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ARTICLE 1 - PROJECT DESCRIPTION

Scope of Work

1.1 The work to be performed shall consist of the demolition and removal of existing troughs in southwest basin (noted as “Clarifier No. 4” on Project Plans) of the Intermediate Clarifier at the Water Reclamation Facility of the Metropolitan Sewerage District of Buncombe County, North Carolina. A bid alternate for additional work in the southeast basin (noted as “Clarifier No. 3” on Project Plans) will be included in the bid form. Determination of inclusion of this additional work will be made prior to CONTRACTOR ordering materials. Existing support structures will remain, CONTRACTOR will clean and re-coat steel I-beam undertrough support structures with a two-part coating system to protect against corrosion. The project shall generally consist of the furnishing of all services, supplies, materials and equipment, and performing of all labor for the demolition of existing troughs, cleaning and coating existing support structures, as well as assembly and installation of replacement troughs.

1.2 Trough (Clarifier 4) dimensions and quantities are as follows:
“Small trough, N-S”: 12” W x 18”D* x 14”9” L, 8 segments, 118 LF total
“Small trough, N-S”: 12” W x 18”D* x 15”3” L, 24 segments, 366 LF total
“Small trough, E-W”: 12” W x 18” D* x 14”3” L, 10 segments, 142.5 LF total
“Large trough, E-W”: 24” W x 37” D* x 16”3” L, 8 segments, 130 LF total

Trough (Clarifier 3) dimensions and quantities are as follows:
“Small trough, N-S”: 12” W x 18”D* x 14”9” L, 8 segments, 118 LF total
“Small trough, N-S”: 12” W x 18”D* x 15”3” L, 24 segments, 366 LF total
“Small trough, E-W”: 12” W x 18” D* x 14”3” L, 10 segments, 142.5 LF total
“Large trough, E-W”: 24” W x 37” D* x 16”3” L, 8 segments, 130 LF total

*Depths are taken from approximate top of weir plate.

CONTRACTOR shall be responsible for field-verifying dimensions prior to ordering materials.

1.3 The work shall be performed under lump sum price contract, and shall consist of furnishing all materials, supplies, and equipment; performing all labor and services incidental to or necessary for the completion of the project in accordance with the Plans and Specifications; and maintenance of each completed portion of the work until final acceptance of the entire project by the DISTRICT, unless otherwise approved by the ENGINEER. Project shall be awarded based on lowest base plus alternate bid price.

1.4 MANUFACTURER shall warrantee the fiberglass reinforced troughs to be free of defects in materials and workmanship for a minimum of two (2) years after installation under normal use, operation, and service.

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In the event a component fails to perform as specified or is proven defective in service during the guarantee period, the manufacturer shall provide a replacement part without cost to the Owner. The contractor shall provide, without cost, such labor as may be required to replace, repair or modify all materials and equipment provided pursuant to this specification.

ARTICLE 2 - PHYSICAL CONDITIONS/CONTRACT PLANS

- 2.1 **Site Conditions.** MSD Plant Operations staff shall be responsible for draining and initial washdown of the basins. Some residual clarifier sludge may be present in the bottom of the basins.
- 2.2 **Contract Plans.** The work shall be performed in accordance with these specifications and contract plans, which are incorporated herein as part of the contract and which are identified by the following numbers and titles:

<u>Sheet No.</u>	<u>Description</u>
PL-1	Effluent troughs - plan and detailed sectional views
PL-2	Effluent troughs – Elevations and details
D-1	Existing Trough as-builts
D-2	Existing Trough as-builts
D-3	Existing Trough as-builts

ARTICLE 3 - PROJECT COORDINATION

3.1 **Intent of Plans and Specifications**

The intent of the Plans and Specifications is to prescribe a complete work that the CONTRACTOR undertakes to do in full compliance with the Contract. The CONTRACTOR shall do all work as provided in the Plans and Specifications and other parts of the Contract and shall do such additional, extra, and incidental work as may be considered necessary to complete the work in a satisfactory and acceptable manner. Any work or material not shown on the Plans or described in the Specifications, but which may be fairly implied as included in any item of the Contract, shall be performed and/or furnished by the CONTRACTOR without additional charge, therefore. The CONTRACTOR shall furnish all labor, materials, tools, equipment, and incidentals necessary for the prosecution of the work.

3.2 **Interpretation of Estimate**

The quantities of the work and materials shown on the Proposal form or on the Plans are believed to approximately represent the work to be performed and materials to be furnished and are to be used for comparison of bids. Payment to the CONTRACTOR will be made only for the actual quantities of work performed or materials furnished in accordance with the Plans and Specifications, and it is

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understood that the quantities may be increased or decreased as hereinafter provided without in any way invalidating the bid prices.

3.3 **Time of Completion**

The CONTRACTOR shall commence work to be performed on the project under this agreement on a date to be specified in a written Notice to Proceed from the DISTRICT and shall duly complete all work under this agreement within **one hundred and twenty (120) consecutive calendar days** from said date. For each day in excess of the completion time limits specified above, the CONTRACTOR shall pay the DISTRICT the sum of Five Hundred Dollars (\$500.00) as liquidated damages reasonably estimated in advance to cover the losses incurred by the DISTRICT by reason of failure of said CONTRACTOR to complete the work within the time specified, such time being in the essence of this Contract and a material consideration thereof.

3.4 **Pre-Construction Conference**

Prior to starting any construction work on this project, a conference will be held in the Construction Office of the DISTRICT for the purpose of verifying general construction procedures, expediting the handling of shop drawings and schedules, and to establish a working understanding between the parties concerned on the project. Present at the conference shall be a responsible representative of the CONTRACTOR and the CONTRACTOR's job superintendent. The time of the conference shall be as agreed upon by the CONTRACTOR and DISTRICT.

3.5 **Progress Meetings**

The CONTRACTOR and any subcontractors, material suppliers or vendors whose presence is necessary or requested shall attend meetings, referred to as Progress Meetings, when requested by the DISTRICT for the purpose of discussing the execution of the work. Each meeting will be held at the time and place designated by the DISTRICT. A schedule for monthly meetings will be agreed upon at the pre-construction conference. The ENGINEER will call for and schedule additional meetings if necessary. All decisions, instructions and interpretations made at these meetings shall be binding and conclusive of the CONTRACTOR and such decisions, instructions and interpretations shall be confirmed in writing by the DISTRICT.

The proceedings of these meetings will be recorded, and the CONTRACTOR will be furnished with a reasonable number of copies for his use and for his distribution to the subcontractors' material suppliers and vendors involved.

3.6 **Coordination with MSD Staff**

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The CONTRACTOR shall coordinate with MSD Plant Operations staff regarding the timing of the project, including draining and filling of the clarifier basins. MSD Plant Operations staff will be responsible for draining and an initial washdown of the basin, which generally takes 48 hours. **The CONTRACTOR shall complete work in one basin prior to beginning work in the second basin to maximize the flow capacity of the Intermediate Clarifiers.**

ARTICLE 4 - SPECIAL REQUIREMENTS – FIBERGLASS REINFORCED PLASTIC TROUGH SPECIFICATIONS

4.1 **Quality Assurance**

The material covered by the specifications shall be furnished by a reputable and qualified manufacturer of proven ability that is regularly engaged in the manufacture and installation of FRP products.

The fabricator shall be experienced in successfully producing FRP products specified for this project, with sufficient production capacity to produce required units without causing delay in the work.

The fabricator shall provide, upon request, a list of ten (10) installations of comparable size in operation for at least ten (10) years.

4.2 **Submittals**

The following shall be submitted in accordance with the General and Special Conditions:

a. Shop Drawings

1. Dimensions.
2. Job specific layout.
3. Sectional assembly.
4. Location and identification mark.
5. Weir locations and attachment
6. Scum Baffle locations and attachment.
7. Accessories, attachments, transition pieces.
8. Connection details.

b. Manufacturer's catalog data showing:

1. Dimensions, spacing, and construction details.
2. Materials of construction.
3. Description.

c. Certificates

1. Submit Manufacturer's certification that all materials furnished are in

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compliance with the applicable requirements of this specification.

d. **Manufacturer's Instructions**

1. Submit complete information and instructions relating to the storage, handling, installation, and inspection of all equipment related to this Section.

4.3 **Shipping and Storage Instructions**

- a. All FRP components shall be shop fabricated and assembled into the largest practical size suitable for transporting.
- b. The parts and assemblies that are shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field.
- c. All FRP materials shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials.

4.4 **Manufacturers**

The following FRP trough manufacturers have been pre-approved for this project:
NEFCO, Incorporated
Fiberglass Fabricators Incorporated

Other FRP trough manufacturers/fabricators must submit specifications and be pre-approved prior to the bid opening.

4.5 **Design Criteria**

- a. Gravity Load - Downward vertical loads shall include the weight of the trough and appurtenance attachments, such as weir plates, baffles and spreader bars, together with the weight of water to fill the trough. Any additional loads, such as piping, etc., shall also be considered.
- b. Buoyant Load - The buoyant load shall act vertically upward, its magnitude equal to the weight of displaced water (trough weight neglected). The line of action passes through the centroid of the submerged cross-sectional area.
- c. Lateral Load - Loads acting against the trough sidewalls; specifically, those induced by differential water levels on either side of the trough walls. The maximum possible differential, existing when the trough is empty and the tank is full, or, when the trough is full and when the tank is empty, shall be used when calculating deflection, fiber stress, etc.

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- d. Thermal Stresses - The troughs shall be designed to accommodate temperature induced stresses resulting from differences in coefficients of thermal expansion (contraction) between the trough and tank/support materials over temperature range of -10°F to 100°F.
- e. Torsional Stability - The trough system shall be designed to resist torsional oscillations induced by the flow of water over trough edges. Any or all of the following trough stabilization techniques shall be considered:
 - 1. Trough-to-trough stabilization
 - 2. Torsional stiffness
 - 3. Support spacing and rigidity
 - 4. Internal baffles and/or flow straighteners
- f. Deflection under Load - Maximum vertical deflection under full buoyant or gravity load shall be less than or equal to $L/1000$, where L is defined as the unsupported trough length in inches. Under no circumstances shall the maximum vertical deflection, measured at mid-point between trough supports, exceed 3/16".
- g. Maximum trough sidewall horizontal deflection under full lateral load shall be less than or equal to $D/100$, where D is defined as the trough depth, in inches. Under no circumstances shall the maximum bottom deflection exceed 3/16".
- h. Trough bottom deflection (oil canning) under full buoyant or gravity load shall be less than or equal to $W/100$, where W is defined as the trough width, in inches. Under no circumstances shall the maximum bottom deflection exceed 3/16".
- i. Thermal Expansion/Contraction - The troughs shall be designed to accommodate a thermally induced expansion (contraction) of 1/8" per 20 ft. length of trough over temperature range of -10°F to 100°F, without exceeding the deflection or strain limitations set forth in the preceding sections.
- j. In addition to AWWA F101-96, the design should include critical buckling load calculations for the trough cross braces or spreaders. This calculation is required to ensure that the cross braces do not approach the critical Euler column buckling load when the trough is empty and the tank is being filled, thereby placing the braces in compression.
- k. The blind or closed end of the trough is anchored to the wall with 3/8" thick FRP spacer washers to allow for thermal expansion along the length of the trough. Using the thermal excursion as specified in AWWA F101-96, maximum thermal displacements will be calculated and applied to the mounting area on the blind end to determine plate bending stresses. The plate

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thickness will then be calculated so that stresses do not exceed the level set forth in the AWWA spec.

4.6 **Materials**

- a. The trough laminate shall meet the following minimum physical and mechanical requirements:

Table 1. Laminate Mechanical and Physical Properties

Property	Test	Value
Tensile Strength	ASTM D-638	18,000 psi
Flexural Strength	ASTM D-790	28,000 psi
Flexural Modulus	ASTM D-790	1.08 x 10 ⁶ psi
Barcol Hardness	ASTM D-2853	40
Notched Izod	ASTM D-256	13 ft-lbs/in
Water Absorption	ASTM D-570	0.08%

- b. Resin - The resin shall be a commercial grade isophthalic polyester thermosetting resin, Corezyn COR75-AQ-010 or equivalent, which has either been evaluated in a laminate, or which has been determined to be acceptable for use in a waste treatment plant environment.
- c. Fillers: The resin shall contain no fillers. Thixotropic agents for viscosity control are acceptable. Colorants which have been determined by at least five years previous service to be acceptable for the service condition are acceptable. The standard color for the trough shall be green. Ultraviolet stabilizers are required in all trough laminates. Catalysts, accelerators and/or promoters shall be added to provide complete cure of the laminate and must meet the physical properties as indicated in Article 4.6 Table 1.
- d. Ultraviolet Resistance - Ultraviolet resistance is required in all laminates exposed to ultraviolet light, whether it be in the form of pigmentation or ultraviolet absorbers or a surface veil.
- e. Metal Reinforcement - When metal reinforcements are used, they shall be free of rust, oil and any foreign matter. They shall be completely encapsulated with a minimum of 1/8" thick laminate.
- f. Glass Mat Reinforcement - Glass mat reinforcement shall consist of chemically bonded surfacing mat and chopped strand or chopped strand mat as hereinafter described. Surfacing mat shall be 0.020 inches thick reinforced with a surfacing mat of Type C veil, 10 to 20 mils thick, with a silane finish and a styrene-soluble binder compatible with the resin; the glass content of this layer shall not exceed 20% by weight. Chopped strands shall be Type E glass, with silane finish and styrene-soluble binder.

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- g. Woven Roving Reinforcement - The finished laminate shall include one layer of 24-ounce woven roving reinforcement over the entire trough surface.
- h. The content of the finished laminate shall be adequate to produce mechanical and physical properties conforming to Article 4.6 Table 1.
- i. Other Reinforcement – Additional reinforcement in the form of foam or balsa sheet for high stress areas at the sides and bottom of the trough shall be completely encapsulated within the laminate. Care shall be taken to ensure that these areas of the trough laminate are not designated as attachment points or drilled for any purpose.
- j. Laminate Construction
 - 1. Inner trough surface shall be a resin rich layer 0.020 inches thick reinforced with a 10-20 mil 'C' veil surfacing mat. This resin rich layer shall contain less than 20% by weight of the reinforcement veil. A gelcoat interior surface may be provided.
 - 2. Structural layers shall consist of plies of chopped strand mat with a maximum of 2 ounces per square foot per spray-up pass. Inter-layered between two layers of mat shall be one layer of 24-ounce woven roving over the entire trough structure. Each successive pass of reinforcement shall be thoroughly wetted with resin and shall be well rolled to exclude all air pockets and bubbles prior to the application of additional reinforcement.
 - 3. Outer trough surface shall consist of a resin rich layer not less than 0.020 inches thick. The outer layer resin shall be applied after cure of the structural layer and suitably embed all reinforcing fibers.
 - 4. Finished trough shall be a minimum of 30% fiber reinforced with a minimum thickness of not less than 1/4". The laminate tolerance thickness shall be $\pm 10\%$.
- k. Materials used in the manufacture of the FRP troughs shall be new stock of the best quality and shall be free from all defects and imperfections that might affect the performance of the finished product.

4.7 **Design and Manufacture**

- a. The inner surface of the trough shall be smooth and resin rich. The outer surface shall be reasonably smooth, resin rich, and no glass fibers shall be exposed. The size and number of air bubbles shall be held to a minimum. Laminations shall be dense and without voids, dry spots, cracks or crazes.

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- b. The top edges of the trough shall be level and parallel with a tolerance of plus or minus 1/8" (measured when the trough is not loaded).
- c. The length of a trough section shall have a tolerance of $\pm 1/8$ " per 10 ft. length.
- d. Horizontal stiffening flanges shall be integrally molded along the top edge of each trough side. These flanges shall be 1" to 3" wide, depending upon the trough configuration and shall face outward.
- e. Thickness at locations of supports such as saddles shall be at least 1-1/2 times the nominal thickness of the trough and shall conform to the fiber stress limitations set forth in Section 4.5.
- f. End flanges, where required to bolt trough sections together, and blind ends for securing to a wall, shall be a minimum of 1-1/2 times the nominal thickness of the trough.
- g. An integrally molded water stop shall be provided on the trough whenever the trough is grouted into and/or passes through a wall.
- h. Horizontal stiffeners shall be provided across the width of the trough to increase the structural rigidity of the trough system. The stiffeners shall be 1" diameter PVC pipe with an internal 1/2" stainless steel rod threaded on both ends and fastened through the trough walls on 2-foot centers, or as recommended by the manufacturer.
- i. After fabrication, all cut edges, holes and abrasions shall be sanded smooth and sealed with a compatible resin coating to prevent the intrusion of water.

4.8 **Trough Supports and Hardware**

- a. Existing galvanized steel I-beam support structures are proposed to remain. CONTRACTOR will be responsible for cleaning and re-coating existing beams with Sherwin-Williams Duraplate 235 or approved equal epoxy coating, in accordance with coating manufacturer's instructions. Dura-plate 235 product information sheet is incorporated at the end of this section.
- b. All trough mounting hardware shall be Type 316 stainless steel and shall be supplied by the trough manufacturer.

4.9 **Trough Installation**

- a. CONTRACTOR shall install troughs and supports in accordance with manufacturer's instructions and approved shop drawings.
- b. Field cutting of troughs is allowed if necessary. All field cut edges and field

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drilled holes shall be sealed per the manufacturer's instructions.

- c. CONTRACTOR shall ensure that troughs and supports are installed plumb and true, free of warp or twist, within the tolerances specified by the MANUFACTURER and as shown on the drawings.
- d. After the MANUFACTURER has approved the installation, and prior to startup, the CONTRACTOR shall clean all surfaces in accordance with the manufacturer's instructions.

4.10 **Trough In-Line Slide Gates**

- a. Each large (24"Wx36" D) trough installed in Clarifier No. 4 shall be fitted with guides for an in-line slide gate on at the easternmost end, per the project plans (Bypass Gate Details on PL-1), to allow flow to be diverted from the channel during installation of the troughs in Clarifier No. 3. These in-line slide gates and guides shall be fabricated and installed by the MANUFACTURER.
- b. Guides shall be constructed of $\frac{3}{4}$ "x $\frac{3}{4}$ "x $\frac{1}{4}$ " FRP angle bracket, 18" long, mounted vertically, with the top flush with the top of the trough. A 6" long guide shall be installed centered in the bottom of the trough.
- c. Slide gate shall be constructed of $\frac{1}{4}$ " aluminum, 24"x36", with bottom corners rounded to conform to the shape of the channel. A $\frac{1}{2}$ " rubber gasket shall be mounted on the perimeter of the gate to assist in sealing.
- d. Gates shall be designed to allow no more than 1 gal/min leakage.
- e. Any modifications of the bypass gate or guide design deemed necessary by the MANUFACTURER shall be pre-approved by the ENGINEER prior to fabrication of troughs and gates.



Protective & Marine Coatings

DURA-PLATE® 235 MULTI-PURPOSE EPOXY

PART A B67-235 **SERIES, COLORS**
PART B B67V235 **STANDARD HARDENER** (<340 g/L VOC, Mixed)
PART B B67V240 **LV HARDENER** (<250 g/L VOC, Mixed)

Revised: August 1, 2022

PRODUCT INFORMATION

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PRODUCT DESCRIPTION

DURA-PLATE 235 Multi-Purpose Epoxy is a modified epoxy phenalkamine, formulated specifically for immersion and atmospheric service in marine and industrial environments. Dura-Plate 235 provides exceptional performance in corrosive environment, and can be applied at temperatures as low as 0°F (-18°C).

- Self-priming
- Low temperature application, 0°F (-18°C)
- Surface tolerant - damp surfaces
- Provides salt water and fresh water immersion resistance
- Approved as a primer per MIL-PRF-23236, Type V, Class 7, Grade C (when mixed with Standard Hardener only)
- Outstanding application properties
- LV Hardener (B67V240) is formulated for CARB and OTC II VOC-restricted areas

PRODUCT CHARACTERISTICS

Finish: Semi-Gloss
Color: Wide range of colors available
Volume Solids: 68% ± 2%, mixed
Weight Solids: 78% ± 2%, mixed
VOC (EPA Method 24):
with Standard Hardener (EPA, OTC I):
Unreduced: <280 g/L; 2.33 lb/gal
Reduced 10%, R7K104: <340 g/L; 2.83 lb/gal
Reduced 10%, R7K111: <280 g/L; 2.33 lb/gal
with LV Hardener (CARB, OTC II):
Unreduced: <250 g/L; 2.08 lb/gal
Reduced 10%, R7K111: <250 g/L; 2.08 lb/gal

Mix Ratio: 4:1 by volume

Recommended Spreading Rate per coat:

	Minimum	Maximum
Wet mils (microns)	6.0 (150)	12.0 (300)
Dry mils (microns)	4.0* (100)	8.0* (200)
~Coverage sq ft/gal (m ² /L)	136 (3.3)	272 (6.6)
Theoretical coverage sq ft/gal (m ² /L) @ 1 mil / 25 microns dft	1088 (26.6)	

*See Performance Tips section

NOTE: Brush or roll application may require multiple coats to achieve maximum film thickness and uniformity of appearance.

Drying Schedule @ 6.0 mils wet (150 microns):

With B67V235	@ 0°F/-18°C	@ 40°F/4.5°C	@ 77°F/25°C 50% RH	@ 120°F/49°C
To touch:	18 hours	3.5 hours	2 hours	20 minutes
To handle:	36 hours	12 hours	3.5 hours	40 minutes
To recoat (self):				
minimum:	36 hours	12 hours	3.5 hours	40 minutes
maximum:	6 months	6 months	6 months	6 months
Cure to service:	30 days	14 days	7 days	3 days

*If maximum recoat time is exceeded, abrade surface before recoating.
Drying time is temperature, humidity, and film thickness dependent.*

Pot Life: 16 hours 8 hours 4 hours 1 hour
Sweat-in-time: 1 hour 30 minutes 15 minutes 5 minutes

PRODUCT CHARACTERISTICS (CONT'D)

Drying Schedule @ 6.0 mils wet (150 microns):

With B67V240	@ 0°F/-18°C	@ 40°F/4.5°C	@ 77°F/25°C 50% RH	@ 120°F/49°C
To touch:	18 hours	4 hours	2 hours	1 hour
To handle:	72 hours	20 hours	4 hours	2 hours
To recoat (self):				
minimum:	24 hours	4 hours	45 minutes	45 minutes
maximum:	6 months	6 months	6 months	6 months
Cure to service:	30 days	14 days	7 days	3 days

*If maximum recoat time is exceeded, abrade surface before recoating.
Drying time is temperature, humidity, and film thickness dependent.*

Pot Life: 16 hours 8 hours 4 hours 1 hour
Sweat-in-time: 1 hour 30 minutes 15 minutes 5 minutes

Shelf Life: Part A: 36 months, unopened
Part B: 24 months, unopened
Store indoors at 40°F (4.5°C) to 100°F (38°C).
Flash Point: 116°F (47°C) PMCC, mixed
Reducer/Clean Up:
EPA, OTC I: Reducer #104 (R7K104)
CARB, OTC II: Reducer #111 (R7K111)

RECOMMENDED USES

- For use over prepared steel and masonry surfaces.
- Salt water and fresh water immersion resistance
 - Ballast tanks, offshore and marine structures
 - Bilges and wet void areas
 - Above- and below- water hull areas
 - Decks and superstructures
 - Water and waste water tanks
 - Acceptable for use with cathodic protection systems.
 - Dura-Plate 235 Black meets or exceeds the performance criteria of C-200; SSPC Paint 16; and MIL-P-23236B(SH), Type I or IV, Class 2
 - Suitable for use in USDA inspected facilities
 - Conforms to MPI # 101 (when mixed with Standard Hardener only)

PERFORMANCE CHARACTERISTICS

Substrate*: Steel
Surface Preparation*: SSPC-SP10/NACE 2
System Tested*:

2 cts. Dura-Plate 235 @ 5.0 mils (125 microns) dft/ct
*unless otherwise noted below

Test Name	Test Method	Results
Abrasion Resistance	ASTM D4060 CS17 wheel, 1000 cycles, 1 kg load	65 mg loss
Adhesion	ASTM D4541	850 psi
Direct Impact Resistance	ASTM D2794	10 in lb (with Std. hardener) 25 in lb (with LV hardener)
Dry Heat Resistance	ASTM D2485	250°F (121°C)
Moisture Condensation Resistance	ASTM D4585, 100°F (38°C), 2000 hours	Rating 10 per ASTM D610 for rusting; Rating 10 per ASTM D714 for blistering
Pencil Hardness	ASTM D3363	H

IMMERSION (Ambient temperature)

- Salt Water Recommended
 - Fresh Water Recommended
 - Ballast Tank Mix Recommended
- Epoxy coatings may darken or yellow following application and curing.



Protective & Marine Coatings

DURA-PLATE® 235 MULTI-PURPOSE EPOXY

PART A B67-235
PART B B67V235
PART B B67V240

SERIES, COLORS
STANDARD HARDENER (<340 g/L VOC, Mixed)
LV HARDENER (<250 g/L VOC, Mixed)

Revised: August 1, 2022

PRODUCT INFORMATION

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RECOMMENDED SYSTEMS

	Dry Film Thickness / ct.	
	Mils	(Microns)
Steel, immersion or atmospheric service:		
2 cts. Dura-Plate 235	4.0-8.0	(100-200)
Steel, immersion service:		
1 ct. Dura-Plate 235	4.0-8.0	(100-200)
1-2 cts. TarGuard Coal Tar Epoxy	8.0-16.0	(200-400)
Steel, atmospheric service:		
1 ct. Dura-Plate 235	4.0-8.0	(100-200)
1-2 cts. Macropoxy 646	5.0-10.0	(125-250)
Steel, atmospheric service:		
1 ct. Zinc-Clad II Plus	3.0-5.0	(75-125)
1-2 cts. Dura-Plate 235	4.0-8.0	(100-200)
Steel, atmospheric service:		
1 ct. Zinc-Clad IV	3.0-5.0	(75-125)
1-2 cts. Dura-Plate 235	4.0-8.0	(100-200)
Steel, atmospheric service:		
1 ct. Corothane I GalvaPac Zinc Primer	3.0-4.0	(75-100)
1-2 cts. Dura-Plate 235	4.0-8.0	(100-200)
Steel, atmospheric service:		
1 ct. Dura-Plate 235	4.0-8.0	(100-200)
1-2 cts. Acrolon 218 HS	3.0-6.0	(75-150)
or Hi-Solids Polyurethane	3.0-5.0	(75-125)
Concrete/Masonry, immersion service:		
1 ct. Kem Cati-Coat HS Epoxy Filler/Sealer	10.0-20.0	(250-500)
as required to fill voids and provide a continuous substrate		
2 cts. Dura-Plate 235	4.0-8.0	(100-200)
Galvanized, atmospheric service:		
1 ct. Dura-Plate 235	2.0-4.0	(50-100)

Steel-Seam FT910 - as required for filling pits, and transitioning sharp edges, weld seams, etc...

The systems listed above are representative of the product's use, other systems may be appropriate.

DISCLAIMER

The information and recommendations set forth in this Product Data Sheet are based upon tests conducted by or on behalf of The Sherwin-Williams Company. Such information and recommendations set forth herein are subject to change and pertain to the product offered at the time of publication. Consult your Sherwin-Williams representative to obtain the most recent Product Data Information and Application Bulletin.

SURFACE PREPARATION

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Refer to product Application Bulletin for detailed surface preparation information.

Minimum recommended surface preparation:

Iron & Steel:

Atmospheric: SSPC-SP2 or SSPC-SP12/NACE 5, WJ-4
Immersion: SSPC-SP10, 2 mil (50 micron) profile or SSPC-SP-12/NACE 5, WJ-2

Concrete & Masonry:

Atmospheric: SSPC-SP13/NACE 6, or ICRI No. 310.2R, CSP 1-3
Immersion: SSPC-SP13/NACE 6-4.3.1 or 4.3.2, or ICRI No. 310.2R, CSP1-3

Galvanized, atmospheric: SSPC-SP1

Surface Preparation Standards

Condition of Surface	ISO 8501-1 BS7079:A1	Swedish Std. SIS055900	SSPC	NACE
White Metal	Sa 3	Sa 3	SP 5	1
Near White Metal	Sa 2.5	Sa 2.5	SP 10	2
Commercial Blast	Sa 2	Sa 2	SP 6	3
Brush-Off Blast	Ca 1	Ca 1	SP 7	4
Hand Tool Cleaning	Rusted D St 2	D St 2	SP 2	-
Pitted & Rusted	D St 2	D St 2	SP 2	-
Rusted	C St 3	C St 3	SP 3	-
Power Tool Cleaning	Pitted & Rusted D St 3	D St 3	SP 3	-

TINTING

Tint Part A with Maxitones only. Mill White tints at 150%. Ultradeep Base tints at 100%. Five minutes minimum mixing on a mechanical shaker is required for complete mixing of color.

APPLICATION CONDITIONS

Temperature: 0°F (-18°C) minimum, 120°F (49°C) maximum (air and surface)
*At least 5°F (2.8°C) above dew point

*Acceptable to apply over damp surfaces <32°F (0°C). Do not apply over surfaces that have ice on them.

Material should be at least 40°F (4.5°C) for optimal performance.

Relative humidity: Not applicable

Refer to product Application Bulletin for detailed application information.

ORDERING INFORMATION

Packaging:

Part A: 1 gallon (3.78L) and 4 gallons (15.1L) in a 5 gallon (18.9L) container
Part B: 1 quart (0.94L) and 1 gallon (3.78L)

Weight: 11.3 ± 0.2 lb/gal ; 1.35 Kg/L, mixed may vary with color

SAFETY PRECAUTIONS

Refer to the SDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

WARRANTY

The Sherwin-Williams Company warrants our products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS, EXPRESSED OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.



Protective & Marine Coatings

DURA-PLATE® 235 MULTI-PURPOSE EPOXY

PART A B67-235
PART B B67V235
PART B B67V240

SERIES, COLORS
STANDARD HARDENER (<340 g/L VOC, Mixed)
LV HARDENER (<250 g/L VOC, Mixed)

Revised: August 1, 2022

APPLICATION BULLETIN

4.67

SURFACE PREPARATIONS

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Iron & Steel, Immersion Service:

Remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1. Minimum surface preparation is Near White Metal Blast Cleaning per SSPC-SP10/NACE 2 or SSPC-SP12/NACE 5. For SSPC-SP10/NACE 2, blast clean all surfaces using a sharp, angular abrasive for optimum surface profile (2 mils / 50 microns). For SSPC-SP12/NACE No. 5, all surfaces to be coated shall be cleaned in accordance with WJ-2. Pre-existing profile should be approximately 2 mils (50 microns). Light rust bloom is allowed. Remove all weld spatter and round all sharp edges by grinding. Prime any bare steel the same day as it is cleaned.

Iron & Steel, Atmospheric Service:

Minimum surface preparation is Hand Tool Clean per SSPC-SP2 or SSPC-SP12/NACE 5. For surfaces prepared by SSPC-SP2, first remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1. For better performance, use Commercial Blast Cleaning per SSPC-SP6/NACE 3, blast clean all surfaces using a sharp, angular abrasive for optimum surface profile (2 mils). For surfaces prepared by SSPC-SP12/NACE No. 5, all surfaces shall be cleaned in accordance with WJ-4. Pre-existing profile should be approximately 2 mils (50 microns). Prime any bare steel the same day as it is cleaned.

Galvanized Steel

Allow to weather a minimum of six months prior to coating. Solvent Clean per SSPC-SP1 (recommended solvent is VM&P Naphtha). When weathering is not possible, or the surface has been treated with chromates or silicates, first Solvent Clean per SSPC-SP1 and apply a test patch. Allow paint to dry at least one week before testing adhesion. If adhesion is poor, brush blasting per SSPC-SP7 is necessary to remove these treatments. Rusty galvanizing requires a minimum of Hand Tool Cleaning per SSPC-SP2, prime the area the same day as cleaned.

Concrete and Masonry

For surface preparation, refer to SSPC-SP13/NACE 6, or ICRI No. 310.2R, CSP 1-3. Surfaces should be thoroughly clean and dry. Concrete and mortar must be cured at least 28 days @ 75°F (24°C). Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement and hardeners. Fill bug holes, air pockets and other voids with Steel-Seam FT910.

Concrete, Immersion Service:

For surface preparation, refer to SSPC-SP13/NACE 6, Section 4.3.1 or 1.3.2 or ICRI No. 310.2R, CSP 1-3.

Follow the standard methods listed below when applicable:

ASTM D4258 Standard Practice for Cleaning Concrete.
ASTM D4259 Standard Practice for Abrading Concrete.
ASTM D4260 Standard Practice for Etching Concrete.
ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete.
SSPC-SP 13/Nace 6 Surface Preparation of Concrete.
ICRI No. 310.2R Concrete Surface Preparation.

Surface Preparation Standards

Condition of Surface	ISO 8501-1 BS7079:A1	Swedish Std. SIS055900	SSPC	NACE
White Metal	Sa 3	Sa 3	SP 5	1
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Hand Tool Cleaning	C St 2	C St 2	SP 2	-
Pitted & Rusted	D St 2	D St 2	SP 2	-
Rusted	C St 3	C St 3	SP 3	-
Power Tool Cleaning	Pitted & Rusted D St 3	D St 3	SP 3	-

APPLICATION CONDITIONS

Temperature: 0°F (-18°C) minimum, 120°F (49°C) maximum (air and surface)
*At least 5°F (2.8°C) above dew point

*Acceptable to apply over damp surfaces <32°F (0°C). Do not apply over surfaces that have ice on them.

Material should be at least 40°F (4.5°C) for optimal performance.

Relative humidity: Not applicable

APPLICATION EQUIPMENT

The following is a guide. Changes in pressures and tip sizes may be needed for proper spray characteristics. Always purge spray equipment before use with listed reducer. Any reduction must be compliant with existing VOC regulations and compatible with the existing environmental and application conditions.

Reducer/Clean Up

EPA, OTC I:Reducer #104 (R7K104)
CARB, OTC II:Reducer #111 (R7K111)

Airless Spray

Unit.....30:1 Pump
Pressure.....2400 - 2800 psi
Hose.....1/4" - 3/8" ID
Tip0.015" - .019"
Filter60 mesh
Reduction.....As needed, up to 10% by volume

Conventional Spray

GunDeVilbiss MBC-510
Fluid TipE
Air Nozzle.....704
Atomization Pressure.....60-65 psi
Fluid Pressure.....5-15 psi
Reduction.....As needed, up to 10% by volume

Brush

Brush.....Natural Bristle
Reduction.....Not recommended

Roller

Cover3/8" woven with solvent resistant core
Reduction.....Not recommended

If specific application equipment is not listed above, equivalent equipment may be substituted.



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Revised: August 1, 2022

APPLICATION BULLETIN

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APPLICATION PROCEDURES

Surface preparation must be completed as indicated.

Mix contents of each component thoroughly using low speed power agitation. Make certain no pigment remains on the bottom of the can. Then combine 4 parts by volume of Part A with 1 part by volume of Part B. Thoroughly agitate the mixture with power agitation. Allow the material to sweat-in as indicated prior to application. Re-stir before using.

If reducer solvent is used, add only after both components have been thoroughly mixed, after sweat-in.

Apply paint at the recommended film thickness and spreading rate as indicated below:

Recommended Spreading Rate per coat:

	Minimum	Maximum
Wet mils (microns)	6.0 (150)	12.0 (300)
Dry mils (microns)	4.0* (100)	8.0* (200)
~Coverage sq ft/gal (m²/L)	136 (3.3)	272 (6.6)
Theoretical coverage sq ft/gal (m²/L) @ 1 mil / 25 microns dft	1088 (26.6)	

*See Performance Tips section

NOTE: Brush or roll application may require multiple coats to achieve maximum film thickness and uniformity of appearance.

Drying Schedule @ 6.0 mils wet (150 microns):

With B67V235	@ 0°F/-18°C	@ 40°F/4.5°C	@ 77°F/25°C 50% RH	@ 120°F/49°C
To touch:	18 hours	3.5 hours	2 hours	20 minutes
To handle:	36 hours	12 hours	3.5 hours	40 minutes
To recoat (self):				
minimum:	36 hours	12 hours	3.5 hours	40 minutes
maximum:	6 months	6 months	6 months	6 months
Cure to service:	30 days	14 days	7 days	3 days
<i>If maximum recoat time is exceeded, abrade surface before recoating.</i>				
<i>Drying time is temperature, humidity, and film thickness dependent.</i>				
Pot Life:	16 hours	8 hours	4 hours	1 hour
Sweat-in-time:	1 hour	30 minutes	15 minutes	5 minutes

Drying Schedule @ 6.0 mils wet (150 microns):

With B67V240	@ 0°F/-18°C	@ 40°F/4.5°C	@ 77°F/25°C 50% RH	@ 120°F/49°C
To touch:	18 hours	4 hours	2 hours	1 hour
To handle:	72 hours	20 hours	4 hours	2 hours
To recoat (self):				
minimum:	24 hours	4 hours	45 minutes	45 minutes
maximum:	6 months	6 months	6 months	6 months
Cure to service:	30 days	14 days	7 days	3 days
<i>If maximum recoat time is exceeded, abrade surface before recoating.</i>				
<i>Drying time is temperature, humidity, and film thickness dependent.</i>				
Pot Life:	16 hours	8 hours	4 hours	1 hour
Sweat-in-time:	1 hour	30 minutes	15 minutes	5 minutes

Application of coating above maximum or below minimum recommended spreading rate may adversely affect coating performance.

PERFORMANCE TIPS

Stripe coat crevices, welds, and sharp angles to prevent early failure in these areas.

When using spray application, use a 50% overlap with each pass of the gun to avoid holidays, bare areas, and pinholes. If necessary, cross spray at a right angle.

Spreading rates are calculated on volume solids and do not include an application loss factor due to surface profile, roughness or porosity of the surface, skill and technique of the applicator, method of application, various surface irregularities, material lost during mixing, spillage, overthinning, climatic conditions, and excessive film build.

Excessive reduction of material can affect film build, appearance, and adhesion.

Insufficient ventilation, incomplete mixing, miscatalyzation, and external heaters may cause premature yellowing.

Excessive film build, poor ventilation, and cool temperatures may cause solvent entrapment and premature coating failure.

For Immersion Service: (if required) Holiday test in accordance with ASTM D5162 for steel, or ASTM D4787 for concrete.

Do not mix previously catalyzed material with new.

Do not apply the material beyond recommended pot life.

In order to avoid blockage of spray equipment, clean equipment before use or before periods of extended downtime with Reducer #104 (R7K104) in EPA and OTC I regions, or Reducer #111 (R7K111) in CARB and OTC II regions.

Please contact your Sherwin-Williams Representative for recommendations for immersion service of tinted material.

When coating over aluminum and galvanizing, recommended dft is 2-4 mils (50-100 microns).

Refer to Product Information sheet for additional performance characteristics and properties.

CLEAN UP INSTRUCTIONS

Clean spills and spatters immediately with Reducer #104 (R7K104) in EPA and OTC I regions, or Reducer #111 (R7K111) in CARB and OTC II regions. Clean tools immediately after use with Reducer #104 (R7K104) in EPA and OTC I regions, or Reducer #111 (R7K111) in CARB and OTC II regions. Follow manufacturer's safety recommendations when using any solvent.

DISCLAIMER

The information and recommendations set forth in this Product Data Sheet are based upon tests conducted by or on behalf of The Sherwin-Williams Company. Such information and recommendations set forth herein are subject to change and pertain to the product offered at the time of publication. Consult your Sherwin-Williams representative to obtain the most recent Product Data Information and Application Bulletin.

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