f. Prior to painting.

1) Written paint mixing procedure, as described in Article 2508.02, E, 4.

2) Manufacturer's Recommendations, as described in Article 2508.02, B, 2.

3) Written designation of the paint manufacturer's technical representative, as described in Article 2508.02, E, 7.

2508.02 PAINTING OF STRUCTURAL STEEL.

A. General.

This work consists of fully repainting, zone painting, or spot painting (or any combination of these) structural steel at designated locations using a paint system designated elsewhere in the contract documents. The work includes:

- Furnishing the coating system specified,
- Application, protection, and curing of paint coatings,
- Protection of all parts of the structure from paint spatter,

- Environmental protection,
- Final cleanup, and
- Supplying all equipment, scaffolding and rigging, labor, and materials.

B. Material Acceptance.

1. Use paints that:
- Are equal to or less than 3.2 pounds per gallon (5.5 kg/L) for VOC. Calculation of VOC content shall account for thinning necessary for field application, and
- Contain pigments which are free from or have constituents at levels below a threshold that when disposed of would be regulated by the 40 CFR, 261.

2. Furnish three copies of the coating manufacturer's certification document for each shipment intended for use on this project. Ensure the document includes the following information:
- Date of shipment to the project,
- Name of painting Contractor or company to which the shipment was made,
- Brand names and product identification numbers,
- The most current Technical Data sheets and MSDS for coatings, thinners, and tints,
- Batch or lot numbers, and
- Batch or lot numbers and producer mill certificate for any zinc pigment, certifying compliance to at least the purity requirements of ASTM D 520 Type II.

3. Provide the Engineer with three copies of the latest Technical Data Sheets, MSDS sheets, and coating manufacturer's written approval for caulking material to be used on this project.

4. Provide the Engineer with two copies of the certification document prior to starting work. Make an additional copy available on-site.

C. Paint System.

The paint system, Epoxy, Moisture Cured Urethane, or Zinc Silicate, for this project is designated elsewhere in the contract documents. The different systems are as follows:

1. Primer Coat.

a. Use a Zinc-rich Epoxy, Zinc-rich Aromatic Moisture Cured Urethane, or Zinc-rich Silicate applied at a rate that results in a targeted dry film thickness (dft) of:
- 3 to 5 mils (75 to 125 µm) for Epoxy.
- 3 to 4 mils (75 to 100 µm) for Moisture Cured Urethane.
- 3 to 5 mils (75 to 125 µm) for Zinc Silicate.

b. There is no color specified for the primer.

c. Dry film thickness listed assumes a surface profile of 1.5 to 2.5 mils (25 µm to 65 µm). If this is not the case, either because of previous blast cleaning operations or improper quality control on this job,

additional dft of primer may be required. In those cases, contact the paint manufacturer to provide a written alternate primer and possible application modifications. Prior to applying additional alternate primer, provide the written alternative to the Engineer for review and approval. Ensure that in no case do surface peaks project above the primer coverage.

d. The use of penetrating sealer, if required, will be designated elsewhere in the contract documents. A penetrating sealer may be required in any of the following areas:
- Where there are cracks and seams,
- In feathered (transition) areas,
- Areas with surfaces prepared by mechanical methods.

e. Apply the sealer at a rate that results in a targeted dft recommended by the paint manufacturer.

2. Intermediate Coat.

a. Use an Aluminum Epoxy Mastic or Aromatic Moisture Cured Urethane applied at a rate that results in a targeted dft of:
- 5 to 7 mils (125 to 175 µm) for Aluminum Epoxy Mastic.
- 3 to 4 mils (75 to 100 µm) for Moisture Cured Urethane, pigmented with micaceous iron oxide.
- No intermediate coat is required for a zinc-rich silicate system.

b. Tint the intermediate coat to a different color than the primer and finish coats.

3. Finish Coat.

a. Use an Aliphatic Polyurethane, Aliphatic Moisture Cured Urethane, or Waterborne Acrylic applied at a rate that results in a targeted dft of:
- 3 to 5 mils (75 to 125 µm) of Aliphatic Polyurethane for the Epoxy system.
- 2 to 3 mils (50 to 75 µm) of Aliphatic Moisture Cured Urethane.
- 2 to 3 mils (50 to 75 µm) of Waterborne Acrylic for the Zinc Silicate system.

b. For the top coat use Federal Color Number 14223 for highway bridges or the color specified in the contract documents.

D. Acceptable Products.

1. General.

a. Refer elsewhere in the contract documents for the system specified for this project. Acceptable suppliers and products for each system are listed in Materials I.M.s 482.02 through 482.06. Choose material for the paint system specified (including thinners, tinting, etc.) from one of the coating manufacturers.

b. When specified in the contract documents, use a penetrating sealer that is:
- Designated by the paint manufacturer for the system specified, and
- Tinted to a different color than that of the primer.

2. Epoxy System.

Use a three coat epoxy paint system consisting of:

- A Zinc-rich Epoxy primer,
- A High-solids Aluminum Epoxy Mastic intermediate coat, and
- An Aliphatic Polyurethane top coat.

3. Moisture Cured Urethane.

Use a three coat moisture cured urethane paint system consisting of:

- A Zinc-rich Aromatic Moisture Cured Urethane primer,
- A Moisture Cured Urethane - pigmented with micaceous iron oxide intermediate coat, and
- An Aliphatic Moisture Cured Urethane top coat.

4. Zinc Silicate.

Use a paint system consisting of a single coat of Zinc Silicate primer with a Waterborne Acrylic top coat system.

E. Application.

1. General.

Apply paint using brush, roller, or spray methods. Apply paint in strict compliance with the coating manufacturer's latest written recommendations. Regardless of the method of application, ensure the specified minimum dft is achieved. Ensure the manufacturer's recommended maximum dft requirement for each coat is not exceeded without approval of the paint manufacturer's technical representative. Additionally:

a. Ensure product parameters, such as application, thinning, mixing, pot life, ventilation, curing, and so forth comply with the manufacturer's recommendations.

b. Ensure the prime, intermediate, and finish coats have a smooth, uniform appearance free from runs, sags, cracks, dry spray, over-spray, or other defects.

c. Shield concrete and galvanized products so that paint application on steel is full and complete without over-spray.

d. Upon completion, permanently stencil the word "painted" followed by the Contractor's name, the month, year, coating system, and manufacturer of the coating system applied. Stencil this information on an inconspicuous surface in a manner and location the Engineer approves.

e. Provide OSHA compliant access for the Engineer to check the surface preparation before painting and the dft after each coat is applied.

2. Painting.

a. Penetrating Sealer.

Apply penetrating sealer to areas designated in the contract documents. Allow to cure according to the coating manufacturer's recommendations before the prime coat is applied.

b. Prime Coat.

1) Apply a prime coat to all areas blasted clean or mechanically cleaned, or both. Apply this coat to areas of bare metal within 24 hours of being blast cleaned. Brush blast the entire prepared area before paint is applied if:

- The prepared surface shows any sign of flash rust, or
- The prime coat is not applied within 24 hours after blast cleaning.

2) Use methods acceptable to the Engineer to re-prepare areas which were prepared by mechanical methods and are showing flash rust.

3) Pay special attention to all rivets, bolts, edges of connections, areas of pack rust, and areas which may be difficult to access. These areas may require ringing/stripping.

4) Allow the prime coat to cure according to the coating manufacturer's recommendations before the intermediate coat is applied.

c. Intermediate Coat.

1) Apply the intermediate coat to all areas that received a prime coat. Allow to cure according to the coating manufacturer's recommendations before the finish coat is applied.

2) The Zinc Silicate system does not require an intermediate coat.

d. Finish Coat.

Fully cover the intermediate coat with the finish coat. Fully cover other surfaces with the finish coat if designated in the contract documents.

3. Recoating.

a. Surface Condition.

1) Ensure surfaces are free of dirt, oxidation products, oil, and other detrimental material prior to painting. Perform cleaning which may be necessary according to the coating manufacturer’s recommendations.

2) Protect all painted surfaces to prevent soiling or detrimental weather conditions during painting and through the tack-free stage.

b. Minimum Time.

1) No additional coat(s) of paint may be applied until the preceding coat has dried. Recoat according to the coating manufacturer's recommendations for time, temperature (ambient and/or surface), and weather conditions.

2) If minimum recoat times are not given by the coating manufacturer, wait at least 24 hours, and until the previous coat is tack-free, before applying the next coat.

c. Maximum Time.

Do not exceed the coating manufacturer's maximum time between coats. If the maximum recoat time is exceeded for any coat, provide the Engineer with a written correction procedure, or approval to proceed without correction, obtained from the coating manufacturer’s technical representative.

4. **Mixing.**
   - **a.** Mix paint according to the coating manufacturer's recommendations. Do not use previously opened or partially used containers of paint. Partial kit mixing will not be allowed.
   - **b.** Together with the coating manufacturer, provide a specific mixing procedure for the Engineer's review prior to performing the work. Follow this procedure unless the Engineer approves a written request to modify it.

5. **Dry Film Thickness.**
   - **a.** The Engineer will determine the dft of each coat and the total paint system using procedures described in SSPC-PA 2. Excessive coating thickness is as equally undesirable as unacceptably thin coating thickness, and both will be sufficient cause for rejection.
   - **b.** Targeted dft is specified herein. Touch up areas having less than specified dft to increase dft to at least that specified in this Article for the system specified. Depending on the condition of the steel substrate and paint system being used, it is possible these areas will require reblasting and repainting.
   - **c.** Excessive thickness will be evaluated on a case-by-case basis in consultation with the coating manufacturer. Depending on the condition of the steel substrate and paint system being used, it is possible these areas will require reblasting and repainting.

6. **Cracks and Seams.**
   - **a.** Use a best effort combination of blasting and possible hand or power tool cleaning to clean cracks and seams that are formed by junctions of joining members, splices, gusset plates, rivets, bolts, nuts, and similar surface irregularities. After application of any penetrating sealer and prior to application of the prime coat, caulk all cracks and seams that are equal to, or greater than, 3/16 inch (10 mm) wide with a durable caulking compound recommended by the paint manufacturer.
   - **b.** Seal cracks and seams less than 3/16 inch (10 mm) wide with the prime coat. Seal cracks and seams that cannot be sealed with the prime coat using caulk before the intermediate coat is applied. In the case of Zinc Silicate, this will be before the top coat is applied.
   - **c.** Use lead free caulking compound, supplied with the latest technical data and MSDS sheets. Obtain the paint manufacturer's and the Engineer's approval prior to incorporation into the project.

7. **Technical Assistance.**
   - **a.** Have the coating manufacturer whose products are used on this contract designate a qualified technical representative to support this project. The technical representative shall be available for on-site assistance and project coating consultation as may be required.
   - **b.** Difficulties in scheduling on-site technical assistance will not be considered a sufficient reason for approving time extensions to the contract period.
   - **c.** Ensure that, in all cases, application parameters are according to the product's Technical Data Sheet or the manufacturer's written

recommendations, unless superseded elsewhere in this specification or in the contract documents.

F. Application Conditions.

1. Apply the manufacturer's published weather restrictions for each coating, except as modified below.

2. Paint only when weather conditions are such that the surfaces to be painted are entirely free from moisture, frost, ice, and snow. When painting in an area protected from the above conditions, protect the surface under cover until the paint is dry.

3. If wet paint is exposed to humidity, rain, snow, or condensation, allow it to dry. Remove damaged paint, reclean the surface, and repaint.

4. Moisture Cured Urethane coating may only be applied when:
- Surface temperatures are between 38°F (4°C) and rising and 100°F (37°C).
- Relative humidity is less than or equal to 95%.

5. Bubbling or pinholing which may occur in Moisture Cured Urethane will be evaluated using SSPC-VIS2. Bubbling or pinholing shall be less than 0.1% as defined by SSPC-VIS2, Photographic Standard No. 8.

2508.03 COAST GUARD REQUIREMENTS.

Apply the following for contracts that require work in and over navigable waters.

A. Comply with the following requirements:
- Established by the Corps of Engineers, the U. S. Coast Guard, and others relative to construction work in and over navigable waters, and
- Applicable to this project, but not covered by existing permits.

B. Construction work includes, but not necessarily limited to:
- Bridge washing, paint removal, cleaning structural steel by blasting, and painting structural steel,
- Containment enclosures, safeguards and temporary falsework or platforms, and lighting during construction, and
- Anchorage of barges and construction equipment, temporary restriction of channel width, and the removal of all temporary construction.

C. Ensure operations within or over the river comply with the requirements or directions of the U.S. Coast Guard District Engineer.

D. The following precautionary measures shall be taken during the performance of this work:

1. Perform work so that the free flow of navigation is not interfered with and navigable depths are not impaired.

2. Ensure floating equipment working in the channel displays lights and signals as required by the current Inland Navigational Rules.

3. If scaffolding or nets are suspended below low steel in the navigation span, contact the Coast Guard Office in St. Louis, Missouri, so that the temporary reductions in clearance for river traffic can be checked and appropriate notices can be published. Remove such scaffolding or nets at night, if required by the Coast Guard.

4. Take positive precautions to prevent spark producing, flame producing, lighted, or other damaging objects from accidentally dropping onto barges or vessels passing beneath the bridge. Cease all flame cutting, welding, and similar spark-producing operations over the channel when vessels are passing beneath the bridge.

5. Ensure work does not interfere with displaying navigation lights on the bridge at night.

6. Immediately remove any material, machinery, plant, or appliance which is lost, thrown from the bridge, sunken, or misplaced during the progress of the work, and which in the Engineer's opinion may be dangerous or obstructive to navigation. Immediately notify the Engineer and provide a description and location of the obstruction. When required, mark or buoy such obstructions until the obstruction is removed.

E. The Federal Water Pollution Control act, as amended, prohibits the discharge of oil, including oil based paints, or hazardous substances into the waters of the United States. The law requires any person in charge of a vessel or facility from which oil or a hazardous substance is discharged shall immediately report the discharge to the U.S. Coast Guard National Response Center at 800.424.8802.

F. The owner/operator of a vessel or facility from which the pollutant is discharged is subject to a civil penalty of up to $5000 and is liable for cleanup costs, if any.

G. Inform the U.S. Coast Guard office in St. Louis, Missouri, the status of this work to enable them to issue cautionary notices to mariners. If the Contractor has a marine radio at the job site, furnish the Coast Guard the call sign and operating frequency so that the information can be included in their notices.

H. No changes in channel conditions or in river bank conditions from natural causes or by reason of channel improvements or other construction, nor methods of river control by the United States or the state are to be considered as having any bearing or effect on the obligations of the contract nor justification for any claim for additional payments or extensions of time.

I. In the event that the United States Coast Guard or other constituted authorities should, during the progress of work, issue directions or orders affecting the Contractor's operations or order of procedure, promptly file with

the Engineer a copy of such order or restrictions from the Corps of Engineers, U.S. Army, U.S. Coast Guard, and/or other authority having jurisdiction.

2508.04 METHOD OF MEASUREMENT.
Lump sum items. No method of measurement.

2508.05 BASIS OF PAYMENT.

A. Payment for the items below will be the lump sum contract price.

1. Bridge Cleaning for Painting.
Payment is full compensation for furnishing materials, labor, and equipment to perform the work in accordance with contract documents.

2. Blast Cleaning of Structural Steel.
Payment is full compensation for furnishing materials, labor, and equipment to perform the work in accordance with contract documents.

3. Containment.

a. Payment is full compensation for furnishing materials, labor, and equipment necessary to install and maintain the containment during blast cleaning operations or paint removal by other methods.

b. For non-hazardous paint removal, payment is also full compensation for monitoring, sampling, testing, reporting, temporary enclosures, temporary storage of waste, and disposal of waste.

c. For hazardous paint removal, payment is full compensation for:

- Furnishing all materials, labor, and equipment to perform all work necessary for containment enclosures,
- Air monitoring, sampling, and testing,
- Decontamination,
- Handling, sampling and testing, containerizing, and storage of paint waste, and
- Installing, maintaining, and removing the waste accumulation points.

4. Paint Waste Transport and Disposal.
Payment is full compensation for furnishing materials, labor, and equipment to perform all work necessary for:

- The proper transport of paint waste,
- The proper disposal of paint waste,
- Analytical testing of paint waste,
- Obtaining all necessary permits and manifests, and
- Preparation of permits and manifests.

5. Painting of Structural Steel.
Payment is full compensation for:

- All materials, labor, equipment,
- Providing material acceptance documents, and

- Providing technical assistance in accordance with contract documents.

B. Coast Guard Requirements will be incidental to the items of work for which they apply.