

QUICK REFERENCE GUIDE

MICROSURFACING



KENTUCKY TRANSPORTATION CABINET
Division of Maintenance
Operations and Pavement Management Branch
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MAINTENANCE REFERENCE GUIDE TO MICROSURFACING

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INTRODUCTION

MICROSURFACING

Microsurfacing is one of the many preventive maintenance treatments in our tool box. It is a cold-laid, polymer-modified, emulsified asphalt pavement course. Microsurfacing consisting of polymer-modified emulsified asphalt (CQS-1hP), crushed aggregate, mineral filler (Portland cement type 1), water and possibly an additive. Microsurfacing adds extended life to existing pavements, provides a new wearing surface, and adds friction to the roadway. Also microsurfacing can be applied in multiple lifts to correct minor defects in the roadway.

TERMINOLOGY

Microsurface – Consists of cationic (positive charge) polymer-modified emulsified asphalt, crushed aggregate, mineral filler (Portland cement type 1), water and possible additives.

Cape Seal – Chip/Scrub seal followed by a single course microsurface or 5/8 thin lay asphalt. Chip/Scrub seal shall have a cure time of no less than 72 hours and placement of surface treatment shall start before 10 days after the chip/scrub seal.

**CQS-1hP – C = Cationic
QS = Quick set
1 = Lower viscosity
H = Hard base
P = Polymers**



PRECONSTRUCTION

- Approved Mix Design
- PR Information Discussion
- Crack Seal
 - Is there existing crack seal
 - Crack seal part of project
 - Placed 30 days prior to microsurface
- Equipment Calibration
 - Distributor
 - Microsurface Machine
 - Mechanical
 - Electronic
- Staging Area/Stockpile
 - If using 2 types of aggregate proper separation and labeling of stockpiles
- Material Sampling
 - Aggregate (Pretest Informational) (Use gradation from supplemental Spec. 804.04.05)
 - Emulsion (1 sample per lot)
 - Lot number on Bill of Lading
- Traffic Control/Phasing
 - Cones, Pilot truck and flaggers
 - Sand Intersections, crossovers, & turnouts
 - Remove sand when project is complete
- Approaches & Crossovers
 - Single or Double Course
 - Back of radius on approach roads?
 - Paving all crossovers?

CALIBRATION & WALK AROUND

- DISTRIBUTER
 - Proper nozzle size
<https://etnyre.com/wp-content/uploads/2021/09/a-149-19.pdf>
 - 30 degree angle
 - 12" height of bar from pavement
 - Material heated to manufactures' recommendations
 - Tack is diluted 2 to 1
 - Incidental to microsurface
(NO PAY)
 - Application rate .03 to .06 gallons per square yard
 - Look for leaks of any fluids



- MICROSURFACE MECHANICAL MACHINE
 - Mix Design is required
 - Use Proper Calibration Sheet
 - <https://transportation.ky.gov/Construction/Pages/Preventive-Maintenance-Resources.aspx>



- Certification that scales have been calibrated
- **Emulsion**
 - 3 Readings within 2%
 - Be sure to input reading from aggregate counter

- **Aggregate**
 - If you have 2 types of aggregate, you calibrate both.
 - Moisture Content of aggregate is needed
 - Contractor calculates and provides moisture content
 - Aggregate should be screened prior to calibration
 - 3 readings at 3" gate setting
 - Readings within 2%
 - 3 readings at 4" gate setting
 - Readings within 2%
 - 3 readings at 5" gate setting
 - Readings within 2%

- **Cement**
 - 3 Readings within 2%

- **Water**
 - 3 Readings within 2%

Input the % emulsion per mix design at bottom of spreadsheet. Spreadsheet will graph the gate setting for you. Click on graph tab at bottom of spreadsheet.

Once gate setting is established, run the mix and drop a sample of mix in the staging lot and monitor workability and setup time. This safeguards that the material cures properly.

During calibration, inspect all machinery and support trucks for fluid leaks. If there are any fluids leaking from equipment, inform the contractor and ensure the proper repairs are complete before work begins



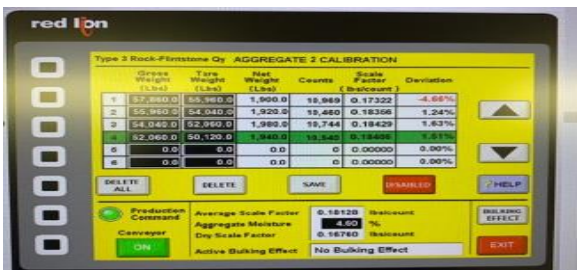
- MICROSURFACE ELECTRONIC MACHINE
 - Mix Design is required
 - Use Proper Calibration Sheets
<https://transportation.ky.gov/Construction/Pages/Preventive-Maintenance-Resources.aspx>



- Certification that scales have been calibrated
- **Emulsions**
 - 3 Readings within 2%
- **Aggregate**
 - 2 types of aggregate, calibrate both types
 - Moisture content of aggregate is needed. Contractor calculates and provides moisture content
 - Aggregate shall be screened prior to calibration
 - 3 Readings within 2%
- **Cement**
 - 3 Readings within 2%
- **Water**
 - 3 Readings within 2%
- **Distance**
 - Layout 1000' strip
 - Take 3 Readings within 2%

Once calibration is complete, run the mix and drop a sample of mix in the staging lot and monitor workability and set time. This safeguards that the material cures properly.

During calibration, inspect all machinery and support trucks for fluid leaks. If there are any fluids leaking from equipment, inform the contractor and ensure the proper repairs are complete before work begins.



WHEN TO RECALIBRATE

- Replacement of emulsion pump
- Replacement of water pump
- Replacement of additive pump
- Replacement of aggregate belt or skirting
- Tips on the pug mill
- Change of mix design
- If changing parts and not sure, just recalibrate

Aggregate Belt



Skirting for aggregate conveyor on Micro Machine

SPREADER BOX COMPONENTS

- Front Seal
 - Contains material inside box
- Runners (Inboard & Outboard)
 - Inboard runners carries weight of box when placing longitudinal joint
 - Outboard runner maintains side seal
- Primary Strike Off
 - Determines your application rate.
 - Rigid (can restore pavement profile)
- Secondary Strike Off
 - Provides finish surface
 - More flexible rubber
- Augers
 - Rear augers bring material to outside of box
 - Front augers bring excess material back to the center of box
- Controls
 - Modifies width, height & shape of material being placed



WEATHER LIMITATIONS

- Ambient temperature 50 degrees and rising
- Pavement Temperature 50 degrees
- No imminent rain in the forecast.
- DO NOT place material between September 30th and May 15th
- No forecast of temperature below 40 degrees within 24 hours after placement
- In a pop up rain event stop placing material immediately. If material starts to run, use a support truck and broadcast aggregate over the microsurfacing. If it rains hard enough, material may need to be removed from roadway.



TRAFFIC CONTROL

- Proper Signs
- Pilot Truck (if needed)
- Flaggers
- Cones and/or Barrels
- Sand roadway where vehicle tires will be turning
- Towel test
 - Use white paper towel on micro to see if material is ready for traffic.
 - Press paper towel on mat, if you see black on paper towel it is not ready but if you just have clear water it is ready for traffic.



SAMPLING MATERIALS

- **Emulsion**
 - 2 one gallon containers per lot
 - More samples may be needed if material is questionable.
 - Lot number shall be on the Bill of Lading(Green Sheet)
 - May need a funnel to get sample or use wide mouth containers for sampling.
- **Aggregate**
 - 1 sample per day of Type II & Type III material used
 - Remember to pretest aggregate prior to beginning production
 - Gradations from Supplemental Specifications 804.04.05 Microsurface Sand equivalent
- **Tack**
 - No sample required (diluted 2 to 1)
- **Mineral Filler (Cement)**
 - On approved Material List for Portland Cement Type 1



SURFACE PREPARATION

- Surface prep is incidental
- Clean roadway of vegetation, loose material, dirt and any other questionable material
- Sweep roadway
- Remove raised/inlaid pavement markers
 - Fill holes from markers with micro, hot mix, or other materials approved by engineer
- Remove thermoplastic
- Ensure pavement has been crack sealed
 - If it has not been crack sealed, is crack seal part of project? If crack seal is part of project, ensure crack seal is placed at least 30 days prior to microsurface.
- Apply tack
 - Diluted 2 to 1 ratio
 - Application rate .03 to .06 gal/sq. yard
 - Never apply tack on top of any microsurfacing material.
 - No sample required because it is diluted



**Not
cleaned
properly**

TEST STRIP

- Prior to production
- 1000' long lane width wide
- Time of day of normal production
 - Daytime or Night time work
- Should be able to hold traffic in 60 minutes
 - Or less if engineer is comfortable with cure time
 - If test strip does not cure in 60 minutes another test strip is required.
- Look for any problems in mix
 - If chevron pattern in mat
 - No cement in mix
 - Box needs adjustment
 - Surface texture looks smooth or slick (should have oatmeal texture)
 - Use a stick and draw a line in mat. If fills with water, too much water in mix.
- Towel Test



CONSTRUCTION OF MICROSURFACE

- Sweep roadway
- Use tar paper or plastic to cover manhole lids, water valves and bridge ends
- **Leveling Course for a Double Micro**
 - Apply tack at .03 to .06 gal/sq. yd.
 - 18 lbs. dry aggregate weight
 - Type III D aggregate always
 - Paid for by the square yard
 - Just meet longitudinal joint no overlap
- **Minor Leveling**
 - Apply tack at .03 to .06 gal/sq. yd.
 - Minimum of 14 lbs. dry aggregate weight
- **Surface Course**
 - **Single Course Micro or Cape Seal (chip seal with micro)**
 - Apply tack at .03 to .06 gal/per. Sq. yd.
 - Type II aggregate
 - Aggregate could be A,B, or D
 - 24 lbs. dry aggregate weight
 - Overlap longitudinal joint with a maximum of 2"
 - Paid by square yard
 - **Double Micro Surface Course**
 - No tack is applied on top of leveling course
 - Type II aggregate
 - Aggregate could be A,B, or D
 - 18 lbs. dry aggregate weight
 - Paid for by square yard

CONSTRUCTION OF MICROSURFACE

- Obtain 3 random yield readings each day
 - Based on dry aggregate weight
- Sand any crossovers, intersections, and turnouts to protect microsurfacing until cured.
 - Remove all sand used once project is complete
- Transverse Joints: DON'T drag box out. Pick box up when full and remove excess material to create a straight line.
- Minimize hand work if possible.



WHAT TO WATCH FOR

- Fluids leaking from any equipment
- Sand falling in front of spreader box
 - Sand will keep micro from bonding to roadway it will bond to sand
 - Could be skirting is worn out
- Material not contained in box
 - Faulty or worn side rubbers on spreader box
 - Excessive amount of water
- Keep mix only halfway or less in spreader box
 - Material can start breaking in box and creating drag marks in the mat.
- Drag Marks in the Mat
 - Buildup on primary or secondary rubbers
 - Material more than halfway up on box
 - Oversized aggregate
 - If oversize aggregate is excessive, ensure that material is being screened or no holes in the screener at staging lot.
 - Contamination in stockpile
 - Brought in with haul trucks
 - Loader scooping dirt or other debris
 - Mud on tires of loader
 - Minor drag marks can be left alone
- Ensure spreader box corners as well as primary and secondary rubbers are cleaned after stops.

- Don't drag out box. Leave enough material in spreader box to get proper thickness. Then pickup box and scrap excess material off roadway to create straight edge for starting
- Blending Type II & Type III aggregates.
 - Pay attention to stockpiles at staging area
 - Blending materials is **NOT** allowed.
- Stringy material coming out behind secondary rubber
 - Check storage tank. Material could be breaking down. Monitor material closely.
- Emulsion CQS-1hP or CQS-1hL
 - Temperatures are best at 80 to 110 degrees
 - Emulsion dropping below 75 degrees may cause material to separate or shear
 - Emulsion over 125 degrees may cause material to break quickly.
 - Emulsion may separate when left in storage tank for multiple days without production. Separation is more probable in early spring and late fall.
 - Excessive pumping of material can shear material apart.
- Tire marks in mat
 - Minor marks can self-correct under traffic
 - Damaged areas shall be corrected by contractor





TROUBLESHOOTING

- **DEBONDING**
 - Petroleum fluids on pavement or leaking from equipment
 - Dirt or debris on roadway
 - Vegetation growing on roadway
 - Aggregate falling in front of spreader box under the paver
 - Lack of tack on existing pavement
 - Traffic on microsurface too soon
 - Dragging box out and not enough material to bond to roadway and/or backing over material and placing more micro.

- **RAVELING**
 - Slight amount of raveling is common
 - Leveling Course will ravel more than surface course
 - Cooler temperatures
 - Micro being placed too thin
 - Traffic allowed on micro too soon
 - Cooler temperatures slows cure time
 - Rain before final cure was achieved

- **WASHBOARD TEXTURE**
 - Paving too fast
 - Rubber strike off needs adjustment

- **CURE TIME TOO FAST**
 - Excessive cement
 - Insufficient additive
 - High ambient/pavement temperature
 - Excessive fines in aggregate
 - Emulsion temperature too hot
 - Too little water
 - Ensure fogging pavement with water in front of spreader box
 - Augers in spreader box are turning the wrong direction

- **CURE TIME TOO SLOW**
 - Insufficient Mineral filler (cement)
 - Reduce additive to mix
 - Reduce water in mix
 - Emulsion formulated for different temperature range

- **SURFACE MAT INCONSISTENCIES**
 - Paving too fast
 - Running material too light
 - Aggregate rolling over crack seal
 - Oversized material
 - Excessive liquids may be floating emulsion to top
 - Use stick and draw a line in material, it should not fill with water
 - Chevron pattern in mat
 - No cement in mix
 - Spreader box too low



Excessive water in mix. Has a slick and smooth appearance. Debonding has occurred and is very slow to cure.



Has a more textured appearance and is not smooth or slick looking. This is a well-constructed microsurface.



Running spreader box out and material is too thin

LIQUIDATED DAMAGES

- Paving completed by September 30th
- Penalty applies from September 30th to November 30th of completion year & May 1st to completion of work the following year.
- With written approval from the engineer, will allow contractors to work October 1st to October 15TH and/or May 1st to May 15th

