



**OHIO TURNPIKE AND
INFRASTRUCTURE COMMISSION**

ADDENDUM NO. 1

**PROJECT NO. 59-19-01
REPAIRS AND RESURFACING
EASTBOUND AND WESTBOUND ROADWAYS
MILEPOST 7.19 TO MILEPOST 14.80
AND PARTIAL EASTBOUND SHOULDER RECONSTRUCTION
MILEPOST 2.87 TO MILEPOST 7.19
WILLIAMS COUNTY**

OPENING DATE:
2:00 P.M. (EASTERN TIME), FEBRUARY 5, 2019

ATTENTION OF BIDDERS IS DIRECTED TO:

QUESTIONS RECEIVED THROUGH 2:00 PM ON JANUARY 29, 2019

-AND-

MODIFICATIONS TO THE CONTRACT DOCUMENTS

Plan Sheets: 2 and 3 of 14
and ODOT SCD MT-95.45

Issued by the Ohio Turnpike and Infrastructure Commission through Anthony D. Yacobucci, Chief Engineer, and Mark R. Musson, Director of Contracts Administration.


Anthony D. Yacobucci Date


Mark R. Musson Date

ANSWERS TO QUESTIONS RECEIVED THROUGH 2:00 PM ON JANUARY 29, 2019:

Q#1 Can an item for 15.22 mile of Temporary Centerline CL 1 be added as a pay item and if the Temporary Centerline would need removed, can REF # 44 – SP614C Removal of Pavement Marking be increased by the 15.22 mile?

A#1 An item of Temporary Centerline, Class 1 and an increase of Reference No. 44, SP 614C, Removal of Pavement markings will not be added to the plans. The Commission will waive the requirements for SP 104, Permitted Lane Closures for Phase 3 and Phase 4 Work. The Contractor shall plan for the installation of Item Special, Asphalt Rejuvenator, Polymer Emulsion, the Installation of Item 642, 6" White Edge Line, Type 1, and the installation of Item SP 621, Raised Pavement Markers at the completion of the paving Work for Phase 4.

Q#2 Bid Ref #5 – Portions of Structure Removed, As Per Plan – With the removal and replacement of the wall sections included in this pay item, the full sequence for each location is expected to take between five and seven days. Multiple locations are expected to be performed concurrently. What maintenance of traffic or traffic protections will be required during this process especially during non-working hours when the existing wall is removed, during the new wall placement, and before the new guardrail ends can be tied in? There are no temporary attenuators nor any temporary barrier wall items listed in the bid summary? Will the requirements change due to the varying Permitted Lane Closure month requirements? Can this work be done during any of the early spring months, the summer months, or the late fall months?

A#2 If a hazard is created by removing guardrail and/or parapet wall then the contractor shall install an impact attenuator and barrier wall per ODOT SCD MT-95.45. The cost of providing the required impact attenuator and barrier wall shall be considered incidental to Item SP 614, Maintaining Traffic, As Per Plan. This requirement does not change based on the time of the year the Work is performed. ODOT SCD MT-95.45 has been included with this Addendum No. 1.

Q#3 Bid Ref #18 calls out SP 304 material. Due to the type of use on this project, could the material be changed to standard ODOT 304?

A#3 ODOT CMS Item 304 is acceptable as a replacement for OTIC Item SP 304 at no additional cost to the Commission. Where appearing throughout the Contract Documents "SP 304" is supplemented with "or 304" through this Addendum No. 1. All applicable provisions of Item 304 of the Specifications shall apply.

Q#4 In SP627 Stone Shoulder Protection, #67 aggregate is specified when 67's are not common to the area. Can the specifications be changed to use 57's instead of 67's?

A#4 The use of #57 stone in place of #67 stone for Item SP 627, Stone Shoulder Protection is an acceptable replacement and can be provided at no additional cost to the Commission. Where

appearing throughout the Contract Documents “#67” is supplemented with “or #57” through this Addendum No. 1.

Q#5 Regarding the references made to using a ski to control the pavement profile, can a 30’ non-contact referencing system be used?

A#5 A 30-foot non-contacting reference systems will be permitted to be used provided it has been submitted for review and approval by the Chief Engineer

Q#6 Bid Ref #15 – 2” shoulder milling and Bid Ref #16 – 3” mainline milling, are prescribed milling depths while on plan sheet #5, in the typical sections, cross-slopes are called out. Is this project milling depth or cross-slope control? If cross-slope control, what is the control point?

A#6 The Contractor shall mill the depths specified in the Plans, however, the Contractor shall monitor the cross slope and bring to the attention of the Chief Engineer any locations that will require field adjustments to the cross slope in order to meet Plan intent.

Q#7 With the sequence of construction being the shoulder milling and paving first and then the mainline lanes later, what should the referencing systems for the milling and paving use as a reference point?

A#7 The Contractor shall match the existing edge of pavement adjacent to the area of Work unless directed otherwise by the Chief Engineer.

Q#8 On plan sheet #8 in the right column, a statement is made regarding a portable asphalt plant being allowed in the infield area of exit #13; what will the access limitations be? Will a continuous flagger be required to get the haul trucks across ramp traffic? Will the existing aggregate drive area east of toll booths be allowed for use as the plant drive entrance? What will the final grading/restoration requirements be, in that will the temporary aggregate pad needed for the site be allowed to remain after the project? If the aggregate pad is allowed to remain after the project, will the stripping piles be allowed to remain on-site as decorative mounds? What current utilities are available for use? An existing north-south power line splits the site east & west restricting the usable space; what setback requirements will be required from the roadways in any direction?

A#8 In accordance with ODOT CMS 107.11.C, the Contractor is to submit a traffic control plan to the Chief Engineer for approval which indicates the method of ingress and egress from the portable plant site. All ingress and egress points will require flaggers, when the site is active, to ensure the safety of the traveling public and ensure the safe flow of construction traffic to and from the site. The existing aggregate drive to the east of the toll plaza will be permitted as an ingress/egress

point. Any temporary aggregate pads placed for the portable asphalt plant may remain, however, any excess millings piles shall be removed, at the end of the Work, in accordance with SP 105. In accordance with the Specifications, the Contractor shall contact the local utilities to determine their availability to the site. The minimum setback from any Turnpike roadway shall be 30 feet to ensure that clear zone requirements are met.

Q#9 On plan sheet #'s 2 and 3, a note #3 is referenced at many of the existing cross-overs, is this reference supposed to be to note #2?

A#9 Plan sheets 2 of 14 and 3 of 14 have been revised to reference plan note #2. Revised Plan Sheet 2 of 14 and 3 of 14 have been included with this Addendum No. 1.

Q#10 SP 400, Part III.F.2 Longitudinal Joints on page SP-54 requires a roller to operate in the adjacent lane which is a live traffic lane with traffic pushed over a small distance due to space limitations; will this roller requirement be waived? In this same section, the course material remaining on the joint overlap after luting, raking, or brooming is to be spread over the loose mat before rolling; so that the laborer is not positioned in the adjacent lane with live traffic slightly pushed over, will the paver screed end gate overlapped onto adjacent mat be adequate rather than placing a laborer in this zone?

A#10 If the Contractor can provide an alternate method that will ensure the longitudinal joint adjacent to a live lane of traffic is compacted, the roller requirements may be waived by the Chief Engineer. The use of the paver screed end gate overlap onto the adjacent lane mat will be permitted so that personnel are not positioned adjacent to a live lane of traffic for Phase 3 and Phase 4 Work.

Q#11 Due to the paving specifications requiring the lute/rake man and the joint compaction roller to operate in the adjacent lane of traffic with the traffic pushed over, in Stage #1, for the between Phase centerline joint, could the milling and paving quantity be extended into the second lane to cover milling and paving 4" of the first lane into the second lane at the center line joint, eliminating the need to put the lute/rake man and the roller in the traffic lane at least on the first lane paved? This additional width would require less care in preparing the joint and less compaction roller conflict with traffic since it would be later milled back out and paved with the second lane. For these same reasons, can the outside lane be milled and paved before the inside lane so that when the inside lane is paved, there is 2' more available on the shoulder for the traffic to be pushed over to while the lute/rake man and the joint compaction roller are in the adjacent travel lane performing the specified work?

A#11 The Contractor shall perform the work for Stage 1, Phase 3 and Phase 4 according to plan. For additional information, see response to Question No. 9.

Q#12 During the Phase 1 and Phase 2 shoulder work, will the Ty II Aggregate Drains needed for Phases 3 & 4 be able to be marked out for installation during Phase 1 and 2? If not, will the additional removal and replacement materials be paid for?

A#12 The Type II Aggregate Drains shall be marked out and installed during Phase 1 and Phase 2 Work. If the Contractor chooses to delay the installation of the Type II Aggregate Drain until Phase 3 and Phase 4, no additional compensation will be granted for additional material needed to repair the shoulders.

Q#13 Will it be allowable to broom the last of the milling fines and the SNAP millings onto the shoulder aggregate for use as berm or shoulder material?

A#13 Per Plan Note #3 on Plan Sheet 5 of 14, the use of Millings is prohibited for use as berm or shoulder material.

Q#14 For the Item Special – Regrading Under Guardrail – is all the existing area under the guardrail for the full 4' wide x 2" deep expected to be excavated as shown in the typical sections on plan sheet #5 or is intended that only the areas higher than the typical section needs excavated? Either way, can the excavated material from this item be utilized behind the 4' rounding area on the foreslope of the roadside ditch or does all the material need to be hauled off-site or to another location on the project?

A#14 Item Special, Regrading Under Guardrail is intended for use in areas that are higher than what is shown on the typical section. All material excavated under Item Special, Regrading Under Guardrail shall be disposed of in accordance with SP 105.

Q#15 For the Item 617 Shoulder Preparation – is the entire section 4' wide x the depth of the 617 berm expected to be excavated or is the shoulder preparation only expected to lower the existing aggregate surface enough to at least accept some additional 617? Can the excavated material from this item be placed on the foreslope of the roadside ditch or does all the material need to be hauled off-site or to another location on the project?

A#15 For Item 617, Shoulder Preparation, the Contractor shall prepare the existing surface to accept some additional 617. Any excess material removed shall be disposed of in accordance with SP 105.

Q#16 For the areas more than 1" higher than the adjacent paved shoulder, can the material be bladed back and used on the foreslope of the roadside ditch?

A#16 For areas that are more than 1” higher than the adjacent paved shoulder, the Contractor shall prepare the existing shoulder to accept some additional 617 and the excess material removed shall be disposed of in accordance with SP 105.

Q#17 For the attenuator truck required in the specifications, in what position should the truck be placed during the milling and paving operations to create beneficial use? In the milling – behind the farthest back brooming operation? In the paving – behind the lab testing technician?

A#17 For the milling operation, placement of the barrier vehicle should occur prior to (trailing in direction of travel) the milling machine. The paving operation (from tester through the paver) is considered one “Work Area”. Per TCR-2, the barrier vehicle and flagger shall be placed prior to the work area.

Q#18 Plan sheet 8 refers to Portable Asphalt Batch plant within the Commission Right-of Way. Is it intended for the batch plant to be located in the infield area north of the toll plaza or any of the infield areas? Can you be more specific on the limits of the Commission’s right of way?

A#18 The Commission’s intent is to provide the infield that is north of the toll plaza for use for the asphalt batch plant.

Q#19 What is the engineer’s estimated budget for this project?

A#19 Under the Ohio Revised Code, the Commission is not obligated to publish the Engineer’s Estimate until the bid opening.

Q#20 Please review Plan Sheets 2 and 3, as it appears that the reference to Note 3 for the existing cross overs should be to Note 2 on Plan Sheet 2, please clarify.

A#20 Please see Response to Q#9.

**Receipt of Addendum No. 1
Project No. 59-19-01 is hereby acknowledged:**

(Firm Name) _____

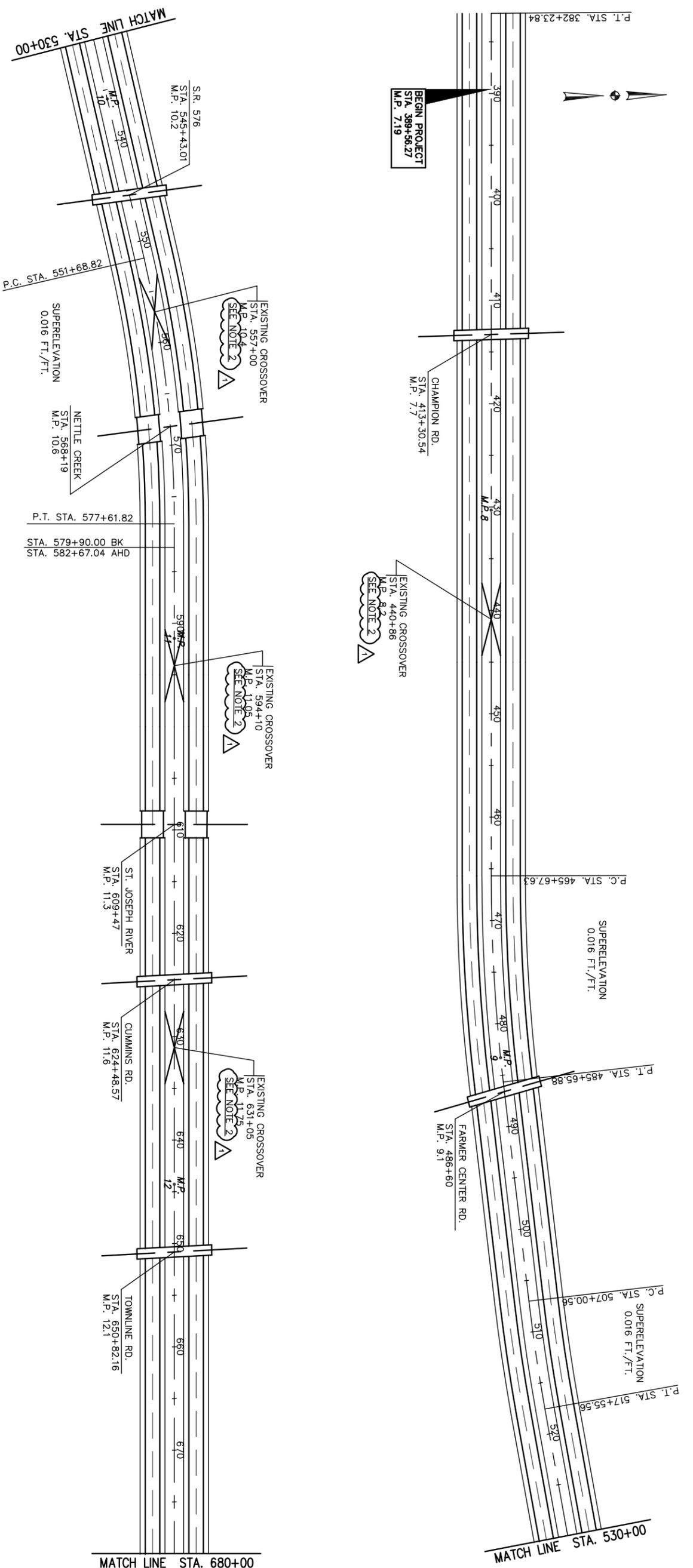
(Signature) _____

(Printed Name) _____

(Date) _____

**BIDDERS MUST RETURN THE ABOVE ACKNOWLEDGEMENT
OF RECEIPT OF ADDENDUM NO. 1 WITH THEIR BID.**

EXISTING MONUMENTS	
P.T. STA	382+23.84
STA	390+00
STA	412+50
STA	414+00
P.C. STA	485+67.83
P.T. STA	485+85.88
STA	487+90
P.C. STA	507+00.56
P.T. STA	517+55.56
STA	544+50
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P.T. STA	577+61.82
STA	624+00
STA	625+00
STA	650+25
STA	651+50

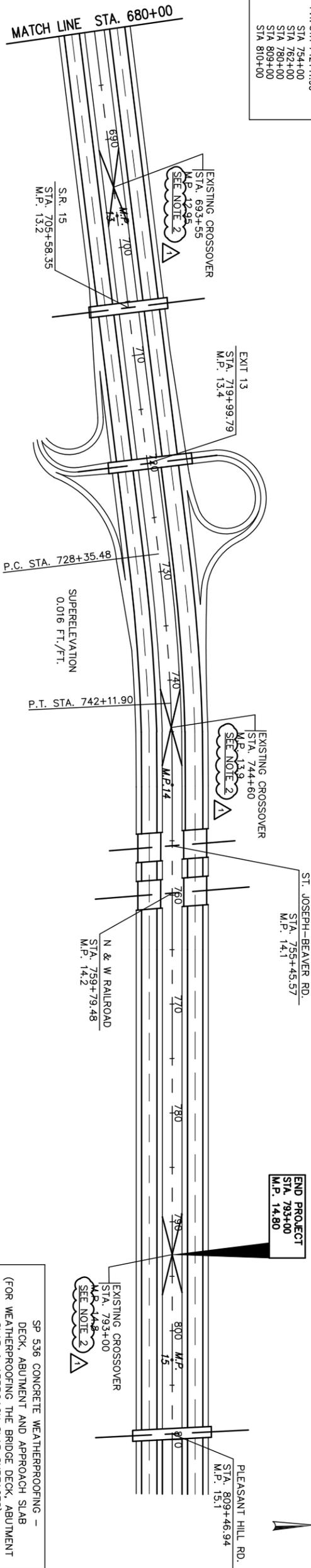


NOTES:

- 1 - AIR SPEED ZONES EXIST BETWEEN M.P. 6.0 TO 7.0 E.B. AND M.P. 9.0 TO 10.0 W.B. THESE ZONES ARE MARKED BY PK/MAG NAILS LOCATED AT QUARTER MILE INTERVALS ON BOTH SHOULDERS. THE CONTRACTOR SHALL LOCATE AND REFERENCE THESE PK/MAG NAILS PRIOR TO ANY WORK ON THE SHOULDERS. NEW PK/MAG NAILS SHALL BE RESET BY THE CONTRACTOR'S LICENSED SURVEYOR UPON COMPLETION OF THE SHOULDER WORK. THE CONTRACTOR SHALL RE-PAINT THE AIR SPEED ZONE MARKERS IN ACCORDANCE WITH OTC STANDARD DRAWING TC-2. ADDITIONALLY, THE COMMISSION WILL SUPPLY THE CONTRACTOR WITH A FORM TO RECORD AIR SPEED ZONE INFORMATION. THIS FORM SHALL BE SEALED AND SIGNED BY A REGISTERED SURVEYOR PRIOR TO SUBMITTING IT TO THE COMMISSION. ALL COSTS ASSOCIATED WITH THE NEEDED SURVEY WORK AND ASSOCIATED DOCUMENTATION NEEDED TO RE-ESTABLISH THE SPEED ZONE MARKINGS SHALL BE CONSIDERED INCIDENTAL TO ITEM SP 623. CONSTRUCTION LAYOUT SURVEY. PAYMENT FOR THE PAINTED AIR SPEED ZONE MARKINGS SHALL BE IN ACCORDANCE WITH ITEM SPECIAL, AIR SPEED ZONE MARKINGS, AS PER PLAN.
- 2 - REMOVE 2" MINIMUM WEARING SURFACE COURSE, PER ITEM 254, OF THE EXISTING CROSSOVER, TACK COAT THE MILLED SURFACE WITH ITEM 407 - NON-TRACKING TACK COAT, AND RESURFACE WITH 2" MINIMUM ITEM SP 404 - ASPHALT CONCRETE SURFACE COURSE, USING CRUSHED STONE, PG64-22. SEE OTC STD. DWG. XOV-1 FOR ADDITIONAL DETAILS. CONTRACTOR SHALL REPAVE THE CROSSOVER IN SUCH A MANNER SO AS TO ENSURE THE CROSSOVER PROPERLY DRAINS. ALL LABOR EQUIPMENT MATERIALS AND INCIDENTALS SHALL BE INCLUDED IN THE PERTINENT BID ITEMS.

2 14	PROJECT 59-19-01	RESURFACING PLAN STA. 389+56.27 TO STA.680+00	DESIGNED	CHECKED	NO.	REVISIONS	BY	DATE	DESIGN AGENCY
			JJS	CAM	△	ADDENDUM NO. 1	JJS	1/29/19	
			DRAWN	IN CHARGE					
			JJS	ADY					

EXISTING MONUMENTS	
STA 690+00	
STA 707+00	
P.C. STA 728+35.48	
P.T. STA 742+11.90	
STA 754+00	
STA 762+00	
STA 780+00	
STA 809+00	
STA 810+00	



APPROX. MILEPOST OF BRIDGE	APPROACH SLAB LOCATION IN DIRECTION OF TRAVEL		REINFORCED CONCRETE APPROACH SLABS (T=12"), AS PER PLAN	APPROACH SLAB REMOVED	AFFECTED LANE(S)			
	LEAD	TRAIL			LT SHLDR	LEFT	RIGHT	RT SHLDR
E.B.		X	70.00	70.00		X	X	X
11.35		X	36.67	36.67		X	X	X
14.2		X						
WB		X	66.67	66.67		X	X	X
11.35		X						
		TOTAL	173.33	173.33		X	X	X

APPROACH SLAB REPAIR NOTE(S):

- 1.- APPROACH SLAB REMOVAL AND REPLACEMENT PERFORMED DURING A WORK SHIFT SHALL BE COMPLETED DURING THAT SAME WORK SHIFT. NO REPAIR SHALL BE LEFT OPEN BEYOND END OF THE SHIFT. ALL PLANNING, LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS NEEDED TO INSURE THE WORK IS COMPLETED DURING THE WORK SHIFT SHALL BE CONSIDERED INCIDENTAL TO THE ITEM.
- 2.- STAGING OF APPROACH SLAB REMOVAL AND REPLACEMENT WILL BE PERMITTED PROVIDED THE NUMBER OF LONGITUDINAL CONSTRUCTION JOINTS ARE KEPT TO A MINIMUM.
- 3.- LONGITUDINAL CONSTRUCTION JOINTS SHALL BE SEALED IN ACCORDANCE WITH SP 516B. THE COST OF SEALING THE JOINT SHALL BE INCIDENTAL TO ITEM 526.
- 3.- WHEN REPAIRING ABUTMENT GRADE BEAM, ITEM 202--PORTIONS OF STRUCTURE REMOVED SHALL BE CONSIDERED INCIDENTAL TO ITEM SP 519--PATCHING CONCRETE STRUCTURES, AS PER PLAN.
- 4.- CONTRACTOR SHALL TAKE REASONABLE CARE WHEN REMOVING THE EXISTING APPROACH SLAB SO AS TO MINIMIZE ANY POTENTIAL DAMAGE TO GRADE BEAM. A CONTINGENCY QUANTITY OF 200 S.F. OF ITEM SP 519 -- PATCHING CONCRETE STRUCTURES, AS PER PLAN, HAS BEEN INCLUDED FOR USE FOR REPAIR OF GRADE BEAMS, OR AS DIRECTED BY THE CHIEF ENGINEER.



SP 536 CONCRETE WEATHERPROOFING - PARAPETS (FOR WEATHERPROOFING THE BRIDGE DECK, ABUTMENT SLAB & APPROACH SLAB SURFACES)	
NETTLE CREEK	1,156 S.Y.
ST. JOSEPH RIVER	1,956 S.Y.
ST. JOSEPH-BEAVER RD.	1,342 S.Y.
NORFOLK-SOUTHERN RAILROAD	1,278 S.Y.
SUBTOTAL	6,232 S.Y.

** SP 536 CONCRETE WEATHERPROOFING - PARAPETS (FOR WEATHERPROOFING THE FRONT FACE, TOP AND BACK FACE OF THE BRIDGE PARAPETS AND THE UNDERSIDES OF THE BRIDGE DECKS TO THE FACIA BEAM UNLESS OTHERWISE NOTED.)	
+ NETTLE CREEK	578 S.Y.
+ ST. JOSEPH RIVER	978 S.Y.
+ ST. JOSEPH-BEAVER RD.	671 S.Y.
+ NORFOLK-SOUTHERN RAILROAD	888 S.Y.
SUBTOTAL	3,115 S.Y.

** WHERE APPLICABLE, PARAPET WEATHERPROOFING WILL REQUIRE TRAFFIC CONTROL ON LOCAL ROADS IN ACCORDANCE WITH OHIO MANUAL UNIFORM TRAFFIC CONTROL DEVICES. PAYMENT TO BE UNDER ITEM SP 614 MAINTAINING TRAFFIC, AS PER PLAN.

+ FOR WEATHERPROOFING THE FRONT FACE, TOP AND UPPER 2'-8" OF THE BACK FACE OF THE BRIDGE PARAPET.

	PROJECT 59-19-01	RESURFACING PLAN STA. 680+00 TO STA. 793+00	DESIGNED	CHECKED	NO.	REVISIONS	BY DATE	DESIGN AGENCY
			JJS	CAM	△	ADDENDUM NO. 1	JJS 11/29/18	
			DRAWN	IN CHARGE				
			JJS	ADY				

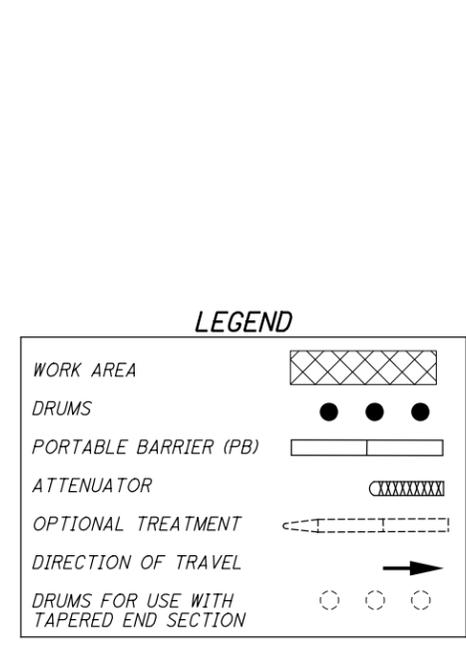
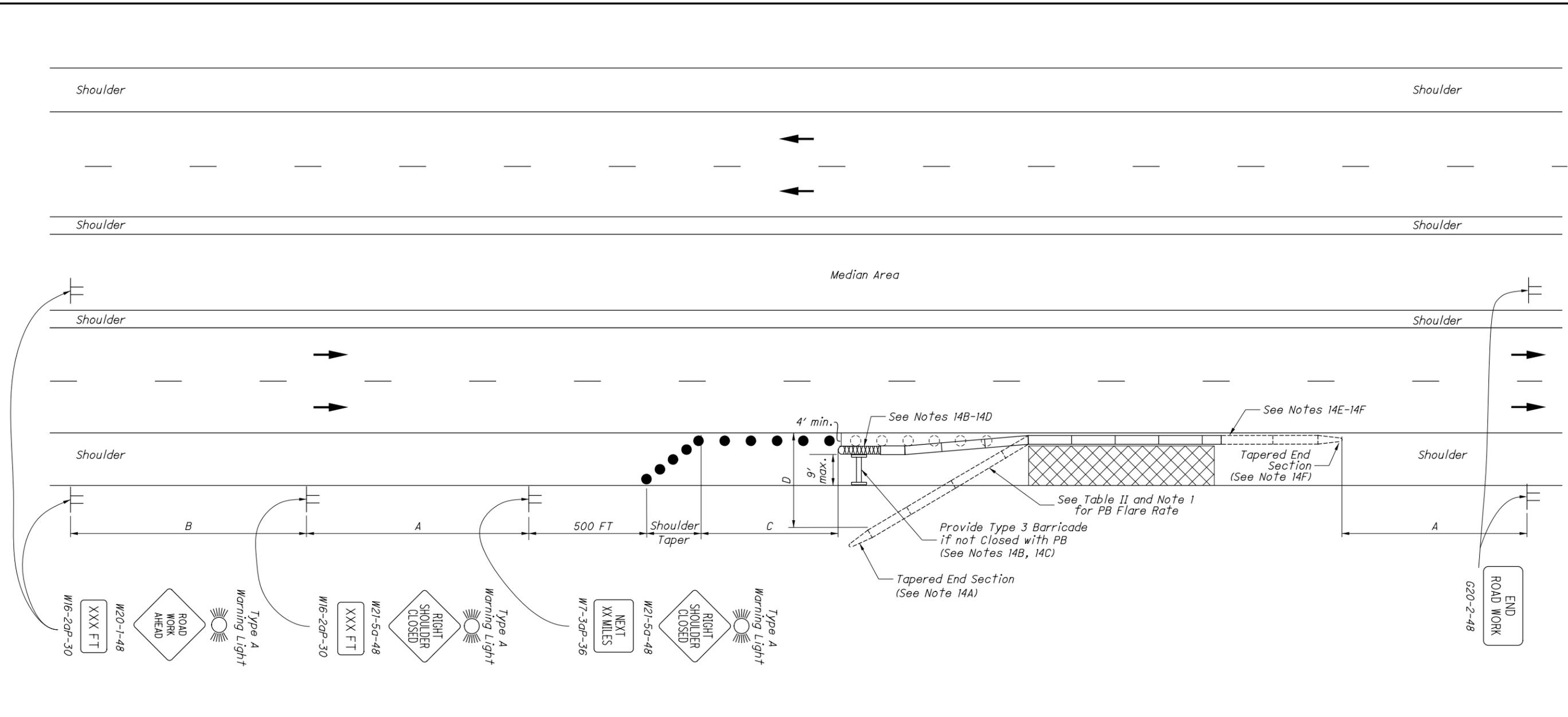


TABLE I (SIGN SPACING)

ROAD TYPE	DISTANCE BETWEEN SIGNS (FT)	
	A	B
MAJOR CONVENTIONAL	500	500
FREEWAY & EXPRESSWAY	1000	1500

TABLE II

SPEED LIMIT (MPH)	SHOULDER TAPER RATE MINIMUM	PB FLARE RATE MINIMUM	MAXIMUM DRUM SPACING (FT)		BUFFER (C) (FT) MINIMUM	CLEAR ZONE WIDTH (D) (FT)
			TAPER SEC.	TANGENT SEC.		
25	4:1	8:1	25	40	155	15
30	5:1	8:1	30	40	200	15
35	7:1	9:1	35	40	250	15
40	9:1	10:1	40	80	305	15
45	15:1	12:1	45	80	360	19
50	17:1	14:1	50	80	425	19
55	19:1	16:1	55	80	495	23
60	20:1	18:1	60	120	570	30
65	22:1	19:1	65	120	645	30
70	24:1	20:1	70	120	730	30

NOTES:

DESIGN SPEED

1. The design speed used for taper rates should typically be the permanent legal speed. However, on construction projects for which the speed limit is reduced, the reduced speed may be used in determining the taper rate when the taper is not the first active construction area within the project.

TAPERS

- 2A. The minimum acceptable rate for the shoulder taper is provided in Table II.

SIGN SPACING

- 3A. The work zone sign spacings shown in Table I are minimums. Maximum spacing should not be greater than 1.5 times the distances shown in Table I.
- 3B. Sign spacing should be adjusted to avoid conflict with existing signs. Minimum spacing to existing signs shall be 200' for speeds of 45 mph or less and a minimum of 400' for speeds 50 mph or greater.

ADJUSTMENTS FOR SIGHT DISTANCE

4. The location of the shoulder taper and the advance warning signs should be adjusted to provide for adequate sight distance for the existing vertical and horizontal roadway alignment.

BASIC SIGNING

- 5A. ROAD WORK AHEAD (W20-1) signs shall be provided on entrance ramps or roadways entering the work limits.
- 5B. END ROAD WORK (G20-2) signs are only required for shoulder closures of more than 1 day. It is intended that these signs be placed on the mainline, on all exit ramps, and on roadways exiting the work limits.
- 5C. Overlapping of signing for adjacent projects should be avoided where the messages could be confusing. Any W20-1 or G20-2 signs which falls within the limits of another traffic control zone shall be omitted or covered during the period when both projects are active.

SIGNING DETAILS

- 6A. When the approach speed limit is 40 mph or less, 36" warning signs may be used.
- 6B. The distance plaque W16-2aP shall indicate the distance to the beginning of the shoulder taper. Distances less than 1 mile may be expressed in feet.

EXTRA ADVANCE WARNING SIGNING

7. Extra Advance Warning Sign Groups consisting of ROAD WORK AHEAD (W20-1), RIGHT SHOULDER CLOSED (W21-5a) signs plus Distance plaques may be specified in the plans or may be required to be erected, as determined by the Engineer (see Standard Construction Drawing (SCD) MT-95.50).

PAVEMENT MARKINGS / RPMs

- 8A. If a shoulder closure of greater than 3 days is required, the following shall be performed:
 - a) The appropriate color work zone edge lines shall be applied along the taper and tangent sections.
 - b) The existing conflicting pavement markings shall be removed or covered per CMS 614.11G.
- 8B. Work zone pavement markings which would conflict with final traffic lanes shall be removable tape (CMS 740.06, Type I) unless the area will be resurfaced prior to project completion.

- 8C. After completion of the work, pavement markings other than CMS 740.06, Type I shall be removed in accordance with CMS 614.11 I. The original markings and raised pavement marker reflectors shall be restored at no additional cost unless separately itemized in the plans.

(RESERVED FOR FUTURE USE)

- 9A. (intentionally blank)
- 10A. (intentionally blank)

FLASHING WARNING LIGHTS

11. Type A flashing warning lights shown on the ROAD WORK AHEAD (W20-1) signs and on the RIGHT SHOULDER CLOSED (W21-5a) signs are required whenever a night lane closure is necessary.

INTERSECTION / DRIVEWAY ACCESS

12. Within the length of the closure, provision shall be made to control traffic entering from intersecting streets and major drives as necessary to prevent wrong-way movements and to keep vehicles off of new pavement not ready for traffic. The Contractor shall:
 - a) Place across the closed shoulder, barricades, and/or
 - b) Provide an additional flagger at every public street intersection and major driveway.

Barricades placed across the closed shoulder shall be located 25' beyond the projected pavement edges of the driveway or cross highway, as shown in SCD MT-101.60.

Existing STOP signs shall be relocated as necessary to assure proper location for the traffic conditions. The method of control shall be subject to the approval of the Engineer.

DRUMS/CONES

- 13A. The maximum drum spacing along tapers and along tangent sections shall be as shown in Table II. A minimum of 5 drums in the taper shall be used to close the upstream shoulder.
- 13B. Cones may be substituted for drums as follows:
 - a) Use of cones is permissible for either daytime operation or for nighttime operation, but shall not be used continuously, day and night. Upon completion of work within the work period, the cones shall be removed. They may again be placed on the highway in order to resume work in the following such work period.
 - b) Cones used for daytime traffic control shall have a minimum height of 28".
 - c) Cones used for nighttime traffic control shall have a minimum height of 42".
 - d) Use of cones at night shall be prohibited along tapers.
 - e) Cone spacing at night shall be at a maximum of 40'.
 - f) Where cones are substituted for drums along tangents, intermixing of channelizing devices within the same run will not be permitted. Either cones shall be used for the entire length of the tangent section, or drums shall be used for the entire length.

- 13C. Provisions shall be made to stabilize the cones and drums to prevent them from blowing over.

- 13D. All drums and cones should have a minimum offset from the edge of the traveled lanes of 1.5 feet.

- 13E. The use of drums or cones in lieu of portable barrier should be based on engineering judgement.

PORTABLE BARRIER (PB)

- 14A. A tapered end section may be used in place of the impact attenuator at locations where the last full section of PB can be extended outside of the clear zone for approaching traffic. See Table II for clear zone widths. When a tapered end section is used, drums shall extend parallel to the travel lanes from the shoulder taper to the first section of PB parallel to the traveled lanes.

- 14B. If it is necessary to provide the Contractor with access to the work area behind the PB flare, the PB end treatment shall include an impact attenuator. The maximum width of the opening shall be 9' between the impact attenuator and the outside edge of the paved shoulder. Where space constraints do not allow for 4' between the lane line and attenuator, a minimum of 1' may be used.

- 14C. If Contractor access is provided per Note 14B, the length of PB shall be adequate to shield the work area from the motorist. This length of need of PB shall be determined from the calculations provided in SCD MT-101.75 and the L&D Manual, Volume I, Figure 602-IE, and shall require the approval of the Engineer.

- 14D. When used, impact attenuators shall be installed parallel to traffic. Also, the last full section of PB, adjacent to the impact attenuator, shall be located parallel to traffic.

- 14E. Where narrow medians are provided, see Table II to determine whether or not the downstream end of the PB is located within the clear zone of opposing traffic. If the PB is located within the clear zone of opposing traffic, the downstream end shall be flared away from opposing traffic to shield the work area from potential errant vehicles crossing the median.

- 14F. If the PB is located beyond the clear zone of opposing traffic, the downstream end of the PB may be provided with a tapered end, located 10' beyond the work area.

- 14G. Where PB is located beyond the edge of the paved shoulder, the cross slope within the clear zone, including the surface on which the PB is placed, shall be graded at 10:1, or flatter. If the cross slope is steeper than 10:1, the PB shall be terminated on the paved shoulder as necessary to satisfy the length of need, and then terminated using an impact attenuator.

- 14H. The work area shall be adequately protected from traffic approaching from intersections and driveway approaches using PB and impact attenuators as called for by the Engineer.

- 14I. For installation procedures, refer to the manufacturer's installation instructions.

- 14J. For details on delineation of PB, see Standard Construction Drawing MT-101.70.