

SECTION 01260 - PREPARE SURFACES AND APPLY ZINC ANODES

(Follow all instructions and make all edits with "Track Changes" turned on. This Section is not published in the Oregon Standard. If there are no instructions [purple text] above a subsection, paragraph, sentence, or bullet, then include it in the Project, unless the item(s) that are included in the subsection, paragraph, sentence, or bullet are not required on the Project and then they should be deleted. In general do not re-number or re-letter subsections when item(s) are deleted. Delete all purple text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

Section 01260, ~~which~~ is not a Standard Specification ~~and~~, is included in this Project by Special Provision.

Description

01260.00 Scope - In addition to the requirements of Section 01201, Section 01210, Section 01215, Section 01220, Section 01235, and Section 01240, this Work consists of the following:

- Initial abrasive blasting of the entire surface in the Work area.
- Installing anode terminal plates at the locations shown.
- Abrasive blasting and cleaning concrete surfaces receiving zinc anodes.
- Thermally spraying coatings of zinc to the concrete surfaces, and masking to separate the zones.

01260.01 Timing - Install anode terminal plates before preparing concrete surfaces and after replacing damaged concrete according to Section 01235.

Begin abrasive blasting operations in each Work area only after containment has been installed according to Section 00253 in that area.

(When removing an existing anode or coating system use (Wet abrasive). For all other Projects use (Abrasive). Delete the language in purple parentheses that does not apply and delete all purple parentheses.)

(Abrasive)(Wet abrasive) blast entire surface within each Work area before beginning the Work of Sections 01215, 01220, 01235, and 01240.

Prepare zinc anode surfaces by abrasive blasting and cleaning the entire surface within each Work area after completing the Work of Section 01215, 01220, 01235, and 01240.

(When removing an existing anode or coating system use (Dry or wet abrasive). For all other projects use (Abrasive). Delete the language in purple parentheses that does not apply and delete all purple parentheses.)

(Abrasive)(Dry or wet abrasive) blast patched concrete areas and anode terminal plates after repair mortar and the resin used to install the anode terminal plates or buildup on shallow rebar in areas of high visual impact has cured as recommended by the manufacturer.

(When removing an existing anode or coating system use (dry). Delete the language in purple parentheses that does not apply and delete all purple parentheses.)

Do not conduct (dry)abrasive blasting operations on surfaces that are wet or damp or if the surfaces are less than 6 degrees Fahrenheit above the dew point.

Thoroughly clean concrete surfaces with a 50-~~5~~psi air blowgun within 15 minutes before zinc spraying. Remove any oil, grease, Soil, water, or other foreign matter that is deposited on the surface after the surface preparation has been completed and before the zinc is applied.

Apply the zinc coatings within 24 hours after completing preparation of zinc anode surfaces.

Test electrical continuity between the primary anode terminal plates and the zinc anodes after installing zinc anodes.

Perform touch-up and patching of zinc coating at Work platform and containment Structure attachment points after removing platforms and containment.

01260.02 Submittals - Submit descriptions of Materials to be used according to 00150.37. Identify all relevant components and properties of each Material and the Specifications with ~~which~~where it complies. Data published by the manufacturer is acceptable, unless otherwise specified.

Submit detailed procedures for performing this Work according to 00150.37, at least 21 Calendar Days Work begins. Include the manufacturer's specifications and operating instructions for all Equipment.

Submit a mill certificate according to 00165.35 verifying compliance with the requirements of ASTM B36 for brass plates.

Submit Material certifications according to 00165.35 verifying compliance with the requirements of ASTM B833 for each lot of zinc.

01260.03 Acceptance Criteria - Anode terminal plates are acceptable if they are attached securely enough that the Engineer is unable to dislodge selected plates and all installations have electrical continuity between the threaded section of the anode terminal plate and the zinc anode.

Furnish ~~A~~acceptable coatings ~~shall~~that have a uniform appearance, follow the form of the concrete surface, and do not contain any lumps, blisters, coarse texture, loosely adhering particles, cracks, pinholes, or chips that expose the concrete substrate.

Minimum acceptable adhesion strength is 50 psi.

Acceptable coating thickness is between 0.015 and 0.020 inch. In narrow areas of thermal spray overlap or difficult access such as behind piping, a coating thickness between 0.010 and 0.035 inch may be allowed.

Materials

01260.10 Anode Terminal Plates - ~~Provide~~ Furnish 2 1/2-inch-diameter, 1/8-inch-thick brass plates ~~conforming according~~ to ASTM B36, UNS number C26000, C21000 or C22000.

~~Provide~~ Furnish 1/4-inch diameter by one ~~1/2~~-inch-long brass cap screws or threaded rod conforming to ASTM F468 UNS number C27000, C46200 or C46400.

~~Provide~~ Furnish #10 x 1" tapered flat head brass screws.

~~Provide~~ Furnish silver alloy brazing filler Material according to AWS classification Bag.

01260.11 Non-Conductive Resin - ~~Provide~~ Furnish non-conductive resin ~~conforming according~~ to 01201.11.

01260.12 Zinc - ~~Provide~~ Furnish High Grade Zinc (Z15005, 99.9 percent zinc) wire according to ASTM B833.

01260.13 Masking - ~~Provide~~ Furnish nonconductive masking Material.

Do not allow the masking to debond the zinc coating on adjacent surfaces when removed.

Demonstrate the performance and acceptability of masking by preparing a 12 by 12 by one inch or larger concrete test sample. After abrasive blasting and before thermal spraying the test sample, install a four by eight inch piece of masking on the concrete surface. Spray zinc on the test sample according to the Specifications and strip the tape from the sample. Examine the condition of adjacent zinc for evidence of debonding.

01260.14 Abrasives - ~~Provide~~ Furnish clean, dry, non-metallic grit abrasive Material with no mineral constituents that break down and remain on the surface in visible quantity. Furnish hard angular shaped abrasives from 16 – 30 mesh.

01260.15 Compressed Air - Provide compressed air that is clean, oil free, and dry per ASTM D4285 for abrasive blasting and thermal spraying. Provide air line filters and moisture separators upstream from the blasting and spraying Equipment. Inspect air line filters and moisture separators daily for cleanliness and correct operation. Immediately correct any malfunctioning Equipment that is indicated by oil or water in the filter or trap.

Equipment

(Use the following subsection .20 when removing an existing anode or coating system.)

01260.20 Abrasive Blasting Equipment - Provide a wet abrasive blaster capable of maintaining a maximum pressure of 80 psi at the blast nozzle. Wet abrasive methods may

include water injected air pressure type, abrasive injected pressurized water type, or pressurized slurry (vapor) type.

Provide a conventional, air pressure-type dry abrasive blaster capable of maintaining a maximum pressure of 80 psi at the blast nozzle.

(Use the following subsection .20 when wet abrasive blasting equipment is not required.)

01260.20 Abrasive Blasting Equipment - Provide a conventional, air pressure-type dry abrasive blaster capable of maintaining a maximum pressure of 80 psi at the blast nozzle.

01260.21 Zinc Application Equipment - Provide one of the following electric-arc type spray systems:

- Precision Arc 4.8 CE, manufactured by Thermion Incorporated
- Arcspray 170-CL, manufactured by Metallisation
- Eco Arc 600, manufactured by Sulzer Metco
- Bridgemaster Arc Spray System, manufactured by TMS Metalizing Systems, Ltd

01260.22 Short Circuit Detection Equipment - Comply with 01201.20.

Construction

01260.40 Anode Terminal Plate Location - Locate the anode terminal plates as shown. ~~Provide~~Furnish at least two anode terminal plates per zone, separated by a minimum of 40 inches and located at least 40 inches from a zone boundary. Locate anode terminal plates for minimum visual impact where they have continuity with conduit runs supplying other zones, a central location in the zone, and ease of future access.

~~Provide~~Furnish additional anode terminal plates to provide continuity across expansion joints, bearings, or other features that cause discontinuity of the anode. ~~Provide~~Furnish a minimum of two anode terminal plates for each discontinuous area.

01260.41 Anode Terminal Plate Installation – Construct anode terminal plates as shown. Braze according to the *AWS Brazing Manual*. Remove flux residue by the method recommended by the manufacturer.

Install anode terminal plates with the exposed face of the plate flush with the concrete surface and the bottom and edges of the plate coated with resin so that no portion of the brass plate is in direct contact with the concrete. Roughen the brass plate by abrasive blasting and then clean it to enhance adhesion. Mix and install the resin according to the manufacturer's recommendations with viscosity to support the plates in place without the resin running onto adjacent concrete surfaces. Place the resin between all surfaces of plate and the concrete as shown.

Ensure that no resin is allowed to run on to the side of the brass plate ~~to which~~where the zinc anode is to be applied. If the concrete-to-brass plate bond is damaged or an anode terminal plate is incorrectly fabricated or installed, install a satisfactory replacement anode terminal plate at the same location at no additional cost to the Agency.

01260.42 Abrasive Blasting and Cleaning - Protect the insulation of all exposed conductors and the threads of all anode terminal plates with tubing that has sufficient abrasion resistance to prevent damage from abrasive blasting operations.

(When removing an existing anode system, add the anode type to the listed surface contaminants in the following paragraph)

Clean concrete surfaces to remove dust, grit, coatings, chalk marks, paints, curing compounds, laitance, and other substances ~~which~~ that would inhibit bonding of the anode to the concrete.

Remove soil, cement spatter, and other foreign matter (other than grease and oil) by scraping, chipping, or brushing with stiff fiber or wire brushes. Remove oil and grease by cleaning with detergents or emulsifying agents. Flush the surface with potable water to remove residue.

Abrasive-blast using non-metallic grit and a maximum pressure of 80 psi at blast nozzle, to remove contaminants and provide a surface according to International Concrete Repair Institute (ICRI) *Guideline 03732 surface profile CSP 4*. Do not damage completed portions of Work. Limit operating pressure and stand-off distance on areas of sound concrete to avoid exposing large Aggregate on finished surfaces. Protect exposed conductors and anode terminal plate threads during abrasive blasting. Do not reuse blasting abrasives that have been used to remove oil and grease. Recovered abrasives may be re-used only if they satisfy the purity and mesh requirements of the Specifications.

Abrasive-blast the unprotected exposed surface of anode terminal plates to provide bright metal.

Thoroughly air-blast all abrasive-blasted surfaces using 80 to 100 psi compressed air through a blasting nozzle held approximately two feet from the surface, to remove all traces of residue. Examine the abrasive-blasted surface for traces of oil, grease, and other adhering contaminants. Repeat cleaning procedures until contaminants are completely removed and concrete surface condition conforms to International Concrete Repair Institute (ICRI) *Guideline 03732 surface profile CSP 4*.

Do not allow cleaned surfaces to become re-contaminated, including contamination by the oil left from a hand print.

01260.43 Masking - Install masking four inches wide between zones. Install masking to provide two inches of uncoated surface between the zinc anode and any exposed metal object.

01260.44 Zinc Anode Application Requirements - Perform coating application, including touch-up and patching, only when the enclosure air temperature and the surfaces to be sprayed are at least 6 °F above the dew point and the surface temperature is 65 °F or higher. Apply coating only to clean, dry, surfaces.

Use a heating and ventilating system to bring surfaces to temperature. It is acceptable to use a portable propane powered weed burner to increase surface temperature in minor areas that do not fully respond to heating and ventilating. If using a weed burner, keep the burner

moving at an even pace, heating the concrete surfaces to a maximum temperature of 150 °F. Use an infrared thermometer to verify the surface temperature.

Start zinc anode application in each zone at the anode terminal plate ~~to which~~ where the short circuit detector is connected. Apply the zinc anode in a continuous coating to facilitate short circuit detection. Adjust machine controls, such as voltage, current, wire feed rate, air pressure, and compressed air flow rate, to provide the most uniform thickness attainable on all accessible surfaces. Carefully monitor spray gun-to-surface distance, rate and path of travel, overlap distance, time between successive overlaps, and number of overlaps to ensure complete coverage and uniform thickness.

Before starting Work on each shift, perform bend tests to verify the proper operation of Equipment, as follows: Spray two separate 2 by 4 inch by 0.05-inch carbon steel coupons with a 0.015- to 0.018-inch-thick coating. Apply the zinc to the coupons using the same techniques and Equipment settings as used for spraying the concrete. Bend the coupons 180 degrees around a 5/8-inch diameter rod with the coating on the tensile side of bend test specimen. Bend test results with minor cracking or no cracking and no lifting or spalling of coating are acceptable. Bend test results with zinc that can be picked off the cracked surface with a knife blade are unacceptable. Adjust Equipment and procedures and repeat bend test until acceptable results are achieved. Do not proceed with production zinc application until approved by the Engineer.

Locate short circuits according to 01201.40.

Eliminate short circuits using a method approved by the Engineer at no additional cost to the Agency.

01260.45 Environmental Monitoring Requirements - Install up to four Agency-furnished temporary run-off monitors at locations designated by the Engineer. Allow the Engineer to collect samples at any time during construction. Repair or replace any components damaged during construction at no additional cost to the Agency.

01260.46 Acceptance Tests - Perform the following tests in the presence of the Engineer, with additional tests as needed to establish the boundary of defective coatings:

(a) **Visual Examination** - Visually inspect anode surfaces using a lens with a magnification of at least 10.

(b) **Adhesion Test** - Measure adhesion strength according to ASTM D7234. Perform adhesion testing between eight and 24 hours after anode application.

Perform a minimum of 15 adhesion tests per zone in the zinc CP surface. Test locations are to be chosen by the Engineer.

After each adhesion test, recoat adhesion test areas with 0.002 to 0.004 inch of zinc after scraping any loose or delaminated zinc caused by the adhesion test.

(c) **Thickness Test** - Perform a minimum of ten thickness measurements for each operator in each shift of zinc application. It is acceptable to use a combination of tape tabs left by the operator and the random adhesion dolly tests.

(d) Anode Terminal Plate Continuity Test - Test electrical continuity between threaded section of anode terminal plate and zinc anode with a resistivity meter ~~conforming~~ according to 01240.20.

Anode terminal plate installations with resistance values less than 1.0 ohm are acceptable. Repair installations with resistance greater than 1.0 ohm by abrasive blasting to remove arc-sprayed zinc from anode terminal plate and recoating with zinc. Repeat continuity test until an acceptable result is obtained.

01260.47 Touch-up, Patching, and Repair of Unacceptable Coatings - After removal of Work platforms and containment Structures, prepare and coat all tie-up points and attachment points with zinc ~~conforming~~ according to 01260.11.

Remove Soil, cement spatter, and other foreign matter, except grease and oil, by scraping, chipping, or brushing with stiff fiber or wire brushes. Remove grease and oil by cleaning with detergents or emulsifying agents. Flush the surface with potable water to remove detrimental residue. Air-blast using 80 to 100 psi compressed air through a blasting nozzle held approximately two feet from the surface, to remove all traces of residue. Examine the abrasive blasted surface for traces of oil, grease, and other adhering contaminants. Repeat cleaning procedures until contaminants are completely removed. If wet cleaning methods are used, allow the surface to dry thoroughly before coating.

Feather the edges of adjacent existing zinc coating by grinding for a distance of one to two inches.

Apply the zinc coating using an approved thermal spray process to a thickness of 0.015 to 0.020 inches. Operate the short circuit detection system during zinc application.

Repair damaged surfaces and surfaces not in compliance with the Specifications at no additional cost to the Agency and according to the following:

(a) Unacceptable Visual Examination - Repair or replace unacceptable areas using an approved procedure as directed by the Engineer.

(b) Unacceptable Adhesion Test - Remove zinc in unacceptable areas and recoat with zinc according to the Specifications. Perform remedial surface cleaning and surface preparation if needed to obtain satisfactory adhesion, regardless of prior surface preparation acceptance.

(c) Insufficient Zinc Thickness - Apply additional zinc by thermal spraying after the surface is completely dry and any visible contamination has been removed. Warm the areas slowly before thermal spray of additional Material to avoid thermal shock.

(d) Excessive Zinc Thickness - Remove and reapply coatings of zinc greater than 0.035 inches according to the Specifications.

Measurement

01260.80 Measurement - No measurement of quantities will be made for preparing anode surfaces or installing zinc anodes.

The quantities of anode terminal plates will be measured on the unit basis.

Payment

01260.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Install Anode Terminal Plates	Each
(b) Prepare Anode Surfaces.....	Lump Sum
(c) Install Zinc Anodes.....	Lump Sum

Payment will be payment in full for furnishing and placing all Materials, and for furnishing providing all Equipment, labor and Incidentals necessary to complete the Work as specified.

Item (a) includes acceptance testing performed according to 01260.46(d).

Item (b) includes all masking, blasting, cleaning and roughening of surfaces including brass anode terminal plates.

Item (c) includes acceptance testing performed according to 01260.46(a), (b), and (c).

No separate or additional payment will be made for touch up, patching or repair of unacceptable or damaged coatings.