



Sealer, Global, Pumpable, High-flow Roof Ditch - Generic Qualification

1 Scope

1.1 Material Description. This specification details the requirements of a paintable, high-flow sealer. The material is applied in the paint shop after the E-Coat bake before primer surfacer and is robotically applied. The material is intended for application to the exterior (horizontal) roof ditch joint and must provide an extremely smooth, seamless appearance bead. It must also be compatible with production primer surfacer and topcoat systems and exhibit excellent painted appearance, durability and painted appearance equivalent to the performance of Class 1 exterior topcoat systems.

1.1.1 The material must be a smooth and homogeneous mixture free of air, lumps, unmixed particles, and foreign materials.

1.1.2 It must be capable of being dispensed with approved and validated production displacement pumping and robotic application equipment.

1.1.3 It must not have a noxious or toxic odor in either the uncured or cured state.

1.1.4 In addition, the material must not adversely affect those personnel handling it.

1.1.5 The material must adhere to all approved production E-Coats.

1.1.6 It must not have corrosion-causing ingredients.

1.2 Symbols. Not applicable.

1.3 Typical Applications. Sealing of exterior (horizontal) roof ditch joints after the E-Coat oven but before primer surfacer application.

1.4 Remarks. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D412	ASTM D2369	EPA Method 24	SAE J1864
ASTM D624	ASTM E1428	ISO 3219	SAE J1960
ASTM D1475	ASTM G21	ISO/TS 16949	
ASTM D2196	EN ISO 1524	SAE J1524	

2.2 GM Standards/Specifications.

9984548	GMW3022	GMW14124	GMW16124
9984549	GMW3025	GMW14829	GMW16701
GMW3016	GMW3059	GMW14873	
GMW3019	GMW3205	GMW15481	

2.3 Additional References.

TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

Part numbers L 000 0794, L 000 0795.

3 Requirements

Specific material requirements and appropriate test procedures are listed under the individual properties and summarized in Table 4. All bake schedules are specified in time at substrate temperature.

3.1 Requirements on Delivery.

3.1.1 Specific Gravity (ASTM D1475). 1.8 maximum.

3.1.2 Odor (GMW3205). The sealer must not emit a toxic or noxious odor. The material must not impose any adverse effects on personnel handling it. Also, after cure the material must not have a perceptible odor. In addition, the ED50 value of the sealer may be requested at the time of approval. Review “odor” and “fogging” GMW(s).

3.1.3 Volatile Organic Content (VOC) Determination (EPA Method 24, Using ASTM D2369). Ideal material performance would be 35.9 kg/m³ (0.3 lb/gal) VOC or less. However, the actual VOC of the product, including all weights, calculations, and runs, are to be identified and reported as data in the submission book.

3.1.3.1 Condensing Volatiles Test (GMW3016). Four percent (4%) maximum allowed when baked as follows and tested according to GMW3016:

- 9984548/L 000 0794: 20 minutes at 165 °C ± 5 °C
- 9984549/L 000 0795: 20 minutes at 130 °C ± 5 °C

3.1.4 Viscosity. The viscosity shall be determined and reported using the following three (3) methods:

3.1.4.1 Press Flow Viscosity (SAE J1524).

- Orifice: 1.32 mm
- Pressure: 414 kPa
- Sample weight: 20 g
- Sample test temperature: 25 °C ± 0.5 °C

3.1.4.1.1 The Press Flow Viscosity requirements are as follows:

- Key Product Characteristic (KPC) requirement at 72 h from batch manufacture: The viscosity shall be 35 s to 45 s.

In addition, when stored in proper conditions, the rate at which the viscosity increases with age should not exceed the following guidelines:

- Viscosity at 90 days shall be ≤ 72 h data + 35%.
- In no case should the material viscosity exceed 60 s at the end of the 90-day shelf life of the material.
- The initial and aging viscosity data shall be provided in both numerical and graphed format in the material submission book.

3.1.4.2 Brookfield Viscosity (ASTM D2196).

- Spindle size: 7
- Rotational speed: 20 rpm
- Sample test temperature: 25 °C ± 0.5 °C
- Rotation time to reading: 1 minute

3.1.4.2.1 The Brookfield Viscosity requirements are as follows:

- Key Product Characteristic requirement at 72 h from batch manufacture: The viscosity shall be 25 000 cps to 40 000 cps.
- In addition, when stored in proper conditions, the viscosity increase with age shall not exceed 50 000 cps by the end of the 90-day shelf life of the material.
- The initial and aging viscosity data shall be provided in both numerical and graphed format in the material submission book.

3.1.4.3 Determination of the Rheometric Viscosity Using a Rotational Viscometer (ISO 3219 and Z4 DIN Cup and Spindle). Refer to Table 1.

- Rotation speed: 0 to 130 at 1/s
- Sample test temperature: 25 °C ± 0.5 °C

Table 1: Viscometer Program

Test	Time	Start Speed	End Speed
Wait Period	300 s	0 1/s	0 1/s
Ascending	120 s	0 1/s	130 1/s
Hold Cycle	180 s	130 1/s	130 1/s
Descending	120 s	130 1/s	0 1/s

3.1.4.3.1 The Relative Viscosity, yield point, and descending Bingham Viscosity (all KPC requirements) 72 h after batch manufacture shall be as follows:

- Yield point (at 72 h): 110 Pa·s to 125 Pa·s
- Bingham Viscosity (at 72 h): 6.5 Pa·s to 6.9 Pa·s
- Relative Viscosity (at 72 h) 7.5 Pa·s to 8.0 Pa·s

3.1.4.3.2 In addition, when stored in proper conditions, the viscosity increase with age shall not exceed the following values:

- Yield point at 90 days shall not be greater than the 72 h data + 25%
- Bingham Viscosity at 90 days shall not exceed 8.0 Pa·s.
- Relative Viscosity at 90 days shall not exceed the 72 h data + 25%.
- The measured and calculated data along with the curves generated shall all be included as data in the submission book.

3.1.5 Particle Size. EN ISO 1524: 200 µm maximum.

3.2 Performance Requirements.

3.2.1 Adhesion (GMW3019). One (1) full set of test panels (bakes according to Table 2 and Table 3) must be prepared using a major production technology from each GM approved source of electrocoat. This must also include electrocoat technologies from all GM regions globally.

The material must be capable of demonstrating a minimum of fine line cohesive adhesion performance after the first primer/sealer bake.

**Table 2: Bakes for Adhesion
(Nominal Baked ELPO)**

Bake System	9984548/ L 000 0794 High Bake	9984549/ L 000 0795 Low Bake
Minimum Prime/Seal	15 minutes at 158 °C	15 minutes at 125 °C
Nominal Prime/Seal	20 minutes at 165 °C	20 minutes at 130 °C
Maximum Prime/Seal	60 minutes at 180 °C	90 minutes at 158 °C
Maximum Powder Prime	60 minutes at 190 °C	Not applicable

**Table 3: Bakes for Adhesion
(Over Baked ELPO)**

ELPO Bake	Sealer/Primer Bake
Maximum: 60 minutes at 190 °C	Minimum for Either High or Low Bake Primer 15 minutes at 158 °C or 15 minutes at 125 °C

The material, when baked as described in Table 2 and Table 3, must not crack or lose adhesion to the substrate during or after exposure to the following conditions. In addition, the material must demonstrate cohesive adhesion when peeled from the substrate.

- Initial adhesion: After cooling to ambient temperatures
- Exterior cycle (GMW14124, Cycle F): 12 cycles

3.2.2 Elongation (ASTM D412, Method A) Using Die “C” Dumbbell and Crosshead Speed of 300 mm/minute. Material baked as described in 3.2.1 must exhibit the elongation requirements in Table 4:

Table 4: Elongation Requirements

	9984548/ L 000 0794	9984549/ L 000 0795
Minimum Bake	100%	100%
Nominal Bake	150%	150%
Maximum Bake	150%	150%
Maximum Powder Bake	100%	Not applicable

3.2.2.1 Aged Elongation. A second set of panels shall be prepared according to 3.3 and then exposed to 70 °C for 336 h. Following this exposure, the samples are allowed to stabilize to room temperature (25 °C) and are then tested for elongation as described in 3.3. The samples must again meet the minimum elongation requirements in Table 4.

3.2.3 Tear Strength (ASTM D624, Method A) Using Die C and Crosshead Speed of 500 mm/minute. Two sets of samples shall be prepared and baked according to Table 2.

3.2.3.1 Initial Tear Strength. The first set of panels prepared in 3.2.2 shall be temperature stabilized to 25 °C and then tested according to 3.3.2. The minimum tear strength requirement is 10 N/mm.

3.2.3.2 Aged Tear Strength. The second set of samples prepared in 3.3.2 shall be exposed to 70 °C for 336 h. Following this exposure, the samples are temperature stabilized to 25 °C and then tested according to 3.3.2. The minimum test strength requirement is again 10 N/mm.

3.2.4 Shrinkage/Expansion (GMW15481). Material baked according to Table 2 (maximum bakes only) must exhibit no (0%) expansion and no shrinkage > 2%.

3.2.5 Porosity. The material must exhibit no signs of trapped air from either an external observation or a cross-sectional view after being baked according to Table 2 (maximum bakes only).

3.2.6 Degradation Resistance. Apply two beads of sealer 3 mm thick x 40 mm wide x 200 mm long to the surface of a phosphated steel panel (inspect panel first to be sure it is free of surface corrosion). Bake panel as follows:

- For 9984548/L 000 0794, bake 1 h at 200 °C
- For 9984549/L 000 0795, bake 1 h at 150 °C

After baking, remove panel from oven and allow it to cool to room temperature before proceeding.

3.2.6.1 After Bake. Remove one (1) sealer bead from the panel and inspect the surface of the panel. There must not be any corrosion on the surface of the panel where the sealer had been.