**SECTION 07 56 00 - LIQUID-APPLIED ROOFING**

1. **GENERAL**
	1. SUMMARY
		1. Section Includes: Remedial roof coating system applied over an existing [TPO] [PVC] [EPDM] roof system.
		2. The existing substrate should be sloped a minimum of 0.25 inches of vertical rise per 12 inches of horizontal run (1/4 in 12 slope) to promote positive drainage.
	2. RELATED SECTIONS

		1. Section 07 01 50 – Roof Repairs
		2. Section 07 62 00 – Sheet Metal Flashing and Trim
		3. Section 07 71 00 – Roof Specialties
		4. Section 07 72 00 – Roof Accessories
		5. Section 07 92 00 – Joint Sealants
	3. SUBMITTALS
		1. Action Submittals:
			1. Product Data: Manufacturer’s current technical data sheet for proposed products.
			2. Shop Drawings: Illustrate scope of work; include roofing details.
		2. Informational Submittals:
			1. Installer’s warranty sample.
			2. Manufacturer’s warranty sample.
				1. Manufacturer Authorized Applicator Credentials: Submit documents stating the applicator is approved to install the specified materials and can obtain the specified warranty. [Specifier Note: For projects requiring a Product Plus or Labor and Material warranty]
			3. Manufacturer’s field installation guide.
			4. Moisture scan report. [Specifier Note: For projects requiring a Labor and Material warranty]
	4. QUALITY ASSURANCE
		1. Manufacturer Qualifications:
			1. Minimum 25 years’ experience in manufacture of silicone roof coatings.
			2. ISO 9001 certified.
		2. Roof Coating:
			1. UL Listed.
			2. FM Class 1, 4470 approved.
			3. NSF P151 Certified.
		3. Applicator Qualifications:
			1. Approved by roof coating manufacturer.
			2. Eligible to offer manufacturer’s warranty.
			3. Applicator shall be experienced with the installation of the same or similar waterproofing materials.
		4. Adhesion Test
			1. Conduct an adhesion test to all differing surfaces that are to receive coating. Test(s) shall be performed in accordance with manufacturer’s written instructions. Document results.
	5. DELIVERY, STORAGE AND HANDLING
		1. Deliver materials and products in their original and unopened packaging.
		2. Materials shall have legible labels with the manufacturer’s name, lot numbers, and product identification visible.
		3. Handling and Storage:
			1. Store roof coating containers between 15- and 109-degrees F (minus 9 to 43 degrees C).
			2. Store other materials in accordance with manufacturer’s instructions.
			3. Keep products out of direct sunlight.
		4. Dispose of all materials according to requirements of Authorities Having Jurisdiction.
	6. PROJECT CONDITIONS
		1. Ensure rooftop equipment and accessories are in place prior to surface preparation and roof coating application.
		2. Weather Conditions: Proceed with the work only when existing and forecasted weather conditions permit materials to be installed in accordance with the manufacturer’s written instructions and requirements.
		3. Substrate Conditions: Do not install materials over substrates that are damp, wet, or otherwise contaminated in such a way to prevent proper adhesion.
		4. Apply roof coatings at temperatures above 0 degrees F (minus 18 degrees C).
		5. Do not apply coating materials when temperatures are less than 5 degrees F (-15 degrees C) above dew point.
		6. Contact manufacturer for recommendations if applying coating to substrates over 120 degrees F (49 degrees C).
	7. WARRANTIES
	**[SPECIFIER TO CHOOSE FROM ONE OF THE FOLLOWING MANUFACTURER WARRANTIES]**
		1. Manufacturer’s Product Warranty: Provide manufacturer’s standard product warranty.
			1. Warranty term: [10] [15] [20] years.
		2. Manufacturer’s Product Plus Warranty: Provide manufacturer’s Product Plus warranty.
			1. Warranty term: [10] [20] [30] years.
		3. Manufacturer’s Labor and Material Warranty: Provide roof coating manufacturer’s labor and material warranty.
			1. Warranty term: [10] [15] [20] years.
		4. Installer’s Warranty: Submit roofing installer’s warranty, signed by Installer, covering the work of this section, including all components installed, for the following term:
			1. Warranty term: [2] [5] [\_\_] years.
2. **PRODUCTS**
	1. GENERAL

		1. All products used as part of the Project must be acceptable to the manufacturer of the roof coating, and used and installed in accordance with the product manufacturer’s requirements.
	2. MANUFACTURERS
		1. Specification is based on products by Momentive Performance Materials, Inc., 260 Hudson River Rd., Waterford, NY 12188 (877) 943-7325 www.siliconesforbuilding.com.
		2. Substitutions: [Under provisions of Division 01.] [Not permitted.]
	3. MATERIALS
		1. Silicone Roof Coating:
			1. Source: Enduris 3525.
			2. Description: High solids, solvent-free, alkoxy-based, moisture-cured, silicone roof coating by Momentive Performance Materials.
			3. Physical properties, tested to ASTM D6694:
				1. Tensile strength: 253 PSI, tested to ASTM D2370.
				2. Elongation at break 550 percent, tested to ASTM D2370.
				3. Volume Solids: Minimum 90 percent, tested to ASTM D1644-01.
	4. ACCESSORIES
		1. Seam Treatment Materials:
			1. Enduris Silicone Liquid Flashing by Momentive Performance Materials.
			2. UltraSpan UST / USM pre-cured silicone transition sheets by Momentive Performance Materials.
			3. Reinforcement fabric: RF100 series, 100 percent polyester spun-laced textile reinforcing fabric.
				1. Available widths: 4-inch, 6-inch, and 12-inch.
			4. Sealant: SWS silicone sealant by Momentive Performance Materials.
		2. Walkway Coating: Enduris 3525 Protection silicone coating, [yellow,] [contrasting color,] with granules installed in coating at the minimum rate of 30 pounds per 100 square feet.
		3. Slip Sheet: TPO single ply membrane for use as a slip sheet under loose-laid materials and equipment such as sleepers, pipe supports, etc.
3. **EXECUTION**
	1. INSPECTION

		1. Walk the interior of the building and if possible, observe the underside of the roof deck. Look for any issues that may indicate problems that need to be addressed, such as damaged roof deck. Notify the appropriate entities of any deficiencies observed and ensure all deficiencies are corrected before beginning coating preparations.
		2. Identify existing roof leaks and notify Owner if any leaks are present that cannot be stopped as part of the Project.
		3. Walk the roof system and look for roof defects and deficiencies to be addressed prior to coating installation. Examples of defective items are open seams, open flashing laps and voids, edge securements, rusted or deteriorated pitch pans, shrunken pitch pan filler, deficient sealant on storm collars, ponding conditions, condition of drain details and components, deteriorated sealant on surface-mounted counter flashings, deteriorated wall joint sealant, and pipe penetration flashing defects. All defects and deficiencies are to be corrected prior to application of the coating.
	2. PREPARATION
		1. Prior to beginning coating, conduct adhesion test in accordance with manufacturer’s adhesion testing procedures; determine if primer or other surface preparation is required. Document adhesion test results.
		2. [Evaluate any existing shrinkage and tenting, and contact roofing manufacturer for required preparation.]
		3. Core the existing roof on all separate roof sections that are part of the Project to document the existing roof assembly. Core suspect areas, such as soft areas, to help identify and address any concerns or issues that may be present, such as:
			1. Moisture laden roofing, especially within the bottom assembly if multiple roofs are present.
			2. Moisture damaged gypsum or lightweight insulating concrete roof decks.
			3. Moisture damaged cement fiber roof decking
		4. Moisture scans are strongly recommended on all membrane roofs and are required where a Labor and Material Warranty is to be issued, to identify moisture laden materials in need of replacement prior to application of the coating. A written report detailing the results of the scan shall be provided to the coating manufacturer. Moisture scans shall comply with the current version of the following ASTM standards:
			1. ASTM C1153 – Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging
			2. ASTM D7954 – Moisture Surveying of Roofing and Waterproofing Systems Using Nondestructive Electrical Impedance Scanners
		5. Mask or otherwise protect surfaces not to be coated.
		6. Review existing and imminent weather conditions including potential for extreme temperatures, relative humidity, frost, dew, and precipitation. Ensure that coating and accessory materials will have sufficient curing time.
		7. Surface Preparation and Repairs:
			1. New roofing materials used for repairs must be primed before coating is applied.
			2. Take corrective measures before beginning coating preparations. Repair failed, damaged, and open areas that could allow water infiltration during cleaning.
			3. Remove all trash and heavy deposits of sediment, dirt, and other vegetative growth.
			4. Reference repair procedures in the NRCA *Repair Manual for Low-Sloped Membrane Roof Systems*, and industry standards.
			5. Remove all moisture-damaged insulation and replace insulation and roof membrane with similar materials.
				1. Follow all code requirements for all work performed, including attachment of new insulation to comply with wind uplift requirements.
				2. All membrane repairs shall be properly secured to the structural deck.
			6. Inspect the roof for loose or open field seams and side laps, including vertical flashing laps. Repair defective seams or laps as follows:
				1. Remove all dirt and debris from inside the seam.
				2. Ensure all roof system components are completely dry.
				3. Option 1: Seal the seam by 3-course method using liquid flashing and fabric reinforcement.
				4. Option 2 [TPO and PVC]: Seal the seam by hot air welding a new piece of membrane over the open seam in accordance with manufacturer’s requirements.
				5. Option 3 [EPDM and TPO]: Install single-ply manufacturer’s approved cover strip over properly prepared surface(s) in accordance with manufacturer’s requirements.
			7. Mechanically remove loose and flaking rust on metal flashings. Severely damaged sheet metal flashings are to be replaced. Follow NRCA and SMACNA guidelines.
			8. Seal all seams with a 3- to 4-inch wide application of a minimum of 40 wet mils of liquid flashing. This includes field seams, penetration flashing seams, wall flashing seams, etc.
			9. Field-wrapped penetrations shall be 3-coursed using liquid flashing and fabric reinforcement.
			10. Prefabricated flashing boots are to be inspected. Damaged boots are to be 3-coursed using liquid flashing and fabric reinforcement. Reseal the tops of all flashing boots using coating manufacturer’s approved sealant.
			11. The tops of all surface-mounted counter flashings shall be 3-coursed using liquid flashing and fabric reinforcement. Remove the chalking from existing sealant, if applicable.
			12. Pitch Pans (aka Penetration Pockets):
				1. Pitch pans around single penetrations are to be removed, the penetration cleaned and then 3-coursed using liquid flashing and fabric reinforcement.
				2. Pitch pans with multi-line penetrations that are more than 1 inch apart shall be removed, the penetrations cleaned, then 3-coursed using liquid flashing and fabric reinforcement.
				3. Pitch pans that are not rusted or corroded, with multiple penetrations that are closer together than one inch, can be encapsulated using liquid flashing and fabric reinforcement providing the penetrations can be sealed against moisture intrusion.
				4. Rusted or corroded pitch pans with multiple penetrations through them that are closer together than one inch, are to be removed and replaced with new pitch pans. The lines through them are to be cleaned and liquid flashing used as pitch pan filler.
				5. Pitch pans with refrigerant lines through them are not warrantable
			13. Roof drains are to have the strainers and clamping rings removed and set aside for reinstallation. Trim the roof membrane and wire brush or otherwise remove all contaminants from the drain bowl. Seal the roof-to-drain bowl connection by 3-course method using liquid flashing and fabric reinforcement. Note the roof membrane may need to be trimmed.
			14. All scuppers are to be 3-coursed using liquid flashing and fabric reinforcement.
			15. All storm collars shall be sealed using liquid flashing or a compatible sealant approved by the coating manufacturer.
			16. Exposed fasteners are to be sealed with liquid flashing or a compatible sealant approved by the coating manufacturer.
			17. Pressure wash the roof surface at 2500 to 4000 PSI utilizing manufacturer’s recommended roof preparation wash or approved biodegradable detergent; remove oils and other materials that could interfere with adhesion. Rinse with clean water until no soap bubbles or foaming remains. Allow to completely dry.
			18. Double wash all areas where water collects as sediments and other debris will collect in these areas and can inhibit proper adhesion.
			19. Allow the roof to completely dry. Any areas where water collects will take longer to dry. The use of mechanical means to help dry the roof is recommended. Examples are hot air roof dryer machines.
			20. Seal all horizontal sheet metal flashing joints such as copings and expansion joint covers, by using a bond breaker and then covering with a minimum of 40 wet mils of liquid flashings or manufacturer-provided, compatible sealant. An example of a bond breaker is running a lumber crayon over the joint and then encapsulating it with the sealant. Standing seam joints are excluded from this requirement.
		8. Required Condition of Surfaces: Clean, sound, dry, and free of materials, laitance, membrane chalk, and loose coatings that could inhibit proper adhesion of coatings or sealants. All penetrations, and flashings are to be sealed watertight prior to coating application.
	3. APPLICATION
		1. Apply roof coating in accordance with manufacturer’s instructions and approved drawings.
		2. Application rates will vary depending on the complexity of the project. The following rates do not consider waste. Applicator is required to calculate the waste factor needed. “Waste” includes material left in the buckets or barrels, on roller frame covers, inside hoses (when spray applied), etc. All application rates apply to both the roof and any walls or curb flashings to be coated.
		3. Apply roof coating at rate of 1.5 gallons per 100 square feet to minimum 21 mils cured coating thickness.

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* + 1. Apply roof coating at rate of 2.0 gallons per 100 square feet to minimum 28 mils cured coating thickness.

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* + 1. Apply roof coating at rate of 2.5 gallons per 100 square feet to minimum 36 mils cured coating thickness.
		2. Apply coating by squeegee, brush, roller, airless sprayer, or combination of these.
		3. Apply liquid flashing by brush, trowel, gloved hand, or use a bulk caulking gun.
		4. Final Roof Coating: Monolithic and seamless, encapsulating entire roof surface.
		5. Granular Coat (Optional)
		If desired, a granular coat may be installed once the underlying coat has cured. Apply one (1) coat of silicone at the minimum rate of approximately one-half (0.5) gallon per 100 square feet (1.9 liters per 9.25 square meters) to achieve a minimum wet film thickness of 8 mils (.008 inches). Simultaneously embed #11 ceramic granules at the rate of approximately 30 pounds per 100 square feet (13.6 kilograms per 9.25 square meters).
		6. Walkway Protection (Optional)
		At all roof access locations and around all rooftop equipment requiring servicing, apply walkway coating a minimum of 60 wet mils thick, simultaneously embedding roofing granules at the rate of approximately 35 pounds per 100 square feet (16 kilograms per 9.25 square meters). Walkway shall be a minimum of 30 inches (760mm) wide. Mask sides to achieve straight lines.
		7. Lift and coat under all sleeper supports, including both wood and manufactured supports, for service lines, and rooftop equipment such as mechanical units, satellite dishes, etc. After coating has cured, all supports shall have a slip sheet placed under them to protect the coating. Slip sheet shall extend past the edges of the sleeper a minimum of 1 inch on all sides.
	1. CLEANING
		1. Clean finished roof surface after completion; ensure that drainage components are not clogged.
	2. PROTECTION
		1. Protect roof coating from foot traffic and damage during curing process. A cure time of 3 days is recommended to achieve full cure.
	3. FIELD QUALITY CONTROL
		1. Verify proper application rates by using a wet film gauge to check wet film thickness as much as possible. A minimum of once every 100 square feet (9.25 square meters) is recommended.
		2. Verify cured mil thickness of coating at end of work and prior to warranty inspection.
		3. Repair deficient areas with liquid flashing or roof coating as applicable to size of deficient area.
		4. Roof coating is subject to pre-job, progress, and final inspections by coating manufacturer or its designated third-party inspectors.

END OF SECTION