Capital Preventive Maintenance – Chip Seals
County Wide

Letting Date – February 12, 2026, 8:30 am

Contractor: _____

Address: _____

_____

Sign & Print: _____

Date: _____

Phone & Fax: _____

Email: _____

Contract Item (Pay Item)	**Pay Unit**	**Unit Price**
Chip Seal, Single	Square Yard	
Chip Seal, Double	Square Yard	
Chip Seal, Prime and Double	Square Yard	
Seal, Polymer Scrub (PASS)	Square Yard	
Raised Pavement Markers	Each	
Seal, Fog	Square Yard	
Seal, Bar 12'-3'	Square Yard	

COMPLETION DATE: Seasonal Limitations per MDOT 2020 Standard Specifications for Construction.
Signed Insurance and Agreement shall be enclosed.

Bids are to be submitted on the Road Commission forms in a plainly marked, sealed envelope. No faxed or emailed bids accepted. Plans and specifications are available online at www.tuscolaroad.org. Please contact Brent Dankert, Tuscola County Highway Engineer at 989-233-7472 or highwayengineer@tuscolaroad.org with any questions. Any addenda must be noted and initialed.

If you are interested in bidding and have downloaded plans from the website please email highwayengineer@tuscolaroad.org to be added to the plan holders list to make sure you receive addendums.

The Contractor has examined the proposal, permits, plans and the location of work described here in and is fully informed as to the nature of the work and the conditions relating to its performance. Proposals will be received from contractors having a current (Ca) prequalification with the Michigan Department of Transportation. All work shall be done in accordance with Section 505 of the 2020 MDOT Standard Specifications for Construction, and as modified herein and as per attached supplemental specifications and provisions.

General:
This work shall be at various locations throughout Tuscola County or state highways under the maintenance jurisdiction of the Tuscola County Road Commission. The work shall consist of one or more applications of bituminous material applied to the prepared surface, and one or more coverings of coarse aggregate applied to the bituminous material.

Schedule:
Contractor shall provide the Tuscola County Road Commission 14 days advance notice prior to mobilize to allow for advance construction signs to be installed and any prep work to be completed.

All interlayers shall be completed by June 30th, in addition to being within seasonal limitations, unless otherwise coordinated with the HMA contractor and approved by the Engineer.

Tuscola County Road Commission will provide a list of projects to the contractor as Townships authorize local road projects, with a complete list by May 1st. Except for interlayer projects, all work shall be completed by the Seasonal Limitations as specified by the 2020 MDOT Standard Specifications for Construction unless otherwise approved by the Engineer**. Liquidated damages may be assessed at a rate of $100.00 per day per project.**

Construction:
The Contractor shall follow the construction methods as described in Section 505.03 of the 2020 MDOT Standard Specifications for Construction except as modified herein:

1. **Bar Seal** - Shall be applied at the width specified, minimum 3' up to 12’ wide as directed by the Engineer. It shall be applied the same as a Single Chip Seal starting at the edge of the existing asphalt.
2. **Scrub Seal** - Shall be installed per the attached special provision.
3. **Loose Gravel Signs** - Contractor shall install Loose Gravel signs with a 35 MPH speed plaque below the sign. Signs shall be placed no greater than ½ mile intervals throughout the project length.
4. **Quality Control** - Shall follow 505.03.G of the MDOT Standard Specification for Construction. A Quality Control Plan and proposed JMFs shall be submitted prior to construction occurring. A Pre-production meeting will be held prior to start up.
5. **Stockpiling of Aggregates** - The contractor shall secure their own stockpile areas at locations near the work. The Road Commission must approve stockpile locations and will require a copy of the contractor's written approval from the property owner. The contractor may use Road Commission Maintenance Garages as stockpile areas; the use of these areas must be coordinated with the Maintenance Department.
6. **Temporary Raised Pavement Markings** - The pavement surface must be clean and dry. Any cold plastic or temporary pavement marking tape shall be removed at this time. Place the marker with protective cap in place on the centerline. The reflector must face on-coming traffic after the cover is removed. Installation is to be made prior to the application of chip seal, and the reflector will protrude above the new material, allowing the centerline to be easily located. The reflector has a protective cap, which is to be removed prior to the road opening to traffic.

Materials:
All materials must meet the requirements under section 505.02 of the 2020 MDOT Standard Specifications for Construction except as modified herein:

1. **Prime Coat** – Shall be SS-1h or Approved Equal. Cost included with other items.
2. **Coarse Aggregate** – Shall be 34CS aggregate as per section 902 of the 2020 MDOT Standard Specifications for Construction. The coarse aggregate shall be from Michigan Department of Transportation tested material or a certified aggregate manufacturer.
3. **Fog Seal** - Per the attached Michigan Department of Transportation Special Provision for Fog Seal.

Equipment Requirements:

All equipment must meet the requirements under Section 505.03 of the 2020 MDOT Standard Specifications for Construction, except as modified herein:

- Pilot Car - Any reference for use of a pilot car shall be deleted.

Traffic Control:
The Road Commission will install "Road Work Ahead" signs prior to the chip seal operations.

1. **Lane Closures**: The contractor shall maintain traffic as per the Tuscola County Road Commission Maintaining Traffic Special Provision attached.
2. **Temporary Road Closures**: Will be allowed if approved by the engineer on a site-specific basis. Type Ill barricades or arrow boards will be required at each end of the project along with a traffic regulator for re-routing traffic.
3. **Temporary Raised Pavement Markers: (Primary roads only)**
   Before applying any asphaltic emulsion that would obliterate existing traffic centerline. The contractor shall place temporary yellow pavement markers on the existing centerline at intervals of not more than 100 feet.

Measurement and Payment:
Contract items shall be invoiced by location. Measurement will be made by the unit specified on page one. Proper material tickets shall be provided with the invoice documenting quantity used of each material.

All invoices **MUST** include the TCRC job number and project location.

Contractors Daily Reports shall also accompany the invoice showing data as specified in section 505.03.F of the MDOT Standard Specifications Book.

The contract unit prices shall be payment in full for all labor, materials, and equipment needed to accomplish the work, including brooming, establishment of yield intervals, maintaining traffic and delayed acceptance inspection.

Warranty:
The Contractor hereby warrants his work and material for one year from date of placement. The Road Commission may choose to hold up to 10% of the project bid cost until the warranty expires.

Delayed Acceptance:
After 30 days from the time of placement of the chip seal, the Road Commission's inspector, in the company of the contractor, if possible, shall inspect the work for any deficiencies. These deficiencies will be limited to surface flushing, surface patterns, or loss of stone retention. All correction work shall be accomplished within seven (9) working days after notification or an agreed upon date. The contractor shall furnish the materials, equipment, and labor to make the identified corrections to the satisfaction of the Road Commission at no additional cost to the Road Commission.

Liability:
The Contractor shall at all times exercise extreme care and shall assume all liability for any damages resulting from his operations and shall hold the Tuscola County Road Commission harmless from any such claims or damages.

The contractor must obtain a Tuscola County Right of Way Permit before any work can begin. The successful bidder must also furnish certificates or policies giving satisfactory evidence of insurance coverage in accordance with *Tuscola County Road Commission Policies and Procedures Manual Section 9.7 Insurance Requirements*, to ensure adequate payment for any damage caused by his operations.

The contractor shall, prior to the start of work, file with the Tuscola County Road Commission a certificate of Workmen's Compensation Insurance. The attached certificate of insurance is required for the successful bidder or bidders.

Non-Compliance with Project Specifications Provisions:
Any variation from the specifications of the project herein without written approval from the Tuscola County Road Commission and/or its authorized representative may result in, at the discretion of the Road Commission, the voiding and/or canceling of the acceptance of any bid and/or contract, resulting from this project.

The Board reserves the right to accept or reject any or all proposals and to re- advertise or to accept the proposal, which in their opinion, is in the best interest of Tuscola County.

Attachments:
1. Title IV and VI Compliance
2. Agreement
3. Tuscola County Right of Way Permit
4. Traffic Control Policy
5. Insurance Policy
6. Special Provision – Fog Seal
7. Special Provision - Polymer Scrub Seal

TUSCOLA COUNTY ROAD COMMISSION
TITLE IV COMPLIANCE
APPENDIX A

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations: The contractor shall comply with the Regulations relative to non-discrimination in Federally-assisted programs of the Department of Transportation, Title 49, code of Federal Regulations, Part 21 as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
2. Non-discrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment.
3. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulation, including employment practices when the contractor covers a program set forth in Appendix B of the Regulations.
4. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to non-discrimination on the grounds of race, color, or national origin.
5. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities us may be determined by the Tuscola County Road Commission to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses this information, the contractor shall so certify to the State high· way department, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.
6. Sanctions for Non-compliance: In the event of the contractor's non-compliance with the non-discrimination provisions of this contract, the Tuscola County Road Commission Shall Impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:
    a) Withholding of payments to the contractor under the contract until the contractor complies, and/or
    b) Cancellation, termination, or suspension of the contract, in whole or in part.
7. Incorporation of Provisions: The contractor shall Include the provisions of paragraphs (l) through (6) in every subcontract, including procurement of materials and leases of equipment, unless exempt by the Regulations, or directives Issues pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Tuscola County Road Commission may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event u contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Tuscola County Road Commission to enter into such litigation to protect the interests of the County, and, in addition, the contractor may request the State highway department to enter into such litigation to protect the interests of the State and/or the United States to enter into such litigation to protect the interests of the United States.

"The TUSCOLA COUNTY ROAD COMMISSION, in accordance with Title VI of the Civil Rights Act of 1964, 78-252, 42 U.S.C. 2000d-222d-4, the Civil Rights Act of 1987, P.L. 100-259, and Title 49, Code of Federal Regulations, Department of Transportation, subtitle A, Office of the Secretary, Part 21, Non- discrimination 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 contract entered into pursuant to this advertisement, Disadvantaged Business Enterprise firms will be afforded full oppo1iunity to submit bids in response to this invitation and will not be discriminated against on the grounds of Race, Color, Sex, Age, National Origin, or Handicap in consideration for an award. For additional compliance information, please see Appendix A."

AGREEMENT

TUSCOLA COUNTY ROAD COMMISSION – 1733 S. MERTZ ROAD, CARO, MI 48723

This agreement made this _____day of_____, 20_____
by and between the Board of Tuscola County Road Commissioners and _____
_____.

1. _____hereby agrees to undertake the following work in the status of an independent contractor performing the following job:
   _____
   _____
   _____.

2. Said contractor, _____, shall at all times exercise extreme care and shall assume any and all liability for property damage or bodily injury resulting from the above operation by this employees, agents, assigns, sub-contractors and anyone else acting under his control or direction; and will indemnify, hold harmless and defend the Tuscola County Road Commission, its Commissioners or employees from any and all claims for property damage or bodily injury arising out of this Agreement.

3. Said contractor, _____, while engaged in said job shall maintain and furnish certificates of insurance, naming the Tuscola County Road Commission and Commissioners as an additional insured under the policy, with policy limits of $500,000/$1,000,000 for property damage and bodily injury, and shall furnish the Tuscola County Road Commission copies of said certificates of insurance prior to commencing any work on said project.
   Additionally, said contractor, _____, shall furnish prior to start of said job with the Board of Tuscola County Road Commissioners, a policy of insurance certifying he carries and has in effect worker's compensation insurance on all those required to be covered under Michigan law.

4. The address of the Board of Tuscola County Road Commissioners is 1733 S, Mertz Rd., Caro, MI 48723.

Witnessed:

_____ _____
Board of Tuscola County Road Commissioners

_____ _____
Contractor

Contractor bid will not be accepted unless the enclosed Agreement is Signed and Returned with you bid.

TUSCOLA COUNTY ROAD COMMISSION

Right - of - Way Permit Worksheet

Permit Fees & Proof of Insurance are required prior to review of the permit application

Date: _____

Applicant/Property Owner:

Name: _____

Address: _____

_____

Phone: _____

Email: _____

Signature: _____

Contractor:

Name: _____

Adddress: _____

_____

Phone: _____

Email: _____

Signature: _____

Project Locations:

Address: _____

Road: _____

Between: _____

And: _____

Township: _____ Section: _____

Project Description:

_____

_____

_____

_____

_____

Type of Work:

Driveway: *Commercial ☐ Residential/Farm ☐

Special Use: Utility ☐ Yard Enclosure ☐

Road Crossing: Bore ☐ Open Cut ☐

Misc.: ☐ _____

Material: *(If Known)*

**Pipe/Culvert Material: _____

Pipe/Culvert Diameter: _____

Pipe/Culvert Length: _____

***Backfill Material: _____

Reviewer's Recommendations:

_____

_____

_____

_____

Additonal Permit Standards & Policies apply, availible upon Request

Reviewer's Signature: _____

****Plastic, Concrete, or CMP (CMP may be purchased thru TCRC if placed in R-O-W)***

Flagged: _____

*****A Copy of the Certified Mechanical Analysis & the Density Report are required for material placed under roadway***

8. TRAFFIC CONTROL POLICY

PURPOSE

The Tuscola County Road Commission manages traffic operations throughout the county and local road network to minimize vehicle crashes and maximize mobility.

POLICY

Traffic shall be maintained in accordance with Sections 812 and 922 of the 2020 Michigan Department of Transportation (MDOT) Standard Specifications for Construction, including any Supplemental Specifications, and as herein specified.

LOCATION OF WORK

A. **Work outside of the shoulder** – occurs when equipment, personnel, and/or material "is confined to an area 5 feet or more from the edge of the traveled way"
B. **Work on the shoulder**– when equipment, personnel, and/or material is confined to the shoulder without reducing any width of the traveled way. Edge of pavement to 5 feet.
C. **Work within the traveled way** – work that exceeds the definition of any work previously described in parts A through B.

Location A. signing for work outside of the shoulder shall be according to the MDOT Maintaining Traffic typical 4000-M-SHL-OUT. Additional signage maybe required at Engineers discretion depending on number of personal & equipment in the ROW.

Location B. signing for a shoulder closure shall be according to attached MDOT Maintaining Traffic Typical 122-NFW-SHL-(R).

Location C. work that exceeds the boundaries set by Parts A and B shall be completed in a single lane closure detailed according to a MDOT typical 110-TR-NFW-2L. Any alterations to this typical must be approved by the engineer prior to implementation of the TTC plan.

CONSTRUCTION INFLUENCE AREA

The construction influence area (CIA) shall consist of the width of the project right-of-way from 3,500 feet before the project P.O.B. to 3,500 feet beyond the project P.O.E. and 1,500 feet in all directions along all crossroads.

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TRAFFIC CONTROL DEVICES

All traffic control devices and their usage shall conform to the Michigan Manual on Uniform Traffic Control Devices (MMUTCD), 2011 edition as amended, and as herein specified.

Sign covers shall be placed over existing regulatory, warning and construction signs that are not applicable during construction.

Arrow boards are to be placed and used in a manner that allows for the signal board to be "clearly legible at distances from 2500 feet to 200 feet, from all traffic lanes and roadway entrances. Do not place the lighted arrow on a horizontal or vertical curve that might interfere with this legibility requirement" – MDOT typical Sheet 104-GEN-AB.

Reflective sheeting must meet or exceed the requirements of ASTM D4956 for Type VIII reflective sheeting on rigid signs. Reflective sheeting must meet or exceed the requirements of ASTM D4956 for Type VI reflective sheeting on flexible, roll-up signs. Orange sheeting must be fluorescent orange reflective sheeting.

FLAGGER/TRAFFIC REGULATORS

Traffic regulators are required to have completed the Michigan Traffic Regulator training within 12 months prior to performing any traffic regulating duties.

Traffic regulators and workers must conform with paragraph 4 of Section 6D.03 (MMUTCD) as quoted below.

Traffic Control for a one-lane, two-way traffic control shall be conducted in accordance with Section 6C.11 of the MMUTCD and as herein modified.

"Traffic should be controlled by a traffic regulator at each end of a constricted section of roadway. One of the traffic regulators should be designated as the coordinator. To provide coordination of the control of the traffic, traffic regulators should be able to communicate with each other orally, electronically, or with manual signs. These manual signals should not be mistaken for traffic regulating signals. Any alternative options must be approved by the engineer."

Alternatively, traffic control may be conducted via an automated flagger assistance device or pilot car as stated by the MMUTCD, except as modified herein w/ prior approval from the Engineer.

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ALL WORKERS IN ROW

"All workers, including emergency responders, within the right-of-way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to work vehicles and construction equipment with the Temporary Traffic Control (TTC) zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure, except as provided in Paragraph 5 (MMUTCD). A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment."

WORK DURATION

Work duration is a major factor in determining the number and types of devices used in TTC zones. The duration of a TTC zone is defined relative to the length of time a work operation occupies a spot location.

Standard

The four categories of work duration and their time at a location shall be:

A. Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days or more.
B. Short-term stationary is daytime work that occupies a location for more than 1 hour within a single daylight period.
C. Short duration is work that occupies a location up to 1 hour.
D. Mobile is work that moves intermittently or continuously."

In addition, work shall be conducted during daylight hours only. No work shall be conducted on Sundays unless approved by the Engineer. The maximum distance between the traffic regulators shall be no more than 2 miles in length. All sequences of more than 2 miles in length will require written permission from the Engineer before proceeding.

Traffic Control for work conducted on the shoulder shall be in accordance with section 6H.01 of the MMUTCD as modified herein.

a. **Short duration or mobile operations on the shoulder** – "Stationary warning signs may be omitted if the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights. If an arrow board is used, the caution mode shall be used. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress."
b. **Short-term or intermediate-term work on the shoulder without encroachment** – "When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain

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within the traveled way. Alternatively, traffic regulation shall be in accordance with MDOT typical 122-NFW-SHL-(R)."

c. **Work on the shoulder with encroachment** – "Where the opposite shoulder is suitable for carrying vehicular traffic and of an adequate width, lanes may be shifted by use of closely-spaced channelizing devices, provided that the minimum lane width of 10 feet is maintained. Otherwise, a lane closure shall be employed in accordance with MDOT typical 110-TR-NFW-2L."
d. Work extending beyond the criteria above shall have traffic control in accordance with MDOT typical 110-TR-NFW-2L or result in a full road closure.

ATTACHMENTS

Maintaining Traffic Typicals can also be found on MDOT's website: https://mdotjboss.state.mi.us/TSSD/tssdHome.htm.

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DISTANCE BETWEEN TRAFFIC SIGNS, "D"

"D" DISTANCES	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)										
	25	30	35	40	45	50	55	60	65	70	75
D (FEET)	250	300	350	400	450	500	550	600	650	700	750

GUIDELINES FOR LENGTH OF LONGITUDINAL BUFFER SPACE, "B"

"B" LENGTHS	SPEED* MPH (PRIOR TO WORK AREA)											
	20	25	30	35	40	45	50	55	60	65	70	75
B (FEET)	33	50	83	132	181	230	279	329	411	476	542	625

* POSTED SPEED, OFF-PEAK 85TH PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED.

MINIMUM MERGING TAPER LENGTH, "L" (FEET)

OFFSET (FEET)	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)										
	25	30	35	40	45	50	55	60	65	70	75
1	11	15	21	27	45	50	55	60	65	70	75
2	21	30	41	54	90	100	110	120	130	140	150
3	32	45	62	80	135	150	165	180	195	210	225
4	42	60	82	107	180	200	220	240	260	280	300
5	53	75	103	134	225	250	275	300	325	350	375
6	63	90	123	160	270	300	330	360	390	420	450
7	73	105	143	187	315	350	385	420	455	490	525
8	84	120	164	214	360	400	440	480	520	560	600
9	94	135	184	240	405	450	495	540	585	630	675
10	105	150	205	267	450	500	550	600	650	700	750
11	115	165	225	294	495	550	605	660	715	770	825
12	125	180	245	320	540	600	660	720	780	840	900
13	136	195	266	347	585	650	715	780	845	910	975
14	146	210	286	374	630	700	770	840	910	980	1050
15	157	225	307	400	675	750	825	900	975	1050	1125

NOT TO SCALE

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL	"B", "D" AND "L" TABLES CHANNELIZING DEVICE SPACING, SIGN BORDER KEY, AND ROLL-AHEAD SPACING	DATE: MAY 2021
FILE: 101-GEN-SPACING-CHARTS.dgn		NO: 101-GEN-SPACING-CHARTS		SHEET: 1 OF 3

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THE FORMULAS FOR THE MINIMUM LENGTH OF A MERGING TAPER IN DERIVING THE "L" VALUES SHOWN IN THE ABOVE TABLES ARE AS FOLLOWS:

"L" = $\frac{W \times S^2}{60}$ WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 40 MPH OR LESS

"L" = W X S WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 45 MPH OR GREATER

L = MINIMUM LENGTH OF MERGING TAPER
S = POSTED SPEED LIMIT IN MPH PRIOR TO WORK AREA
W = WIDTH OF OFFSET

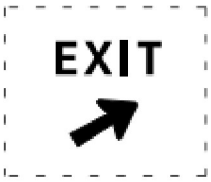
TYPES OF TAPERS	TAPER LENGTH
UPSTREAM TAPERS	
MERGING TAPER	L - MINIMUM
SHIFTING TAPER	1/2 L - MINIMUM
SHOULDER TAPER	1/3 L - MINIMUM
2 TO 1 LANE ROAD TAPER	100' - MAXIMUM
DOWNSTREAM TAPERS (USE IS RECOMMENDED)	100' (PER LANE)

MAXIMUM SPACING FOR CHANNELIZING DEVICES

WORK ZONE SPEED LIMIT	DRUM AND 42" DEVICE SPACING (FT)		NIGHTTIME 42" DEVICE SPACING (FT)	
	TAPER	TANGENT	TAPER	TANGENT
< 45 MPH	1 x SPEED LIMIT	2 x SPEED LIMIT	25 FEET	50 FEET
≥ 45 MPH	50 FEET	100 FEET	25 FEET	50 FEET

SIGN OUTLINE KEY

DASHED OUTLINES INDICATE A SIGN THAT EXISTS ON SITE, AND NEEDS TO BE COVERED.



SOLID OUTLINES INDICATE A SIGN THAT IS TO BE PLACED ON THE PROJECT

NOT TO SCALE

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL	"B", "D" AND "L" TABLES CHANNELIZING DEVICE SPACING SIGN BORDER KEY AND ROLL-AHEAD SPACING	DATE: MAY 2021
FILE: 101-GEN-SPACING-CHARTS.dgn		NO: 101-GEN-SPACING-CHARTS		SHEET: 2 OF 3

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GUIDELINES FOR ROLL-AHEAD DISTANCES FOR TMA VEHICLES - TEST LEVEL 2

WEIGHT OF TMA VEHICLE	PREVAILING SPEED (POSTED SPEED PRIOR TO WORK ZONE)	ROLL-AHEAD DISTANCE* (DISTANCE FROM FRONT OF TMA VEHICLE TO WORK AREA)
5.5 TONS (STATIONARY)	40 MPH OR LESS	25 FT

* ROLL-AHEAD DISTANCES ARE CALCULATED USING A 4,410 POUND IMPACT VEHICLE WEIGHT.

GUIDELINES FOR ROLL-AHEAD DISTANCES FOR TMA VEHICLES - TEST LEVEL 3

WEIGHT OF TMA VEHICLE	PREVAILING SPEED (POSTED SPEED PRIOR TO WORK ZONE)	ROLL-AHEAD DISTANCE* (DISTANCE FROM FRONT OF TMA VEHICLE TO WORK AREA)
5 TONS (MOBILE)	45 MPH	100 FT
	50-55 MPH	150 FT
	60-75 MPH	175 FT
12 TONS (STATIONARY)	45 MPH	25 FT
	50-55 MPH	25 FT
	60-75 MPH	50 FT

* ROLL-AHEAD DISTANCES ARE CALCULATED USING A 10,000 POUND IMPACT VEHICLE WEIGHT.

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL	"B", "D" AND "L" TABLES CHANNELIZING DEVICE SPACING SIGN BORDER KEY AND ROLL AHEAD SPACING	DATE: MAY 2021
FILE: 101-GEN-SPACING-CHARTS.dgn		NO: 101-GEN-SPACING-CHARTS		SHEET: 3 OF 3

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THE FOLLOWING NOTES APPLY IF CALLED FOR ON THE TRAFFIC TYPICAL

GENERAL NOTES

G1: SEE GEN-SPACING-CHARTS FOR COMMON VALUES INCLUDING:
D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES
L = MINIMUM LENGTH OF TAPER
B = LENGTH OF LONGITUDINAL BUFFER
ROLL AHEAD DISTANCE

G2: DISTANCE BETWEEN SIGNS, "D", THE VALUES FOR WHICH ARE SHOWN IN TYPICAL GEN-KEY ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.

G3: ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING MUST MEET NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM REPORT 350 (NCHRP 350) TEST LEVEL 3, OR MANUAL FOR ASSESSING SAFETY HARDWARE (MASH) TL-3 AS WELL AS THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.

G4: DO NOT STORE EQUIPMENT, MATERIALS OR PERFORM WORK IN ESTABLISHED BUFFER AREAS.

G5: ALL EXISTING PAVEMENT MARKINGS WHICH ARE IN CONFLICT WITH EITHER PROPOSED CHANGES IN TRAFFIC PATTERNS OR PROPOSED TEMPORARY TRAFFIC MARKINGS SHALL BE REMOVED BEFORE ANY CHANGE IS MADE IN THE TRAFFIC PATTERN. EXCEPTION WILL BE MADE FOR TRAFFIC PATTERNS FOR WORK LESS THAN THREE DAYS THAT ARE ADEQUATELY DELINEATED BY OTHER TRAFFIC CONTROL DEVICES.

SIGN NOTES

S1: ALL NON-APPLICABLE SIGNING WITHIN THE CIA MUST BE MODIFIED TO FIT CONDITIONS, COVERED, OR REMOVED. FOR GUIDANCE SEE THE WORK ZONE SAFETY AND MOBILITY MANUAL, SECTIONS 6.01.09 AND 6.01.10.

S2: R5-1Bb SIGNS ARE ONLY REQUIRED ON FREEWAY PROJECTS WITH A DURATION OF 15 DAYS OR LONGER OR NON-FREEWAY PROJECTS WITH A DURATION OF 90 DAYS OR LONGER. TO APPLY THIS TYPICAL WITHOUT R5-1Bb SIGNS, REMOVE THE SIGNS AND CONSOLIDATE THE SEQUENCE AS APPROPRIATE.

S3: R5-1Bc IS ONLY REQUIRED IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. OMIT THIS SIGN IN SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE.

S4: ADDITIONAL SIGNING AND/OR ELONGATED SIGNING SEQUENCES SHOULD BE USED WHEN TRAFFIC VOLUMES ARE SIGNIFICANT ENOUGH TO CREATE BACKUPS BEYOND THE W20-5 SIGNS.

S5: PLACE ADDITIONAL SPEED LIMIT SIGNS REFLECTING THE WORK ZONE SPEED AFTER EACH MAJOR CROSSROAD THAT INTERSECTS THE WORK ZONE, OR AFTER EACH ENTRANCE RAMP THAT COMES ONTO THE FREEWAY WHERE THE REDUCED SPEED IS IN EFFECT. PLACE ADDITIONAL SPEED LIMIT SIGNS AT INTERVALS ALONG THE ROADWAY SUCH THAT NO SPEED LIMIT SIGNS ARE MORE THAN 2 MILES APART. WHEN REDUCED SPEED LIMITS ARE UTILIZED IN THE WORK AREA, PLACE ADDITIONAL SPEED LIMIT SIGNS RETURNING TRAFFIC TO ITS NORMAL SPEED BEYOND THE LIMITS OF THE WORK AREA AS INDICATED, IF PERMANENT SIGNS DISPLAYING THE CORRECT SPEED LIMIT ARE POSTED, OMIT ALL W3-5b AND R2-1 SIGNS AND REDUCE SPACING ACCORDINGLY.

S6: FABRICATE SPECIAL SIGNS IN ACCORDANCE WITH CURRENT SIGNING DESIGN STANDARDS.

S7: PLACE ADDITIONAL R8-3 SIGNS AT A MAXIMUM 500' SPACING THROUGHOUT THE WORK ZONE.

S8: WHEN SPEED LIMIT SIGNS CANNOT BE PLACED SIDE BY SIDE AS SHOWN, PLACE THEM "D" DISTANCE APART.

S9: STOP SIGNS NOT REQUIRED IF SIGNALS ARE ON 4-WAY FLASHING RED. STOP AHEAD SIGNS ARE NOT REQUIRED IF THERE IS ADEQUATE VISIBILITY OF THE STOP SIGN OR IF SIGNALS ARE BEING USED TO CONTROL TRAFFIC.

S10: PLACE REDUCED SPEED ZONE AHEAD SIGN (W3-5b) HERE WHEN USING A SPEED REDUCTION IN THIS DIRECTION.

S11: THE NUMBER OF W1-6 SHIFT SIGNS TO PLACE FOR A SHIFT IS AS FOLLOWS:
SHIFTS 4FT OR LESS, PLACE ONE W1-6(R)(L)
SHIFTS 5FT TO 12FT, PLACE TWO W1-6(R)(L)
SHIFTS MORE THAN 12FT, PLACE THREE OR MORE W1-6(R)(L) SIGNS DEPENDING UPON LENGTH OF SHIFT AND AS PER THE ENGINEER.

S12: PLACE R2-1 SIGNS AS DETAILED IN NOTE S5 WHEN THERE IS A SPEED REDUCTION IN THIS DIRECTION

TRAFFIC REGULATOR NOTES

TR1: TRAFFIC REGULATORS MUST FOLLOW ALL THE REQUIREMENTS IN THE STANDARD SPECIFICATIONS, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS, THE CURRENT VERSIONS OF THE TRAFFIC REGULATOR'S INSTRUCTION MANUAL AND THE VIDEO "HOW TO SAFELY REGULATE TRAFFIC IN MICHIGAN". THE MAXIMUM DISTANCE BETWEEN THE TRAFFIC REGULATORS IS DETERMINED BY THE ROADWAY ADT, GEOMETRICS, AND AS DIRECTED BY THE ENGINEER.

TR2: PROVIDE APPROPRIATE BALLOON LIGHTING TO SUFFICIENTLY ILLUMINATE TRAFFIC REGULATOR'S STATIONS WHEN TRAFFIC REGULATING IS ALLOWED DURING THE HOURS OF DARKNESS.

TR3: PROVIDE EITHER A STOP/SLOW AFAD OR A RED/YELLOW LENS AFAD, MEETING THE REQUIREMENTS OF THE MMUTCD

TEMPORARY TRAFFIC CONTROL DEVICE NOTES

TCD1: THE MAXIMUM DISTANCE IN FEET BETWEEN CHANNELIZING DEVICES IN A TAPER SHOULD NOT EXCEED 1.0 TIMES THE WORK ZONE SPEED LIMIT IN MPH FOR ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT LESS THAN 45 MPH AND SHOULD NOT EXCEED 50 FEET ON ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT OF 45 MPH OR GREATER. THE SPACING FOR 42 INCH CHANNELIZING DEVICE TAPERS ARE NOT TO EXCEED 25 FEET AT NIGHT.

TCD2: THE MAXIMUM DISTANCE IN FEET BETWEEN CHANNELIZING DEVICES IN A TANGENT SHOULD NOT EXCEED TWICE THE WORK ZONE SPEED LIMIT IN MPH FOR ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT LESS THAN 45 MPH AND SHOULD NOT EXCEED 100 FEET ON ROADWAYS WITH A POSTED WORK ZONE SPEED LIMIT OF 45 MPH OR GREATER. THE SPACING FOR 42 INCH CHANNELIZING DEVICE TANGENTS ARE NOT TO EXCEED 50 FEET AT NIGHT.

TCD3: TYPE III BARRICADES MUST BE LIGHTED FOR OVERNIGHT CLOSURES.

TCD4: WHEN THE HAUL ROAD IS NOT IN USE, PLACE LIGHTED TYPE III BARRICADES WITH "ROAD CLOSED" EXTENDING COMPLETELY ACROSS THE HAUL ROAD.

TCD5: USE OBJECT MARKER SIGNS IN LIEU OF THE TYPE B HIGH INTENSITY LIGHT SHOWN IN THE STANDARD PLAN FOR TEMPORARY CONCRETE BARRIER (R-53, AND R-126) WHEN USED WITH A TEMPORARY SIGNAL SYSTEM. THE OBJECT MARKERS MUST BE A MINIMUM OF 12 INCHES IN WIDTH AND 36 INCHES IN HEIGHT AND HAVE ORANGE AND WHITE RETROREFLECTIVE SHEETING. THE RETROREFLECTIVE SHEETING MUST HAVE ALTERNATING DIAGONAL ORANGE AND WHITE STRIPES SLOPING DOWNWARD AT AN ANGLE OF 45 DEGREES IN THE DIRECTION VEHICULAR TRAFFIC IS TO PASS.

TCD6: PLACE LIGHTED ARROW PANELS AS CLOSE TO THE BEGINNING OF TAPERS AS PRACTICAL, BUT NOT IN A MANNER THAT WILL OBSCURE OR CONFUSE APPROACHING MOTORISTS WHEN PHYSICAL LIMITATIONS RESTRICT PLACEMENT. IN CURBED SECTIONS, IF ARROW BOARD CANNOT BE PLACED BEHIND CURB, PLACE ARROW BOARD IN THE CLOSED LANE AS CLOSE TO THE BEGINNING OF TAPER AS POSSIBLE.

TCD7: ADDITIONAL TYPE III BARRICADES MAY BE REQUIRED TO COMPLETELY CLOSE OFF ROAD FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT.

TCD8: WHERE THE SHIFTED SECTION IS SHORTER THAN 600 FEET, A DOUBLE REVERSE CURVE SIGN (W24-1) CAN BE USED INSTEAD OF THE FIRST REVERSE CURVE SIGN, AND THE SECOND REVERSE CURVE SIGN CAN BE OMITTED.

TCD9: RUMBLE STRIPS ARE TO BE PLACED AS SPECIFIED IN THE CONTRACT. IF NOT SPECIFIED IN THE CONTRACT, PLACE RUMBLE STRIPS AS SHOWN, AND IN ACCORDANCE WITH THE RUMBLE STRIP MANUFACTURER'S RECOMMENDATIONS. AN ARRAY OF RUMBLE STRIPS CONTAINS THREE RUMBLE STRIPS. PLACE THE RUMBLE STRIPS IN THE ARRAY AT A CONSISTENT DISTANCE, BETWEEN 10' AND 20' APART.

TCD10: SEE THE WORK ZONE SAFETY AND MOBILITY MANUAL, PORTABLE CHANGEABLE MESSAGE SIGN GUIDELINES FOR RECCOMENDED AND CORRECT PCMS MESSAGING. STAGGER PCMS THAT ARE ON OPPOSING SIDES OF THE ROAD 1000 FEET FROM EACH OTHER.

RAMP NOTES

RMP1: WHEN CONDITIONS ALLOW, E5-1 SIGNS MUST BE REMOVED OR COVERED AND CHANELIZING DEVICES MUST BE POSITIONED TO ENABLE RAMP TRAFFIC TO DIVERGE IN A FREE MANNER

RMP2: STOP AND YIELD CONDITIONS SHOULD BE AVOIDED WHENEVER PRACTICAL. WHEN CONDITIONS WARRANT, R1-1 SIGNS MAY BE USED IN PLACE OF R1-2 SIGNS. WHEN R-1 SIGNS ARE USED, W3-1 SIGNS MUST BE USED IN PLACE OF W3-2 SIGNS. CONSIDERATION SHOULD BE GIVEN TO CLOSING THE RAMP TO COMPLETE WORK TO ALLOW AN ADEQUATE MERGE DISTANCE. WORK SHOULD BE EXPEDITED TO AVOID THE STOP AND/OR YIELD CONDITIONS.

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL NO: 102-GEN-NOTES	TRAFFIC TYPICALS NOTE SHEET	DATE: MAY 2022 SHEET: 1 OF 2
FILE: 102-GEN-NOTES.dgn				

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THE FOLLOWING NOTES APPLY IF CALLED FOR ON THE TRAFFIC TYPICAL

SIGNAL NOTES

SIG1: EXISTING SIGNAL MUST BE EITHER 4-WAY FLASHING RED, BAGGED, OR TURNED OFF.

SIG2: SIGNAL IS IN OPERATION.

SIG3: DELINEATE THE WORK ZONE AREA WITH 28 INCH CONES FOR DAYTIME WORK, OR 42 INCH CHANNELIZING DEVICES FOR NIGHTTIME WORK.

SIG4: THE CONTRACTOR MUST HAVE A DESIGNATED SPOTTER IF THE AERIAL BUCKET TRUCK IS LOCATED OVER ACTIVE TRAVEL LANES.

SIG5: THE LOWEST POINT OF THE BUCKET MAY NOT TRAVEL BELOW 14 FOOT VERTICAL CLEARANCE. THE CONTRACTOR MUST UTILIZE AN ALTERNATE SET UP, OR PLACE THE INTERSECTION IN A 4 WAY STOP IF THE 14 FOOT VERTICAL CLEARANCE IS COMPROMIZED. USE TRAFFIC REGULATORS TO CONTROL TRAFFIC THROUGH THE INTERSECTION WHEN TRAFFIC IS PLACED IN A 4 WAY STOP.

SIG6: DELINEATE THE TRUCK WITH CHANNELIZING DEVICES. THE POSITION OF THE TRUCK MAY BE MOVED TO FACILITATE WORK.

MAINTENANCE AND SURVEYING NOTES

MS1: WHENEVER STOPPING SIGHT DISTANCE EXISTS TO THE REAR, THE SHADOW VEHICLES SHOULD MAINTAIN THE RECOMENDED DISTANCE FROM THE WORK AREA AND PROCEEED AT THE SAME SPEED. THE SHADOW VEHICLE SHOULD SLOW DOWN AND TRAVEL AT A FARTHER DISTANCE TO PROVIDE ADEQUATE SIGHT DISTANCE IN ADVANCE OF VERTICAL OR HORIZONTAL CURVES.

MS2: WORKERS OUTSIDE OF VEHICLES SHOULD WORK WITHIN 150' OF WORK VEHICLES WITH AN ACTIVATED BEACON. BETWEEN THE "BEGIN WORK CONVOY" SIGN AND THE "END WORK CONVOY" SIGN, OR BETWEEN THE "WORK ZONE BEGINS" AND "END ROAD WORK" SIGN.

MS3: WORK OR SHADOW VEHICLES WITH OR WITHOUT A TMA MAY BE USED TO SEPARATE THE WORK SPACE FROM TRAFFIC, IF USED, THE VEHICLES SHOULD BE PARKED ACCORDING TO THE ROLL AHEAD DISTANCE TABLES.

MS4: WORK AND SHADOW VEHICLES SHALL BE APPROPRIATELY EQUIPPED WITH AN ACTIVATED AMBER BEACON.

MS5: WHEN WORKERS ARE OUTSIDE THEIR VEHICLES IN AN EXISTING LANE WHILE A MOBILE OPERATION IS OCCURRING DURING THE NIGHTTIME HOURS, CHANNELIZING DEVICES TO DELINEATE OPEN OR CLOSED LANES AT 50 FT SPACING MUST BE USED. AN EXAMPLE OF AN OPERATION (BUT NOT LIMITED TO) IS THE LAYOUT OF CONCRETE PATCHES.

MS6: W21-6 AND W20-1 SIGNS MAY BE SUBSTITUTED AS DETERMINED BY THE TYPE OF WORK TAKING PLACE AS PER THE ENGINEER.

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL NO: 102-GEN-NOTES	TRAFFIC TYPICALS NOTE SHEET	DATE: MAY 2022 SHEET: 2 OF 2
FILE: 102-GEN-NOTES.dgn				

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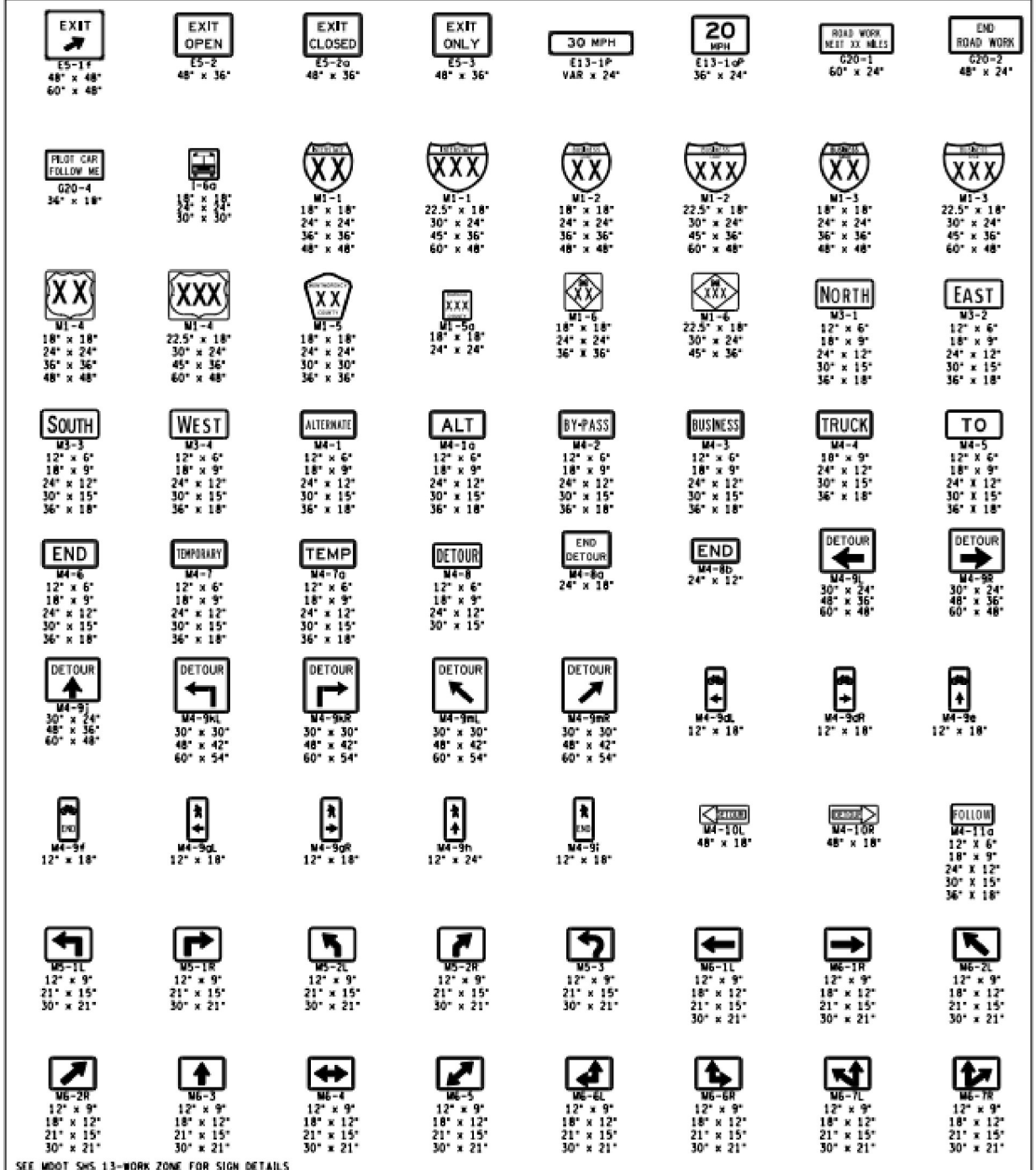
SIGN NUMBER KEY



SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL NO: 103-GEN-SIGN	TRAFFIC TYPICALS SIGN SHEET	DATE: JUNE 2021 SHEET: 1 OF 5
FILE: 103-GEN-SIGN.dgn				

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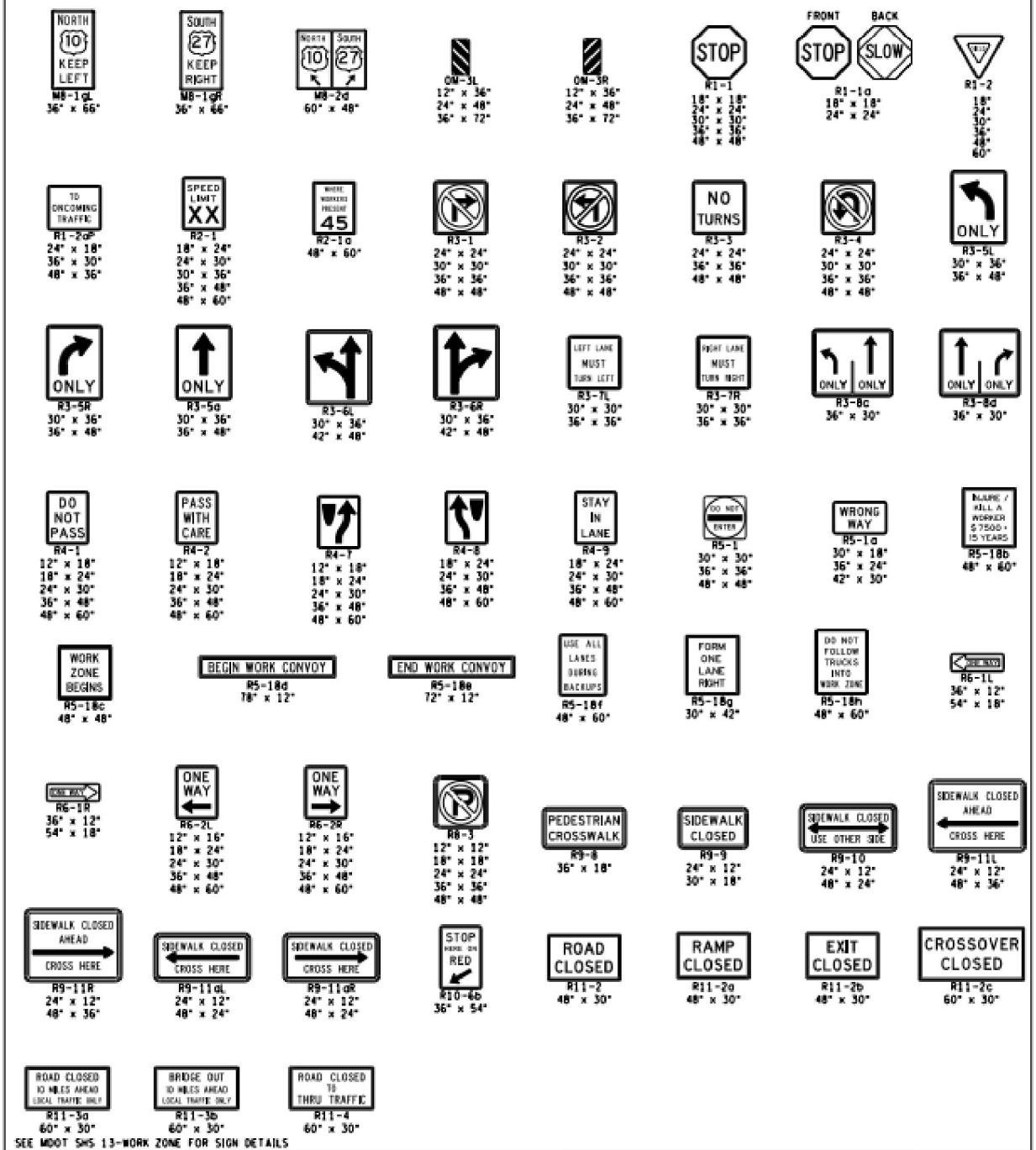

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

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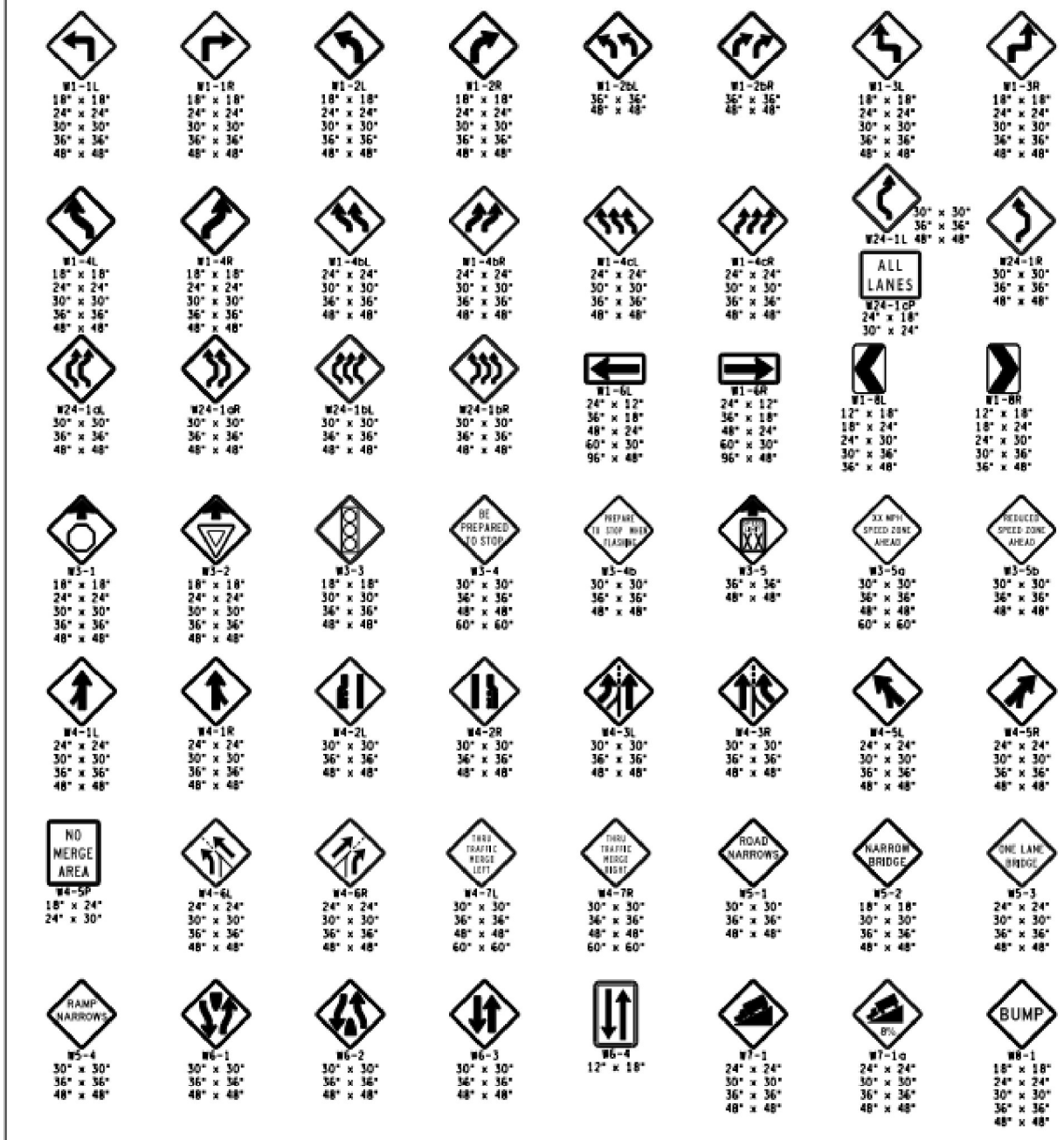

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

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FILE: 103-GEN-SIGN.dgn				

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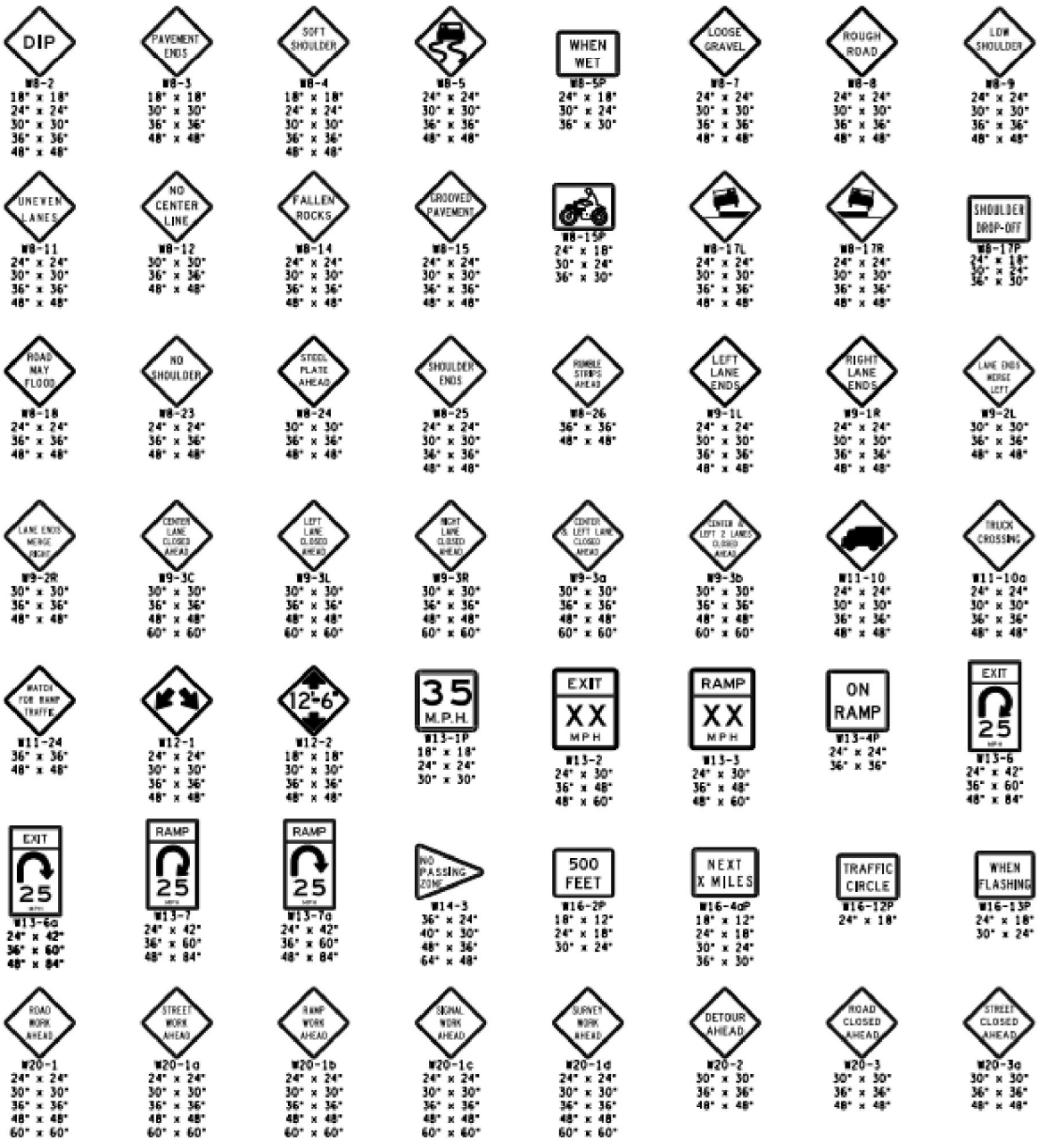

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

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FILE: 103-GEN-SIGN.dgn				

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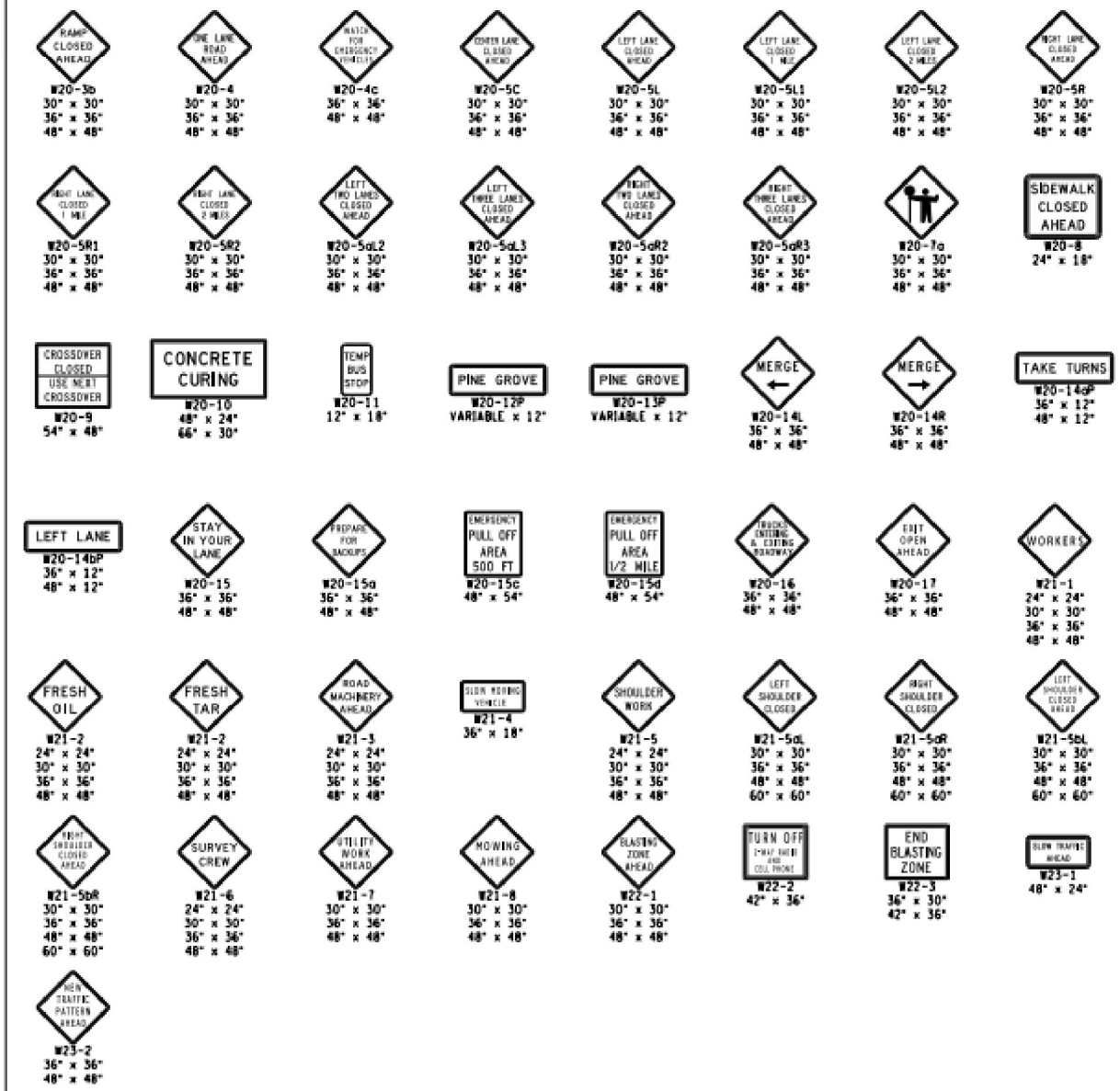

SEE MDOT SHS 13-WORK ZONE FOR SIGN DETAILS

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FILE: 103-GEN-SIGN.dgn				

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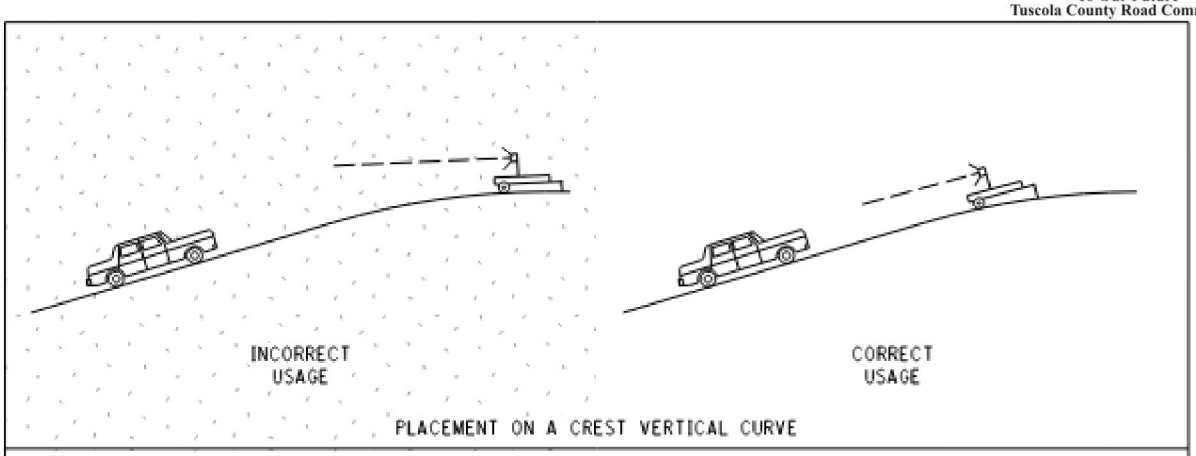
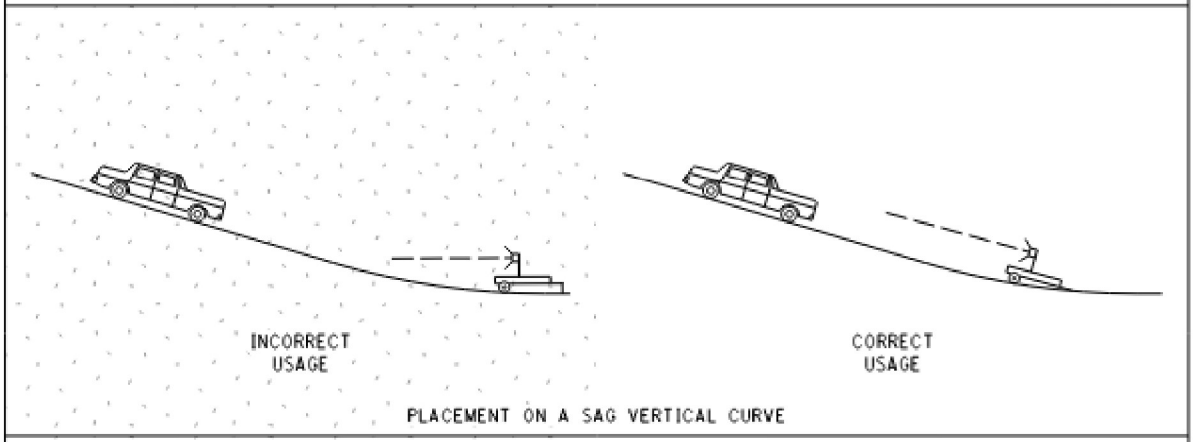
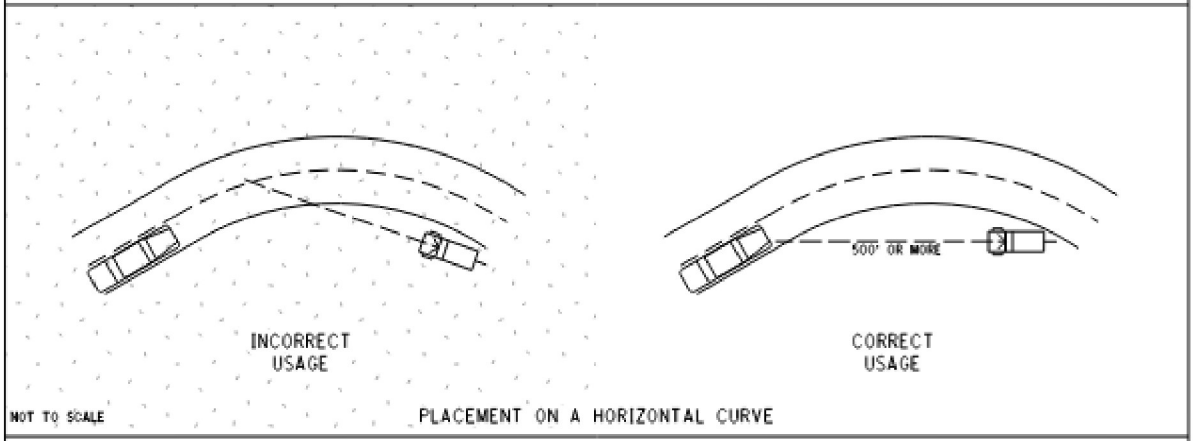


PLACEMENT ON A CREST VERTICAL CURVE



PLACEMENT ON A SAG VERTICAL CURVE



NOT TO SCALE

PLACEMENT ON A HORIZONTAL CURVE

NOTE:
ENSURE THE ARROW REMAINS CLEARLY LEGIBLE AT DISTANCES FROM 2,500 FEET TO 200 FEET, FROM ALL TRAFFIC LANES AND ROADWAY ENTRANCES. DO NOT PLACE THE LIGHTED ARROW ON A HORIZONTAL OR VERTICAL CURVE THAT MIGHT INTERFERE WITH THIS LEGIBILITY REQUIREMENT.

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL NO: 104-GEN-AB	USE OF ARROW BOARD ON HILL OR CURVE AND WORK ZONE LAYOUT	DATE: MAY 2021 SHEET: 1 OF 1
FILE: 104-GEN-AB.dgn				

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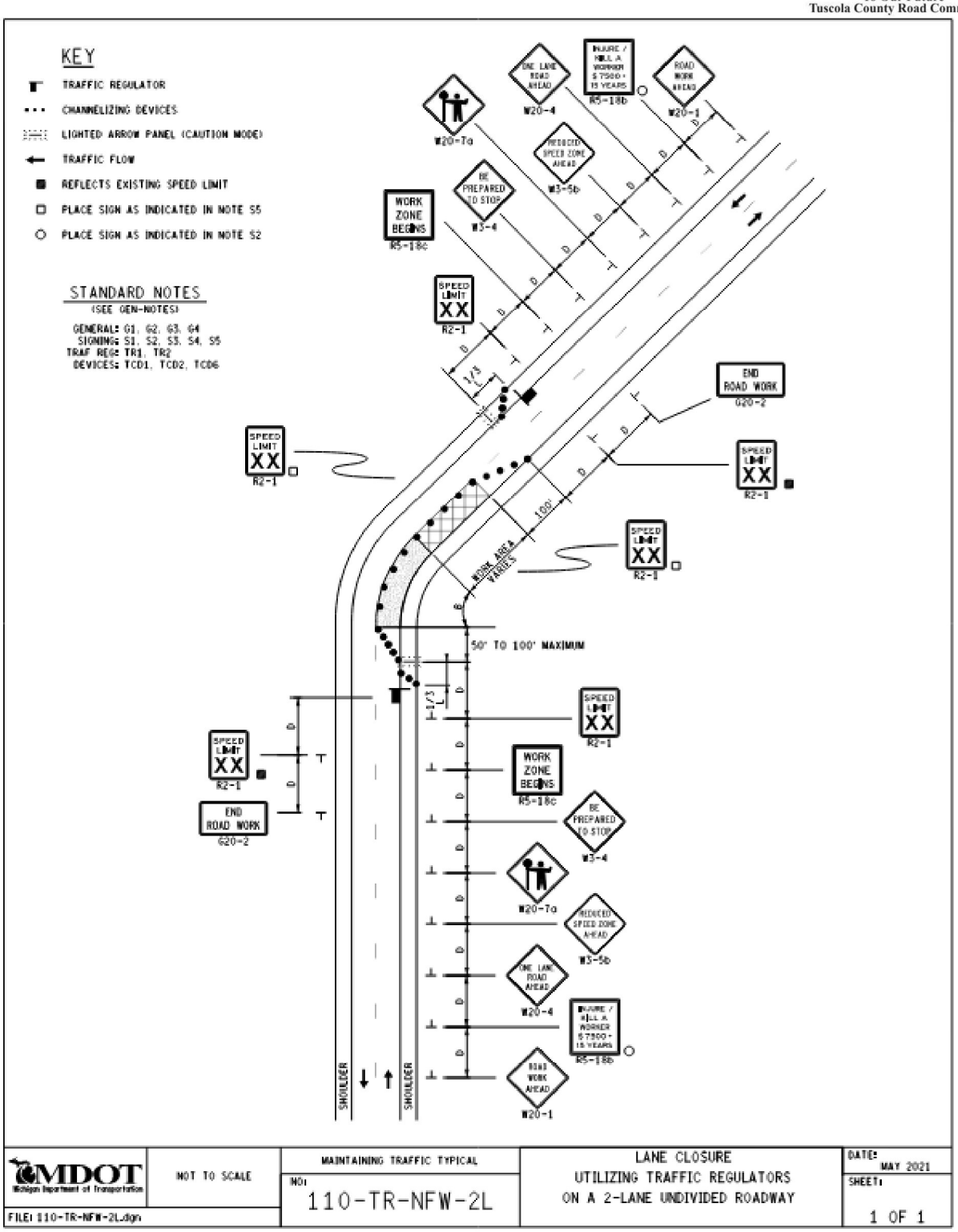
KEY
TRAFFIC REGULATOR
CHANNELIZING DEVICES
LIGHTED ARROW PANEL (CAUTION MODE)
TRAFFIC FLOW
REFLECTS EXISTING SPEED LIMIT
PLACE SIGN AS INDICATED IN NOTE S5
PLACE SIGN AS INDICATED IN NOTE S2
STANDARD NOTES
(SEE GEN-NOTES)
GENERAL: G1, G2, G3, G4
SIGNING: S1, S2, S5, S4, S5
TRAF REG: TR1, TR2
DEVICES: TCD1, TCD2, TCD6
ONE LANE ROAD AHEAD W20-4
INJURE / KILL A WORKER $ 7500 + 15 YEARS R5-18b
ROAD WORK AHEAD W20-1
W20-7a
REDUCED SPEED ZONE AHEAD W3-5b
BE PREPARED TO STOP W3-4
WORK ZONE BEGINS R5-18c
SPEED LIMIT XX R2-1
END ROAD WORK G20-2
WORK AREA VARIES
50' TO 100' MAXIMUM
SHOULDER
SHOULDER
MDOT Michigan Department of Transportation
NOT TO SCALE
MAINTAINING TRAFFIC TYPICAL
NO: 110-TR-NFW-2L
LANE CLOSURE
UTILIZING TRAFFIC REGULATORS
ON A 2-LANE UNDIVIDED ROADWAY
DATE: MAY 2021
SHEET: 1 OF 1
FILE: 110-TR-NFW-2L.dgn

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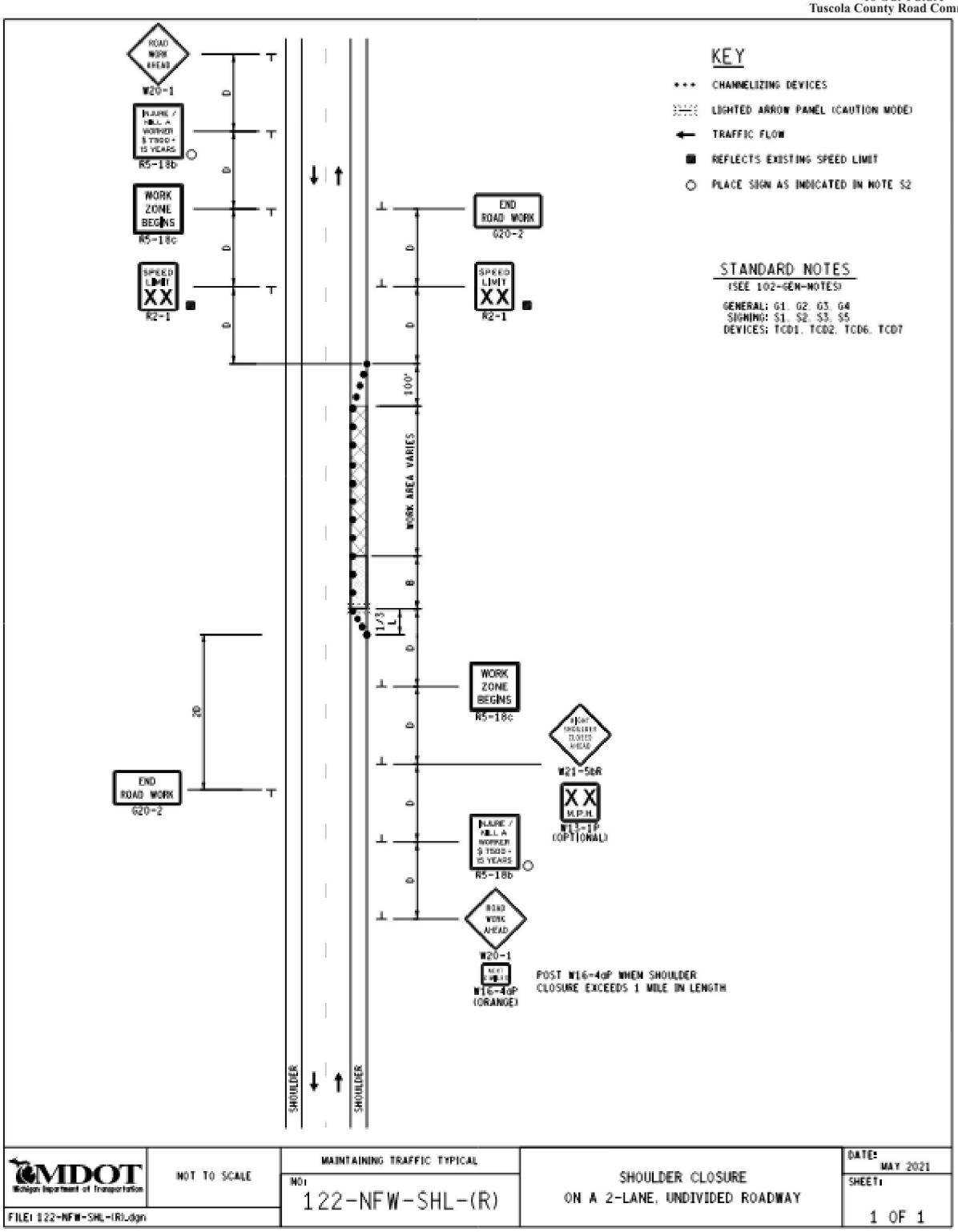

MDOT Michigan Department of Transportation	NOT TO SCALE	MAINTAINING TRAFFIC TYPICAL NO: 122-NFW-SHL-(R)	SHOULDER CLOSURE ON A 2-LANE, UNDIVIDED ROADWAY	DATE: MAY 2021 SHEET: 1 OF 1
FILE: 122-NFW-SHL-(R).dgn				

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NOTES

1. FOR SHORT-DURATION OR MOBILE OPERATIONS, NO SIGNS ARE REQUIRED IF APPROPRIATELY EQUIPPED VEHICLES ARE USED.
2. IF THE OPERATION HAS VEHICLE(S) PARKED ON THE SHOULDER OR VEHICLES ACCESSING THE WORK SITE VIA THE HIGHWAY OR CROSSING THE HIGHWAY TO PERFORM OPERATIONS, A "ROAD WORK AHEAD" SIGN OR AN ARROW BOARD IN CAUTION MODE SHALL BE USED.
3. WORK VEHICLES SHOULD BE PARKED AS FAR OFF THE TRAVELED WAY AS PRACTICAL.
4. IF THE WORK SPACE IS IN THE MEDIAN OF A DIVIDED ROADWAY, ADVANCE WARNING SIGNS SHALL BE PLACED IN BOTH DIRECTIONS OF TRAVEL.
5. VEHICLES AND PERSONNEL SHOULD ALL BE LOCATED AND PARKED ON THE SAME SIDE OF THE ROADWAY TO THE EXTENT PRACTICAL.

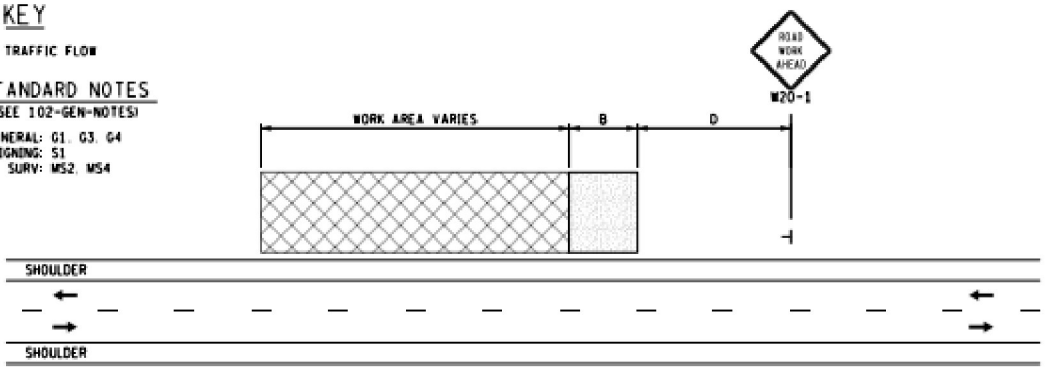
KEY

← TRAFFIC FLOW

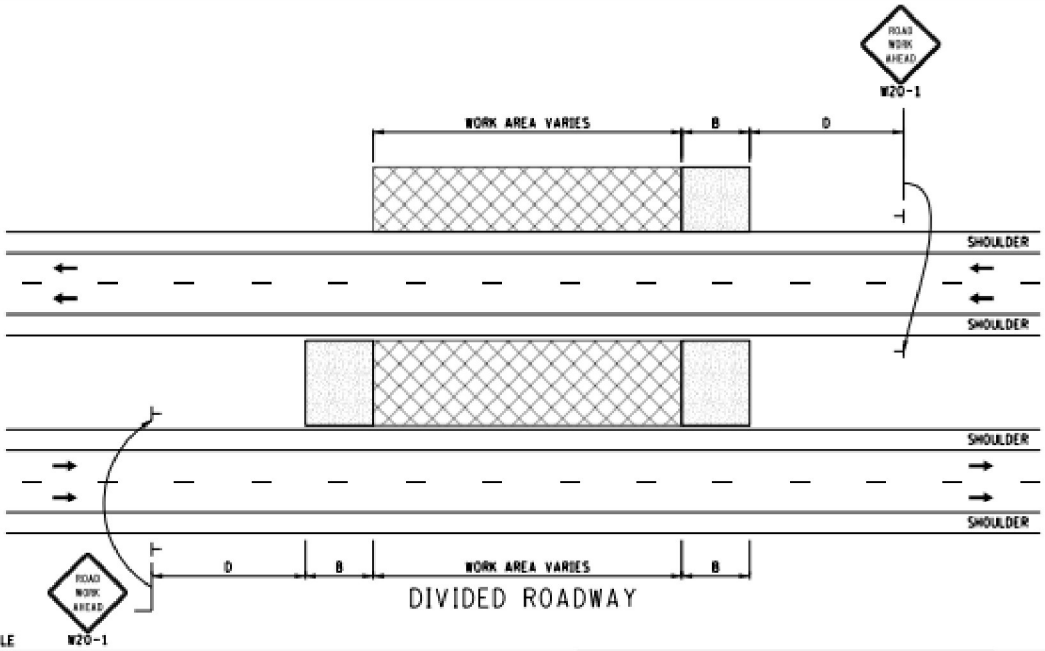
STANDARD NOTES

(SEE 102-GEN-NOTES)

GENERAL: G1, G3, G4
SIGNING: S1
MAINT & SURV: MS2, MS4



TWO LANE, TWO WAY ROADWAY



DIVIDED ROADWAY

NOT TO SCALE

MDOT Michigan Department of Transportation	MAINTENANCE MAINTAINING TRAFFIC TYPICAL	DURATION: ALL	WORK OUTSIDE SHOULDER	DATE: MAY 2021
				NO: 4000-M-SHL-OUT
FILE: 4000-M-SHL-OUT.dgn				SHEET: 1 OF 1

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9.7. INSURANCE REQUIREMENTS

Agriculture Hauling Permit	
Type of Insurance	**Notes**
None	As required by Statute per the Attorney General Opinion

Oversize / Overweight Permits						
Type of Insurance	**Coverage Limits**	**Addl. Insured**	**Waiver of Subrogation**	**Primary/Non Contributory**	**Claims Made**	**Indemnification**
Auto Liability	Michigan No Fault Coverage/Property Protection (PPI) $1M Statutory Limit	No	No	No	No	Yes

Driveway Permit

Individual Homeowner Permit Holder - Residential Driveway

Type of Insurance	Notes
None	Advise homeowner they will be responsible for any damage done to the ROW
	Advise homeowner they will be responsible for any injuries as a result of the work in the ROW
	Advise homeowner they will be required to indemnify the RC as outlined in the ROW permit

Contractor Permit Holder - Commercial or Residential Driveway

Type of Insurance	Coverage Limits		Addl. Insured	Waiver of Subrogation	Primary/Non Contributory	Claims Made	Indemnification
Commercial General Liability (CGL)	Each Occurrence	$2,000,000	No	No	No	No	Yes
	Products Comp/Op Aggregate	$3,000,000					
	General Aggregate	$3,000,000					

Special Event / Parade Permits							
Type of Insurance	**Coverage Limits**		**Addl. Insured**	**Waiver of Subrogation**	**Primary/Non Contributory**	**Claims Made**	**Indemnification**
Commercial General Liability (CGL)	Each Occurrence	$2,000,000	Yes	Yes	Yes	No	Yes
	General Aggregate	$2,000,000					
	Notes						
	For special events requiring participant waivers - Endeavor to have the RC added to the waiver. If alcohol is being served, host liquor liability is required.						

General Right of Way Permit

Individual Homeowner Permit Holder

Type of Insurance	Notes
None	Advise homeowner they will be responsible for any damage done to the ROW
	Advise homeowner they will be responsible for any injuries as a result of the work in the ROW
	Advise homeowner they will be required to indemnify the RC as outlined in the ROW permit

Contractor Permit Holder

Type of Insurance	Coverage Limits		Addl. Insured	Waiver of Subrogation	Primary/Non Contributory	Claims Made	Indemnification
Commercial General Liability (CGL)	Each Occurrence	$2,000,000	Yes	Yes	Yes	No	Yes
	Products Comp/Op Aggregate	$3,000,000					
	General Aggregate	$3,000,000					
Auto Liability	Michigan No Fault Coverage/Property Protection (PPI) $1M Statutory Limit		No	No	No	No	Yes
Professional Liability, as required	Each Occurrence & Aggregate	$2,000,000	N/A	N/A	N/A	Yes	Yes

Umbrella may be used to meet limit requirements: Commercial General Liability & Auto Liability
Retro Date for Professional Liability must be prior to issuing permit date.
It is recommended the Self Insured Retention (SIR) for CGL be no greater than $25,000.

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MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
FOG SEAL

CFS:TGH 1 of 4 APPR:KPK:NDM:08-30-24

a. Description. This work consists of an application of a fog seal. A fog seal is a light application of a quick-setting emulsified asphalt diluted with water. Ensure all work and materials are in accordance with the standard specifications, except as modified herein.

b. Materials. Furnish materials in accordance with subsection 904.03 of the Standard Specifications for Construction with the following alternative:

1. Asphalt Emulsion. Furnish Cationic Quick Setting Emulsified Asphalt (CQSEA) meeting the requirements of Table 1.

Dilute asphalt emulsion, at a maximum of one part asphalt emulsion to one part water, at the emulsion plant.

c. Equipment. Use equipment that is safe, environmentally acceptable, and capable of producing a quality product.

1. Pressure Distributor. Ensure the pressure distributor has the following characteristics:

A. Has a ground speed computer-controlled device interconnected with the asphalt emulsion pump such that the specified application rate is supplied at any speed.

B. Can maintain the asphalt emulsion at the specified temperature.

C. Has spray bar nozzles capable of producing a uniform fan spray and with shutoff control that is instantaneous, with no dripping.

D. Can maintain the specified application rate within ±0.015 gallons per square yard (gal/syd) for each load.

2. Miscellaneous. Furnish a power broom and all necessary hand tools, thermometers, etc. Ensure distributors and power brooms are equipped with at least one visible approved flashing, rotating, or oscillating amber light.

d. Pre-Paving On-Site Meeting. A pre-paving meeting between the Engineer and Contractor will be held prior to beginning work. The agenda for this meeting will include a review of the following:

1. Work schedule,

2. Traffic control plan,

3. Equipment calibration and adjustments,

4. Condition of materials and equipment, and

5. Quality control plan (JMF, Yield Check Methods, etc.).

e. Construction. Place the longitudinal construction joint at the edge of metal of the driving lane; at a location requiring a minimal overlap onto the driving lane; or at a location requiring a minimal overlap of the new longitudinal joint resulting from milling and resurfacing.

Where corrugations are present longitudinal joints are to be constructed at the outside edge of the far side of the corrugation on the first pass. Place the longitudinal joint at the outside edge of the opposite side of the corrugation for the second application.

If applying fog seal to a chip seal, begin the application of the fog seal within 48 hours of the completion of the chip seal work on the project, but not on the same day as the application of chip seal. Once the fog seal application has begun, work must continue to completion except for; work restrictions outlined in the contract, state holidays, weekends, or inclement weather as defined in the following paragraph.

Apply the fog seal only when the pavement and air temperature is 55 °F or above. Do not apply the fog seal if there is forecast of greater than 50 percent chance of rain within 2 hours of application. Do not apply the fog seal if temperatures are forecast to be below 32 °F within 24 hours from the time of application.

Use pressure sufficient to apply emulsion at a uniform rate, but without splattering or drilling from the spray bar. Adjust nozzle angle and spray bar height to ensure correct spray pattern.

Apply fog seal at a rate of 0.07 to 0.15 gallons of diluted material per square yard of pavement treated. Ensure the fog seal application results in a uniform coverage of emulsion just sufficient to flow into and seal the pavement pores, small cracks, and voids. The asphalt emulsion application rate, as determined by a yield check, must not exceed a tolerance of ±0.015 gal/syd from the established JMF application rate.

If a condition is identified that causes an unsatisfactory fog seal, stop all production work and perform corrective action immediately at no additional cost to the contract. If there are adverse environmental conditions, furnish the Engineer an action plan that clearly demonstrates how the fog seal operation will be adjusted for the actual environmental conditions.

Allow the Engineer access to all work in progress for the purpose of quality assurance review and testing.

f. Quality Control. Establish, maintain, and follow an effective QC system in accordance with current Department procedures. The QC system must detail plans, procedures, and organization necessary to furnish and apply a fog seal that complies with the contract. Follow the QC system until work is accepted.

Establish, maintain, and follow a Contractor Quality Control (CQC) plan sufficient to ensure that the warranty related treatment complies with the contract. The CQC plan must cover all fog seal operations. Submit a copy of the plan to the Engineer, at the preconstruction meeting, for approval. Follow the approved plan throughout the project.

Include the following information, at a minimum, in the CQC plan:

1. Materials to be used on the project.

2. Sampling and testing methods used to determine compliance with material specifications.

3. Equipment to be used on the project.

4. Calibration method used to determine compliance with the application rates.

5. Procedures for pavement preparation.

6. Controls implemented by the Contractor to ensure that the fog seal material is cured or set up satisfactorily before opening to traffic.

7. Procedures implemented by the Contractor for monitoring initial acceptance requirements.

g. Documentation. Furnish the Engineer a daily report including the following information:

1. Control section, project number, county, route, Engineer;

2. Date, air temperature, pavement temperature, humidity;

3. Asphalt emulsion temperature;

4. Beginning and ending stations;

5. JMF: application and dilution rates (asphalt emulsion);

6. Yield checks on asphalt emulsion (3 per day, minimum);

7. Length, width, total square yards; and

8. Contractor's signature.

Furnish asphalt emulsion documentation in accordance with current Department acceptance procedures.

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

Pay Item	**Pay Unit**
Seal, Fog	Square Yard

Seal, Fog includes placement of the asphalt emulsion including surface preparation, stationing, and documentation.

Table 1: Cationic Quick Setting Emulsified Asphalt (CQSEA)

Test Method	CQSEA Requirements
Viscosity, Saybolt Furol, *AASHTO T59/ASTM D7496*: At 25 °C, sec	20–100
Storage Stability Test, *AASHTO T59/ASTM D6930*, 24 hr, % Difference, max	1
Particle Charge Test, *AASHTO T59/ASTM D7402* (a)	Positive
Sieve Test, *AASHTO T59/ASTM D6933*, % max (Distilled Water)	0.10
Residue, min	60
Penetration, 25 °C, 100 g, 5 sec, dmm, *AASHTO T49/ASTM D5/D5M*	40–90
Ductility, 25 °C, 5 cm/min, cm, min, *AASHTO T51/ASTM D113/D113M*	40
Solubility in Trichloroethylene, % min, *AASHTO T44/ASTM D2042*	97.5
Ash Content, % max, *ASTM D128*	2

a. If Particle Charge Test is inconclusive, material having a maximum pH of 6.7 is acceptable.

SUPPLEMENTAL SPECIFICATION

POLYMER SCRUB SEAL

(STRESS ABSORBING MEMBRANE INTERLAYER)

1. Description

This work shall consist of furnishing all materials, equipment, labor, and preparation necessary for the application of the polymer modified asphaltic rejuvenating emulsion Stress Absorbing Membrane Interlayer - Scrub Seal. The applied material shall completely seal the pavement surface and provide a uniform textured surface, suitable for placement of hot mixed asphalt, micro-surfacing, slurry seal, fog seal or as a finished surface.

The work shall be completed as follows: Prepare the pavement surface; apply the polymer modified asphaltic rejuvenating emulsion and scrub the applied emulsion with a scrub broom as specified herein; apply aggregate, broom the aggregate with a secondary broom when specified, roll the aggregate; and sweep and dispose of excess aggregate.

2. Materials

POLYMER MODIFIED BITUMINOUS REJUVENATING EMULSION BINDER

Emulsion Property	**Min.**	**Max.**	**Test Method**
Viscosity at 122°F (SFS)	75	450	ASTM D244
Residue, W%, Max		65	ASTM D244
PH	2.0	5.0	ASTM E70
Sieve, W%, Max		0.1	ASTM D244
Oil Distillate, W%, Max		1.0	ASTM D244
Specific Gravity of Residue of Recovered Latex, Min	1.15		WE-EM-1002

Residue Property	**Min.**	**Max.**	**Test Method**
Viscosity at 140°F, P, Max		5000	ASTM D2171
Elastic Recovery on Residue by Distillation % Min	45		AASHTO T59 (1,2)
Penetration at 77°F, Min.	80		ASTM D5

Latex Property	**Min.**	**Max.**	**Test Method**
Specific Gravity, Min	1.08		ASTM 1475
Tensile Strength, Die C Dumbbell, PSI, Min 500	500		ASTM D412 (3)
Swelling in Rejuvenating Agent, %, Max; 48 hours Exposure at 104°F		40% Intact Film	ASTM D471 (4) Modified

Rejuvenating Agent Property	**Min.**	**Max.**	**Test Method**
Flash Point, Coc, °F	>380		ASTM D92
Asphaltenes, Max		1	
Hot Mix Recycling Agent Classification, Min	RA1		ASTM D4552

Recycling Agent	**Min.**	**Max.**	**Test Method**
Viscosity, 140°F, CST	50	175	
Saturate, % by WT., Max		30	

Recycling Agent Residue	**Min.**	**Max.**	**Test Method**
Weight Change, %, Max		6.5	
Viscosity Ratio, Max		3	

(1) Exception to AASHTO T59: Bring the temperature on the lower thermometer slowly to 350° F plus or minus 10° F. Maintain at this temperature for 20 minutes. Complete total distillation in 60 plus or minus 5 minutes from first application of heat.

(2) Elastic Recover @ 10° C (50° F): Hourglass sides; pull 20 cm, hold 5 minutes then cut, let sit 1 hour.

(3) Tensile Strength Determination: Samples for testing for tensile strength in accordance with ASTM D412 shall be cut using a die dumbbell at a crosshead speed of 20 in/min.

(4) Latex Testing: Suitable substrate for film formation shall be polyethylene boards, silicone rubber sheeting, glass, or any substrate which produces a cured film of uniform cross-section. Polymer film shall be prepared from latex as follows:

Resistance to Swelling: Polymer films shall be formed by using a 50 mil drawdown bar and drawing down 50 mils of the latex on polyethylene boards. Films shall be cured for 14 days at 75°F and 50% humidity. Samples for resistance to swelling in rejuvenating agent shall be 1" by 2" rectangles cut from the cured film. Cut at least 3 specimens for each sample to be tested for swelling. Fill 3-8 oz ointment tins with at least a ½" deep of rejuvenating agent. Swelling samples shall be weighed and then placed in the ointment tins on top of the rejuvenating agent. Then, add at least another ½" deep of rejuvenating agent over each of the latex samples. The ointment tins shall be covered and placed in an oven at 104° F for the specified 48 hours +/- 15 minutes. The ointment tins are allowed to cool to 75° F and then the latex films are removed from the tins. Unabsorbed rejuvenating agent is removed from the intact latex film by scraping with a rubber policeman and blotting with paper towels. If the latex film does not remain intact during removal from the tins or while removing the unabsorbed rejuvenating agent, the sample shall be rejected. After the rejuvenating agent is removed from the samples they are then weighed. Percent swelling is reported as weight increase of the polymer film; report mass increase as a percent by weight of the original latex film mass upon exposure of films to the recycling agent.

COARSE AGGREGATE

The coarse aggregate shall be 100% crushed material from quarried stone, natural gravel or other high quality aggregate and meet the following requirements:

PHYSICAL REQUIREMENTS

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

GRADING REQUIREMENTS - ASTM C-117

Sieve		**Type I**
1 inch	(25 mm)	100
3/4 inch	(19 mm)	100
1/2 inch	(12.5 mm)	95-100
No. 4	(4.75 mm)	5-25
No. 8	(2.36 mm)	0-10
No. 200	(75 um)	2

3. Equipment

All equipment required for performance of the work shall be approved before construction is to begin and shall be maintained in satisfactory operating condition. The Contractor shall furnish an accurate thermometer, hand brooms and other small tools and equipment essential for the completion of the work.

PRESSURE DISTRIBUTOR

The pressure distributor shall have a computerized rate control that automatically adjusts the distributor's pump to the ground speed. The pressure distributor shall be capable of heating and re-circulating the bituminous binder to the specified temperature. The proper nozzles shall be used for the material and rate specified.

SCRUB BROOM

The scrub broom frame shall be constructed such that the scrub broom is attached to the distributor truck. The scrub broom must be equipped with the means to mechanically raise and lower the scrub broom off and onto the road surface at designated points of completion and start up. It shall be towable in the elevated position. The weight of the broom assembly shall be such that it does not squeegee the emulsion off the roadway surface.

The main body of the scrub broom shall be a frame minimum 6'-9" wide and 10 feet long. The maximum transverse rigid frame width at any point shall not exceed 6'-9". The nearest and furthest members, paralleling the back of the spreader truck, and diagonal members shall be equipped with emulsion scrub brooms. The leading member and the trailing member shall have broom heads angled at 1O to 15 degrees off the centerline of the supporting member. The diagonal members shall have broom heads

attached in line with the centerline of the supporting member. Each individual emulsion scrub broom attached to the scrub broom assembly shall be 3 ½" W x 6 ½" H x 16" L and have stiff nylon bristles. Bristle height is to be maintained at a minimum of 5 inches. The scrub broom shall be equipped with hinged wing assemblies attached to the main body not to exceed 4'-6" per side, with diagonals and equipped with emulsion scrub brooms. The purpose of the maximum rigid frame width and the hinged wing extensions is not only for maximum width of 16 feet but to maintain the scrubbing process consistently as surface textures and conditions along with cross-sections change along the existing roadway surface.

NOTE: The contractor must supply a scrub broom as described for the purpose of scrubbing the polymer modified asphaltic rejuvenating emulsion. If the Contractor fails to supply the scrub broom specified, the project shall be shut down. Shutdowns resulting from the failure to provide this specified scrub broom shall not excuse the Contractor from the provisions of contract working days.

AGGREGATE SPREADER
The aggregate spreader shall be self-propelled and shall be equipped with hoppers, revolving cylinders, and adjustments necessary to produce a uniform distribution of material at the specified rate.

PNEUMATIC TIRE ROLLER
The pneumatic tire rollers shall weigh a minimum of eight (8) tons.

STREET SWEEPER
The sweeper shall be a mechanical or vacuum powered street sweeper pick up type.

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

- Review of Contractor's detailed work schedule
- Review of the traffic control plan
- Inspection of equipment
- Calibration and adjustment to equipment as needed

5. Weather Limitations
The stress absorbing membrane Interlayer scrub seal shall be placed when the pavement and atmospheric temperature Is 40° F and rising. Placement Is not permitted if It is raining, when the pavement surface has standing water, or when temperatures are forecasted to be below 32° F within 24 hours of placement.

6. Qualifications
The Contractor shall: a) Be DOT pre-qualified or b) Have had a minimum of five (5) years' experience in the application of the polymer modified asphaltic emulsion as applied to SAMI; and c) have successfully completed at least three (3) SAMI projects utilizing the scrub- broom. References shall be supplied upon request.

7. Construction

The Contractor shall follow the construction methods as described.

- Give the TCRC minimum one week notice of start of work so that Road Work Ahead signs can be installed by TCRC crew.
- Preparation of the surface shall include removal of all vegetation, dirt and debris from the roadway. The surface shall be cleaned by the Contractor and shall be reasonably dry when the bituminous binder is applied. Material cleaned from the surface shall be properly disposed of.
- If pavement repairs have been performed within the last 2 weeks, those areas shall have a tack coat applied to the patched area prior to the stress absorbing membrane Interlayer scrub seal.
- The scrub seal shall be applied from edge of pavement to edge of pavement. The edges of the limits of the scrub seal application on both sides of the road shall be maintained in a neat and uniform line.
- Immediately following the application of the polymer modified bituminous rejuvenating emulsion binder to the roadway surface, the material shall be scrubbed with the scrub broom for the purpose of forcing the emulsion into the existing surface voids and distributing the emulsion over variable roadway surface textures and conditions.
- The application of the polymer modified asphaltic rejuvenating emulsion and scrub broom operation shall cease +/-40 feet prior to the end of the road section or intersection. The remaining polymer modified asphaltic rejuvenating emulsion shall be drug out by the scrub broom, and the remaining emulsified material required to complete the pass shall be applied only by the distributor at the specified rate.
- The specified aggregate shall be spread uniformly onto the bituminous binder within 30 seconds of the bituminous spray and rolled with pneumatic rollers.
- Projects with segments greater than 12,000 syds shall use a minimum of two rollers.
- Rollers shall proceed at maximum speed of 5 mph. The entire surface shall receive a minimum of two roller passes. The first roller pass shall be performed within one minute of aggregate spreading.
- Sweeping of the completed surface shall be accomplished prior to unrestricted use by traffic. The entire surface shall be clean of all loose material within 24 hours and prior to placement of any surface course.
- The Contractor shall protect all utility castings using tarpaper, plastic or other approved material. All covers shall be properly fitted to the casting and protective covering removed upon completion of sweeping.

8. Application of Bituminous Binder and Coarse Aggregate

The bituminous binder shall be heated to specified temperature and uniformly placed to prevent ridges or streaks in the surface.

BITUMINOUS BINDER
The bituminous binder shall be applied at a temperature of 110 F to 180 F, and at the rate specified.

COARSE AGGREGATE

- Stockpiling and loading methods shall permit ready identification of material and minimize segregation and contamination of the aggregate.
- The moisture content of the course aggregate shall be below 4% and maintained throughout the project.
- Course aggregate shall be spread uniformly without ridges or gaps at the specified rates.
- Spreading of the aggregate shall be adjusted to produce a minimum of excess loose particles, shall provide complete coverage and there shall be no "excessive" bleed through after rolling.
- The spreading operation shall be accomplished in such a manner that neither the tires of trucks nor the spreader come into contact with the newly applied bituminous material.

MATERIAL APPLICATION RATES

Binder Application Rate		
(Gallons per Square Yard)		
Application Type	**Application**	**Tolerance**
Scrub Seam	0.25-0.40	0.05

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

9. Quality Control
To measure compliance, the Contractor shall use the methods described in this section.

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

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

BITUMINOUS BINDER
The application rate shall not exceed a tolerance of +/-0.05 gallons per square yard from the specified rate, and within the temperature range as specified.

COURSE AGGREGATE
The aggregate shall be clean and uniform and shall be within the gradation range as specified. Moisture content shall not exceed the tolerance as specified.

10. Documentation
The Contractor shall provide the Engineer a daily report with the following information:

- Project Number/County/Route/Street
- Date/Air Temperature/Pavement Temperature
- Bituminous Binder Temperature (3 per day) Location per Test
- Beginning and Ending Locations
- Yield Check on Bituminous Binder (3 per day)
- Aggregate Gradation & Moisture (1 per day)
- Length/Width/Total Area

Other required documentation shall include:

- Bill of lading on aggregate and bituminous binder, to be provided as requested or at project completion.

11. Acceptance
The Contractor shall inspect the completed Scrub Seal during the application process for any deficiencies. The deficiencies will be limited to flushing, surface patterns and loss of stone retention.

Workmanship shall be inspected for the following:

- Untreated areas (missed)
- Excessive overlap on longitudinal joints
- Excessive overlap on construction joints

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

12. Placement of Surface Course
If the scrub seal application is used as an Intermediate layer for a Fog Seal, a minimum period of 24 hours shall be observed prior to the placement of the surface course, but within 48 hours of the scrub seal material placement.

A penalty of $100/per day per project may be accessed if the Fog Seal is not placed within this time frame. This time limit may be increased or decreased with approval of the Engineer dependent on ambient temperatures and conditions.

13. Method of Measurement

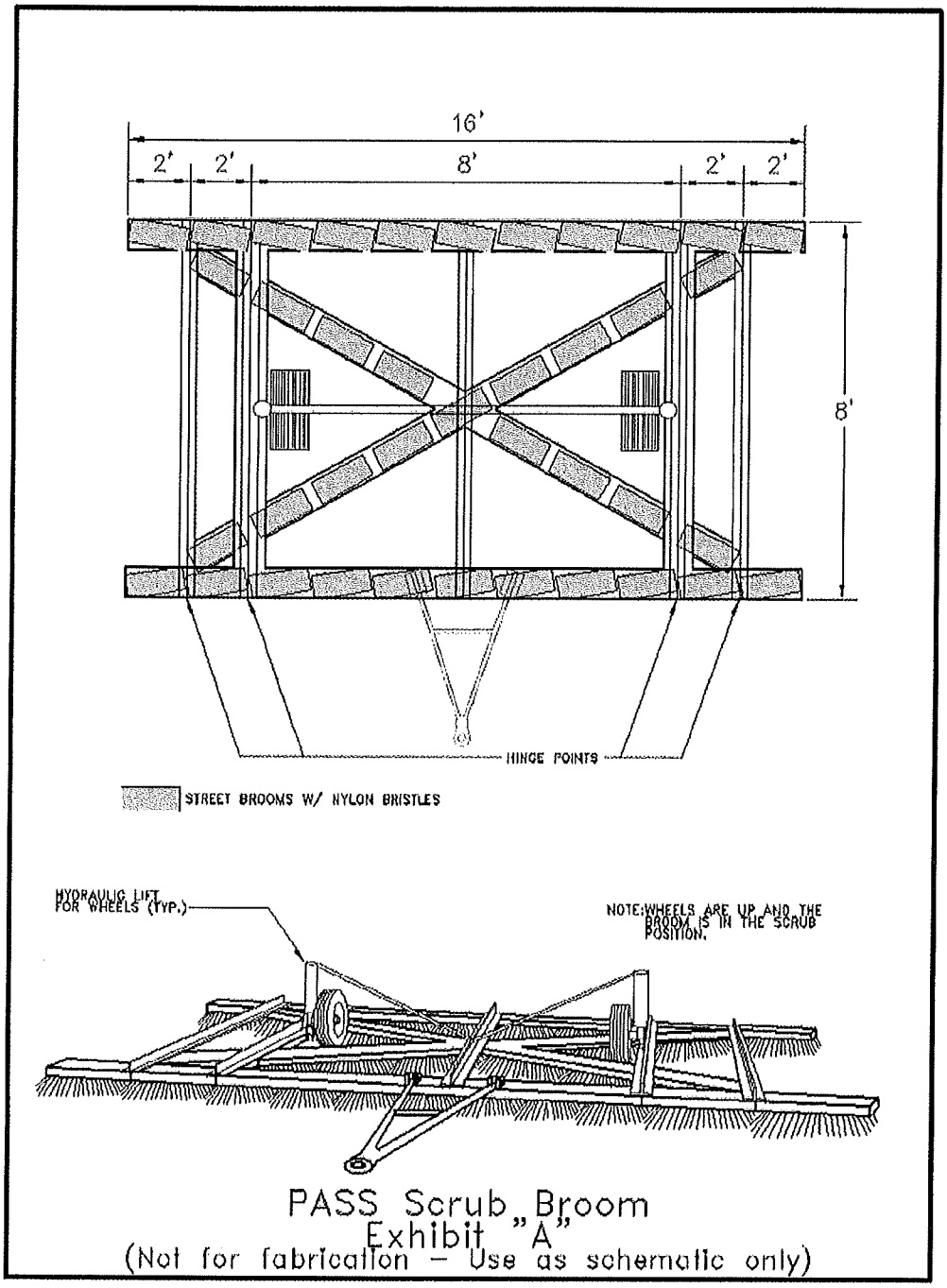
The scrub seal will be measured by the square yard as provided for in the Contract Documents. The accepted quantities, measured as provided for above, will be paid for at the contract unit price for scrub seal.

14. Basis of Payment

Stress absorbing membrane interlayer scrub seal shall be paid for per square yard for furnishing all preparation, materials, equipment, labor, clean up, and incidentals necessary to complete the work as specified.

Item	**Description**	**Unit**
Special	Scrub Seal	Square Yard

EXHIBIT A


16'
2'
2'
8'
2'
2'
8'
HINGE POINTS
STREET BROOMS W/ NYLON BRISTLES
HYDRAULIC LIFT FOR WHEELS (TYP.)
NOTE: WHEELS ARE UP AND THE BROOM IS IN THE SCRUB POSITION.
PASS Scrub „Broom
Exhibit "A"
(Not for fabrication – Use as schematic only)