MONROE COUNTY
ROAD
COMMISSION

840 S. Telegraph Road • Monroe, Michigan 48161 • Phone: (734) 240-5102 • Fax: (734) 240-5101

PROPOSAL

FOR

2016 FULL DEPTH RECLAMATION PROGRAM

BID OPENING:

Tuesday, April 19, 2016 at 10:00 a.m.

BOARD OF COUNTY ROAD COMMISSIONERS
OF THE COUNTY OF MONROE

Paul Iacoangeli, Chairman
Dan Minton, Vice Chairman
Bruce R. Stammer, Jr., Member
Stephen J. Pace, Member
Charles A. Londo , Member

MONROE COUNTY ROAD COMMISSION
INVITATION TO BID

Sealed bids will be received by the Board of County Road Commissioners of the County of Monroe until **10:00 a.m.** local time on **Tuesday, April 19, 2016** at their office located at 840 South Telegraph Road, Monroe, Michigan, 48161 for the following:

- 2016 Fog Seal Program
- 2016 Full Depth Reclamation Program
- 2016 Guardrail Spraying Program
- 2016 Scrub Seal Program
- Liquid Calcium Chloride
- Mineral Well Brine

Bids will be publicly opened and read aloud by the Bid Committee at 10:00 a.m. Proposals may be downloaded from the Road Commission's website at www.mcrc-mi.org/bids.html.

BOARD OF COUNTY ROAD COMMISSIONERS
OF THE COUNTY OF MONROE, MICHIGAN

MONROE COUNTY ROAD COMMISSION
PROPOSAL
2016 FULL DEPTH RECLAMATION PROGRAM

TO: The Board of County Road Commissioners of the County of Monroe, Michigan

FOR: 2016 Full Depth Reclamation Program

Ladies and Gentlemen:

The undersigned bidder hereby affirms that:

1. The proposal is in all respects fair and without any collusion or fraud.

2. The undersigned have examined the site of the proposed project and have made a personal investigation and estimate of quantities.

3. The undersigned will contract to furnish all labor, equipment, tools, material and traffic control devices necessary at the unit prices stated on the attached bid forms and to complete the work in the time specified to the satisfaction of the Board of County Road Commissioners of the County of Monroe, Michigan.

Company: _____

Address: _____

City, State, ZIP: _____

Telephone: _____

By: _____

Title: _____

Date: _____

Notes:

1. If the bidder is a partnership, each member must sign the proposal

2. Corporations must execute the proposal by duly authorized officers in accordance with the Articles of Incorporation.

INSTRUCTIONS TO BIDDERS
and
GENERAL CONDITIONS

The Michigan Department of Transportation 2012 Standard Specifications for Construction are incorporated as part of these bidding documents and shall govern except as provided in the Invitation to Bid, Instructions to Bidders and General Conditions, and Proposal. Reference to the Department or Commission in the Michigan Department of Transportation 2012 Standard Specifications for Construction shall for this project mean the Board of County Road Commissioners of the County of Monroe, hereinafter referred to as "Board", unless otherwise specified.

OWNER
The owner of the project is the Board of County Road Commissioners of the County of Monroe, also referred to as the "Board."

ENGINEER
The Engineer is the Director of Operations or the individual assigned by the Director of Operations to be in charge of the Contract.

BIDDER
The Bidder is one who submits a signed bid with the required documentation directly to the Board at the time and place specified.

BID FORMS
Sealed proposals must be submitted on the bid forms furnished by the Board. The proposal shall be submitted in its entirety (pages 1 through 11) with no modifications or changes except as authorized by an addendum and with no pages removed. All proposals must be filled out in ink or typewritten and shall be legibly signed, giving the complete name and address of the Bidder.

All bids must be in a sealed envelope and clearly marked "**Bid for 2016 Full Depth Reclamation Program**."

BIDDER'S SURETY
The proposal must be accompanied by a cashier's check, certified check or a bid bond made payable to the Board of County Road Commissioners of Monroe County, Michigan in the sum of five percent (5%) of the amount of the bid. Upon awarding and signing of a contract, or in the event of bid rejection, such bid surety will be returned to the Bidder. Bids may be held for a period of forty (40) days.

INTERPRETATION AND ADDENDA
All questions about the meaning or intent of the Bidding Documents are to be directed to the Engineer. Interpretation or clarification considered necessary by the Engineer to such questions will be issued by Addenda delivered to all parties recorded by the Engineer as having received the Bidding Documents. Questions received less than seven days prior to the date for opening the bids may not be answered. Only questions answered by formal written Addenda are binding. Oral and other interpretations or clarifications will be without legal effect.

OPENING OF BIDS
Bids will be received by the Board at 840 S. Telegraph Road, Monroe, Michigan, 48161 until **10:00 a.m.** local time on **April 19, 2016** at which time they will be publicly opened and read aloud.

ACCEPTANCE AND REJECTION OF BIDS
The Board reserves the right to accept, reject and/or modify any or all bids received, to waive any irregularities therein and to make the award in any manner deemed to be in the best interest of the Monroe County Road Commission.

TITLE VI ASSURANCE

The Monroe County Road Commission, in accordance with Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC 2000d to 2000d-4) and Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, hereby notifies all bidders that it assures that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, gender, age, or disability in consideration for an award.

PROHIBITION OF DISCRIMINATION

In accordance with Act No. 453, Public Acts of 1976, the Contractor and subcontractors hereby agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, or marital status. Further, in accordance with Act No. 220, Public Acts of 1976 as amended by Act No. 478, Public Acts of 1980, the Contractor and subcontractors hereby agree not to discriminate against an employee or applicant for employment tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of a disability that is unrelated to the individual's ability to perform the duties of a particular job or position. A breach of the above covenants shall be regarded as a material breach of this contract.

CONTRACT EXECUTION

The Bidder to whom the contract is awarded shall, within ten (10) calendar days after notice of award, enter into a written contract with the Board and furnish bonds and proof of insurance as hereinafter specified. Failure to execute the contract or furnish satisfactory bonds and proof of insurance will be considered cause for annulment of award and forfeiture of the Bidder's surety.

PERFORMANCE AND LIEN BONDS

The successful Bidder to whom the contract is awarded shall furnish two (2) surety bonds as follows:

> Performance Bond - To the Board of County Road Commissioners of the County of Monroe, Michigan for the faithful fulfillment of the terms of the contract in the amount of one-hundred (100) percent of the contract amount.
>
> Lien Bond - To the Board of County Road Commissioners of the County of Monroe, Michigan for the payment of all labor and materials used in the work in the amount of one-hundred (100) percent of the contract amount.

INCREASED OR DECREASED QUANTITIES

The Board reserves the right to increase or decrease quantities from those originally estimated and such changes will be paid for at the unit price bid so long as the total contract amount is not changed more than twenty-five (25) percent. Changes in excess of that amount will be individually negotiated.

PROGRESS SCHEDULE

In no case shall any work be commenced prior to receipt of formal notice of award by the Board.

The low Bidder for the work covered by this proposal will be required to meet with the Board's representative to review the Contractor's proposed work schedule. The schedule for this meeting will be set within one (1) week after the low bidder is determined.

The Board's representative will arrange the time and place for the meeting.

TIME OF COMPLETION

The work on Brewer Road, Newburg Road and Substation Road may not begin prior to **June 27, 2016** and shall be completed on or before **August 5, 2016**.

All work shall be completed on or before **September 30, 2016**.

FAILURE TO COMPLETE ON TIME

Liquidated damages in the amount of **$600** per day will be assessed for each calendar day the work remains incomplete beyond the completion dates.

PAYMENTS TO CONTRACTOR

The Contractor shall invoice the Monroe County Road Commission for their work on the contract. Each invoice shall contain, at a minimum, the following information: road name and limits, date(s) the work was performed, pay items, quantities of work completed, and the contract unit prices

ASSIGNMENT CLAUSE

The contract between the Board and the Contractor may not be assigned to a third party without the written consent of the Board.

FINAL INSPECTION, ACCEPTANCE AND FINAL PAYMENT

The Engineer or their designated representative will make an inspection of all work included in the contract and notify the Contractor of defects to be remedied prior to acceptance and payment.

DISPUTES

The Engineer's written decision on any question arising under the contract between the Board and Contractor shall be final and binding upon both the Board and the Contractor in the absence of fraud, bad faith, or abuse of discretion.

TAXES

The Contractor shall include, and will be deemed to have included, in its base bid and contract price all applicable Michigan Sales and Use taxes which have been enacted into law as of the date the bid is submitted.

BOARD RESPONSIBILITY

The Board shall not supervise, direct or have control or authority over, nor be responsible for, the Contractor's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with laws and regulations applicable to the furnishing or performance of the work unless otherwise specified in the Special Provisions. The Board will not be responsible for the Contractor's failure to perform or furnish the work in accordance with the Contract Documents.

INDEMNIFICATION, DAMAGE LIABILITY AND INSURANCE

A. Indemnification. The Contractor must hold harmless, indemnify, defend and represent the Board and its officers, agents and employees against any and all claims for bodily injury or property damage, or any other claim arising out of performance of the work on this contract. The Contractor will not be responsible for claims that result from the sole negligence or willful acts of said indemnitee.

B. Workers' Compensation Insurance. The Contractor must carry the necessary Workers' Compensation Insurance and submit a certification that it carries Workers' Compensation to the Board.

C. Bodily Injury and Property Damage. The Contractor must carry adequate insurance, satisfactory to the Board, to afford protection against all claims for damage to public or private property and injuries to persons arising out of performance of the work. Copies of completed certificates must be submitted to the Board.

1. General Liability, Bodily Injury and Property Damage. The Contractor must provide the following minimum limits of property damage and bodily injury liability:

Bodily Injury and Property Damage Liability:	
Each Occurrence	$1,000,000
Aggregate	$2,000,000

2. Automobile Liability, Bodily Injury and Property Damage. The Contractor must provide the following minimum limits of property damage and bodily injury liability:

Bodily Injury Liability:	
Each Person	$500,000
Each Occurrence	$1,000,000
Property Damage Liability:	
Each Occurrence	$1,000,000
Combined Single Limit for Bodily Injury and Property Damage Liability:	
Each Occurrence	$2,000,000

3. Umbrella Policy. The Contractor may meet the requirements of above minimum limits of bodily injury and property damage liability through an umbrella policy.

D. Additional Insured. The Bodily Injury and Property Damage Policy must include the following endorsements, verbatim:

"Additional Insured: The Board of County Road Commissioners of the County of Monroe, the Monroe County Road Commission and its officers, agents and employees."

"Provide written notice ten (10) days prior to cancellation, expiration, termination or reduction in coverage for nonpayment of the premium and written notice thirty (30) days prior to cancellation, expiration, termination or reduction in coverage for all other reasons."

E. Notice. The Contractor must ensure that all insurance policies and binders include an endorsement by which the insurer agrees to notify the Department in writing at least 30 days before there is a cancellation or material change in coverage. The Contractor must stop operations if any insurance is canceled or reduced, and must not resume operations until new issuance is in force.

F. Reports. The Contractor or insurance carrier shall report to the Board any claims received, inspections made and the disposition of claims. The Board will withhold final payment release until either the Contractor pays the claim or until final disposition of the claim by the Contractor's insurance company has been received by the Board.

MAINTENANCE OF TRAFFIC

Maintain traffic in accordance with sections 104.07, 104.11, 812 and 922 of the Michigan Department of Transportation 2012 Standard Specifications for Construction and the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

The Contractor shall be responsible for the protection of vehicular and pedestrian traffic, work in progress and construction workers in the work zone through the implementation of procedures as described in this proposal, the MMUTCD, the Standard Specifications for Construction, and other applicable state and federal requirements.

The Contractor shall coordinate this work with any other contractors or maintenance agencies performing work within the work zone or adjoining areas to avoid conflicts in the maintenance of traffic, construction signing and the orderly progress of contract work.

No work shall be performed during the Memorial Day, Independence Day or Labor Day holiday weekends as defined by the Engineer.

Each of the roads on this contract will be closed to through traffic during construction. The Monroe County Road Commission will provide the temporary construction signing and barricades for the road closures.

The Contractor will be responsible for the protection of vehicular and pedestrian traffic, moving barricades into place prior to beginning work, and maintaining local traffic within the work zone. This work will be not be paid for separately and is included in the unit price for **Full Depth Reclamation, (Type) Stabilized Base Course, 6 inch**.

ALTERNATE BIDS

This contract is an alternate stabilization bid contract where Contractors are allowed to submit a bid that includes the price for either the emulsified asphalt stabilization alternate or the asphalt cement stabilization alternate.

Alternate 1 is the emulsified asphalt stabilization, and Alternate 2 is the asphalt cement stabilization. **Contractors are allowed to bid only one of the alternates. Do not enter unit prices for the unwanted alternate.**

SPECIFICATIONS

All work not otherwise specified shall be done in accordance with the Michigan Department of Transportation 2012 Standard Specifications for Construction. Within these specifications, all references to the Michigan Department of Transportation shall mean the Board.

MATERIALS

All materials shall be in accordance with section 904 of the Michigan Department of Transportation 2012 Standard Specifications for Construction except as modified herein.

UNIQUE SPECIAL PROVISIONS

The following unique special provisions are attached to this proposal:

A. Full Depth Reclamation, Emulsified Asphalt Stabilized Base Course, 6 inch
B. Full Depth Reclamation with Emulsified Asphalt Mix Design Procedures
C. Full Depth Reclamation, Asphalt Cement Stabilized Base Course, 6 inch

LIST OF ROADS

Alternate 1 – Emulsified Asphalt Stabilized Base Course

Township	Road	From	To	Existing Surface	Length (Ft)	Stabilized Width (Ft)	Area (Syd)	Estimated Emulsion Rate (Gal/Syd)	Estimated Emulsion (Gal)
Ash	Newburg	Burns	Maxwell	Gravel	2,550	24	6,800	3.5	23,800
Bedford	Clover Lane	State Line	Whiteford Ctr.	HMA	3,000	23	7,770	2.4	18,650
Bedford	Section	Whiteford Ctr.	Secor	Chip Seal	5,070	21	11,830	3.0	35,490
Bedford	Substation	W. of Crabb	Crabb	Gravel	1,560	21	3,640	3.5	12,740
Bedford	Substation	Crabb	Minx	Gravel	5,260	22	12,860	3.5	45,010
Dundee	Brewer	County Line	Dennison	Chip Seal / Macadam	10,880	23	27,810	3.0	83,430
						Totals =	**70,710**		**219,120**

Alternate 2 – Asphalt Cement Stabilized Base Course

Township	Road	From	To	Existing Surface	Length (Ft)	Stabilized Width (Ft)	Area (Syd)	Estimated Asphalt Cement Rate (Gal/Syd)	Estimated Asphalt Cement (Gal)
Ash	Newburg	Burns	Maxwell	Gravel	2,550	24	6,800	2.5	17,000
Bedford	Clover Lane	State Line	Whiteford Ctr.	HMA	3,000	23	7,770	1.7	13,210
Bedford	Section	Whiteford Ctr.	Secor	Chip Seal	5,070	21	11,830	2.2	26,030
Bedford	Substation	W. of Crabb	Crabb	Gravel	1,560	21	3,640	2.5	9,100
Bedford	Substation	Crabb	Minx	Gravel	5,260	22	12,860	2.5	32,150
Dundee	Brewer	County Line	Dennison	Chip Seal / Macadam	10,880	23	27,810	2.2	61,190
						Totals =	**70,710**		**158,680**

OTHER ITEMS OF WORK

Following is a description of other items of work on this contract:

Trenching (Sta) – The Trenching item of work shall be in accordance with section 307 of the Michigan Department of Transportation 2012 Standard Specifications for Construction. This item of work will be used for a 4 foot wide by 6 inch deep trench along the edge of the existing Macadam base on Brewer Road. Both sides of Brewer Road shall be trenched and widened with 21AA aggregate prior to pre-pulverizing the existing pavement.

Aggregate Base (Ton) – The Aggregate Base item of work shall be in accordance with section 302 of the Michigan Department of Transportation 2012 Standard Specifications for Construction except that 98 percent compaction will not be required. This item of work will be used for placement of 21AA aggregate in the trench widening along both sides of Brewer Road. All areas trenched shall be backfilled with 21AA aggregate the same day.

COMMUNICATIONS

Any questions regarding this bid shall be directed to the person listed below:

Name: Michael Smith
Phone: 734-240-5103
Email: MSmith@mcrc-mi.org

MONROE COUNTY ROAD COMMISSION
UNIT PRICE CONTRACT
2016 FULL DEPTH RECLAMATION PROGRAM

TO: Board of County Road Commissioners of Monroe County, Michigan

The undersigned, having full knowledge of the proposal and specifications for the **2016 Full Depth Reclamation Program** including Bidders' Addenda _____ and the conditions of these Contract Documents, hereby agrees to furnish all labor, equipment, materials, transportation and incidentals necessary to perform the Work as specified in the Instructions to Bidders and General Provisions at the unit price named below:

Alternate 1 – Emulsified Asphalt Stabilized Base Course				
Item Description	**Estimated Quantity**	**Unit**	**Unit Price**	**Bid Amount**
Full Depth Reclamation, Emulsified Asphalt Stabilized Base Course, 6 inch	70,710	Syd	$	$
Emulsified Asphalt	219,120	Gal	$	$
Trenching	218	Sta	$	$
Aggregate Base	2,900	Ton	$	$
Total Bid				**$**

Alternate 2 –Asphalt Cement Stabilized Base Course				
Item Description	**Estimated Quantity**	**Unit**	**Unit Price**	**Bid Amount**
Full Depth Reclamation, Asphalt Cement Stabilized Base Course, 6 inch	70,710	Syd	$	$
Asphalt Cement, PG 58-28	158,680	Gal	$	$
Trenching	218	Sta	$	$
Aggregate Base	2,900	Ton	$	$
Total Bid				**$**

Note: Contractors are allowed to bid only one of the alternates. Do not enter unit prices for the unwanted alternate.

Contractor Signature: _____

Printed Name and Title: _____

Quantities are not guaranteed. Final payment will be based on actual quantities.

Bidder agrees that the work will be completed and ready for final payment in accordance with the General Conditions. Work on the **2016 Full Depth Reclamation Program** is to be completed by either **August 5, 2016** or **September 30, 2016** as detailed in the Time of Completion section above.

Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the work on time.

The following documents are attached to and made a condition of this Bid:

Required Bid Security in the form of either:

Certified Check or a Bidder's Bond in the amount of:

_____ Dollars ($ _____)

Communications concerning this Bid shall be addressed to the Bidder's representative.

Name of Representative: _____

Address: _____

City, State, ZIP: _____

Telephone Number: _____

Fax Number: _____

E-Mail Address: _____

The terms used in this Bid, which are defined in subsection 101.03 of the Michigan Department of Transportation 2012 Standard Specifications of the Construction, have the meanings assigned to them in the Standard Specifications for Construction.

SUBMITTED on: _____ , 2016

If Bidder is:

An Individual

By: _____ (SEAL)
Individual's Name

Doing Business As: _____

Business Address: _____

_____

Phone No: _____

A Partnership

By: _____ (SEAL)
Firm Name

_____
General Partner

Business Address: _____

_____

Phone No.: _____

A Corporation

By: _____ (Corporate SEAL)
Corporate Seal

_____
State of Incorporation

By: _____
Name of Person Authorized to Sign

_____
Title

Business Address: _____

_____

Phone No.: _____

A Joint Venture

By: _____
Name

Business Address: _____

_____

Phone No.: _____

By: _____
Name

Business Address: _____

_____

Phone No.: _____

(Each joint venture must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

MONROE COUNTY ROAD COMMISSION

SPECIAL PROVISION
FOR
FULL DEPTH RECLAMATION WITH EMULSIFIED ASPHALT
MIX DESIGN PROCEDURES

a. Laboratory Temperature and Humidity Control. Each laboratory performing mix designs shall have heating, ventilation, and air conditioning (HVAC) equipment that maintains a room temperature of 68 to 86 °F (20 to 30 °C) and relative humidity of less than 60 percent. The mix design laboratory shall be an AMRL accredited lab in asphalt, HMA, aggregate and soils at a minimum.

b. Sampling and Processing. A minimum sample size of 350 pounds (160 kg) is needed for each mix design. Bulk samples of the recycled layer thickness shall be obtained from either test pits or cores. Each layer shall be examined to confirm thickness and material.

The hot mix asphalt millings, RAP, shall be crushed. A washed gradation of the crushed bituminous materials(s) shall be performed according to AASHTO T 27 and reported and meet the following requirement(s).

Table 1: Grading Requirements for FDR Aggregate

Sieve Size		**Percent Passing**	
		FDR Crushed Gradations	
		Ideal	**Less Suitable**
2 in	50 mm	100	
1 1/2 in	37.5 mm	87 – 100	
1 in	25 mm	77 – 100	100
3/4 in	19 mm	66 – 99	99 – 100
1/2 in	12.5 mm	67 – 87	87 – 100
3/8 in	9.5 mm	49 – 74	74 – 100
No. 4	4.75 mm	35 – 56	56 – 95
No. 8	2.36 mm	25 – 42	42 – 78
No. 16	1.18 mm	18 – 33	33 – 65
No. 50	300 µm	10 – 24	24 – 43
No. 200	75 µm	4 – 10	10 – 20

Washed gradation (AASHTO T 27) and sand equivalent (ASTM D 2419, Method B) shall be performed and reported for any granular layer. The washed gradation (AASHTO T 27) of combined layers shall be performed and reported. If combined layers include an aggregate layer, the sand equivalent (ASTM D 2419, Method B) shall be performed and reported.

All washed gradations shall be dried at no greater than 104 °F (40 °C).

c. Mixing and Compaction. Perform Modified Proctor compaction according to ASTM D 1557, Method C to determine optimum moisture content (OMC) at peak dry density. OMC shall be defined by a best-fit curve from a minimum of four points. Material containing 20 percent or more passing the No. 200 sieve shall be mixed with target moisture, sealed, and set aside a minimum of 12 hours. All other material shall be set aside a minimum of 3 hours. If a material contains less than 4 percent passing the No. 200 sieve, then this testing is not required.

Select the water content of specimens, not including water in the emulsified asphalt, based on sand equivalent value (SE) from the combined materials:

- 60 to 75 percent of OMC if SE ≤ 30
- 45 to 65 percent of OMC if SE > 30

If a material contains less than 4 percent passing the No. 200 sieve or if no peak develops with the OMC curve, then fix the moisture content between 2 and 3 percent.

Specimens shall be mixed with the required amount of water before the addition of emulsified asphalt. Specimens shall be mixed with the appropriate amount of water and allowed to sit sealed according to the same guidelines as used for Modified Proctor specimens.

Samples shall have a weight before addition of water and emulsified asphalt to produce 2.75 to 3.25 inch (70 mm to 80 mm) tall compacted specimens.

Choose four emulsified asphalt contents that will bracket the design emulsified asphalt content. Recommended emulsified asphalt content percentages: 1.5, 2.0, 2.5, 3.0, 3.5, or 4.0. The following specimens shall be created:

- A minimum of two specimens at each of four emulsified asphalt contents shall be produced for short-term strength testing.
- Four specimens at each of four emulsified asphalt contents shall be produced for the strength and retained strength tests.
- Two specimens shall be produced for maximum specific gravity.

A mechanical mixer shall be used that has a bowl with a diameter of 10 to 12 inches (250 to 300 mm). It shall rotate on its axis at 50 to 75 revolutions per minute. A mixing paddle which makes contact with the bottom and side of the bowl shall rotate on its axis at twice the bowl rotation rate and in the opposite rotation direction as the bowl.

Aggregate material and emulsified asphalt shall be mixed at a temperature of 68 to 79 °F (20 to 26 °C). Water shall be mixed for 60 seconds. Emulsified asphalt shall be mixed for 60 seconds. If other materials are added, such as lime or cement, then they shall be introduced in a similar manner as they will be on the project. For example, if lime is incorporated a day or more before emulsified asphalt addition, then it shall be added to the wet aggregate a day or more before mixing with emulsified asphalt. If lime is incorporated as a slurry, then it shall be incorporated as a slurry in the laboratory.

Loose specimens shall be cured individually in plastic containers of 4 to 7 inches (100 to 175 mm) in height and 6 inches (150 mm) in diameter. Specimens shall be cured at 104 °F (40 °C) for 30 ± 3 minutes. No further mixing or aeration shall occur during this time.

Specimens shall be compacted in a Superpave gyratory compactor (SGC) at a vertical pressure of 87 psi (600 kPa), an angle of 1.25°, and a mold of 6 inches (150 mm) in diameter for 30 gyrations. After the last gyration, 87 psi (600 kPa) ram pressure shall be applied for 10 seconds. The mold shall not be heated.

d. Curing After Compaction. Specimens (except STS specimens) shall be cured for 72 hours at 104 °F (40 °C). The bottom of the specimens shall rest on racks with slots or holes for air circulation. After curing, specimens for moisture conditioning shall be cooled at ambient temperature a maximum of 24 hours; specimens for dry strength shall cool at ambient temperature or 77 °F (25 °C) and be tested at the same time as the moisture-conditioned specimens.

Specimens for Rice (maximum theoretical) specific gravity shall be cured at the same conditions as the compacted specimens, except they can be tested after cooling a maximum of 24 hours.

e. Short-Term Strength (STS) Test. A modified Hveem cohesiometer apparatus shall be used to test early strength (1 hour). This apparatus and procedure generally conforms to ASTM D 1560, Section 13 with the following exceptions:

- It shall have the capability of testing 6 inch (150 mm) diameter specimens.
- It shall have a shot flow rate of 5.95 ± 0.11 pounds per minute (2700 ± 50 grams per minute).
- Specimens shall be cured before compaction according to Section 5, and cure each specimen at each emulsified asphalt content for 60 ± 5 minutes at 77 °F (25 °C) and 10 to 70 percent humidity after compaction and before testing.

The following calibrations shall be made:

- The counter balance should be positioned exactly so that the hinged plate just barely remains horizontal when the top brackets and empty bucket are in place. This ensures that there is no force on the sample until shot begins to flow into the bucket.
- The gap between the bars of the switch that turns off the flow of shot should have a gap of 0.75 inches (18 mm) when there is 3000 grams of shot in the bucket. During this adjustment the locking bolt that prevents the plate from moving is in place.

Cohesion shall be tested as follows:

1. Tare the balance with the empty bucket weight.
2. Center the specimen on the unit.
3. Place plates on top of sample and press down while adjusting the outer lower nuts up until they just contact the bottom of the plate.

4. Use a torque wrench or torque meter to tighten the nuts on the specimen to a maximum of 1.6 foot-pounds (2.6 Newton-meters).

5. Gently support the bar so the unit does not move when the pin is pulled releasing the hinged plate.

6. Pull pin and push open valve to start the flow of shot.

7. After the unit shuts off the flow of shot, immediately put the locking pin in place and then record the weight of shot.

8. Loosen top nuts to remove plates and rotate specimen 90 degrees.

9. Repeat procedure on the other axis of the specimen.

10. Calculate short-term strength as follows:

$$STS = SW / (15(0.031h + 0.0027h^2)) \quad \text{Formula 1}$$

Where:

SW = *Shot Weight in grams*
h = *height in centimeters*

A total of two results will be obtained for each specimen at each emulsified asphalt content, and a total of four results will be obtained at each emulsified asphalt content.

f. Volumetric Measurements. Determine bulk specific gravity (ASTM D 6752) of the specimens. Keep specimens in bags until testing or vacuum saturation is performed. ASTM D 2726 may be used to determine bulk specific gravity if the specimens' absorption is less than or equal to 2 percent of water by volume.

Determine Rice (maximum theoretical) specific gravity (ASTM D 2041) except as noted in the Mixing, Compaction, and Curing after Compaction sections.

Determine air voids at all emulsified asphalt contents used in the design.

g. Mechanical Measurements. Perform ITS testing according to ASTM D 4867. Specimens shall be conditioned at 77 °F (25 °C) for two hours before testing. Vacuum saturate half the specimens at each emulsified asphalt content to a minimum 55 percent of the voids filled with water. Soak for 24 hours at 77 °F (25 °C) before testing.

h. Emulsified Asphalt Content Selection. The emulsified asphalt content selected shall result in the mixture meeting the mix design requirements of the FDR with Emulsified Asphalt special provision.

i. Report. All mix design test results shall be reported to the Engineer. All additional additives and bituminous material shall be reported to the Engineer.

j. Measurement and Payment. All costs associated with preparing the mix designs are included in the unit price for **Full Depth Reclamation, Emulsified Asphalt Stabilized Base Course, 6 inch** and will not be paid for separately.

MONROE COUNTY ROAD COMMISSION

SPECIAL PROVISION
FOR
FULL DEPTH RECLAMATION,
EMULSIFIED ASPHALT STABILIZED BASE COURSE, 6 INCH

a. Description. This work consists of pulverizing the existing hot mix asphalt, chip seal or gravel road surface and a portion of the existing aggregate base material to the specified depth and maximum size; shaping and compacting the pulverized material to correct for profile, crown and contour; mixing emulsified asphalt, water and additives with the pulverized material; and spreading and compacting the mixture to produce a stabilized base course.

b. Submittals. Prepare and submit a mix design report for the existing pavement and aggregate base sampled from the project, emulsified asphalt, water and additives to be used on the project in accordance with the Special Provision for Full Depth Reclamation with Emulsified Asphalt Mix Design Procedures to produce a stabilized base course that meets or exceeds all requirements specified.

Prior to construction, submit a list of the equipment to be used for the full depth reclamation work for review and approval by the Engineer.

c. Materials. Provide materials in accordance with the following:

1. Asphalt Emulsion. The type of asphalt emulsion to be used shall be determined by the mixture design in order to meet the requirements in Table 1. A representative from the asphalt emulsion supplier shall be on the job site at the beginning of the emulsion injection process to monitor the characteristics and performance of the asphalt emulsion. The asphalt emulsion supplier representative shall be available throughout the duration of the project to provide technical support to the Contractor and the Engineer. The asphalt emulsion supplier representative has the right to make adjustments to the asphalt emulsion formulation and job mix formula during this project, as required, to provide for changing conditions in material, weather or any other unforeseen condition. The supplied emulsified asphalt residue penetration shall be within 25 percent of the design emulsified asphalt residue penetration. The emulsified asphalt shall be received on the job site at a temperature no greater than 120 °F. The emulsified asphalt shall meet the requirements of Table 1.

Table 1: Emulsified Asphalt Material Specifications

Test	Procedure	Minimum	Maximum
Viscosity, Saybolt Furol, at 77 °F (25 °C), SFS	AASHTO T59	20	100
Sieve Test, No. 20 (850 µm), retained on sieve, %	AASHTO T59		0.10
Storage Stability Test, 24 hour, %	AASHTO T59		1.0

Distillation Test, Residue from distillation to 347 °F ± 9 °F (175 °C ± 5 °C), %	AASHTO T59 (a)	64.0	
Distillation Test, Residue from distillation to 347 °F ± 9 °F (175 °C ± 5 °C), %	AASHTO T59		1.0
Penetration, 77 °F (25°C), 100 gram, 5 second, dmm	AASHTO T49	75	200
a. Modified AASHTO T59 procedure – distillation temperature of 347 °F ± 9 °F (175 °C ± 5 °C) with a 20 minute hold.			

2. Water. Water shall conform to section 911 of the Standard Specifications for Construction and be free from salt, sugar and other harmful materials.

3. Other Additives. If necessary, additives may be used to meet the requirements in Table 1. In the case that an additive is used, the type and allowable usage percentage must be described in the submitted mix design.

4. Pulverized Material. Prior to the addition of the emulsified asphalt, the gradation of the pulverized material shall meet the requirements of Table 2.

Table 2: Pulverized Material Gradation		
Gradation No.	**Sieve Size and Percent Passing**	
	2 inch (50 mm)	**1 1/2 inch (37.5 mm)**
PM 3	100	100 - 97

d. Mix Design Requirements. A mix design for each distinct pavement section shall be submitted to the Engineer prior to construction using in-situ materials sampled by the Contractor and any new materials from the Contractor's material suppliers proposed for the project. The job mix formula shall meet the criteria of Table 3 and be approved by the Engineer.

Table 3: Full Depth Reclamation with Emulsified Asphalt Mix Design Requirements			
Test Method	**FDR Type 1 (a)**	**FDR Type 2 (a)**	**Test Purpose**
Gradation for Design Millings, AASHTO T 27	Report	Report	
Sand Equivalent, ASTM D2419, Method B	Report	Report	
Modified Proctor, ASTM D1557, Method C	Report	Report	Optimum Moisture Content for Density and Compaction
Design Moisture Content	Report	Report	Dispersion of Emulsion

Superpave Gyratory Compaction, 1.25° angle, 87 psi (600 kPa)	30 gyrations at 6 inches (150 mm)	30 gyrations at 6 inches (150 mm)	Laboratory Density Indicator
Short Term Strength (STS), ASTM D 1560, Part 13, 175 g/25 mm of width	175 minimum	150 minimum	Stability Indicator
Bulk Specific Gravity (Density), ASTM D 6752 or ASTM D 2726	Report	Report	Laboratory Density Indicator
Rice (Maximum Theoretical) Specific Gravity, ASTM D 2041	Report	Report	Laboratory Density Indicator
Air Voids, Modified	Report	Report	Laboratory Density Indicator
Indirect Tensile Strength, ASTM D 4867, psi (kPa)	40 (276) minimum	35 (241) minimum	Strength Indicator
Conditioned Indirect Tensile Strength, ASTM D 4867, psi	25 (172) minimum	20 (138) minimum	
Additional Additive(s) (b) Coarse Aggregate Fine Aggregate RAP Fly Ash Cement, %	 Report Report Report Report 1.0 maximum	 Report Report Report Report 1.0 maximum	
Emulsified Asphalt (b) Distillation Residue, % Residue Penetration, dmm Optimum Emulsion Content, % Residual Asphalt to Cement Content Ratio	 Report Report Report 3:1 minimum	 Report Report Report 3:1 minimum	

a. FDR Type 1 for mixtures containing < 8 percent passing No. 200. FDR Type 2 for mixtures containing ≥ 8 percent passing No. 200 or for all granular materials.
b. Report shall include type/gradation and producer/supplier.

e. Equipment. Provide equipment capable of producing a stabilized base that meets the requirements of this special provision

1. Reclaimer/Stabilizer. The self-propelled reclaimer shall be capable of fully pulverizing the existing pavement and aggregate base material to the depth shown on the plans, incorporating the asphalt emulsion and water, and mixing the materials to produce a homogenous material. The recommended minimum power of the reclaimer shall be 400 horsepower. The machine shall be capable of reclaiming not less than 7 feet wide and up to 12 inches deep in each pass. The reclaimer shall have a system that includes a full width spray bar with nozzles for adding asphalt emulsion and a positive displacement pump interlocked to reclaimer speed so that the amount of emulsion added is automatically adjusted with changes in the ground speed. The additive system shall be capable of incorporating up to 7 gallons of emulsified asphalt per square yard. Individual nozzles on the spray bar shall be capable of being turned off as necessary to minimize emulsion overlap on

subsequent passes. The use of a heating device to soften the pavement will not be permitted.

2. Grader. The grader shall be capable of aerating, spreading and final shaping of the pulverized and reclaimed material. The grader shall have an automated cross slope indicator and a grade reference system for longitudinal control. The grader blade shall not have scarifying teeth.

3. Rollers. Provide rollers meeting the following minimum requirements:

   A. Vibratory Padfoot Roller. The self-propelled vibratory padfoot shall have a minimum 84 inch wide drum and a 10 ton minimum weight. A front mounted blade is recommended for back dragging. A self-propelled vibratory padfoot roller shall be required for each self-propelled reclaimer. If the reclamation depth is 6 inches or less, a vibratory padfoot roller is optional if all the compaction requirements can be met.

   B. Pneumatic Tire Roller. The self-propelled pneumatic tire roller shall have a water spray system and a 20 ton minimum weight. If a vibratory padfoot roller is not used, then the pneumatic tire roller shall be increased to a 25 ton minimum weight.

   C. Vibratory Steel Drum Roller. The vibratory steel roller, double drum or single drum, shall have with a water spray system and a 10 ton minimum weight.

4. Water Truck. A water truck capable of supplying the above equipment and providing a controlled spray of water on the road as required for moisture content before, during and after the asphalt emulsion injection and as required to assist in final compaction of the reclaimed material shall be used. The water truck shall be free of excessive leaks that would be detrimental to the reclaimed material.

f. Construction. Perform stabilization operations only for the length that required compaction can be completed within the work day and prior to impending inclement weather that could be detrimental to compaction and curing of the stabilized base material.

1. Weather Limitations. This work shall be performed when the atmospheric temperature in the shade and away from artificial heat is 50 °F and rising. Also, the weather shall not be foggy or rainy. The weather forecast shall not call for freezing temperatures within 7 days after placement of any portion of the project and the annual average low temperature within 7 days of the end of the project shall be greater than 32 °F. The Engineer may restrict work when the heat index is greater than 100 °F.

2. Pre-pulverization and Initial Shaping. The existing pavement shall be pre-pulverized by the self-propelled reclaimer and/or shaped by the grader to correct for profile, crown and contour before the addition of the emulsified asphalt. Water, coarse aggregate, RAP material or other additives may be added during this operation. The

pre-pulverized and shaped material shall be compacted with a vibratory roller in static mode to support equipment and/or traffic and to provide depth control during processing. Depth of pre-pulverization and shaping shall be 1 inch to 2 inches less than the depth of final processing.

2. Processing and Placing. Moisture content of the pulverized material shall be within 1.0 percent of the mix design. If the moisture content is too low, water shall be added directly to the surface of the pulverized material by a water truck. The emulsified asphalt shall be applied at the percentage recommended in the mix design. The required depth of reclamation shall be monitored regularly. Prior to spreading and compacting, the processed material shall have a gradation meeting the mix design. Uniformly spread the processed material to the dimensions shown on the plans.

3. Compaction. The recycled material shall be compacted according to the following:

   A. Rollers. Immediately after processing and final shaping, the recycled material shall be compacted with equipment meeting the requirements of this special provision.

   B. Rolling. The breakdown roller shall be 500 feet or less behind all self-propelled reclaimer units. The recycled material shall be compacted by the vibratory padfoot roller, applying high amplitude and low frequency, or the pneumatic-tired roller. Breakdown rolling shall be performed until the breakdown roller walks out of the material. “Walking out” for the vibratory padfoot roller is defined as light being clearly evident between all of the pads at the recycled material-padfoot drum interface and being no more than 3/16 inch deep. “Walking out” for the pneumatic-tired roller is defined as no significant wheel impressions being left on the surface.

      After the completion of breakdown rolling, the grader shall be used to cut the recycled material no deeper than necessary to remove breakdown roller marks from the initial compaction and to achieve desired cross slope.

      The bladed recycled material shall be compacted by the intermediate and final rollers. The number of passes and order of rollers may be altered to meet compaction requirements. Finish rolling shall not be done in vibratory mode. Water may be lightly sprayed by a water truck to aid in improving final density and appearance. A second water truck is required if water is also being added ahead of the reclaimer. The stabilized recycled material shall not be reshaped with a grader after final compaction. Should reshaping be required, a micromill may be acceptable as long as the mill is not detrimental to the integrity of the stabilized recycled material.

   C. Density Measurement. A nuclear gauge (ASTM D 2950, direct transmission) shall be used for acceptance testing, and the density shall be measured at the same location as the Modified Proctor for the first test. Subsequent gauge

readings may use the results of the initial Modified Proctor as long as the recycled pavement material remains constant or until the next required Modified Proctor test is performed. Samples shall be obtained from the full depth reclamation before rolling and stored in sealed containers for no longer than one hour before Proctor compaction. The recycled pavement material shall be compacted to a minimum of 97 percent of the Modified Proctor dry density (ASTM D 1557, Method C, 6 inch mold). Moisture content on the material shall be tested to permit the calculation of the dry density of the Modified Proctor sample. The mold shall be placed on a firm surface during compaction. If accurate dry density results cannot be obtained, then wet density shall be the reference.

4. Opening to Traffic. The compacted recycled pavement material shall be proof rolled with the type of vehicular traffic expected on the road. If permanent deformation does not occur, moving vehicular traffic may be allowed on the recycled pavement material. If permanent deformation greater than 1/4 inch occurs, truck traffic shall be kept off until the recycled pavement material is firm enough to support expected traffic with minimal deformation.

5. Curing. Before placing any surfacing, the recycled pavement material shall be allowed to cure until the moisture content is less than 2.5 percent, or less than 50 percent of the optimum moisture content as determined during the mix design process, or at the discretion of the Engineer. The recycled pavement material shall be surfaced before November 1.

6. Surface Test. The completed recycled pavement material will be tested for smoothness in the wheel paths with a 16 foot straightedge from any point on the straightedge resting on any two points and laid parallel to the centerline.

   The crown will be tested for smoothness with variations no greater than 3/8 inch from any point on a 10 foot straightedge resting on any two points and laid at right angles to the centerline.

   For each variation in the recycled pavement material that exceeds 3/8 inch, the entire area affected shall be corrected by a self-propelled cold milling machine. The recycled pavement material shall be swept by a mechanical broom to remove all loose material before opening to traffic. Correct all deviations from this tolerance at no additional cost.

   The Contractor shall assist in the surface testing, furnish the 10 foot and 16 foot straightedges, and provide for their transportation to the job site at no additional cost.

g. Quality Assurance Testing. The Engineer will conduct assurance tests on the stabilized base material.

1. Test Methods and Frequency.

   A. Pulverized Material Sizing and Gradation. A sample shall be obtained before the addition of asphalt cement and screened using a 1.5 inch sieve (or smaller sieve if required) to determine if the material meets the maximum particle size requirement. Gradations shall be performed each day on site on the pulverized material using the following sieves: 1.5 inch, 1.0 inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16 and No. 30. The resulting gradation shall be compared to the mix design gradations to determine any necessary changes to asphalt cement content.

   B. Depth of Base Stabilization. The Engineer will check the nominal depth at the centerline and edges of the stabilized base. Anytime depth changes are made or equipment is idle, a depth check shall be taken.

   C. Emulsified Asphalt Content. The Engineer shall be notified any time emulsified asphalt content is changed. The emulsified asphalt content shall be checked and recorded for each segment in which the percentage is changed. Emulsified asphalt content changes shall be made based upon mix design recommendations, which are based upon different mix designs for road segments of varying construction. The emulsified asphalt content shall be checked from the belt scale totalizer or emulsified asphalt pump totalizer.

   D. Water Content. The Engineer shall be notified any time the water content is changed. Water content changes shall be made based on mixture consistency, coating, and dispersion of the recycled materials.

   E. Compacted Density. Compacted density shall be determined using a nuclear gauge following the procedures for ASTM D 2950, direct transmission measurement. This measurement shall be compared to the target density obtained by the Modified Proctor test following the procedures for ASTM D 1557, Method C.

   F. Frequency. Table 4 provides the recommended frequency for tests; however, the Engineer may increase the testing frequency if the construction process is experiencing problems or unknown conditions are encountered.

Table 4: Recommended Quality Assurance Testing Frequency

Test	QA Testing Frequency
Pulverized Material Gradation	1 per day of production
Depth of Base Stabilization	1 per 2,500 feet
Emulsified Asphalt Content	1 yield check per day of production

Water Content	1 per 2,500 feet
Modified Proctor Test	1 per day of production
Compacted Density	1 per 2,500 feet

h. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item **Pay Unit**

Full Depth Reclamation, Emulsified Asphalt Stabilized Base Course, 6 inch .....Syd
Emulsified Asphalt.....Gal

The Engineer will measure **Full Depth Reclamation, Emulsified Asphalt Stabilized Base Course, 6 inch** by width and length, for the specified depth, as shown on the plans or as directed by the Engineer. The unit price for **Full Depth Reclamation, Emulsified Asphalt Stabilized Base Course, 6 inch** includes the cost of the following:

1. Sampling the existing pavement surface and aggregate base;
2. Preparing and submitting a mix design based on the sampled in-situ materials and any new materials, if applicable;
3. Pulverizing the existing road surface and aggregate base;
4. Initial shaping and compaction of the pulverized material to correct for profile, crown and contour;
5. Mixing emulsified asphalt, water and additives with the pulverized material;
6. Spreading and compacting the mixed material to produce a stabilized base course;
7. Proof rolling the compacted stabilized base course prior to opening to traffic;
8. Moving barricades into place prior to beginning work; and
9. Protecting vehicular and pedestrian traffic and maintaining local traffic within the work zone.

The emulsified asphalt added to the pulverized material will be paid for separately. The Engineer will measure **Emulsified Asphalt** by volume in gallons at a temperature of 60° Fahrenheit.

MONROE COUNTY ROAD COMMISSION

SPECIAL PROVISION
FOR
FULL DEPTH RECLAMATION,
ASPHALT CEMENT STABILIZED BASE COURSE, 6 INCH

a. Description. This work consists of pulverizing the existing hot mix asphalt, chip seal or gravel road surface and a portion of the existing aggregate base material to the specified depth and maximum size; shaping and compacting the pulverized material to correct for profile, crown and contour; mixing asphalt cement with the pulverized material; and spreading and compacting the mixture to produce a stabilized base course.

b. Submittals. Prepare and submit a mix design report for the existing pavement and aggregate base sampled from the project and asphalt cement to be used on the project.

Prior to construction, submit a list of the equipment to be used for the full depth reclamation work for review and approval by the Engineer.

c. Materials. Provide materials in accordance with the following:

1. Asphalt Cement. The asphalt cement shall be PG 58-28. The asphalt cement shall meet the requirements of subsection 904.03.A of the Michigan Department of Transportation 2012 Standard Specifications for Construction.

2. Pulverized Material. Prior to the addition of the asphalt cement, the gradation of the pulverized material shall meet the requirements of Table 1.

Table 1: Pulverized Material Gradation	
Sieve Size and Percent Passing	
2 inch (50 mm)	**1 1/2 inch (37.5 mm)**
100	100 - 95

d. Mix Design Requirements. A mix design for each road to be stabilized shall be submitted to the Engineer prior to construction using in-situ materials sampled by the Contractor and asphalt cement from the Contractor's material supplier. The mix designs shall be prepared by an AASHTO R18 accredited laboratory for both aggregates and asphalt mixtures. The mix designs shall be based on the test methods in Table 2.

Table 2: Mix Design Test Methods for Asphalt Cement Stabilized Base Course	
Test Method	**Test Purpose**
Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus, ASTM D 1559	Determination of Design Asphalt Cement Content
Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus, AASHTO T 245	Preparation of Cylindrical Specimens of Bituminous Mixture Loaded on the Lateral Surface by Means of a Marshall Apparatus
Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures, ASTM D 2726	Determination of Bulk Specific Gravity and Density of Specimens of Compacted Bituminous Mixture

e. Equipment. Provide equipment capable of producing a stabilized base that meets the requirements of this special provision

1. Reclaimer. The self-propelled reclaimer shall be capable of fully pulverizing the existing pavement and aggregate base material to the required size and depth. The reclaimer shall be a bidirectional rotary reduction machine capable of operating in either an upcut or downcut mode to ensure reducing the existing pavement to the specified size and gradation. The rate of forward speed and depth of cut must be positively controlled to ensure consistent size of the pulverized material. Both the front and rear material control gates shall be hydraulically adjustable from the operator's platform in increments of 1/8 inch to control the amount of material being processed to ensure proper sizing.

2. Grader. The grader shall be capable of spreading and final shaping of the pulverized and stabilized material. The grader shall have an automated cross slope indicator and a grade reference system for longitudinal control.

3. Stabilizer. The stabilizer shall be a single-pass, multi-drum, self-propelled machine combining a cutting rotor, a blending rotor and two mixing rotors in the mixing chamber. The mixing chamber shall have positive depth control to ensure a uniform depth of stabilized material and must be capable of loosening the base materials to the specified depth without disturbing the subbase.

   The stabilizer shall add the asphalt cement in predetermined and accurately metered quantities while maintaining a constant and fixed rate of forward motion. The stabilizer shall thoroughly blend the asphalt cement with the base materials and spread the mixture uniformly on the roadway. The spray bar shall have nozzles spaced at increments not to exceed six (6) inches and shall operate in a manner to ensure the asphalt cement is uniformly applied throughout the mixing chamber at the time of injection. The asphalt cement additive system shall consist of a positive displacement pump and shall display the temperature, pressure and flow rate of the asphalt cement to check the rate of application at any time.

4. Rollers. Provide rollers meeting the following minimum requirements:

   A. Pneumatic Tire Roller. The self-propelled pneumatic tire roller shall have a water spray system and a 20 ton minimum weight.

   B. Vibratory Steel Drum Rollers. The vibratory steel rollers, double drum or single drum, shall have a water spray system and a 10 ton minimum weight.

5. Water Truck. A water truck capable of supplying the above equipment and providing a controlled spray of water on the road as required. The water truck shall be free of excessive leaks that would be detrimental to the reclaimed material.

f. Construction. Perform stabilization operations only for the length that required compaction can be completed within the work day and prior to impending inclement weather that could be detrimental to compaction of the stabilized base material.

1. Pre-pulverization and Initial Shaping. The existing pavement shall be pre-pulverized by the self-propelled reclaimer and shaped by the grader to correct for profile, crown and contour. Water, coarse aggregate, RAP material or other additives may be added during this operation. The pre-pulverized and shaped material shall be compacted with a vibratory roller in static mode to support equipment and traffic and to provide depth control during processing.

2. Weather Limitations. Asphalt cement shall not be applied to the aggregate when rain is threatening or when the air temperature is lower than 50° Fahrenheit.

3. Stabilization. The asphalt cement shall be added only to that material which can be completely mixed and compacted in one day. The asphalt cement shall be added through the mixing chamber at the rate and temperature range directed by the Engineer. The temperature of the asphalt cement shall be kept below the flash point but shall not fall below 350° Fahrenheit.

4. Shaping and Compacting. Shaping and compacting shall be done while the mixed material is in a workable state. The final shaping and compacting shall be accomplished as soon as possible after addition of the asphalt cement. The mixed material shall be shaped and compacted in reasonably close conformity with the lines, grades, and cross slopes established by the Engineer.

   A minimum of one pneumatic tire roller and two vibratory steel drum rollers are required for compaction of the stabilized base. For stabilization projects less than 10,000 square yards, the Engineer may waive the requirement for the second vibratory steel drum roller.

5. Density Measurement. The stabilized material shall be compacted to a minimum of 97 percent of the Modified Proctor density (ASTM D 1557, Method C).

6. Opening to Traffic. The compacted stabilized base material shall be proof rolled with the type of vehicular traffic expected on the road. If permanent deformation does not occur, vehicular traffic may be allowed on the stabilized base material.

7. Surface Test. The stabilized base material will be tested for smoothness in the wheel paths with a 16 foot straightedge from any point on the straightedge resting on any two points and laid parallel to the centerline.

   The crown will be tested for smoothness with variations no greater than 3/8 inch from any point on a 10 foot straightedge resting on any two points and laid at right angles to the centerline.

   For each variation in the stabilized base material that exceeds 3/8 inch, the entire area affected shall be corrected by a self-propelled cold milling machine. The stabilized base material shall be swept by a mechanical broom to remove all loose material before opening to traffic. Correct all deviations from this tolerance at no additional cost.

   The Contractor shall assist in the surface testing, furnish the 10 foot and 16 foot straightedges, and provide for their transportation to the job site at no additional cost.

g. Quality Assurance Testing. The Engineer will conduct assurance tests on the stabilized base material.

1. Test Methods and Frequency.

   A. Pulverized Material Sizing and Gradation. A sample shall be obtained before the addition of asphalt cement and screened using a 1.5 inch sieve (or smaller sieve if required) to determine if the material meets the maximum particle size requirement. Gradations shall be performed each day on site on the pulverized material using the following sieves: 1.5 inch, 1.0 inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16 and No. 30. The resulting gradation shall be compared to the mix design gradations to determine any necessary changes to asphalt cement content.

   B. Depth of Base Stabilization. The Engineer will check the nominal depth at the centerline and edges of the stabilized base. Anytime depth changes are made or equipment is idle, a depth check shall be taken.

   C. Asphalt Cement Content. The Engineer shall be notified any time the asphalt cement content is changed. The asphalt cement content shall be checked and recorded for each segment in which the percentage is changed.

   D. Compacted Density. Compacted density shall be determined using a nuclear gauge following the procedures for ASTM D 2950, direct transmission measurement. This measurement shall be compared to the target density obtained by the Modified Proctor test following the procedures for ASTM D 1557, Method C.

F. Frequency. Table 3 provides the minimum frequency for tests; however, the Engineer may increase the testing frequency if the construction process is experiencing problems or unknown conditions are encountered.

Table 3: Recommended Quality Assurance Testing Frequency	
Test	**QA Testing Frequency**
Pulverized Material Gradation	1 per day of production
Depth of Base Stabilization	1 per 2,500 feet
Asphalt Cement Content	1 yield check per day of production
Modified Proctor Test	1 per day of production
Compacted Density	1 per 2,500 feet

h. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item **Pay Unit**

Full Depth Reclamation, Asphalt Cement Stabilized Base Course, 6 inch .....Syd
Asphalt Cement, PG 58-28..... Gal

The Engineer will measure **Full Depth Reclamation, Asphalt Cement Stabilized Base Course, 6 inch** by width and length, for the specified depth, as shown on the plans or as directed by the Engineer. The unit price for **Full Depth Reclamation, Asphalt Cement Stabilized Base Course, 6 inch** includes the cost of the following:

1. Sampling the existing pavement surface and aggregate base;
2. Preparing and submitting a mix design based on the sampled in-situ materials and any new materials, if applicable;
3. Pulverizing the existing road surface and aggregate base;
4. Initial shaping and compaction of the pulverized material to correct for profile, crown and contour;
5. Mixing asphalt cement with the pulverized material;
6. Spreading and compacting the mixed material to produce a stabilized base course;
7. Proof rolling the compacted stabilized base course prior to opening to traffic;
8. Moving barricades into place prior to beginning work; and
9. Protecting vehicular and pedestrian traffic and maintaining local traffic within the work zone.

The asphalt cement added to the pulverized material will be paid for separately. The Engineer will measure **Asphalt Cement, PG 58-28** by volume in gallons at a temperature of 60° Fahrenheit.