

ISSA PRESIDENT'S AWARD FOR EXCELLENCE

Pavement Preservation
Combination Treatments

Town of Owego, NY
Vestal Asphalt, Inc.



2024



APPLICANT CONTACT INFORMATION



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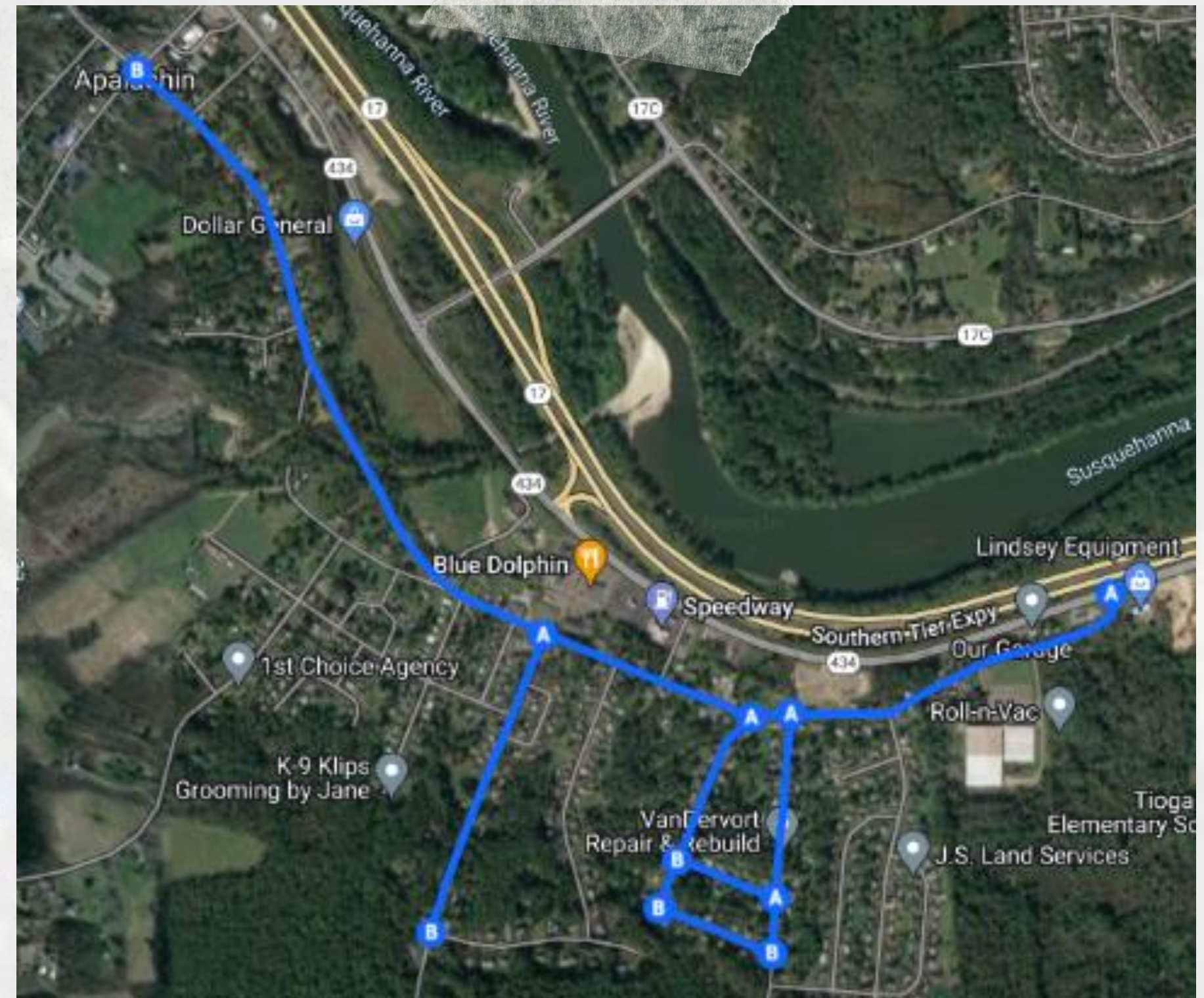
PROJECT LOCATION

WOODWIND SUBDIVISION:

MAIN STREET, LAINE COURT,
SHADY HILL ROAD, ELAND
DRIVE, PERRY DRIVE,
MCFADDEN ROAD

APALACHIN, NEW YORK 13732
42.057741, -76.138803

[MAP VIEW](#)



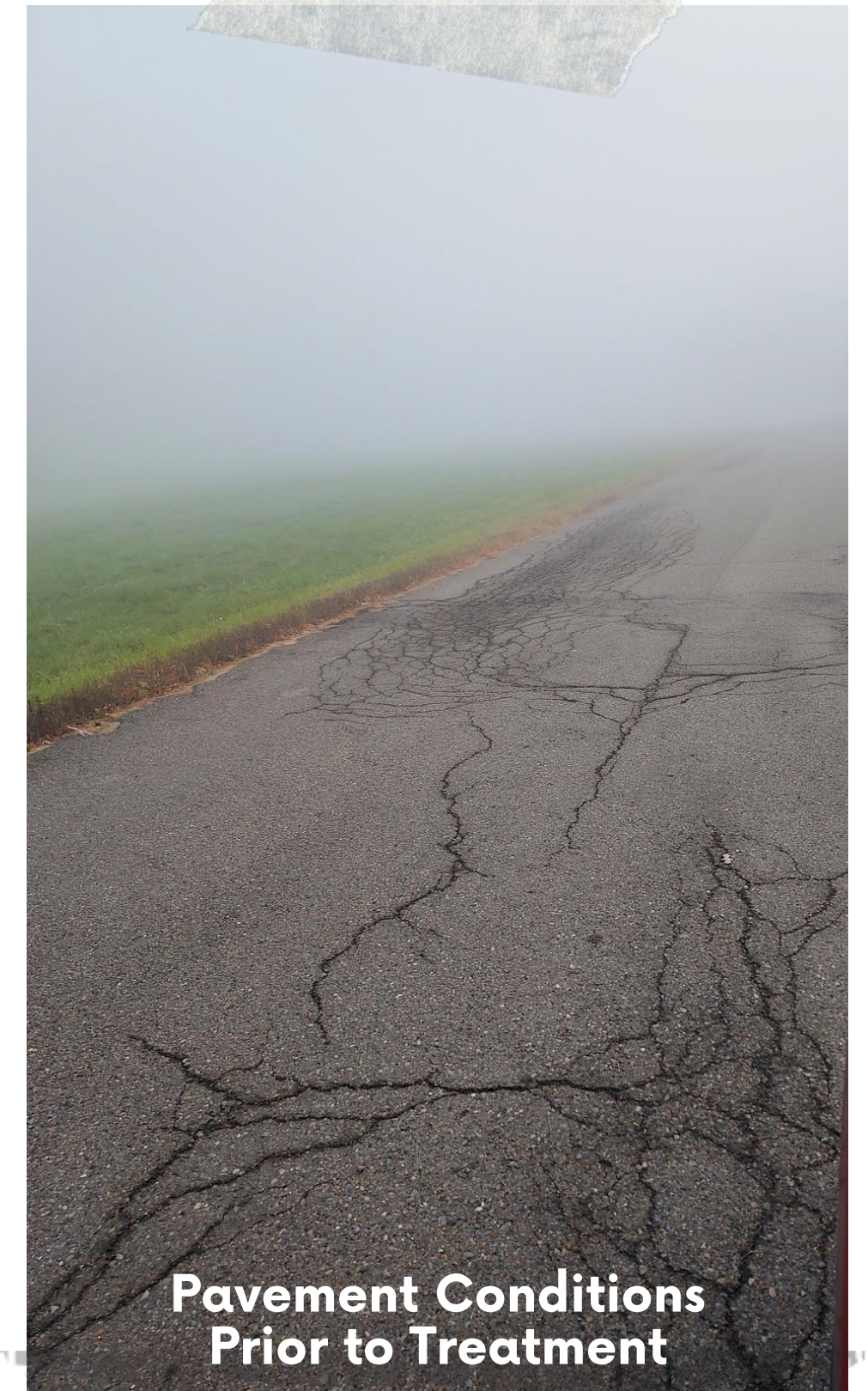
PROJECT DESCRIPTION

TOWN OF OWEGO, NEW YORK

- Population: 18,000
- Owego comes from the Iroquois word ahwaga, which means "where the valley widens"
- Small municipality west of Binghamton, NY, located along the Susquehanna river and interstate-86
- Four distinct seasons, with July temperatures ranging from 47° to 96° f

PROJECT BACKGROUND

- Newly elected town highway superintendent
- Pavement showed moderate cracking, fatigue, and oxidation
- No previous treatment history was available
- High-profile residential area which includes heavily traveled feeder road
- Quick return to traffic was extremely important to limit impact on residents



**Pavement Conditions
Prior to Treatment**

PROJECT PROPOSAL

COMBINATION TREATMENTS:

- Crack seal
- Cold-Mix Pave
- Fog Seal
- Microsurfacing

ADDITIONAL PROJECT NOTES:

- Drainage issues were identified by the contractor and remedied by the town prior to project
- Many concerned and very vocal residents

ESTIMATED PROJECT BUDGET:

\$491,000.00

INVOICED PROJECT TOTAL:

\$414,354.94

COMPARATIVE ESTIMATE FOR
HMA MILL & FILL:

\$635,000.00



CRACK SEAL TREATMENT



PAVEMENT FOLLOWING
CRACK SEAL APPLICATION



**PAVEMENT CONDITION
VARIED FROM ROAD TO
ROAD**



**CERTAIN ROADS HAD
LITTLE TO NO CRACKING,
OTHERS SHOWED
MODERATE CRACKING**



**AREAS REQUIRING
CRACK SEAL WERE
TREATED AS NECESSARY**

MATERIAL:

CRAFCO
ROADSAVER201
AASHTO D6690 TYPE II

EQUIPMENT:

CRAFCO EZ-POUR 400

NYSDOT CRACK SEAL SPECIFICATIONS

ITEM 412.76030001- CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT USING HOT APPLIED SEALANT (LANE MILES)

DESCRIPTION
Clean and seal all cracks at locations shown in the contract documents or where directed by the Engineer. In this specification, the word crack also means joint.

MATERIALS
Crack Sealant. Use a sealant that appears on the Approved List for Joint Materials, Pavement / Highway Joint Sealants (ASTM D 6690, TYPE II) (705-02). Deliver the sealant in the manufacturer's original sealed container legibly marked with the following information:

- Manufacturer's name
- Trade name of the sealant
- Manufacturer's lot or batch number
- ASTM D6690, Type II
- Minimum application temperature
- Maximum (or safe) heating temperature

Provide the Engineer with a copy of the manufacturer's recommendations pertaining to heating and application of the sealant prior to commencing work.

CONSTRUCTION DETAILS

General. Complete all pavement repairs contained in the contract documents bordering pavement cracks prior to commencing work.

Furnish all equipment that is necessary for cleaning and sealing the pavement cracks. Use equipment meeting the description and/or performance requirements described herein and approved by the Engineer.

Seal all cracks.1/8" to 1" in width.

The following cracks should not be sealed

- Multiple nearby cracks which have raveled.
- Multiple cracks that include broken asphalt
- Multiple longitudinal cracks within a 10 foot segment, which are separated by less than 10 inches..

Crack Preparation. Prepare cracks for sealing on the same day that they are to be sealed.

Use a high pressure air lance or hot air lance to thoroughly clean cracks to a minimum depth of 1/2 inch of dust, dirt, foreign material, sand and any other extraneous materials immediately prior to sealing. Do not burn, scorch or ignite the adjoining pavement when using a hot air lance.

Install suitable traps or devices on the compressed air equipment to prevent moisture and oil from contaminating the crack surfaces. Maintain these devices and see that they are functioning properly.

ITEM 412.76030001- CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT USING HOT APPLIED SEALANT (LANE MILES)

Protect the public from potentially objectionable and/or hazardous airborne debris.

Sealant Melting. Heat and melt the sealant in a melter constructed either as a double boiler filled with a heat-transfer medium between the inner and outer shells, or with internal tubes or coils carrying the sealant through a heated oil bath and into a heated double wall hopper. The melter will be equipped with separate thermometers to indicate the temperature of the heat transfer medium and the sealant material, positive temperature controls and with a mechanical agitator or a pump to assure a homogeneous blend of the sealant. Maintain the sealant at the pouring temperature $\pm 10^{\circ}\text{F}$ indicated on the material packaging.

Check the discharge temperature of the sealant with a non-contact infrared thermometer. Discharge the sealant at a temperature between the manufacturer's recommended pouring and safe heating temperatures indicated on the material packaging. Submit an alternate method for measuring the discharge temperature to the Engineer for approval if desired.

Sealing is not permitted if the melter and discharge temperatures do not meet with the requirements described above.

Equip the discharge hose with a thermostatically controlled heating apparatus or insulate it to maintain the proper sealant pouring temperature. Holster the discharge hose to the melter if it is not thermostatically heat controlled. Circulate the sealant from the discharge hose and the melter to maintain the proper sealant pouring temperature.

Do not use sealant material heated beyond the safe heating temperature.

If the manufacturer's recommendations allow the sealant to be reheated or heated in excess of six hours, recharge the melter with fresh material amounting to at least 20 percent of the volume of the material remaining in the melter.

Sealing. Sealing is to be done when ambient air temperature is at or above 40°F.

Seal the crack by placing the applicator wand in or directly over the crack opening and carefully discharge the sealant. Strike-off the sealant flush with the pavement surface using a squeegee or sealing shoe pressed firmly against the pavement. Sealant application should produce a film 1/16" thick and between 1"-2" wide. If the sealant sinks into the crack more than 3/8 inch below the pavement surface, clean it with high pressure air and seal it to meet the specified thin film amount.

A low pressure, light spray of water may be used to accelerate cooling of the sealant. Blotting the sealant with fine aggregate is not allowed. Remove and dispose sealant in excess of the specified thin "film" dimensions or that has not bonded to both sides of the crack.

Do not allow traffic on the sealed cracks until the seal has cured so as not to track. Clean sealed cracks damaged from traffic with high pressure air and reseal them to meet the specified thin film amount at no additional cost to the State.

ITEM 412.76030001- CLEANING AND SEALING CRACKS IN HOT MIX ASPHALT PAVEMENT USING HOT APPLIED SEALANT (LANE MILES)

The finished work shall produce a water tight crack sealed flush with the pavement surface.

Replace pavement markings, in kind, that become covered and/ or obliterated more than 25% of their width with sealant. Replace with the appropriate items in accordance to §640 ReflectORIZED Pavement Markings or §685 Epoxy ReflectORIZED Pavement Markings, at no additional cost to the State:

METHOD OF MEASUREMENT
The Engineer will measure the number of lane miles of pavement that has been cleaned and sealed in accordance with this specification. The cost to clean and seal cracks in shoulders, medians, gore areas and tapers are included in the adjacent travel lane. Full width ramps and turn lanes are considered separate travel lanes.

BASIS OF PAYMENT
The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Item No.	Item	Pay Unit
412.76030001	Cleaning and Sealing Cracks in HMA Pavements Using Hot Applied Sealant	LN MILES

COLD MIX PAVING – LAB ANALYSIS/MIX DESIGN

CUSTOMER GOALS:

The customer would like to create a serviceable cold mix pavement using a combination of the aggregates provided.

ASSUMPTIONS/ OBSERVATIONS:

The laboratory received two samples of aggregate to be used in combination for cold mix paving in the town of Owego. The aggregates provided were NYS 1A's and NYS 1B's, both from a commonly used local quarry. From previous experience, we suspect these aggregates to be cationic-favoring.

ANALYSIS PERFORMED:

We ran 60% 1A's + 40% 1B's in two batches. One with 14 Gal./Ton HFMS-2 and the other with 14 Gal./Ton CMS-2.

Between the two batches, the anionic version coated poorly and created a loose material.

The cationic version coated much better, held its coat and the resulting material became hard after resting. The only critique we have is that it could have coated more fully. 15 Gal./Ton may be necessary for full coating, or adjusting the ratio of aggregates closer to 70% 1A's and 30% 1B's.

These aggregates favor a cationic emulsion.

CONCLUSIONS AND RECOMMENDATIONS:

Based on these observations, we recommend 14-15 Gal./Ton CMS-2 with 60% 1A's and 40% 1B's

Alternatively, 14 Gal./Ton CMS-2 with 70% 1A's and 30% 1B's.

Aggregate blend and emulsion quantities may need to be adjusted at time of mixing based upon the moisture content of the pile or adjusted to field conditions.

Knowing that we planned on covering the cold mix with a fog seal, we made field adjustments to lower the emulsion content closer to 13 Gal./Ton and increased the ratio of 1A's.

NYS DOT COLD MIX SPECIFICATIONS

ITEM 405.01000003 - COLD MIX BITUMINOUS PAVEMENT
ITEM 405.02000003 - LIQUID BITUMINOUS MATERIAL

DESCRIPTION

This work shall consist of placing one or more courses of cold mix bituminous pavement, and preparing the roadway surface on which the courses are to be placed. The bituminous pavement is defined by two items, the aggregate item, and the asphalt item. They are to be used in conjunction only.

MATERIALS

Bituminous Material

Use a medium setting asphalt emulsion meeting the requirements of Section 702 *Bituminous Materials* with the following exceptions

- The emulsion will have a minimum asphalt content of 70% and a penetration of 60 – 140.

Aggregates

The aggregates shall be Department approved aggregates meeting the requirements of § 703-02, Coarse Aggregates, for the sizes specified. Screened gravel shall not be permitted unless specified in the contract documents. Material shall consist of crushed aggregates having a minimum angularity of 40.

Composition of Mixtures

The mix will be proportioned as specified in the table below.

COMPOSITION OF COLD BITUMINOUS MIXTURES			
Sieve Size	Mixes		
	Type 1 General Limits % passing ¹	Type 2 General Limits % passing ¹	Type 3 General Limits % passing ¹
2 in	-	-	100
1 1/2 in	-	100	90-100
1 in	100	90-100	70-90
1/2 in	90-100	60-90	50-75
1/4 in	30-70	30-65	30-60
1/8 in	20-50	20-50	20-50
No. 200	1-5	1-5	1-5
Bituminous Material ^{2,3}	4.7-7.0	4.0-6.0	3.5-5.5

1. Percentage based on total aggregate weight.

2. Total Emulsion Percentage based on total mix weight.

3. When crushed air-cooled blast furnace slag aggregate is selected, the above bituminous material content shall be increased approximately 25%.

CONSTRUCTION REQUIREMENTS

Weather Limitations

Mixture shall not be applied under any of the following conditions;

- Soft or unsupported base

ITEM 405.01000003 - COLD MIX BITUMINOUS PAVEMENT
ITEM 405.02000003 - LIQUID BITUMINOUS MATERIAL

- Wet surfaces
- Surface temperature below 45°F
- Other weather conditions would prevent proper construction of the pavement.

Equipment

The following equipment shall be required:

- Either central pugmill mixer and bituminous paver or travel plant mixer and grader
- Steel wheeled roller, 8-12 Ton or Approved vibratory roller
- Power broom
- Miscellaneous equipment to perform the work

All equipment and the condition of the equipment for this work shall be subject to the approval of the Engineer. The bituminous material shall be incorporated into the mix using a calibrated totalizing meter. The calibration shall be submitted to the Engineer prior to work and be good for up to 90 days after calibration.

The pugmill mixer, either traveling or central type, shall be provided with weighing, volumetric or other gauging equipment which shall be capable of providing accurate control at all times of the amount of aggregate entering the mixer per time interval. The mixer shall accurately proportion the mix by volume or weight and provide a thorough and uniform coating.

When using a central continuous type pugmill, a mechanically operated discharge hopper will be provided.

Preparation of the Roadway Surface

The roadway surface to be covered shall be free from holes, depressions, bumps, waves and corrugations. Any unsuitable surface areas shall be repaired by replacement of the unstable materials or by patching with a material to produce a tight surface having the same elevation as the surrounding surface. The roadway surface shall be broomed when ordered by the Engineer to remove loose material.

Mixing and Spreading

The aggregate and asphalt shall be thoroughly mixed so that the bituminous material is uniformly distributed throughout and all aggregate particles are uniformly coated.

The mixture shall be deposited on the prepared base either in a windrow at the back of the travel mixer or mechanically spread in a uniform layer so as to produce the specified thickness after compaction. If deposited in a windrow, it shall be spread over the entire roadway surface by grader or other approved spreader to produce the specified thickness after compaction.

The maximum allowable compacted thickness shall be 2 inches for the Type 1 mix, and 4 inches for the Type 2 and Type 3 mixes.

ITEM 405.01000003 - COLD MIX BITUMINOUS PAVEMENT
ITEM 405.02000003 - LIQUID BITUMINOUS MATERIAL

Compaction

After spreading, the mixture shall be thoroughly and uniformly compacted with a self-propelled steel-wheeled roller or an approved vibratory roller. The number of roller passes to achieve the desired compaction shall be approved by the Engineer.

Surface Testing

The finished surface of the pavement shall be tested with a 16 foot straight edge laid parallel with the center line of the pavement. Any area exceeding a 1/4 inch variation from the surrounding area shall be satisfactorily corrected or removed and replaced, at no additional cost to the State.

METHOD OF MEASUREMENT

The bituminous cold mix pavement will be measured by the number of tons of compacted aggregate placed in accordance with the specifications. The tons of compacted cold mix will be determined by use of a certified scale or by another calibrated method acceptable to the Engineer.

The liquid bituminous material will be measured by the number of 60°F gallons incorporated into the work.

BASIS OF PAYMENT

The unit price bid for Cold Mix Bituminous Pavement shall include the cost of furnishing all labor, materials, and equipment necessary to prepare the surface; mix, place, compact and test all courses of bituminous cold mix pavement.

The unit price bid for Liquid Bituminous Material shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily incorporate the liquid bituminous material into the work.

Payment will be made under:

<u>Item No.</u>	<u>Item</u>	<u>Pay Unit</u>
405.01000003	Cold Mix Bituminous Pavement	Ton
405.02000003	Liquid Bituminous Material	Gallons

COLD MIX PAVING IN ACTION



FOG SEAL

- An application of fog seal was recommended to protect the fresh cold mix from traffic, turning, power steering burns, etc. While giving the pavement time to cure.
- Given the traffic load and residential population density of the area, quick return to traffic was essential.
- Typically, fog seals in NY are applied using the following emulsions: Diluted Tack Coat, SS-1h, CSS-1h, or HFMS-2h.
- In this scenario and for these reasons, we formulated a C/NTT emulsion.
- Application rate was approx. 0.1 Gal./SY

NYS DOT ANIONIC & CATIONIC EMULSION SPECIFICATIONS

TABLE 702-4 ANIONIC ASPHALT EMULSIONS																				
TYPE	RAPID SETTING								MEDIUM SETTING								SLOW SETTING			
MATERIAL DESIGNATION	702-3001		702-3002		702-3101		702-3102		702-3201		702-3301		702-3401		702-3402		702-3501		702-3601	
GRADE	RS-1		RS-1h		RS-2		HFRS-2		MS-2		HFMS-2		HFMS-2h		HFMS-2s		SS-1		SS-1h	
Test Requirements	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Emulsion⁽¹⁾:																				
Viscosity, Saybolt Furol, 77°F (25°C), second	20	100	20	100	-	-	-	-	100	-	100	-	100	-	50	-	20	100	20	100
Viscosity, Saybolt Furol, 122°F (50°C), second	-	-	-	-	75	400	75	400	100	400	100	400	-	-	-	-	-	-	-	-
Storage Stability Test, 1 Day (Difference in % Residue)	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1
Demulsibility, 35 mL, 0.02 N, CaCl ₂ , %	60	-	60	-	60	-	60	-	-	-	-	-	-	-	-	-	-	-	-	-
Cement Mixing Test ⁽²⁾ , %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	2.0
Sieve Test, %	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10
Residue by Distillation, %	55	-	55	-	63	-	63	-	65	-	65	-	65	-	65	-	57	-	57	-
Oil Distillate, Volume Total Emulsion, %	-	1.5	-	1.5	-	2.5	-	2.5	-	8	-	8	-	8	-	8	-	1.5	-	1.5
Residue from Distillation Test⁽¹⁾:																				
Penetration, 77°F (25°C), 100 g, 5 second	100	200	40	90	100	200	100	200	100	200	100	200	40	90	200	-	100	200	40	90
Ductility, 77°F (25°C), 5 cm/minute, cm	40	-	40	-	40	-	40	-	40	-	40	-	40	-	40	-	40	-	40	-
Solubility in trichloroethylene, %	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-
Float Test ⁽³⁾ , 140°F (60°C), second	-	-	-	-	-	-	1200	-	-	-	1200	-	1200	-	1200	-	-	-	-	-

1. All tests performed per AASHTO T 59 unless otherwise noted.

2. The Cement Mixing test is waived if the emulsion will be used for soil stabilization.

3. Float Test AASHTO T 50, except that the residue from distillation shall be poured immediately into the float collar at 500°F (260°C).

TABLE 702-5 CATIONIC ASPHALT EMULSIONS																	
TYPE	RAPID SETTING						MEDIUM SETTING				SLOW SETTING				QUICK SETTING		
MATERIAL DESIGNATION	702-4001		702-4002		702-4101		702-4201		702-4301		702-4401		702-4501		702-4601		
GRADE	CRS-1		CRS-1h		CRS-2		CMS-2		CMS-2h		CSS-1		CSS-1h		CQS-1h		
Test Requirements	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Emulsion⁽¹⁾:																	
Viscosity, Saybolt Furol, 77°F (25°C), second	20	100	20	100	-	-	-	-	-	-	20	100	20	100	20	100	
Viscosity, Saybolt Furol, 122°F (50°C), second	-	-	-	-	100	400	50	450	50	450	-	-	-	-	-	-	
Storage Stability Test, 1 Day (Difference in % Residue)	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	
Classification Test	Passes		Passes		Passes		---		---		---		---		---		
Particle Charge Test ⁽²⁾	Positive		Positive		Positive		Positive		Positive		Positive		Positive		Positive		
Sieve Test, %	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	
Cement Mixing Test ⁽³⁾ , %	-	-	-	-	-	-	-	-	-	-	-	2.0	-	2.0	-	-	
Residue by Distillation, %	60	-	60	-	65	-	65	-	65	-	57	-	57	-	62	-	
Oil Distillate, Volume Total Emulsion, %	-	1.5	-	1.5	-	2.5	-	10	-	10	-	1.5	-	1.5	-	-	
Residue from Distillation Test⁽¹⁾:																	
Penetration, 77°F (25°C), 100 g, 5 second	100	250	40	90	100	250	100	250	40	90	100	250	40	90	40	90	
Ductility, 77°F (25°C), 5 cm/minute, cm	40	-	40	-	40	-	40	-	40	-	40	-	40	-	40	-	
Solubility in trichloroethylene, %	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	

1. All tests performed per AASHTO T 59 unless otherwise noted.

2. If the Particle Charge test is inconclusive, material having a maximum pH value of 6.7 will be accepted.

3. The Cement Mixing test is waived if the emulsion will be used for soil stabilization.



**MICROSURFACING
BEING APPLIED**



**MICROSURFACING
BEING APPLIED**

MICROSURFACING LAB ANALYSIS/MIX DESIGN

AGGREGATE: NYSDOT APPROVED
TYPE II MICROSURFACING
AGGREGATE FROM LOCAL QUARRY
WAS DELIVERED TO THE
LABORATORY FOR EVALUATION.

EMULSION: THE CQS-1HP
EMULSIONS FORMULATED WITH
EMULSIFIER(S), LATEX, AND 62% PG
64-22 ASPHALT CEMENT WERE
SMOOTH AND STABLE, WITH MEDIAN
PARTICLE SIZE OF 3.85 MICRONS.

SUMMARY ANALYSIS: TRIAL MIXES
PROVIDED COMPATIBLE AND
CONSISTENT MIXES. THE MIX CAN
BE OPEN TO TRAFFIC IN APPROX.
ONE HOUR.

MICROSURFACING LAB ANALYSIS - AGGREGATE

Aggregate Gradation	Type II Aggregate	Type II Specifications
Sieve Size, mm	% Passing	% Passing
12.5	100.0	100
9.5	100	95-100
4.75	75.1	65-90
2.36	49.0	45-70
1.18	35.7	30-50
0.600	27.4	18-30
0.300	16.4	10-22
0.075	11.1	5-15
2. Sand Equivalent %	52.0	65.0 Minimum
3. Plasticity Index(PI)	0; non-plastic	0; non-plastic
4. MBV (Methylene Blue)	2.5 mg/g, 0/#325	0-6 mg/g = Excellent

The Type II aggregate met the gradation requirements, but failed the sand equivalent value.

However, the aggregate is classified as Non-Plastic by testing, according to AASHTO T89, "Determining the Liquid Limit of Soils" and AASHTO T 90, "Determining the Plastic Limit and Plasticity Index of Soils" and can be evaluated for a microsurfacing system.

Also, the #325 minus material met the Methyl Blue Test, testing with a MBV of 2.5 mg/g, according to AASHTO T 330 "Standard Method of Test for The Qualitative Detection of Harmful Clays of the Smectite Group in Aggregates Using Methylene Blue".

Note: This is common with aggregates found in the Northeast US

MICROSURFACING LAB ANALYSIS - MIX DESIGN

Micro-Surfacing Job Mix Formula (Mix Design)	Mix Design
QUARRY Type II Micro Aggregate	100.0%
Portland Cement, Type 1	1%
Water	As required
CQS-1HP Emulsion	11.50%

Trial Mixes and Test Results on Mix Design		Specifications
Mix Time @ 25 degC, sec.	200	120 Minimum
Cohesion Test, kg-cm		
- Setting Time, 0.5 hour	16.0	12.0 Minimum
- Traffic Time, 1.0 hour	22.0	20.0 Minimum
Wet Stripping Test, % retained coated	95+	90.0 Minimum
Wet Track Abrasion Test, - 1 hour soak, g/ft ²	19.5	50 Maximum
Wet Track Abrasion Test, - 6 day soak, g/ft ²	45.5	75 Maximum
Loaded Wheel: Vertical Displacement Test, pct.	5.0	10 Maximum
Loaded Wheel: Lateral Displacement Test, pct.	3.2	5 Maximum
Specific Gravity after 1000 cycles, 57 kg.	1.89	2.1 Maximum
Classification Compatibility by S-B-R Test	AAA (12 pts.)	11 points Minimum (AAA, BAA, ABA)
- Absorption, pct.	2.90	
- Abrasion Loss, gm.	0.68 (A), 4 pt.	
- Integrity, pct.	97.8 (A), 4 pt.	
- Adhesion, pct. Retained coating	95.0 (A), 4 pt.	
Note: The components in the mix design are based on the weight of dry aggregate.		

MICROSURFACING LAB ANALYSIS - CONCLUSIONS & RECOMMENDATIONS

→ The CQS-1hp emulsion formulated with emulsifiers, latex and 62% pg64-22 asphalt cement met the requirements for microsurfacing emulsions.

→ Trial Mixes using the Type II crushed aggregate provided compatible and consistent mixes with formulated CQS-1hp emulsion. The mix can be open to traffic in one hour.

→ The Mix Design presented, using Type II crushed aggregate and CQS-1hp emulsion, met the specifications for a microsurfacing system.

Recommended job mix formula (JMF) for microsurfacing application as follows (based on dry aggregate):

QUARRY Type II Aggregate	100%
Portland Cement, Type 1	1% (+/-0.5%)
Water	As required
CQS-1HP Asphalt Emulsion	11.5% (+/- 1.0%)

Construction field trials and test calibration checks on the continuous flow mixing units are required to ensure that the microsurfacing system meets design specifications and has good workability and placement characteristics.

NYSDOT MICROSURFACING SPECIFICATIONS

ITEM 10410.102102 M - MICRO-SURFACING, TYPE II
ITEM 10410.103102 M - MICRO-SURFACING, TYPE III
ITEM 10407.10 M - EMULSION TACK COAT

DESCRIPTION

Apply a properly proportioned mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives to a paved surface. All necessary surface cleaning, joint sealing, crack filling, pavement markings removal, tack coats, and utility grade adjustments will be paid for under their appropriate items.

MATERIAL REQUIREMENTS

A. Asphalt Emulsion. § 702 - Bituminous Materials, CQS-1p, Item 702-4801. Use this emulsion for both the tack coat and micro-surfacing mixture.

B. Aggregates. § 703-02, Coarse Aggregate, except as modified herein.

1. Use 100% crushed aggregate, from an approved source.
2. Use aggregate with a minimum sand equivalent quality of 65%, as determined according to AASHTO T 176, "Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test," or that is classified as non-plastic according to AASHTO T 89, "Determining the Liquid Limit of Soils," and AASHTO T 90, "Determining the Plastic Limit and Plasticity Index of Soils."
3. Use aggregate that consists of one of the following when sampled and tested in accordance with Materials Method 28, "Friction Aggregate Control and Test Procedures."
 - a. Limestone having an acid insoluble residue content $\pm$ 20.0%, excluding particles of chert and similar siliceous rocks, unless otherwise approved by the Director, Materials Bureau. Blends of siliceous and non-siliceous limestones will not be permitted.
 - b. Dolomite having an acid insoluble residue content $\pm$ 17.0%, excluding particles of chert and similar siliceous rocks, unless otherwise approved by the Director, Materials Bureau. Blends of siliceous and non-siliceous dolomite will not be permitted.
 - c. Sandstone, granite, chert, traprock, ore tailings or other similar non-carbonate materials.
 - d. Use gravel or blend two or more of: gravel, limestone, dolomite, sandstone, granite, chert, traprock, ore tailings, or other similar materials to produce a final blend having at least 40.0% (by weight with adjustments to equivalent volumes for materials of different specific gravities) non-carbonate particles in each size fraction coarser than the 600 μ m sieve. Non-carbonate particles are those having a minimum acid insoluble residue content of 80.0%.

C. Water. § 712-01, Water.

D. Mineral Filler. § 703-08, Mineral Filler.

E. Equipment. Use micro-surfacing equipment appearing on the Department's Approved List. Equipment must be designed and manufactured specifically for mixing and placing micro-surfacing. The equipment must be capable of accurately proportioning the constituent materials, thoroughly mixing those materials, and placing the micro-surfacing in conformance with this specification. Submit requests to add equipment to the Approved List to the Director, Materials Bureau, at least 30 days before the start of work.

ITEM 10410.102102 M - MICRO-SURFACING, TYPE II
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Calibrate each mixing unit according to Materials Method 8.4M, "Calibrating Micro-Surfacing Mix Units." Calibrations are valid for 90 days.

The emulsion, aggregate and mineral filler counters must be accessible to the Engineer and inspectors.

MIXTURE DESIGN

Employ a Department approved laboratory to develop a mixture design meeting the requirements in Table 1 - Proportional Requirements, Table 2 - Physical Requirements, and Table 3 - Gradation Requirements. All materials used to develop the mixture design must be representative of the material to be used on the project. Submit the mixture design, to the Director, Materials Bureau, for approval at least 14 days before the start of work. Mixture design approvals are valid until December 31, of the year in which they are approved.

TABLE 1 - PROPORTIONAL REQUIREMENTS	
Constituent	Proportional Requirement
Residual Asphalt	5.5% to 10.5% by dry mass of aggregate.
Mineral Filler	0.0% to 3.0% by dry mass of aggregate.
Water	As required to produce proper mixture consistency.
Field Control Additive	As required to control of the emulsion's set properties or increase adhesion, but must be part of the mixture design and compatible with all other components.

TABLE 2 - PHYSICAL REQUIREMENTS		
Property	Test Method	Requirement
Wet Cohesion	ISSA TB 139; 30 minutes ISSA TB 139; 60 minutes	12 kg-cm, minimum 20 kg-cm, minimum
Wet Track Abrasion Loss	ISSA TB 100; 1 hour soak ISSA TB 100; 6 day soak	538 g/m ² , maximum 807 g/m ² , maximum
Mix Time	ISSA TB 113	Controllable to 120 sec., min.
Classification Compatibility	ISSA TB 144	11 grade points, minimum
Wet Stripping	ISSA TB 114	Pass (90.0% minimum)
Excess Asphalt by LWT Sand Adhesion	ISSA TB 109	538 g/m ² maximum
Lateral Displacement	ISSA TB 147A	5.0% maximum
Specific Gravity after 1000 cycles of 125 lbs.	ISSA TB 147A	2.10 maximum

TABLE 3 - GRADATION REQUIREMENTS	
Mixture Type	Aggregate Gradation
Type II	2MS ⁽¹⁾
Type III	3MS ⁽¹⁾

⁽¹⁾ § 703-02 Material Requirements, Table 703-3 Sizes of Crushed Gravel, Stone, and Slag for Slurry.

CONSTRUCTION DETAILS

Submit a copy of the approved mix design and equipment calibration information to the Engineer prior to the start of work. Adjust the material delivery settings on the micro-surfacing equipment to produce the approved mix design. Verify the calibration and material delivery settings during construction according to Materials Method 8.4M, "Calibrating Micro-Surfacing Mix Units" as requested by the Regional Materials Engineer.

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A. Stockpile. Build an aggregate stockpile at a location approved by the Engineer. When blending multiple aggregates, use automated proportioning and blending equipment to produce a uniformly graded stockpile. Screen the aggregate at the stockpile, prior to delivering it to the micro-surfacing equipment.

1. Testing. Take three samples, according to Materials Method 5, "Plant Inspector's Manual for Bituminous Concrete Mix Production" and test for gradation, according to AASHTO T 11, "Materials Finer than 75 μ m Sieve in Mineral Aggregates by Washing," and AASHTO T 27, "Sieve Analysis of Fine and Coarse Aggregates." Each sample must contain material from each face of the stockpile.

When blending multiple aggregates, sample and test the stockpile in accordance with Materials Method 28, "Friction Aggregate Control and Test Procedures."

Submit the test results to the Engineer and Regional Materials Engineer for approval before using material from the stockpile.

The Engineer will take at least one sample for friction aggregate analysis according to Materials Method 28.

2. Tolerance. The maximum stockpile tolerances are given in Table 4 - Maximum Stockpile Tolerances. The design value plus the stockpile tolerance cannot exceed the gradation limits (Table 3 - Gradation Requirements).

TABLE 4 - MAXIMUM STOCKPILE TOLERANCES								
Screen Sizes (mm)	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
Stockpile Tolerance	-	$\pm$ 5.0%	$\pm$ 5.0%	$\pm$ 5.0%	$\pm$ 5.0%	$\pm$ 4.0%	$\pm$ 3.0%	$\pm$ 2.0%

3. Approval. Stockpile gradation approval is valid until new material is added to the stockpile. Approval will be based on the average of three gradation tests. If the percent passing exceeds the stockpile tolerance or is outside the gradation limits for any sieve, or ranges from the high end to the low end of the tolerance limits for any two consecutive sieves, the stockpile will be rejected.

All micro-surfacing placed with material from a stockpile rejected for gradation will be rejected pending submission and approval of a mix design representing the stockpile gradation and admixture placed.

If the non-carbonate or acid insoluble residue contents of the material in the stockpile are not within the specified limits, the stockpile will be rejected. All micro-surfacing placed with material from a stockpile rejected for non-carbonate or acid insoluble residue content will be rejected pending evaluation of the pavement in accordance with Materials Method 28.

B. Weather and Seasonal Limitations. The requirements of Section 402-3.01 Weather and Seasonal Limitations apply, except as modified herein. Do not place micro-surfacing in the rain, or if the air temperature is expected to fall below freezing within 24 hours after application. Application will be permitted to begin when pavement temperature is $> 7^{\circ}\text{C}$ and expected to rise, above 10°C . Stop micro-surfacing if the temperature drops below 10°C .

C. Mixture Consistency. Produce a mixture which is homogeneous, with no lumps, balls, unmixed aggregate, segregation, and excess water or emulsion.

NYSDOT MICROSURFACING SPECIFICATION- CONT'D.

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Control the break time and mix consistency with mixture proportion adjustments. Keep the mixture from setting until after application. The maximum allowable adjustment of the mineral filler is 1.0%. Report all mixture adjustments to the Engineer before they are made.

D. Surface Preparation.

1. Thoroughly clean the entire surface before applying the asphalt emulsion and micro-surfacing. The surface should be free of dirt, oil, and other foreign materials. Remove all debris and standing water.
2. Cover all manhole covers, water boxes, catch basins, and other such utility structures within the area being paved with plastic, building felt, or other material approved by the Engineer. Remove the covers each day.
3. Apply the asphalt emulsion on to the membrane in accordance to §407-3, Construction Details, at a rate of 0.16 to 0.20 L/m² before applying micro-surfacing mixture. Alternate application rates require the Engineer's approval.

E. Application.

1. **Application Rate.** Use at least 2 applications to achieve the application rate as detailed in the contract documents. Application rate limits are given in Table 5 - Application Limits. When filling ruts, fill each wheel rut as detailed in the contract documents.

TABLE 5 - APPLICATION LIMITS			
Gradation	Maximum Single Pass Application Rate (kg/m ²)	Total Application Tolerance (kg/m ²)	Typical Total Application Rate Range (kg/m ²)
Type II	11	± 2.0	14 - 22
Type III	16	± 3.0	20 - 32

2. **Coverage.** Apply the micro-surfacing to the pavement evenly across the entire width of the spreader box to produce a smooth riding surface with no streaks, excess buildup, thin or uncovered areas. Do not use hand tools to expand the width of application wider than the spreader box, except as described under *Hand Finishing* below. Hand held squeegees may not be used to expand the width of application during mainline paving.
3. **Joints.** Minimize the number of joints. Construct joints such that no gap is present between adjacent applications. When possible, place longitudinal joints at the edges of traffic lanes. Measure the difference in grade across joints by laying a 3 m straight edge centered on the joint perpendicular to the direction of the joint. Joint overlap and grade difference requirements are given in Table 6 - Joint Requirements.

TABLE 6 - JOINT REQUIREMENTS		
Requirement	Minimum	Maximum
Difference in Grade	-	6.0 mm
Longitudinal Joint Overlap	50 mm	150 mm
Transverse Joint Overlap	50 mm	300 mm

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4. **Variable-Width Passes.** Apply no more than one variable-width pass. Variable-width passes will not be permitted as the last pass unless ordered by the Engineer.

5. **Hand Finishing.** Use hand held squeegees to finish areas which cannot be reached with the spreader box, and to produce straight lines along curbs, shoulders, and through intersections. Apply the same type of finish to the surface as is applied by the spreader box.

6. **Excess Material.** Remove all excess material in areas such as driveways, gutters, intersections, etc. as specified by the Engineer, each day.

- F. Curing.** Allow each coat to cure sufficiently to resist damage from the micro-surfacing equipment, before applying the next coat. Protect the micro-surfacing from traffic until the mixture has cured sufficiently to resist damage. The time required will vary based on the mix design and environmental conditions. Repair damage from micro-surfacing equipment or traffic to the Engineer's satisfaction.

METHOD OF MEASUREMENT.

Micro-Surfacing. The Engineer will measure the total metric tons of aggregate, mineral filler, and asphalt emulsion used according to Materials Method 8.4M, "Calibrating Micro-Surfacing Mix Units."

Emulsion Tack Coat. The Engineer will measure the number of liters of asphalt emulsion used for the emulsion tack coat, measured at 16°C.

BASIS OF PAYMENT.

Micro-Surfacing. Include the cost of all labor, materials, and equipment necessary to perform the work in the unit price bid per metric ton.

Emulsion Tack Coat. Include the cost of all labor, materials, and equipment necessary to perform the work in the unit price bid per liter.

Payment will be made under:

Item No.	Item	Pay Unit
10410.102102 M	Micro-Surfacing, Type II	Metric Ton
10410.103102 M	Micro-Surfacing, Type III	Metric Ton
10407.10 M	Emulsion Tack Coat	Liter



SAFETY CONSIDERATIONS

Employees wore appropriate PPE, hearing, eye, and hand protection. Our heat advisory protocols were in effect for this job. The project supervisor was on site and communicating with the public. Senior management including the VP of operations, Safety Director, and CEO were on site at various times supporting the job.

Separate staging and stockpile areas were easily accessible to our employees while protected from public access.

The staging area was used for company vehicles and equipment that were not in use to be parked/stored out of the traffic flow of equipment accessing the stockpile. The area was used for morning and end of day meetings, food & water breaks, and other material storage.

The stockpile area was restricted to only the employees running the equipment supplying the material. Material, tanker storage and equipment were set off to one side, a safety boundary was created for operations with limited access. Traffic flow was only allowed one way, vehicles would pull in, get loaded with material then drive straight out, this created an order for loading and traffic flow only moving one way.

Inside the work zone, communication was constant keeping all employees up to date with the flow of work. Signage was set up to inform the public of the work at all access roads. This was a mobile worksite and needed other signage to be moved as the work area changed. Flaggers were stationed at each end of the active work zone and at intersections. All were equipped with radios and had direct contact with the supervisor and paving crew.

Other traffic control employees assisted moving signage and helping any of the public that needed access in or out of their driveways.

ADDITIONAL PROJECT CONSIDERATIONS

SCHEDULE/PLANNING:

ON THIS JOB IN PARTICULAR, COMMUNICATION WITH RESIDENTS AND BUSINESSES WAS PARAMOUNT, BOTH TO APPEASE THE PUBLIC BUT ALSO TO PROTECT THE TREATMENTS BEING APPLIED.

PUBLIC CONCERN/PUSHBACK:

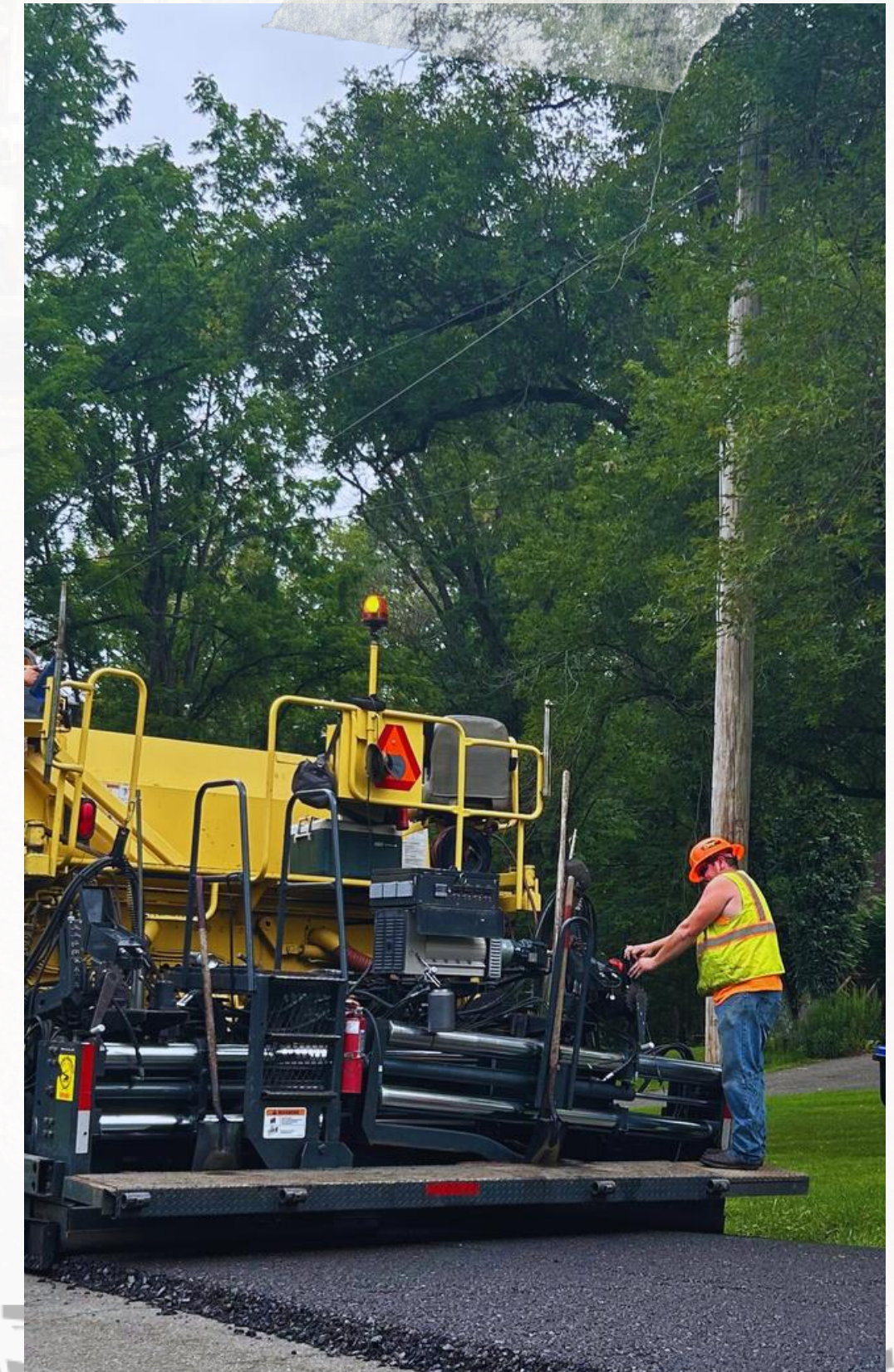
THE LOCAL RESIDENTS HAD NO PREVIOUS EXPERIENCE WITH THESE PROCESSES. THEY WERE COMFORTABLE WITH HOT MIX APPLICATIONS AND WERE SKEPTICAL AND CONCERNED LEADING UP TO AND THROUGHOUT THE PROJECT. WE MADE EXTRA EFFORTS TO COMMUNICATE WITH THEM AND EXPLAIN WHAT THE REASONING WAS BEHIND THE CHOICE OF TREATMENTS, THE BENEFITS OF EACH TREATMENT, AND WHAT THEY SHOULD EXPECT.

DIVERSE TRAFFIC:

TRAFFIC CONTROL ON MAIN STREET WAS ESPECIALLY CHALLENGING DUE TO THE VARYING NATURE OF TRAFFIC. WE SUCCESSFULLY MANAGED THE BALANCE BETWEEN BUSINESSES WITH DELIVERY TRUCKS, BARS/RESTAURANTS, RESIDENTIAL AREAS, ETC.

SUCCESS:

PROJECT WAS COMPLETED ON-TIME, UNDER BUDGET, AND WITH NO SAFETY ISSUES.

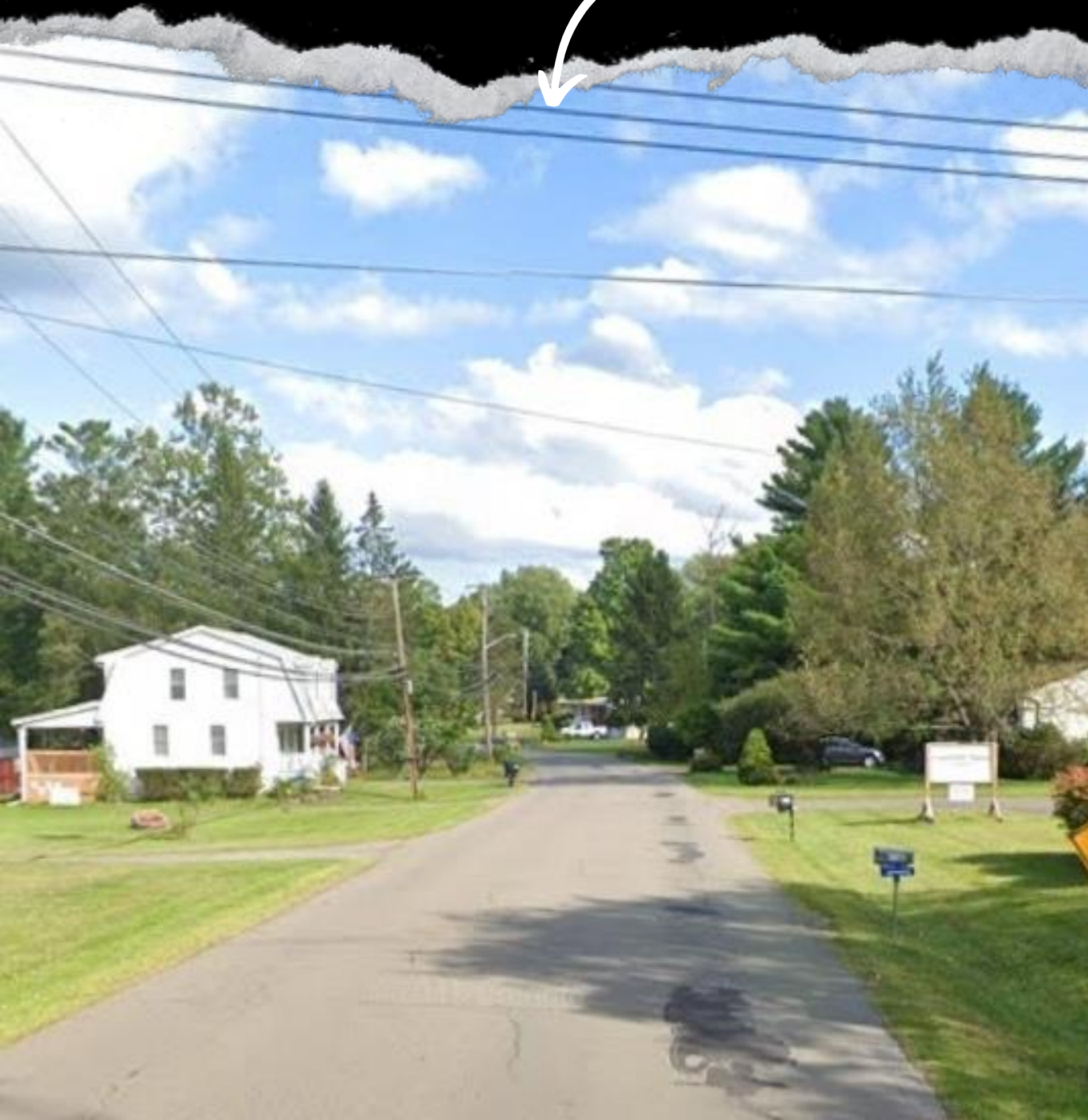


Customer Statement

WE AT THE TOWN OF OWEGO HIGHWAY DEPARTMENT ARE ELATED WITH HOW THIS PROJECT TURNED OUT - BOTH WITH THE END PRODUCT AND WITH THE SERVICE PROVIDED BY VESTAL ASPHALT. WE WORKED TOGETHER TO EVALUATE THE ROADS, DEVELOP A SOLUTION, OVERCOME SOME SIGNIFICANT CHALLENGES, AND GET THE BEST FINISHED PRODUCT. NOT ONLY WAS THE END RESULT A BEAUTIFUL ROAD THAT THE RESIDENTS CAN BE PROUD OF, BUT IT SAVED A SIGNIFICANT PORTION OF OUR MAINTENANCE BUDGET. OUR TOWN HAS PRIMARILY FOCUSED ON HOT MIX PAVING FOR SEVERAL YEARS, SO THIS WAS A BIG CHANGE. I BELIEVE THE COLD-MIX PAVING AND MICROSURFACING APPLICATIONS WE USED ON THIS PROJECT WERE THE "ICING ON THE CAKE". WE ALSO USED MICROSURFACING OVER OTHER PROCESSES THIS YEAR AND I'M POSITIVE WE WILL BE USING IT AS A PRESERVATION TREATMENT FOR YEARS TO COME IN THE TOWN OF OWEGO.

MIKE ROBERTS, HIGHWAY SUPERINTENDENT

BEFORE & AFTER



BEFORE & AFTER



OUR CREW HARD AT WORK



DURING & AFTER

