85 WEST HIGHWAY M-115
BOON, MICHIGAN 49618
PHONE 231-775-9731
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WEXFORD COUNTY ROAD COMMISSION

OUR MISSION IS TO IMPROVE AND MAINTAIN A SAFE AND EFFICIENT ROAD SYSTEM

May 28, 2019

NOTICE TO CONTRACTORS AND MATERIAL SUPPLIERS

Sealed bids will be received at the office of the Wexford County Road Commission, 85 West Highway M-115, Boon, Michigan 49618 until 2:00 p.m. Thursday, June 13, 2019, at which time and place the bids will be opened and read for furnishing the Wexford County Road Commission for construction of the following:

Cold in place recycling Asphalt Paving

Specifications are available at the Road Commission office in Boon, Michigan. Telephone or faxed bids will not be accepted.

All materials and all work will be in accordance with the 2012 MDOT Standard Specifications for Construction. Insurance requirements shall be in accordance with the 2012 MDOT Standard Specifications for Construction. Award is contingent upon Board approval and funding being available from Federal Aid buyout.

The Wexford County Road Commission, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, SubTitle A, Office the Secretary, Part 21, Nondiscrimination in Federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contact 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, or national origin in consideration for an award.

The Board reserves the right to reject any or all bids or any part of the same, to waive irregularities and/or informalities and to make the award in part or entirety in any manner deemed to be in the best interest of the Wexford County Road Commission. Contractors / suppliers that do not honor their bid through out the season may at WCRC discretion be precluded from future bid lettings.

Wexford County Road Commission

Lorne Haase, Chairman
Harold Falan, Vice-Chairman
Harry Hagstrom, Member
Dean Jurik, Member
Jim Leggett, Member

WCRC CIPR Projects
Bid Proposal #1

Project Location:

Cold In Place Recycling the existing pavement Wexford County, Michigan.
Mackinaw Trail from 52 Rd to M-115

Description of Work:

This work involves the pulverization of the existing pavement and stabilizing the driving lanes with COLD IN PLACE RECYCLING per the specifications. The Wexford County Road Commission will perform some preparatory work by removing the guardrail panels from the posts and then replacing them after all the paving is complete, and then place the aggregate shoulders after bituminous paving is complete. The contractor will be responsible for all items of work listed in the Bid Proposal.

Project Schedule:
Timing is critical with this project and necessary to be completed prior to September 14, 2019. No work on Saturdays, Sundays, or holidays. Mackinaw Trail work shall be coordinated with the paving project low bidder so that the project can be paved within 7 days completion of CIPR. Both contractors shall be required to work together to coordinate timing for projects.

Insurance Requirements

Insurance: Requirements as per MDOT 2012 Standard Specifications for Construction
Mackinaw Trail- From 52 rd north to M-115 for 2.49 miles

Project:

	Project Stations:	
Crush and Shaping & Cold-in-Place Recycling	0+00	P.O.B. 50' south of 52 Road
	131+50	P.O.E. M-115

Existing Mainline pavement is 28' wide. New CIP to be 28' in width

Project Dates:

Project Start Date:	As soon as able to coordinate between the CIPR contractor and the Paving contractor (Elmers)
Project Completion Date:	September 14, 2019

Crushing And Shaping:

The Contractor shall crush and shape the existing pavement in the widened sections and guard rail areas that are outside of the mainline stabilized area.

Cold-in-Place Recycling Pavement Partial Depth:

See attached Special Provision for CIR process. Bids may be submitted for both a foamed asphalt stabilized base or an emulsion stabilized base. Base shall be stabilized to a depth of 4".

Project Submittals:

The following shall be submitted to the Road Commission Engineer for approval prior to project start:

1. Material Source List (MDOT Form 501)
2. Progress Schedule (must be submitted within 5 days of Contract award)

Traffic Control:

All traffic control, signing and traffic control items shall be paid for as **Maintaining Traffic.** Traffic will be maintained by the Contractor in accordance with the 2011 Michigan Manual of Uniform Traffic Control Devices. It is recommended that the winning contractor work with the winning paving contractor to avoid duplication of signs.

The Contractor may elect to detour through traffic if an acceptable detour can be negotiated with the Road Commission and provide all signing and Traffic Control included in the cost of maintaining traffic. If the contractor elects to use the gravel section of 43 rd they are responsible to maintain that section of road during the detour. The detour on the gravel portion shall be no longer than 3 days and if speed or condition of the roadway become a problem then the contractor shall provide flag control and a lead car to maintain traffic on the detour and shall be included in the Traffic Control Item. Regardless of how contractor decides to maintain traffic they shall place Barrels along both side of the roadway at proper spacing prior to work beginning and left until after the road is paved and shouldered included in Maintaining Traffic.

General Note:

All work shall be done in accordance with the Michigan Department of Transportation 2012 Standard Specification for Construction. All materials shall meet the requirements of the Michigan Department of Transportation Materials Source Guide.

For protection of underground utilities, and in conformance with Public act 53 of 1974, the contractor shall call MISS DIG a minimum of three full working days, excluding Saturdays, Sundays and Holidays, prior to beginning work in areas where public utilities have not been previously located. All MISS DIG participating members will be thus routinely notified. This does not relieve the Contractor from notifying utility owners who may not participate in the MISS DIG alert system.

Subcontractors:

The Contractor shall submit the attached "Subcontractor Certification" along with the Bid Sheet. The Contractor will certify that no subcontractor(s) will be used on the project or list the subcontractors, and work items, that will be part of the project.

Project Quantities:

HMA Base Crushing and Shaping	21,000	SYD.	
CIR, Partial Depth 4"	42,357	SYD	
Foamed Asphalt Stabilizing Agent		260*	Ton
Traffic Control	1	LS	

*Contractor to perform testing on existing grade to confirm quantity needed to perform the Cold-in-Place Recycling to assure final grade meets all-season road standards.

Bid Sheet

Board of Wexford County Road Commissioner
85 West M-115
Boon, MI 49618

Gentlemen:

The undersigned proposes to furnish any and all materials, labor, and equipment necessary for the Crush and Shaping and Cold-in-Place Recycling on Mackinaw Trail as spelled out in the "Invitation to Bid" for the prices below.

Project: Mackinaw Trail -From M-115 South

Item	Quantity	Unit	Unit Price	Total
Mobilization	1	LS		
HMA Base Crush and Shaping	21,000	Syd		
CIR Partial Depth 4"	42,357	Syd		
Foamed Asphalt Stabilizing Agent	260	Ton		
Maintaining Traffic	1	LS		
			TOTAL PROJECT COST ESTIMATE =	

Bidder: _____ Address: _____

_____ _____

Signature: _____ Phone No.: _____

Printed Name: _____ Date: _____

Title: _____

WCRC CIPR Projects
Bid Proposal #2

Project Location:

Cold In Place Recycling the existing pavement Wexford County, Michigan.
Mackinaw Trail from 52 Rd to M-115

Description of Work:

This work involves the pulverization of the existing pavement and stabilizing the driving lanes with COLD IN PLACE RECYCLING per the specifications. The Wexford County Road Commission will perform some preparatory work by removing the guardrail panels from the posts and then replacing them after all the paving is complete, and then place the aggregate shoulders after bituminous paving is complete. The contractor will be responsible for all items of work listed in the Bid Proposal.

Project Schedule:
Timing is critical with this project and necessary to be completed prior to September 14, 2019. No work on Saturdays, Sundays, or holidays. Mackinaw Trail work shall be coordinated with the paving project low bidder so that the project can be paved within 7 days completion of CIPR. Both contractors shall be required to work together to coordinate timing for projects.

Insurance Requirements

Insurance: Requirements as per MDOT 2012 Standard Specifications for Construction
Mackinaw Trail- From 52 rd north to M-115 for 2.49 miles

Project:

	Project Stations:	
Crush and Shaping & Cold-in-Place Recycling	0+00	P.O.B. 50' south of 52 Road
	131+50	P.O.E. M-115

Existing Mainline pavement is 28' wide. New CIP to be 28' in width

Project Dates:

Project Start Date:	As soon as able to coordinate between the CIPR contractor and the Paving contractor (Elmers)
Project Completion Date:	September 14, 2019

Crushing And Shaping:

The Contractor shall crush and shape the existing pavement in the widened sections and guard rail areas that are outside of the mainline stabilized area.

Cold-in-Place Recycling Pavement Partial Depth:

See attached Special Provision for CIR process. Bids may be submitted for both a foamed asphalt stabilized base or an emulsion stabilized base. Base shall be stabilized to a depth of 4".

Project Submittals:

The following shall be submitted to the Road Commission Engineer for approval prior to project start:

1. Material Source List (MDOT Form 501)
2. Progress Schedule (must be submitted within 5 days of Contract award)

Traffic Control:

All traffic control, signing and traffic control items shall be paid for as **Maintaining Traffic.** Traffic will be maintained by the Contractor in accordance with the 2011 Michigan Manual of Uniform Traffic Control Devices. It is recommended that the winning contractor work with the winning paving contractor to avoid duplication of signs.

The Contractor may elect to detour through traffic if an acceptable detour can be negotiated with the Road Commission and provide all signing and Traffic Control included in the cost of maintaining traffic. If the contractor elects to use the gravel section of 43 rd they are responsible to maintain that section of road during the detour. The detour on the gravel portion shall be no longer than 3 days and if speed or condition of the roadway become a problem then the contractor shall provide flag control and a lead car to maintain traffic on the detour and shall be included in the Traffic Control Item. Regardless of how contractor decides to maintain traffic they shall place Barrels along both side of the roadway at proper spacing prior to work beginning and left until after the road is paved and shouldered included in Maintaining Traffic.

General Note:

All work shall be done in accordance with the Michigan Department of Transportation 2012 Standard Specification for Construction. All materials shall meet the requirements of the Michigan Department of Transportation Materials Source Guide.

For protection of underground utilities, and in conformance with Public act 53 of 1974, the contractor shall call MISS DIG a minimum of three full working days, excluding Saturdays, Sundays and Holidays, prior to beginning work in areas where public utilities have not been previously located. All MISS DIG participating members will be thus routinely notified. This does not relieve the Contractor from notifying utility owners who may not participate in the MISS DIG alert system.

Subcontractors:

The Contractor shall submit the attached "Subcontractor Certification" along with the Bid Sheet. The Contractor will certify that no subcontractor(s) will be used on the project or list the subcontractors, and work items, that will be part of the project.

Project Quantities:

HMA Base Crushing and Shaping	21,000	SYD.
CIR, Partial Depth 4”	42,357	SYD
Asphalt Emulsion. Engineered	285*	Ton
Traffic Control	1	LS

*Contractor to perform testing on existing grade to confirm quantity needed to perform the Cold-in-Place Recycling to assure final grade meets all-season road standards.

Bid Sheet

Board of Wexford County Road Commissioner
85 West M-115
Boon, MI 49618

Gentlemen:

The undersigned proposes to furnish any and all materials, labor, and equipment necessary for the Crush and Shaping and Cold-in-Place Recycling on Mackinaw Trail as spelled out in the "Invitation to Bid" for the prices below.

Project: Mackinaw Trail -From M-115 South

Item	Quantity	Unit	Unit Price	Total
Mobilization	1	LS		
HMA Base Crush and Shaping	21,000	Syd		
CIR, Partial Depth 4"	42,357	Syd		
Asphalt Emulsion, Engineered	285	Ton		
Maintaining Traffic	1	LS		
			TOTAL PROJECT COST ESTIMATE =	

Bidder: _____ Address: _____

_____ _____

Signature: _____ Phone No.: _____

Printed Name: _____ Date: _____

Title: _____

SPECIAL PROVISION

FOR

MAINTAINING TRAFFIC

KFH / WCRC *1 of 2* *5-11-19*

Description:

This work shall consist of all labor, materials, and equipment required to maintain traffic as specified herein.

General:

Traffic shall be maintained in accordance with Section 103.05, 103.06, and 812 of the 2012 MDOT Standard Specifications for Construction, including any supplemental specifications, and as herein specified. All traffic control devices and their usage shall comply with the 2010 edition of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

The Contractor shall submit a written plan for maintaining traffic prior to beginning work, and subsequent updates of the plan to the Engineer for approval prior to putting changes into effect. The information shall note the traffic control devices and their placement, the location of flag persons, and intermediate flag persons as necessary. The maximum length of a flag control sequence shall be two miles with only one flag control sequence allowed at a time. Flag persons shall be equipped with two-way radios and a warning garment that is both fluorescent orange and reflectorized. Flag persons shall be used at crossroads or other traffic generators within the lane closure as directed by the Engineer.

SPECIAL PROVISION
FOR
MAINTAINING TRAFFIC

KFH / WCRC *2 of 2* *5-11-19*

Traffic Restrictions:

All work shall be confined to daylight hours. No work shall be permitted on Sundays, holidays, holiday weekends, or during special events. All lanes of traffic shall be open at the end of each working day. A minimum of one lane of traffic shall be maintained at all times, except where noted in the plans. Current MDOT signing sequences shall be utilized for the operation being performed. Commercial and residential driveways shall remain accessible at all times.

Measurement and Payment:

The completed work for Traffic Control, including all labor, materials, and equipment as required, shall include, but not be limited to, the following items as described in the 2012 MDOT Standard Specifications for Construction:

Flag Control
Minor Traffic Devices
Sign, Type B, Temporary
Lighted Arrow, Type A
Sign Covers
Temporary Pavement Markings

These items will not be paid for separately, but will be included in and paid for at the unit price for the following contract pay item:

Pay Item	Unit
Maintaining Traffic	*LSUM*

WEXFORD COUNTY ROAD COMMISSION

SPECIAL PROVISION
FOR
COLD IN PLACE RECYCLING

WCRC: KFH 1 of 9 5-28-19

a. Description. This work consists of cold milling and pulverizing the existing asphalt pavement to the dimensions specified on the plans, processing the reclaimed asphalt pavement (RAP) and mixing with emulsified asphalt, water and additives, then paver placing/spreading and compacting the emulsified RAP mixture into a stabilized asphalt base. This work includes sampling and testing existing HMA pavement, performing a mixture design for the emulsified RAP mixture, and quality control testing to ensure the completed emulsified RAP base layer is consistent with the mix design and compaction requirements specified herein. Perform all work according to the Michigan Department of Transportation 2012 Standard Specifications for Construction, except as modified herein.

b. Materials. Use materials as specified herein.

1. Asphalt Emulsion. Provide an engineered asphalt emulsion of the type and grade as determined by the Contractor's mixture design in order to meet the requirements in Table 3 and as specified in Table 1, below. Furnish emulsified asphalt having a penetration within ± 25% of the emulsified asphalt selected for the mix design, but not outside the range specified in Table 1. Deliver the asphalt emulsion to the job site at a temperature no greater than 120ºF. Provide a representative from the asphalt emulsion supplier at the job site for a minimum of the first full day of emulsion treatment, and available throughout the recycling process to monitor the characteristics and performance of the asphalt emulsion, make adjustments to the asphalt emulsion formulation as required, and to resolve any emulsion related problems with the cold in place recycling (CIPR) process.

Table 1: Engineered Asphalt Emulsion Requirements

Test	Method	Minimum	Maximum
Viscosity, Saybolt Furol, at 77°F (25°C), SFS	AASHTO T59 (ASTM D244)	20	100
Sieve Test, Retained on #20 (0.85 mm), %	AASHTO T59 (ASTM D244)		0.1
Storage Stability Test, 24 hr, %	AASHTO T59 (ASTM D244)		1.0
Distillation Test, Residue from distillation to 177°C, %	AASHTO T59 (ASTM D244) [1]	64.0	
Oil Distillate by Volume, %	AASHTO T59 (ASTM D244) [1]		1.0
Penetration (TBD[2]), 25°C, 100g, 5 s, dmm	AASHTO T49	75	100

[1]Modifed AASHTO T59 procedure – distillation temperature of 177°C with a 20 minute hold
[2]TBD – Penetration value to be determined by the Mix Design Requirements in Table 3.

2. Pulverized/Crushed Existing HMA Pavement. Produce a uniform mixture of pulverized material from the existing HMA pavement surface prior to the addition of the asphalt emulsion. Process crushed material with the specified equipment to meet the gradation requirements below:

Table 2: Cold Pulverized Material Gradations		
Gradation	Sieve Size and Percent Passing	
	1 1/2 in. (37.5 mm)	1 in. (25 mm)
PM 1	100	
PM 2[1]		100

[1]Use PM 2 only when a finer gradation of RAP is required by the mix design.

3. Additional Aggregate. Where specified on the plans or required by the approved mix design, furnish reclaimed asphalt pavement (RAP) from an off-site source(s) with a target asphalt content of 5% (-0.5% tolerance) or furnish aggregate of the specified gradation. Furnish RAP and aggregates only from approved sources. Use the same aggregate source and gradation for the mix design that will be used on the project.

4. Fog Seal Emulsion. If required, provide SS-1h per Section 904 or approved equal.

5. Water. Provide water according to Section 911. Include sugar with the injurious substances listed in Section 911.01.

6. Other Additives. Use common commercially available asphalt additives as necessary to meet the requirements in Table 3. Detail all additives, including the type, amount, and tolerances (percent) in the submitted mix design.

c. Mix Design. Using the performance requirements in Table 3 below, submit a mix design for each distinct pavement section from a design laboratory possessing a current and valid AASHTO R18 accreditation in both aggregates and HMA. Base the mix design on the actual materials that will be recycled, obtained directly from the project site and the actual source(s) for additional aggregate. Prior to sampling existing pavement for the mix design, furnish the proposed sampling plan for the Engineer's approval, including proposed traffic control and patching method. Perform pavement sampling according to the approved plan. Similar recycled material samples may be combined to provide a single mix design for the combined sample. Provide a separate mix design for recycled materials when the variability of samples indicates that the specified criteria would likely be appreciably affected.

Table 3: Mix Design Performance Requirements		
Test Method	CIPR	Test Purpose
Gradation for Design Millings, AASHTO T27	Report	
Modified Proctor, ASTM D1557, Method C	Report	Optimum Moisture Content for Density and Compaction
Design Moisture Content	Report	Dispursion of Emulsion
Superpave Gyratory Compaction, 1.25 angle, 600 kPa	30 gyrations at 4 in (100 mm)[1]	Laboratory Density Indicator
Bulk Specific Gravity (Density), ASTM D6752 or ASTM D2726	Report	Laboratory Density Indicator
Rice (Maximum Theoretical) Specific Gravity, ASTM 2041	Report	Laboratory Density Indicator
Air Voids	Report	Laboratory Density Indicator
Marshall Stability, ASTM D1559, lbs	1,250 minimum[1]	Stability Indicator
Retained Stability	70% minimum	Moisture Damage Resistance
Raveling Test, ASTM D7196	2% Maximum	Raveling Resistance
Additional Additive(s)[2] Coarse Aggregate Fine Aggregate RAP Fly Ash Cement	 Report Report Report Report 1.0% maximum	
Emulsified Asphalt[2] Distillation Residue, % Residue Penetration, dmm Optimum Emulsion Content, % Residual Asphalt to Cement Content Ratio	 Report Report Report 3:1 minimum	

[1]6 inch samples may be used; however, if 6 inch samples are used, the Marshall Stability is required to be 2,500 lbs minimum.
[2]TBD – Penetration value to be determined by the Mix Design Requirements in Table 3

d. Equipment. Furnish equipment according to section 501 and as specified herein. Perform the necessary processes for cold-in-place recycling (CIPR) using a single unit recycler or multi-unit recycling train.

1. Multi-Unit Recycling Train.

A. Furnish a self-propelled milling machine that is capable of pulverizing the existing bituminous pavement to the depth shown on the plans and to a minimum full lane width (±12 ft) in a single pass, with automatic depth controls to maintain the cutting

depth to within ± ¼ inch of that shown on the plans, and a positive means for controlling cross slope elevations. Do not use a heating device to soften the pavement.

B. Furnish a material sizing unit having screening and crushing capabilities to reduce the cold pulverized material to the maximum size requirements as specified, utilizing a screening and crushing unit with a closed-circuit system capable of continuously returning oversized material to the crusher.

C. Furnish a mixing unit consisting of an on-board, completely self-contained pug mill, equipped with a belt scale for the continuous weighing of the pulverized and sized bituminous material and a coupled/interlocked computer controlled liquid metering device capable of automatically adjusting the flow of emulsified asphalt to compensate for any variation in the weight of pulverized material coming into the mixer. Use the metering device to deliver the amount of emulsified asphalt to within ± 0.2 percent of the required amount by weight of pulverized bituminous material (for example, if the design requires 3.0 percent, adjust the metering device to maintain 2.8 percent to 3.2 percent emulsion). Equip the mixer with an emulsified asphalt pump of sufficient capacity to allow emulsion contents up to 3.5% by weight of pulverized bituminous material. Display automatic digital readings for both the flow rate and total amount of pulverized bituminous material and emulsified asphalt in appropriate units of weight and time.

2. Single Unit Recycler. Furnish a single unit recycler consisting of a self-propelled cold milling/recycling machine with a down-cutting drum head, having sufficient power and suitable configuration to pulverize and recycle the existing hot-mix asphalt pavement to a maximum depth of 5 inches and incorporate the prescribed amounts of emulsified asphalt and water to produce a homogeneous asphalt base material, and capable of pulverizing and recycling a full lane width (±12 ft) in each pass. Equip the machine with separate systems for adding emulsified asphalt and water, with each system having a full width spray bar with a positive displacement pump interlocked to the machine's ground speed to insure that the amount of emulsified asphalt and water being added is automatically adjusted with changes to the machine's ground speed; each additive system spray bar fitted with 2 nozzles per foot of spray bar, capable of incorporating up to 7 gallons per square yard of emulsified asphalt and/or water, with individual valves on the spray bars capable of being turned off as necessary to minimize emulsion and water overlap on subsequent passes.

3. Additive Distributors. Control additives such as water, lime slurry, etc. introduced at the mill head or mixing unit with liquid metering devices capable of automatically adjusting for the variation in the weight of the pulverized material going into the mixing unit. Provide metering devices capable of delivering the amount of additive to within +/- 0.2 percent of the required amount by weight of the pulverized bituminous material.

Furnish a water distribution system capable of adding up to 5% water by weight of pulverized bituminous material, if necessary based on environmental and material requirements. Metering of water added at the milling machine to control dust in the screens, belts, or crusher/material sizing unit is not required.

4. Elevator. Use a pick-up machine capable of removing the entire windrow of processed RAP down to the milled HMA surface.

5. Paver. Use a separate self-propelled paving machine with independent slope control to distribute and place the recycled pavement material.

6. Rollers. Furnish self-propelled pneumatic-tired roller(s) with a gross weight (mass)

of not less than 25 tons. Furnish double drum vibratory roller(s) with a gross operating weight of not less than 10 tons and a minimum width of 78 inches.

7. Power-Broom. Furnish a power broom to sweep the completed recycled pavement to maintain the surface prior placing the HMA wearing course.

e. Construction Methods.

1. Grading. Prior to performing CIPR operations, perform grading or other suitable means to remove grass and other vegetation from the edge of the existing (adjacent) roadbed shoulder areas to prevent contamination of the CIPR base. Excavate or trench shoulders (paid for separately) according to the plans and Standard Specifications. Remove trenched shoulder, material or form a windrow for re-grading of shoulders after CIPR operations, per the plans.

2. HMA Base Crushing and Shaping. Crush and shape the existing asphalt pavement prior to CIPR operations at locations as shown on the plans (paid for separately). Additional aggregate base material (paid for separately) shall be placed prior to crushing and shaping operations to achieve the cross sections shown on the plans. The mixed crushed and shaped and additional aggregate material shall be graded and compacted prior to CIPR operations. Emulsified asphalt and water is to be added to the crushed and shaped sections in accordance with e.5.

3. Weather Restrictions. Perform the CIPR work only when atmospheric temperature in the shade and away from artificial heat is 50°F (10°C) and rising, with dry (no rain or fog) conditions, and forecast temperatures above freezing within 48 hours after completion of recycled pavement in any portion of the project. The Engineer may restrict work when the heat index is greater than 100°F (38°C).

4. Recycling. Pulverize the profiled pavement by cold milling to the depth and width shown on the plans. Do not disturb the underlying material in the existing roadway. Conduct the pulverizing operation so that the amount of fines occurring along the vertical faces of the cut will not prevent bonding of the cold recycled materials.

Pulverize/cold mill the existing pavement to the depth necessary to achieve the compacted thickness shown on the plans, ± ¼ inch. Adjust the pulverizing depth as necessary following depth checks per paragraph f.3.B. below to achieve the specified compacted depth.

If a paving fabric is encountered during the CIPR operation, make the necessary adjustments in equipment or operations so that at least ninety percent (90%) of the shredded fabric in the recycled material is no more than 5 in^2, with no fabric piece of any dimension exceeding 4 inches. Adjustments may include, but not be limited to, adjusting the milling rate and adding or removing screens in order to obtain a specification recycled material. Dispose of material containing oversized pieces of paving fabric as directed by the Engineer. Extra work to handle paving fabric will not be paid for separately, provided the paving fabric is shown or noted on the plans.

5. Mixing. Determine the appropriate amounts of emulsified asphalt and water at various portions of the project through the sampling and mix design process. Thoroughly mix pulverized material, emulsified asphalt and any additives within the pug mill to produce a homogeneous mixture of recycled asphalt stabilized base material. Incorporate the emulsified asphalt into the pulverized asphalt pavement material at an initial rate according to the approved mix design(s). Make field adjustments to the additive application rates

between project segments (with different mix designs) and also as necessary within any mix design segment to account for in-situ material and ambient weather condition variations.

6. Spreading and Finishing. Spread the homogeneous asphalt mixture using a self-propelled HMA paver. Use a pick-up machine to transfer the windrowed material into the hopper of the paver. Maintain a maximum distance of 150 feet between the recycler and the paver. Using the paver, spread and finish the mixture without segregation to the lines and grades established by the plans (with adjustments as directed by the Engineer) in one continuous pass.

7. Compaction. Develop a density growth curve within the first half mile of production for each mix design, consisting of a plot of unit weight (lb/ft^3) vs. number of roller passes with the project breakdown roller. Maintain consistent roller speed during the growth curve testing as during the normal paving operation. Establish this curve with a nuclear density gauge. Take nuclear density measurements after each roller pass until a maximum density is achieved. Discontinue the breakdown roller passes after the measured density is confirmed to have passed the peak density (i.e. a second consecutive reduction in density following an incremental roller pass. Use the peak density measured as the target maximum density (TMD). If a peak density is not achieved, furnish a larger breakdown roller such that the peak density can be developed.

The Engineer reserves the right to request an additional growth curve if any of the following conditions apply:

A. field adjustment(s) are made to the mix design;

B. significant changes in ambient moisture and temperature occur during the day;

C. the recycled mix is experiencing major displacement or cracking;

D. the measured densities consistently exceed 102% of the target maximum.

Develop a new growth curve if the breakdown roller used on the initial growth curve is replaced with a different production roller. Use the target density only to the specific gauge used to develop the growth curve. If additional gauges are to be used to determine density specification compliance, establish a unique minimum allowable target density for each gauge from the peak density location of the growth curve.

Use a vibratory roller operating in a static or vibratory mode for breakdown rolling. Use vibratory mode only if it is shown to not damage the pavement. Continue intermediate rolling using self-propelled pneumatic roller(s) until no displacement is observed and a minimum required density of 97% of the TMD is achieved. Complete final rolling with one or more double drum steel rollers operating in static mode to eliminate pneumatic tire marks and to produce a uniform, smooth recycled pavement surface.

Start rolling no more than 30 minutes behind the paver. Complete and finish rolling no later than one hour after recycling is completed. Whenever possible, start and stop rolling on previously compacted material or existing pavement.

8. Opening to Traffic. After compaction of the recycled pavement, do not allow public or Contractor traffic for at least two (2) hours. Open the recycled pavement to rolling traffic upon approval of the Engineer, following sufficient curing of the finished surface to resist traffic induced raveling or permanent deformation.

9. Maintenance. After opening to traffic, maintain the surface of the recycled pavement surface in a condition suitable for the safe movement of traffic. Power-broom the surface as directed to remove all loose particles that may develop on the recycled pavement surface under traffic, and otherwise maintain the recycled pavement surface in a manner satisfactory to the Engineer until the HMA wearing course has been constructed.

10. Curing. Before placing the HMA wearing course, allow the recycled pavement surface to cure until the moisture content is reduced to 2.0 percent or less. Place the leveling course within ten days of the final curing of the recycled pavement, but not later than **October 19**, unless otherwise approved by the Engineer. Place SS-1h tack coat on the recycled surface immediately prior to paving the HMA wearing course (included with payment for HMA item).

If the recycled pavement is to be left unsurfaced for more than seven (7) days, place a fog coat surface seal. Apply fog seal at a rate of ±0.20 gallons per square yard. If fog seal is placed, the paving tack coat may be omitted, as approved by the Engineer.

11. Surface Requirements. Furnish a 16-foot straightedge at the project site and test the completed recycled pavement for smoothness in the wheel paths by checking for surface variations in excess of 3/8 inch. Correct areas that exceed the 3/8-inch tolerance with a cold milling machine. Power-broom the loose material from profile milling prior to opening to traffic.

f. Quality Control. Perform quality control sampling and testing as specified herein.

1. Quality Control by the Contractor. Perform (or subcontract) the inspection and tests required to assure conformance to contract requirements. Control includes the recognition of obvious defects and their immediate correction. This may require increased testing, expedited communication of test results to the job site (including the Engineer), modification of operations, suspension of the work, or other actions as appropriate.

Immediately notify the Engineer any failing tests and subsequent remedial action. Report passing tests to the Engineer no later than the start of the next work day.

2. Quality Assurance by the Engineer. The Engineer will conduct independent assurance tests on split samples taken by the Contractor for quality control testing. In addition, the Engineer will witness the sampling and splitting of these samples and will immediately retain witnessed split samples for quality assurance testing**.**

3. Test Methods and Frequency.

A. Pulverized Material Sizing and Gradation. Obtain a sample before emulsion addition and screened using a 1.5 in. (37.5mm) sieve (or smaller sieve if required) to determine if meeting the maximum particle size requirement. Perform gradation testing on the moist millings each day using the following sieves: 1.5 inch, 1.0 inch, ¾ inch, ½ inch, 3/8 inch, No.4, No.8, No.16, and No.30. Compare the resulting gradation to the mix design gradations to determine any necessary changes to emulsion content.

B. Depth of Compacted Recycled Pavement. Measure the nominal depth at the centerline and midpoint of the outside lane. Check the depth any time depth changes are made or equipment is idle.

Obtain samples according to ASTM D979 or AASHTO T168. When the Engineer determines the location for a gradation sample, cease addition of the asphalt emulsion and mark the location, continuing to pulverize the hot-mix asphalt pavement until the Engineer is satisfied with the length of material pulverized without the addition of the emulsified asphalt (100 feet maximum). After obtaining gradation samples, back up the recycling machine location where the asphalt emulsion was discontinued, then re-pulverize this material adding the required amount of emulsified asphalt to the pulverized material.

C. Emulsified Asphalt Content. Furnish a one-gallon sample per day of production to the Engineer. Notify the Engineer any time emulsified asphalt content is changed. Check and record the emulsified asphalt content for each segment in which the percentage is changed. Make changes to the emulsified asphalt content according to the approved mix designs or as otherwise directed by the Engineer. Check the emulsified asphalt content from the belt scale totalizer or asphalt pump totalizer

D. Water Content. Notify the Engineer any time the water content is changed. Check and record the water content at the milling head for each segment in which the percentage is changed. Gather this information from the water metering device, which can be checked from the belt scale totalizer to verify daily quantities used. Make water content changes as approved, based on mixture consistency, coating, and dispersion of the recycled materials.

E. Compacted Density. Determine wet density using a nuclear moisture-density gauge generally following the procedures for ASTM D2950, backscatter measurement. Compare this measurement to the target density obtained by the growth curve. Where the measured density is less than the minimum specified (97% of TMD), immediately take appropriate steps to increase the in-place density to meet the specified minimum.

F. Frequency. Perform quality control testing according to the frequency shown in the table below, however, the Engineer may increase the testing frequency if the construction process is experiencing problems or unforeseen conditions are encountered.

Table 4: QC/QA Testing Frequency

Test	QC Frequency[1]	QA Frequency[1]
Depth of Pulverization	1 per 500 feet	1 per 1000 feet
Pulverized Material Sizing and Gradation	1 per 1/2 day production	1 per day
Emulsified Asphalt Content	1 per 500 feet	1 per 1000 feet
Water Content	1 per 500 feet	1 per 1000 feet
Compacted Density	1 per 1/4 mile	1 per mile

[1]Perform all quality control tests within the first 500 ft (75 m) after startup or any change in the mix. The Engineer will also run the split samples at these locations.

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

Contract Item (Pay Item)	Pay Unit
CIR Partial Depth 4"	Square Yard
Asphalt Emulsion, Engineered	Ton

The work for **CIR Partial Depth 4"** as described herein will be measured in place by the square yard to the limits and depth shown on the typical cross sections. Payment for **CIR Partial Depth 4"** includes all tools, equipment, labor, and materials necessary to complete the work as described herein, including mix design, profile milling, pulverizing/crushing and processing existing HMA pavement with water, engineered asphalt emulsion (and other additives consistent with the mix design requirements), paver placing processed RAP, compacting the recycled surface, performing the required quality control procedures, processes, and reporting, and all corrective grading necessary to meet the specified profile requirements.

Maintenance and/or repairs to the recycled pavement surface related to contractor construction procedures or quality of work, will be included with payment for not be paid for **CIR Partial Depth 4"** , and will not be paid for separately.

Asphalt Emulsion, Engineered will be measured by weight and paid for separately by the Ton.

WEXFORD COUNTY ROAD COMMISSION

SPECIAL PROVISION
FOR
COLD IN-PLACE RECYCLING
CIR 4”

a. Description. This work consists of cold milling and pulverizing the existing asphalt pavement to the dimensions specified on the plans, processing the reclaimed asphalt pavement (RAP) and mixing with a foamed asphalt stabilizing agent, water and additives, then paver placing/spreading and compacting the asphalt stabilized RAP mixture into a stabilized asphalt base. This work includes sampling and testing existing HMA pavement, performing a mixture design for the asphalt stabilized RAP mixture, and quality control testing to ensure the completed asphalt stabilized RAP base layer is consistent with the mix design and compaction requirements specified herein. Perform all work according to the Michigan Department of Transportation 2012 Standard Specifications for Construction, except as modified herein.

b. Materials. Use materials as specified herein.

1. Foamed Asphalt Stabilizing Agent. Provide an asphalt stabilizing agent the meets the following:

A. Foamed Asphalt. Provide a PG 58-28 liquid asphalt cement,(or equivalent meeting requirements table 3) as determined by the Contractor’s mixture design in order to meet the requirements in Table 3. Deliver the asphalt cement to the job site at a temperature minimum 365 Deg F.

Liquid asphalt shall produce asphalt foam with a minimum expansion ratio of 8 with a half-life no less than 6 seconds.

2. Produce a uniform mixture of pulverized material from the existing HMA pavement surface prior to the addition of the asphalt stabilizing agent with the specified equipment to meet the gradation requirements below:

Table 2: Cold Pulverized Material Gradation		
	Sieve Size and Percent Passing	
Gradation	1 ½ inch (37.5 mm)	
PM 1	100	

3. Additional Aggregate. Where specified on the plans or required by the approved mix design, furnish reclaimed asphalt pavement (RAP) from off-site source(s) with a target asphalt content of 5% (-0.5% tolerance) or furnish aggregate of the specified gradation. Furnish RAP and aggregates only from approved sources. Use the same aggregate source and gradation for the mix design that will be used on the project.

4. Fog Seal Emulsion. If required, provide SS-1h per Section 904 or approved equal.

5. Water. Provide water according to Section 911. Include sugar with the injurious substances listed in Section 911.01.

6. Other Additives. Use common commercially available asphalt additives as necessary to meet the requirements in Table 3. Detail all additives, including the type, amount, and tolerances (percent) in the submitted mix design.

c. Mix Design. Using the performance requirements in Table 3 below, submit a mix design for each distinct pavement section from an approved design laboratory. Base the mix design on the actual materials that will be recycled, obtained directly from the project site and the actual source(s) for additional aggregate.

Prior to sampling existing pavement for the mix design, furnish the proposed sampling plan for the Engineer's approval, including proposed traffic control and patching method. Perform pavement sampling according to the approved plan. Similar recycled material samples may be combined to provide a single mix design for the combined sample. Provide a separate mix design for recycled materials when the variability of samples indicates that the specified criteria would likely be appreciably affected.

Develop and submit a Job Mix Formula (JMF) for approval 10 business days prior to the start of the CIR operation. Submit the JMF to the engineer for review. The JMF shall be the baseline measure for the rate of stabilizing agent application and water blended with the RAP to construct the CIR mixture. The mix design shall indicate the allowable tolerance for field adjustments for the stabilizing agent and/or water.

Table 3: Mix Design Performance Requirements		
Test Method	**CIR**	**Test Purpose**
Gradation for Design Millings, AASHTO T 27	Report	
Modified Proctor, ASTM D1557, Method C	Report	Optimum Moisture for Density and Compaction
Superpave Gyratory Compaction, 1.25° angle, 600 kPa	30 gyrations at 4 inches (100 mm) (a)	Laboratory Density Indicator
Bulk Specific Gravity (Density), ASTM D6752 or ASTM D2726	Report	Laboratory Density Indicator
Rice (Maximum Theoretical) Specific Gravity, ASTM D2041	Report	Laboratory Density Indicator
Air Voids	Report	Laboratory Density Indicator
Indirect Tensile Strength (ITS) ITS_{DRY} ITS_{WET}	 45 psi 30 psi	
Additional Additive(s) (a) Coarse Aggregate Fine Aggregate RAP Fly Ash Cement	 Report Report Report Report 1.0% maximum	
Liquid Asphalt (a) Expansion Ratio Foam Half Life	 8 minimum 6 sec minimum	
a. Report shall include type/gradation and producer/supplier.		

d. Equipment. Furnish equipment in accordance with Section 501 and as specified herein. Perform the necessary processes for cold-in-place recycling (CIR) utilizing a single unit recycler or multi-unit recycling train.

1. Multi-Unit Recycling Train.

A. Furnish a self-propelled milling machine that is capable of pulverizing the existing bituminous pavement to the depth shown on the plans and to a minimum full lane width (±12 ft) in a single pass, with automatic depth controls to maintain the cutting depth to within ± ¼ inch of that shown on the plans, and a positive means for controlling cross slope elevations. Do not use a heating device to soften the pavement.

B. Furnish a material sizing unit having screening and crushing capabilities to reduce the cold pulverized material to the maximum size requirements as specified, utilizing a screening and crushing unit with a closed-circuit system capable of continuously returning oversized material to the crusher.

C. Furnish a mixing unit consisting of an on-board, completely self-contained pug mill, equipped with a belt scale for the continuous weighing of the pulverized and sized bituminous material and a coupled/interlocked computer controlled liquid metering device capable of automatically adjusting the flow of an asphalt stabilizing agent to compensate for any variation in the weight of pulverized material coming into the mixer. Use the metering device to deliver the amount of asphalt stabilizing agent to within ± 0.2 percent of the required amount by weight of pulverized bituminous material (for example, if the design requires 3.0 percent, adjust the metering device to maintain 2.8 percent to 3.2 percent emulsion). Equip the mixer with an asphalt stabilizing agent pump of sufficient capacity to allow asphalt stabilizing agent contents up to 3.5% by weight of pulverized bituminous material. Display automatic digital readings for both the flow rate and total amount of pulverized bituminous material and asphalt stabilizing agent in appropriate units of weight and time.

2. Single Unit Recycler. Furnish a single unit recycler consisting of a self-propelled cold milling/recycling machine with a down-cutting drum head, having sufficient power and suitable configuration to pulverize and recycle the existing hot-mix asphalt pavement to a maximum depth of 7 inches and incorporate the prescribed amounts of asphalt stabilizing agent and water to produce a homogeneous asphalt base material, and capable of pulverizing and recycling a full lane width (±12 ft) in each pass. Equip the machine with separate systems for adding asphalt stabilizing agent and water, with each system having a full width spray bar with a positive displacement pump interlocked to the machine's ground speed to insure that the amount of asphalt stabilizing agent and water being added is automatically adjusted with changes to the machine's ground speed; each additive system spray bar fitted with 2 nozzles per foot of spray bar, capable of incorporating up to 7 gallons per square yard of asphalt stabilizing agent and/or water, with individual valves on the spray bars capable of being turned off as necessary to minimize asphalt stabilizing agent and water overlap on subsequent passes.

3. Additive Distributors. Control additives such as water, lime slurry, etc. introduced at the mill head or mixing unit with liquid metering devices capable of automatically adjusting for the variation in the weight of the pulverized material going into the mixing unit. Provide metering devices capable of delivering the amount of additive to within +/-0.2 percent of the required amount by weight of the pulverized bituminous material. Furnish a water distribution system capable of adding up to 5% water by weight of pulverized bituminous material, if necessary based on environmental and material requirements. Metering of water added at the milling machine to control dust in the screens, belts, or crusher/material sizing unit is not required.

4. Elevator. Use a pick-up machine capable of removing the entire windrow of processed RAP down to the milled HMA surface.

5. Paver. Use a separate self-propelled paving machine with independent slope control to distribute and place the recycled pavement material.

6. Rollers. Furnish break down double drum vibratory roller(s) with a gross operating weight of not less than 12 tons and a minimum width of 78 inches. In addition a Pneumatic Tired roller of sufficient capacity to finish roll the recycled mat

7. Power Broom. Furnish a power broom to lightly sweep the completed recycled pavement to maintain the surface prior placing the HMA wearing course.

8. Note: the recycling equipment foamed asphalt system shall be the same as the lab system used to develop the mix design to ensure compatibility and consistency of field results

e. Construction.

1. Grading. Prior to performing CIR operations, perform grading or other suitable means to remove grass, loose pieces of asphalt pavement from shoulder and other vegetation from the edge of the existing (adjacent) roadbed shoulder areas to prevent contamination of the CIR base.

2. Weather Restrictions. Perform the CIR work only when the pavement temperature to be recycled is a minimum of 50F (10C) and rising, with dry conditions, and forecast temperatures above freezing within 48 hours after completion of recycled pavement in any portion of the project.

3. Recycling. Pulverize the profiled pavement by cold milling to the depth and width shown on the plans. Do not disturb the underlying material in the existing roadway. Conduct the pulverizing operation so that the amount of fines occurring along the vertical faces of the cut will not prevent bonding of the cold recycled materials.

Pulverize/cold mill the existing pavement to the depth necessary to achieve the compacted thickness shown on the plans, ± ¼ inch. Adjust the pulverizing depth as necessary following depth checks per paragraph f.3.B below to achieve the specified compacted depth.

If a paving fabric is encountered during the CIR operation, make the necessary adjustments in equipment or operations so that at least ninety percent (90%) of the shredded fabric in the recycled material is no more than 5 square inches, with no fabric piece of any dimension exceeding 4 inches. Adjustments may include, but not be limited to, adjusting the milling rate, or milling depth and adding or removing screens in order to obtain a specification recycled material. Dispose of material containing over-sized pieces of paving fabric as directed by the Engineer. Extra work to handle paving fabric will not be paid for separately, provided the paving fabric is shown or noted on the plans.

4. Mixing. Determine the appropriate amounts of asphalt stabilizing agent and water at various portions of the project through the sampling and mix design process. Thoroughly mix pulverized material, asphalt stabilizing agent and any additives within the pug mill to produce a homogeneous mixture of recycled asphalt stabilized base material. Incorporate the asphalt stabilizing agent into the pulverized asphalt pavement material at an initial rate according to the approved mix design(s). Make field adjustments to the additive application rates between project segments (with different mix designs) and also as necessary within any mix design segment to account for in-situ material and ambient weather condition variations.

5. Spreading and Finishing. Spread the homogeneous asphalt mixture using a self-propelled HMA paver (No heating of screed). Directly load the recycled material from the recycling unit by means of rear conveyor or use a pick-up machine to transfer the windrowed material into the hopper of the paver. Maintain a maximum distance of 150 feet between the recycler and the paver. Using the paver, spread and finish the mixture without segregation to the lines and

grades established by the plans (with adjustments as directed by the Engineer) in one continuous pass.

6. Compaction. Develop a density growth curve within the first half mile of production for each mix design, consisting of a plot of unit weight (lb/ft3) vs. number of roller passes with the project breakdown roller. Maintain consistent roller speed during the growth curve testing as during the normal paving operation. Establish this curve with a nuclear density gauge. Take nuclear density measurements after each roller pass until a maximum density is achieved. Discontinue the breakdown roller passes after the measured density is confirmed to have passed the peak density (i.e. a second consecutive reduction in density following an incremental roller pass. Use the peak density measured as the target maximum density (TMD). If a peak density is not achieved, furnish a larger breakdown roller such that the peak density can be developed.

The Engineer reserves the right to request an additional growth curve if any of the following conditions apply:

A. Field adjustment(s) are made to the mix design;
B. Significant changes in ambient moisture and temperature occur during the day;
C. The recycled mix is experiencing major displacement or cracking; or
D. The measured densities consistently exceed 102% of the target maximum.

Develop a new growth curve if the breakdown roller used on the initial growth curve is replaced with a different production roller. Use the target density only to the specific gauge used to develop the growth curve. If additional gauges are to be used to determine density specification compliance, establish a unique minimum allowable target density for each gauge from the peak density location of the growth curve.

Use a vibratory roller operating in a static or vibratory mode for breakdown rolling. Use vibratory mode only if it is shown to not damage the pavement. Continue intermediate rolling using self-propelled pneumatic roller(s) until no displacement is observed and a minimum required density of 97% of the TMD is achieved. Complete final rolling with one or more double drum steel rollers operating in static mode to eliminate pneumatic tire marks and to produce a uniform, smooth recycled pavement surface.

Start rolling immediately behind the paver. Complete finish rolling no later than one hour after recycling is completed. Whenever possible, start and stop rolling on previously compacted material or existing pavement.

7. Opening to Traffic. After compaction of the recycled pavement, do not allow public or Contractor traffic for at least two (2) hours. Open the recycled pavement to rolling traffic upon approval of the Engineer, following sufficient curing of the finished surface to resist traffic induced raveling or permanent deformation.

8. Maintenance. After opening to traffic, maintain the surface of the recycled pavement surface in a condition suitable for the safe movement of traffic. Lightly Power broom the surface as directed to remove all loose particles that may develop on the recycled pavement surface under traffic, and otherwise maintain the recycled pavement surface in a manner satisfactory to the Engineer until the wearing course has been constructed.

9. Curing. Place the wearing course within ten days of the final curing of the recycled pavement, but not later than September 14, unless otherwise approved by the Engineer. Place SS-1h tack coat on recycled surface immediately prior to placing an HMA course. If the recycled pavement is to be left unsurfaced for more than seven (7) days, place a fog coat surface seal. Apply the fog seal at a rate of
±0.20 gallons per square yard. If an HMA course is applied within 20 days of placement of fog seal, the tack coat may be omitted, as approved by the Engineer.

10. Surface Requirements. Furnish a 16-foot straightedge at the project site and test the completed recycled pavement for smoothness in the wheel paths by checking for surface variations in excess of ⅜-inch. Correct areas that exceed the ⅜-inch tolerance with a cold milling machine. Lightly Power broom any loose material from the milled surface prior to opening to traffic.

f. Quality Control. Perform quality control sampling and testing as specified herein.

1. Quality Control by the Contractor. Prepare and implement a quality control (QC) plan as specified herein. Submit QC plan to the Engineer for approval not less than 10 business days prior to the start of the CIR operation. The QC plan must:

A. Describe the organization, laboratory, responsible parties, and procedures used to perform the following:

(1) Control and coordinate the production process.
(2) Determine whether a change to the production process is needed.
(3) Obtain samples, including determining sampling locations.
(4) Control quality, including sampling, testing and reporting.
(5) Determine action limits when corrective actions are needed.
(6) Implement corrective actions.

B. Include action and suspension limits and the details of the corrective action to be taken if any process is outside of those limits. The suspension limits must not exceed the specified acceptance criteria.

C. Contain copies of the forms that will be used to provide the required inspection records and sampling and testing results.

Perform (or subcontract) the inspection and tests required to assure conformance to contract requirements. Immediately notify the Engineer any failing tests and subsequent remedial action. Report passing tests to the Engineer no later than the start of the next work day.

Provide a representative from the laboratory or stabilizing asphalt agent supplier at the job site for a minimum of the first full day of CIR operation, and available throughout the recycling process authorized to: monitor the characteristics and performance of the stabilizing asphalt agent; to adjust the stabilizing asphalt agent formulation as required; and to resolve any problems with the cold in place recycling process related to the stabilizing asphalt agent.

2. Quality Assurance by the Engineer. The Engineer will conduct independent assurance tests on split samples taken by the Contractor for quality control testing. In addition, the

Engineer will witness the sampling and splitting of these samples and will immediately retain witnessed split samples for quality assurance testing.

3. Tests Methods and Frequency.

A. Pulverized Material Sizing and Gradation. Obtain a sample before foamed asphalt addition using a 1½-inch (37.5mm) sieve to determine if meeting the maximum particle size requirement.

Obtain samples according to ASTM D979 or AASHTO T168. When obtaining gradation sample, cease addition of the asphalt stabilizing agent and mark the location, continuing to pulverize the existing HMA pavement until the Engineer is satisfied with the length of material pulverized without the addition of the asphalt stabilizing agent (100 feet maximum). After obtaining gradation samples, back up the recycling machine location where the asphalt stabilizing agent was discontinued, then re-pulverize this material adding the required amount of asphalt stabilizing agent to the pulverized material.

B. Depth of Compacted Recycled Pavement. Measure the nominal depth at the centerline and midpoint of the outside lane. Check the depth any time depth changes are made or equipment is idle.

C. Asphalt Stabilizing Agent Content. Furnish a sample each day of production to the Engineer. Notify the Engineer any time the asphalt stabilizing agent content is changed. Check and record the asphalt stabilizing agent content for each segment in which the percentage is changed. Make changes to the asphalt stabilizing agent content according to the approved mix designs or as otherwise directed by the Engineer. Check the asphalt stabilizing agent content from the belt scale totalizer or asphalt pump totalizer.

D. Water Content. Notify the Engineer any time the water content is changed. Check and record the water content at the milling head for each segment in which the percentage is changed. Gather this information from the water metering device, which can be checked from the belt scale totalizer to verify daily quantities used. Make water content changes as approved, based on mixture consistency, coating, and dispersion of the recycled materials.

E. Compacted Density. Determine wet density using a nuclear moisture-density gauge generally following the procedures for ASTM D2950, backscatter measurement. Compare this measurement to the target density obtained by the growth curve. Where the measured density is less than the minimum specified (97% of TMD), immediately take appropriate steps to increase the in-place density to meet the specified minimum.

F. Frequency. Perform quality control testing according to the frequency shown in Table 4; however, the Engineer may increase the testing frequency if the construction process is experiencing problems or unforeseen conditions are encountered.

Table 4 – QC/QA Testing Frequency		
Test	**QC Frequency**(a)	**QA Frequency**(a)
Depth of Pulverization	1 per 500 feet	1 per 1000 feet
Pulverized Material Sizing and Gradation	1 per ½ day production	1 per day
Asphalt stabilizing agent Content Micro processor reading	1 per 500 feet	1 per 1000 feet
Water Content Micro processor reading	1 per 500 feet	1 per 1000 feet
Compacted Density	1 per ¼ mile	1 per mile
a. Perform all quality control tests within the first 500 feet (75 m) after startup or any change in the mix. The Engineer will also run the split samples at these locations.		

g. Measurement and Payment. The completed work as measured will be paid for at the contract unit price for the following contract items (pay items):

Contract Item (Pay Item)	**Pay Unit**
CIR, 4 inch	Square Yard
Foamed Asphalt stabilizing agent	Ton

The Engineer will measure **Cold In-Place Recycling**, of the thickness specified, longitudinally along the pavement surface and will use the transverse dimension shown on the plans. The unit price for **Cold In-Place Recycling** includes the cost of the following:

1. Sampling the existing pavement and preparing a mix design;
2. Profile milling, pulverizing and processing the existing HMA pavement with water, asphalt stabilizing agent and other additives consistent with the mix design requirements;
3. Placing the processed RAP mixture with a paver;
4. Compacting the processed RAP mixture;
5. Performing quality control sampling and testing, and providing the Engineer with reports;
6. Performing any corrective measures necessary to meet the specified profile requirements.

Maintenance and/or repairs to the recycled pavement surface related to the Contractor's construction procedures or quality of work are included in the payment for **Cold In-Place Recycling** and will not be paid for separately.

FOAMED BITUMEN MIX DESIGN - WORKSHEET

Project				Date		
Sample / Mix No.:				Location		
Material Description:						
Maximum dry density				Optimum moisture content		
Percentage < 0.075mm			Grading:	Coarse	Medium	Fine
Plasticity Index						
Bitumen Source				Bitumen Type		
Active Filler Type				Filler Source		

MOISTURE DETERMINATION			Specimen manufacture		After Curing	
		Hygroscopic	Sample 1	Sample 2	Dry	Soaked
Pan No.						
Mass wet sample + pan	m_1					
Mass dry sample + pan	m_2					
Mass pan	m_p					
Mass Moisture	$m_1-m_2 = M_m$					
Mass dry sample	$m_2-m_p = M_d$					
Moisture Content	$M_m / M_d \times 100 = M_h$					

Mass of air-dried sample placed in the mixer (kg)						
Percentage of water added to sample for mixing:				Amount of water added:		
Percentage water added to sample for compaction				Amount of water added:		
Total percentage water added:				Total Water added:		
Foamed bitumen addition (%)				Active filler addition (%)		
Foam water injection rate (%)						
Temperatures (°C)	Material:		Bitumen:		Water:	

SPECIMAN DETAILS						
Speciman ID						
Date Moulded						
Date removed from oven						
Date tested						
Diameter (mm)						
Individual height						
measurements (mm)						
Average height (mm)						
Mass after curing (g)						
Bulk Density (kg/m³)						
Average bulk density						
Dry density (kg/m³)						

ITS TEST						
Specimen condition	Unsoaked (ITD_{DRY} / ITS_{EQUIL})			Soaked (ITD_{WET} / ITS_{SOAK})		
Maximum load (kN)						
Internal temperature °C						
Deformation (mm)						
ITS (kPA)						
Average ITS (kPa)						
TSR (%)						

FOAMED BITUMEN MIX DESIGN - WORKSHEET

Project				Date		
Sample / Mix No.:				Location		
Material Description:						
Maximum dry density				Optimum moisture content		
Percentage < 0.075mm			Grading:	Coarse	Medium	Fine
Plasticity Index						
Bitumen Source				Bitumen Type		
Active Filler Type				Filler Source		

MOISTURE DETERMINATION			Specimen manufacture		After Curing	
		Hygroscopic	Sample 1	Sample 2	Dry	Soaked
Pan No.						
Mass wet sample + pan	m_1					
Mass dry sample + pan	m_2					
Mass pan	m_p					
Mass Moisture	$m_1-m_2 = M_m$					
Mass dry sample	$m_2-m_p = M_d$					
Moisture Content	$M_m / M_d \times 100 = M_h$					

Mass of air-dried sample placed in the mixer (kg)						
Percentage of water added to sample for mixing:				Amount of water added:		
Percentage water added to sample for compaction				Amount of water added:		
Total percentage water added:				Total Water added:		
Foamed bitumen addition (%)				Active filler addition (%)		
Foam water injection rate (%)						
Temperatures (°C)	Material:		Bitumen:		Water:	

SPECIMAN DETAILS						
Speciman ID						
Date Moulded						
Date removed from oven						
Date tested						
Diameter (mm)						
Individual height						
measurements (mm)						
Average height (mm)						
Mass after curing (g)						
Bulk Density (kg/m³)						
Average bulk density						
Dry density (kg/m³)						

ITS TEST						
Specimen condition	Unsoaked (ITD_{DRY} / ITS_{EQUIL})			Soaked (ITD_{WET} / ITS_{SOAK})		
Maximum load (kN)						
Internal temperature °C						
Deformation (mm)						
ITS (kPA)						
Average ITS (kPa)						
TSR (%)						

FOAMED BITUMEN MIX DESIGN - WORKSHEET

Project				Date		
Sample / Mix No.:				Location		
Material Description:						
Maximum dry density				Optimum moisture content		
Percentage < 0.075mm			Grading:	Coarse	Medium	Fine
Plasticity Index						
Bitumen Source				Bitumen Type		
Active Filler Type				Filler Source		

MOISTURE DETERMINATION			Specimen manufacture		After Curing	
		Hygroscopic	Sample 1	Sample 2	Dry	Soaked
Pan No.						
Mass wet sample + pan	m_1					
Mass dry sample + pan	m_2					
Mass pan	m_p					
Mass Moisture	$m_1-m_2 = M_m$					
Mass dry sample	$m_2-m_p = M_d$					
Moisture Content	$M_m / M_d \times 100 = M_h$					

Mass of air-dried sample placed in the mixer (kg)					
Percentage of water added to sample for mixing:			Amount of water added:		
Percentage water added to sample for compaction			Amount of water added:		
Total percentage water added:			Total Water added:		
Foamed bitumen addition (%)			Active filler addition (%)		
Foam water injection rate (%)					
Temperatures (°C)	Material:		Bitumen:		Water:

SPECIMAN DETAILS						
Speciman ID						
Date Moulded						
Date removed from oven						
Date tested						
Diameter (mm)						
Individual height						
measurements (mm)						
Average height (mm)						
Mass after curing (g)						
Bulk Density (kg/m^3)						
Average bulk density						
Dry density (kg/m^3)						

ITS TEST						
Specimen condition	Unsoaked (ITD_{DRY} / ITS_{EQUIL})			Soaked (ITD_{WET} / ITS_{SOAK})		
Maximum load (kN)						
Internal temperature °C						
Deformation (mm)						
ITS (kPA)						
Average ITS (kPa)						
TSR (%)						

FOAMED BITUMEN MIX DESIGN - WORKSHEET

Project				Date		
Sample / Mix No.:				Location		
Material Description:						
Maximum dry density				Optimum moisture content		
Percentage < 0.075mm			Grading:	Coarse	Medium	Fine
Plasticity Index						
Bitumen Source				Bitumen Type		
Active Filler Type				Filler Source		

MOISTURE DETERMINATION			Specimen manufacture		After Curing	
		Hygroscopic	Sample 1	Sample 2	Dry	Soaked
Pan No.						
Mass wet sample + pan	m_1					
Mass dry sample + pan	m_2					
Mass pan	m_p					
Mass Moisture	$m_1-m_2 = M_m$					
Mass dry sample	$m_2-m_p = M_d$					
Moisture Content	$M_m / M_d \times 100 = M_h$					

Mass of air-dried sample placed in the mixer (kg)					
Percentage of water added to sample for mixing:			Amount of water added:		
Percentage water added to sample for compaction			Amount of water added:		
Total percentage water added:			Total Water added:		
Foamed bitumen addition (%)			Active filler addition (%)		
Foam water injection rate (%)					
Temperatures (°C)	Material:		Bitumen:		Water:

SPECIMAN DETAILS						
Speciman ID						
Date Moulded						
Date removed from oven						
Date tested						
Diameter (mm)						
Individual height						
measurements (mm)						
Average height (mm)						
Mass after curing (g)						
Bulk Density (kg/m^3)						
Average bulk density						
Dry density (kg/m^3)						

ITS TEST						
Specimen condition	Unsoaked (ITD_{DRY} / ITS_{EQUIL})			Soaked (ITD_{WET} / ITS_{SOAK})		
Maximum load (kN)						
Internal temperature °C						
Deformation (mm)						
ITS (kPA)						
Average ITS (kPa)						
TSR (%)						