Item C422 (Special) - Stress Absorbing Membrane Interlayer (SAMI)

Item C422.1 Description. This item shall consist of furnishing all materials, equipment, labor, and preparation necessary for the application of Stress Absorbing Membrane Interlayer. The applied material shall completely seal the entire pavement surface and provide a uniform textured surface, suitable for placement of hot mixed asphalt overlays, micro-surfacing, or slurry surfacing overlays, or left intact as a finished pavement surface.

Item C422.2 Applicable Specifications and Materials

Item C422.2.1 Polymer Modified Asphalt Emulsion Binder

Table 2.1-1 Emulsion Property Method

Emulsion Property Method	Min.	Max.	Test Method
S.F. Viscosity, 50 C (sec)	50	400	ASTMD 244
Percent Solids (%)*	68	---	ASTMD 244
Storage Stability, 24hrs. (%)	---	1	ASTMD 244
Sieve Test, #20 mesh (%)	---	0.1	ASTMD 244

Table 2.1-2 Residue Property Method

Residue Property Method	Min.	Max.	Test Method
Penetration, 100g, 5 sec, 25 C (dmm)	70	100	ASTM D 5
Softening Point, Ring & Ball (C)	48.9	---	ASTM D 36
Elastic Recovery, 4 C, 10 cm (%) **	60	---	ASTM D 6084
Force Ductility, 4 C, 40 cm ***	20 lbs./sq.in.	---	ASTM D 113[1]

[1]Modified

*By distillation or evaporation

** The specimen is extended 10 cm. The extended area is severed in the middle using a pair of shears. After 1 hour, at the test temperature the severed ends are returned to contact and the ductilimeter reading is made again. The sample must recover at least 70 percent of the original 10 cm distance.

*** ASTM D 113 as modified by the addition of a load cell to the standard ductility test apparatus. The load cell is calibrated in pounds per square centimeter. Reading is measured at 40 cm. Reading is multiplied by 6.45 to yield pounds per square inch force required to extend the test specimen.

The asphalt modifier shall be a SBS type polymer, Styrene-Butadiene-Styrene. The modifier shall be added to the asphalt cement prior to the emulsification process.

Item C422.2.2 Aggregate. The surface cover aggregate shall be 100% crushed material from quarried stone, natural gravel or other high-quality aggregate and meet the following requirements:

Table 2.2-1 Aggregate Physical Requirements

Test	Description	Specification
AASHTO T96	L.A. Abrasion Test	40% max.
S1029*	Deleterious Material	1.0 max.
S1021*	Crushed Pieces	100%
AASHTO T104	Sodium Sulfate Soundness Test, 5 Cycle	15

Table 2.2-2 Aggregate Grading Requirements – ASTM C-117

Sieve Size		Total Percent Passing	
		Type 1	Type 2
1 inch	(25mm)	100	100
3/4 inch	(19mm)	100	90-100
1/2 inch	(12.5mm)	95-100	20-50
No. 4	(4.75mm)	5-25	0-10
No. 8	(2.36mm)	0-10	0-5
No. 200	(75μm)	2	2

Storage of Materials

Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work.

Stockpiles

Stockpiling and loading methods shall be such as to permit ready identification of the aggregate materials and to minimize segregation. Sites for stockpiles shall be clean prior to storing materials. Material shall not be removed from stockpiles within one foot of the ground until final clean-up of the worksite. Materials shall be handled in a manner such that moisture content shall be reasonably minimized and uniform for each days run.

Item C422.3 Equipment. Equipment shall be safe, environmentally acceptable, and capable of producing a consistent quality product.

Pressurized Distributor Applicator

The pressure distributor shall have a computerized rate control that automatically adjusts the distributor's pump to the ground speed. The distributor shall be capable of heating and re-circulating the asphalt binder to the specified temperature. A number of nozzles shall be spaced longitudinally along the variable width spray bar from uniformly applying the asphalt material and shall include a means of controlling the operation of the nozzles. Interchangeable nozzles and sizes shall be used for the material and rate specified and shall be properly positioned and bar height adjusted so as to provide an overlapping pattern and a uniform rate of application across the desired pavement coverage width without ridges or streaking.

The unit shall include:

- A speed control used by the operator to control the travel speed and rate of product application.
- A method for the driver to control the product placement edge from either side of the unit.
- A digital speed/application readout that operates continuously and is located in the operators view.
- The asphalt application system capable of maintaining the specified application rate within ± 0.02 gal/sq.yd.

Aggregate Spreader

The aggregate spreader shall be a variable width, self-propelled unit equipped so as to deliver a uniform distribution of aggregate particles across the desired pavement surface without ridges or laps at the specified rate. The aggregate spreader unit shall include:

- A ground speed control device interconnected with the aggregate applicator so as to provide a computerized application rate control of the aggregate that adjusts to the travel speed.
- A variable wide application box which is adjustable to maintain a uniform application rate of aggregate to cover exposed emulsion without ridges or laps.
- Capability to apply aggregate at an application rate range of 5 to 70 lbs./sq.yd.
- Spreading of aggregate in a manner such that the tires of the truck or spreader at no time contact the uncovered and newly applied asphalt material.

Compacting Equipment – Self-propelled pneumatic-tired roller(s), weighing not less than 8 tons shall be used.

Miscellaneous – All equipment including hand tools, thermometers, etc., shall be provided. All equipment used on the roadway shall be equipped with at least on e approved flashing, rotating or oscillating amber light visible from all sides. All material storage tanks and material handling units shall be capable of heating and storing materials such as to not cause damage to the emulsion. The Contractor may us conventional chip seal equipment on project segments of less than 24,000 square yards or on spot repairs. Equipment shall conform to ODOT Item 407.03.

Item C422.4 Pre-Paving Onsite Meeting. A meeting between the Contractor and Engineer will be held at the project site prior to beginning work. The agenda for this meeting will include.

- Review of Contractors detailed work schedule
- Review of the traffic control plan
- Inspection of equipment
- Calibration and adjustment to equipment

Item C422.5 Weather Limitations. The stress absorbing membrane interlayer shall be placed when the pavement and atmospheric temperature is 50º F or above. Placement is not permitted if it is raining, the chance of rain is imminent or when the pavement surface condition is wet or when impending weather conditions are such that proper curing may not be obtained.

Item C422.6 Construction

The Contractor shall follow the construction methods as described.

1. The contractor shall establish stations, at 1000 feet intervals on the entire project, prior to placing the stress absorbing membrane. The stations shall be maintained until project completion.
2. Preparation of the surface shall be in accordance with ODOT Item 407.05. The surface shall be thoroughly cleaned by the contractor and shall be dry when the asphalt binder is applied. Materials cleaned from the surface shall be removed and disposed of as directed

by the engineer. Removal of mud, clay, and other fine silts shall be accomplished by high pressure spray water, min. 6000 psi.

3. Asphalt SAM-CE emulsion shall be heated to a temperature within the specified range and applied using an approved pressurized distributor and at a uniform and consistent rate as approved for the design of the project surface to be treated.
4. The specified aggregate shall be spread uniformly onto the asphalt binder within 120 seconds of the asphalt spray and be in accordance with ODOT Item 422.08, except that three wheel rollers are not required.
5. Projects greater than 10,000 sy^2 shall use a minimum of two rollers. Rollers shall proceed at maximum speed of 5 mph. The entire surface shall receive a minimum if two roller passes. The first roller pass shall be performed within one minute of aggregate spreading.
6. Projects greater than 10,000 sy^2 shall use a minimum of two brooming machines. Brooming of the completed surface shall be accomplished prior to full opening to unrestricted use by traffic. The entire surface shall be clean of all loose material within 24 hours prior to the resurfacing with an asphalt mixture.
7. Before opening to traffic the contractor shall post loose stone signs and 25 mph speed plaque mounted below the sign. These signs shall be placed at the beginning of the work area and at one-mile intervals throughout the project. The loose stone signs shall be maintained until the completed surface is free of loose material.
8. The contractor shall protect all utility casting using tarpaper or other approved material. All covers shall be properly fitted to the casting and removed prior to sweeping.

Item C422.7 Application of Asphalt Binder and Coarse Aggregate. The asphalt binder shall be heated to specified temperature and uniformly placed to prevent ridges or streaks in the surface and shall be in accordance with ODOT Item 409.07 and Section 6 Item 3 above.

Item C422.7.1 Asphalt Binder. The asphalt binder shall be applied at a temperature of 150 F to 190 F, and at the rate specified ±gallons/sq.yd. The supplier of (SAM-CE) binder is to design the application rate of the cover material and binder in relation to the surface condition to be treated. This rate shall be approved by the engineer prior to use.

Item C422.7.2 Application of Surface Cover Aggregate

- Stockpiling and loading methods shall permit ready identification of material and to minimize segregation and contamination of the aggregate.
- The moisture content of the coarse aggregate shall be below 4% and maintained throughout the project.
- Coarse aggregate shall be spread uniformly without ridges or gaps at the specified rates.
- Spreading of the aggregate shall be adjusted to produce a minimum of excess loose particles and shall provide complete coverage after rolling.
- The spreading operation shall be accomplished in such a manner that the tires of trucks or the spreader at no time comes into contact with the newly applied asphalt material.

Item C422.7.3 Material Application Rates. The binder's application rate is in gallons per square yard.

Table 7.3-1 Material Application Rates

Application Type	Type I	Type II	Tolerance
Finished Surface	0.40-0.45	N/A	+/- 0.2
Prior to Micro-Surfacing	0.45-0.50	N/A	+/- 0.2
Prior to 1 inch min. Overlay	0.50-0.55	0.65-0.70	+/- 0.2

Aggregate Application Rate – The aggregate application rate shall be as determined by the supplier of the SAMI binder and project design and shall produce a completed surface with no exposed binder.

The supplier of the SAMI emulsion shall determine the application rate for emulsion and aggregate, based on pavement condition, aggregate type, and aggregate size. This information shall be reported to the Engineer prior to beginning work and shall include an aggregate gradation on the job specific materials.

Item C422.8 Quality Control. The Contractor to measure compliance shall use the methods described in this section.

- Aggregate gradation
- Aggregate Moisture Content
- Yield Check on Asphalt Binder
- Temperature Check on Asphalt Binder

If the Contractor's test results exceed any of the identified quality control tolerances, the Engineer shall be immediately notified. The Engineer will review the explanation and the corrective action taken by the Contractor. Another test will be taken and if the results still exceed the quality control tolerance, placement shall stop. The Contractor shall immediately notify the Engineer, and identify the cause of the excessive deviation and detail corrective action necessary to bring the deficiency into compliance. The Engineer will give approval prior to resumption of work.

Item C422.8.1 Asphalt Binder. The application rate shall not exceed a tolerance of 0.02 gallons per square yard from the specified rate, and within the temperature range as specified in Sub-Section 7.1.

Item C422.8.2 Surface Cover Aggregate. The aggregate shall be clean and uniform, and shall be within the gradation range as specified in Sub-Section 2.3. Moisture content shall not exceed the tolerance as specified in Sub-Section 7.2.

Item C422.9 Documentation. The Contractor shall provide the Engineer a daily report with the following information:

- Control Section/Project Number/County/Route
- Date/Air Temperature/Pavement Temperature
- Asphalt Binder Temperature (3 per day)
- Station Location per Test

- Beginning and Ending Stations
- Yield Check on Asphalt Binder (3 per day)
- Aggregate Gradation & Moisture (1 per day)
- Length/Width/Total Area

Other required documentation shall include: Bill of lading on aggregate and asphalt binder, to be provided as requested or at project completion.

Item C422.10 Acceptance. The Contractor shall inspect the completed Stress Absorbing Membrane during the application process for any deficiencies. The deficiencies will be limited to surface flushing, surface patterns, and loss of stone retention.

Workmanship shall be inspected for the following:

- Untreated areas (missed)
- No overlap on longitudinal joints
- No overlap on construction joints

All corrective work shall be accomplished prior to resurfacing with asphalt materials, or within 24 hours. The Contractor shall furnish materials, equipment and labor to make corrections at no additional cost to the Contract. The Engineer shall give final approval on inspection and corrective work.

Item C422.11 Placement of Asphalt Overlay. If the SAMI application is used as an intermediate layer for an asphalt overlay, a period of 24 hours shall be observed prior to the placement of the asphalt surface coarse after placement of the SAMI material. This time limit may be increased or decreased by the Engineer dependent on ambient temperatures and conditions.

Item C422.12 Measurement and Payment. The completed work as measured will be paid for at the Contract unit price for the contract items below, and shall include all preparation, materials, equipment, labor, clean up, and incidentals necessary to complete the work as specified.

Payment will be based on the unit price bid:

Item	Unit	Description
C422	Square Yard	Stress Absorbing Membrane Interlayer, Type I
C422	Square Yard	Stress Absorbing Membrane Interlayer, Type II