PO Box 508
Barton, VT 05822
Phone: (802)525-9506
Fax: (802)525-4616
www.jpsicard.com

Submittal Data Sheet

Submittal #: 3

Submission #: 2

Date: 4/28/2016

Project Name: Irasburg IM Deck (46)

Owner: Vermont Agency of Transportation

Engineer: VTrans

Contractor: J.P. Sicard, Inc.

Item Number: Special Provision 900.645 (Traffic Control)

Supplier: Ruggles Engineering Services, Inc.

Description of Item: Site Specific Traffic Control Plan Rev1

Subsitution: NO

Engineers Review Comments:

Submitted By:	Brad Drake
Title:	Project Manager
Company:	JP Sicard, Inc.

Vermont Agency of Transportation
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BY: Jennifer Fitch DATE: 05/02/2016

CLD Consulting Engineers, Inc.
Checked for
CONFORMANCE
BY: L. GREER DATE: 05/02/2016

SITE SPECIFIC

TRAFFIC CONTROL PLAN

FOR

Irasburg IM Deck (46)

(State of Vermont, Agency of Transportation
Interstate 91, Bridge No 107N)

FOR

www.jpsicard.com
J.P. SICARD, INC.
Barton, Vermont
802-525-9506

PO BOX 508
BARTON, VT 05822

STATE OF VERMONT
BRIAN P. SICARD
No. 53831
Civil
LICENSED
PROFESSIONAL ENGINEER

4/27/16

April, 2016

Prepared by:

RUGGLES ENGINEERING SERVICES INC.

Ruggles Engineering Services, 4580 Memorial Drive, St. Johnsbury, VT 05819
www.rugglesengineeringservices.com

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SECTION 1 – GENERAL INFORMATION

1.1 Purpose:

The purpose of this Traffic Control Plan is to present site specific construction methods for work zone traffic control. This work shall consist of furnishing, installing, maintaining and removing traffic control devices necessary to provide reasonable protection & advanced warning for motorists and construction workers. The road surface will be maintained and will be free of defect or imperfections that would inhibit safe travel.

Traffic control devices include but are not necessarily limited to signs, signals, lighting devices, markings, barricades, channeling and hand signaling devices and flaggers. This plan is for traffic control and does not include a worker safety plan.

This plan is intended to comply with the Traffic Control Plan Requirements and the VTrans Work Zone Safety & Mobility Guidance Document, Appendix "A" Temporary Traffic Control Devices. All traffic control devices shall conform to the requirements of Part VI of the 2009 edition of the MUTCD, Rev. 2 (Manual on Uniform Traffic Control Devices) and comply with the NCHRP 350 and MASH guidelines and the requirements of this Traffic Control Plan. This plan will be used in conjunction with the Contract Plans, Special Provisions and Notice To Bidders.

A copy of this section of the manual and this Traffic Control Plan will be available at the construction site through the Key Personnel listed in section 1.5. All subcontractors working on this project along with our project superintendent, paving foreman and sign foreman will be provided with a copy of this Traffic Control Plan in addition to the field office copy.

1.2 Description of Project:

The project will include traffic control related items for the replacement of the existing bridge deck and related approach work for Bridge No. 107N on Interstate 91. The project length is 600 feet including 447.43 feet of bridge.

The project will include advanced warning, temporary and permanent signs along with permanent lane closures for the construction phasing. Phases will include temporary lane closures to set up permanent lane closures for deck replacement phases and final paving, markings and other incidental work.

This project is located on a high speed principal arterial highway. The project will also effect a low volume, rural, local road for work under the bridge.

Project approach signing will be in place before the project starts as shown in Section 3.

SECTION 2 – SITE SPECIFIC REQUIREMENTS

2.1 Work Zone Limitations

a. Work Restrictions

b. The work on this project will be performed during daylight hours, Monday thru Friday. The Resident will be notified in advanced regarding Saturday work.

Highway Parking Restrictions are referenced Contract Special Provisions.

c. Permanent Signs

Permanent signs will be in place before the project starts. Permanent signs will be installed as shown on the figures (pages 9-10, 12)in section 3.

d. Lane Width

One- 12 foot wide lane will be open for passage by vehicle traffic at all times.

e. Pedestrian Traffic

There is no pedestrian traffic on the limited access highway. Pedestrians may walk under the bridge which will be protected from falling objects or debris.

f. Traffic Impact

Construction phasing and sequencing will be used to minimize traffic impacts.

i. Delay Time

Delay time will only occur as a result of lowering the regulated speed limit from 65mph to 55 mph through the 0.75 mile work zone. The project was designed with a reduced speed zone. Temporary Speed Limit Certificates will be needed for the North Bound lane closure at the MM 166.5 U-Turn and the Southbound lanes associated with the modified T-16 plans.

ii. Portable Changeable Message Signs (PCMS)

PCMS boards will be used as required in the Contract to warn motorists of the upcoming closures or delays. All sign locations shall be laid out prior to installation as shown on this Plan with final approval from the Resident Engineer.

g. Speed Reduction

The approved speed reduction is from 65 mph to 55 mph.

h. Lane Closure

Temporary Work Zone Lane Closure:

The project limits will be reduced to a single lane during work hours as needed and returned to two lanes unless the permanent closures are in place.

Signs not applicable to current work area conditions will be laid down as required by VTrans or removed as needed. Lane closures will also be used on River Road under the bridge. Lane closures will consider the proximity of the railroad tracks that parallel the road. A railroad flagger will be present when activities encroach into the railroad foul space.

Permanent Work Zone Lane Closure:

The project limits will be reduced to a single lane for permanent closures to reconstruct the bridge deck. Permanent closures will be phased according section 3.

Rolling Road Block:
A rolling road block has been designed into the project to shift traffic from the left lane closure to the right lane closure. A rolling road block may be The roadblock will slow traffic to create a 5 minute gap to shift taper barrels, arrow board and to replace lane closed signs.

The rolling roadblock has been designed based on the VTrans Traffic Engineering Instructions (TEI) 16-601, approved on April 1, 2016. Local fire, police, transportation and the DMV will be notified prior to the rolling roadblocks.

The rolling roadblock is for the short duration period when the construction sequence needs to shift. The rolling roadblock will allow for a gap in traffic to allow for the work activities to be performed. The pacing will be set at a speed of 20 mph. The pacing of traffic will be controlled by a law enforcement pilot vehicle with blue lights. If there are delays in coordination, officers may signal to reduce the speed to 15 mph. The rolling road block will also require the Interchange 26 northbound onramp to be shut down for a period of 5 minutes. The full TEI 16-601 is included in the appendix. Timing of the event will be coordinated with the Resident Engineer. Timing may occur during mid-morning, early afternoon or early evening during daylight hours.

i. Roadway Surface Conditions

The road surface maintained and open to traffic will be free of defect or imperfections that would inhibit safe travel. Approach milling and paving will be performed behind the barrier closures or temporary day closures.

j. Temporary Pavement Markings

Temporary pavement markings will include temporary tape edge lines and temporary RPM's. The RPM's will be located along the outside edge of the temporary tape at an interval of 20 feet as required by the contract plans. Typical RPM's are included in the appendix.

Installation of these devices will only be performed behind a temporary lane closure package prior to shifting traffic during the same day that the shift occurs.

Replacement of these devices will only be performed behind a rolling road block since workers cannot perform maintenance within an open lane of traffic. Temporary RPM's

are designed for temporary use and may require maintenance periods during the permanent periods of closure.

k. Detours

There are no detours planned on this project.

l. Signage

- Permanent signs will be located in along approach areas as shown on the site specific plans in Section 2. Signs will not be placed such that they are obscured by existing signs or objects.

  The height of permanent signs will be as shown on Permanent Sign detail in Appendix A, the bottom of the sign will be no less than 7 feet above the adjacent grade.

  Sign locations will not be placed such that they would interfere with existing signs.

- Portable signs will be placed on the edge of the roadway and a minimum of 1 foot above the travel way.

- Vegetation that interferes with the visibility of the signs will be removed.

- When signs are placed behind Guardrails, the portable sign face will be above the top of the rail.

- Permanent signs will be mounted on two steel posts, complying with NCHRP 350 or MASH and manufacturers installation procedures. The steel post installation procedure requires a lap splice breakaway system. The installation details have been included in Appendix A. In addition to the post installation methods, the top of the steel posts will not protrude above the signs when installed.

- Portable signs will be mounted on aluminum easel "tri-busters" or steel "Little Buster" labeled NCHRP 350 and 2009 MUTCD compliant. The easels maybe tethered using a sand bag resting on the ground. Signs meeting the NCHRP Report 350 will continue to be used however newer sign hardware may be certified from the AASHTO Manual for Assessing Safety Hardware (MASH).

m. Other Projects

No other projects are known within the project area.

2.2 Flaggers and UTO's utilized in the Work Zones

a. Flaggers:

Flaggers may be used for traffic calming signaling during setup's and takedowns. Flaggers may hand signal vehicles to slow to the posted speeds during periods when workers are setting up or taking down or when trucks may be entering or exiting the work zone per the modified T-16. Flaggers will not be directing traffic but act as a visual presence of workers for oncoming traffic. Flaggers will remain behind barrels, cones and barrier devices as appropriate.

Flaggers will also be used when lane closures are needed on the dirt road (River Road) under the bridge.

Rail road flaggers will be coordinated separate of the TCP plan with the use of worker clearance forms and VT Rail approvals.

b. Uniform Traffic Officers (UTO)

UTO's will be utilized in the work zones including;

- Ahead of the immediate work area during temporary closures for blue light presence. Officers will be required to remain in their vehicles.
- Rolling Road Blocks.
- as required by the Resident Engineer
- Law enforcement personnel within the TTC zone may wear high-visibility safety apparel that meets the performance requirements of the ANSI/ISEA 207-2006 publication entitled "American National Standard for High-Visibility Public Safety Vests" (see Section 1A.11) and labeled as ANSI 207-2006. Required apparel will be the responsibility of the Law Enforcement Authority.

2.3 Key Personnel and Contact Info*:

JP Sicard, Inc.

Paul Carr (Project Superintendent)	(802) 673-7802
Brad Drake (Project Manager)	Office (802) 525-9506 (802) 323-6714
Jason Sicard (President)	(802) 793-2151

PLAN PREPARER
RUGGLES ENGINEERING SERVICES, INC.
Nathan P. Sicard, P.E. (802) 748-5898, nate.res@myfairpoint.net

*FOR NON-WORKING HOUR ISSUES OR EMERGENCIES SEE EMERGENCY CONTACT INFO.

The Project Superintendent listed above has the authority to correct issues and to shut down the project if the traffic control items are not in place or not up to the standards as set forth in the MUTCD manual or as dictated in the plan. He will be responsible for reviewing work zone signs during periods of time that work is progressing on the project.

Any significant changes needed for the traffic control plan will be provided to Ruggles Engineering Services, prior to forwarding to VTrans for approval. This plan does not account for other projects within or adjacent to the work area which might affect the implementation of this traffic control plan.

2.4 Emergency Contact Information

The following is a list of contact numbers for notifying the Resident & local emergency officials, and local government officials whenever significant traffic impacts are anticipated or an emergency occurs.

EMERGENCY PHONE NUMBERS:

FIRE – POLICE – AMBULANCE ……. 911

JP Sicard, Inc.

Paul Carr (Project Superintendent) …… (802) 673-7802

Brad Drake (Project Manager) ……. (802) 323-6714

VTrans District 9 (Derby) ……..…..…….....…...…….. (802) 334-7934
Dale Perron
Dale.Perron@vermont.gov

State Police Barracks (Derby) ……..…...……. (802) 334-8881
Station Commander
Walter.Smith@vermont.gov

SECTION 3 – CONSTRUCTION PHASING AND SEQUENCING

3.1 GENERAL:

JP Sicard will utilize construction phasing or sequencing that reasonably minimizes traffic impacts and provides a safe work area. The phasing of the traffic control plan will be coordinated with the Project Schedule.

The sequence of work as it relates to the major items will be as follows: Installation of Permanent Traffic Control Devices, Phase 1 Deck Replacement, Phase 2 Deck Replacement, Phase 3 Deck Replacement, Bridge Expansion Joints, Final Pavement Markings and Removal of Permanent Traffic Control Devices.

Although no issues or conflicts are expected, weekly meetings will be held as needed to discuss any issues that may arise, to resolve any conflicts on this portion of the project and to ensure the least possible disruption to the traveling public as possible.

Construction workers will follow this plan and all supplemental safety plans for working in traffic.

3.2 Installation of Permanent Signage:

Phase 1 will include the installation of Permanent Project Approach Signing. Signs will be installed as described in the following Figures. Prior to installing the signs, PCMS Boards will be installed to warn motorists of the upcoming work.

Advance Warning Base Map

Legend

Work Area

Closure Zones (Permanent and Temporary) See Specific Phases for detail MM 162.7 Additional temporary lane closures will begin 2000' south of closure when installing masking and temporary tape.

PCMS BOARD #1

	PHASE 1	PHASE 2
1.	BRIDGE WORK	BEGINS MAY X

2. Change when work begins

BRIDGE	EXPECT
WORK	LANE
AHEAD	CLOSURES

3. Change when permanent closures are in place.

LANE	STAY
CLOSURES	ALERT
AHEAD	

4. Change when permanent closures are removed.

BRIDGE	EXPECT
WORK	LANE
AHEAD	CLOSURES

PCMS BOARD #2

	PHASE 1	PHASE 2
1.	BRIDGE WORK	BEGINS MAY X

2. Change when work begins

BRIDGE	EXPECT
WORK	LANE
AHEAD	CLOSURES

3. Change when permanent closures are in place.

LANE	STAY
CLOSURES	ALERT
AHEAD	

4. Change when permanent closures are removed.

BRIDGE	EXPECT
WORK	LANE
AHEAD	CLOSURES

Interchange 26

Begin Permanent Sign's "Road Work Ahead" MM 161.65 Each Side and on Ramp

PCMS BOARD #2 Interchange 26 on ramp. (275' from start, right shoulder)

Begin Advanced Warning for temporary closures to install masking/ temporary lines at MM 161.25

PCMS BOARD #1 Left Shoulder (30' left of pavement in median at MM 160.8)

© 2015 Google

River Road TCP

Permanent Sign Plan

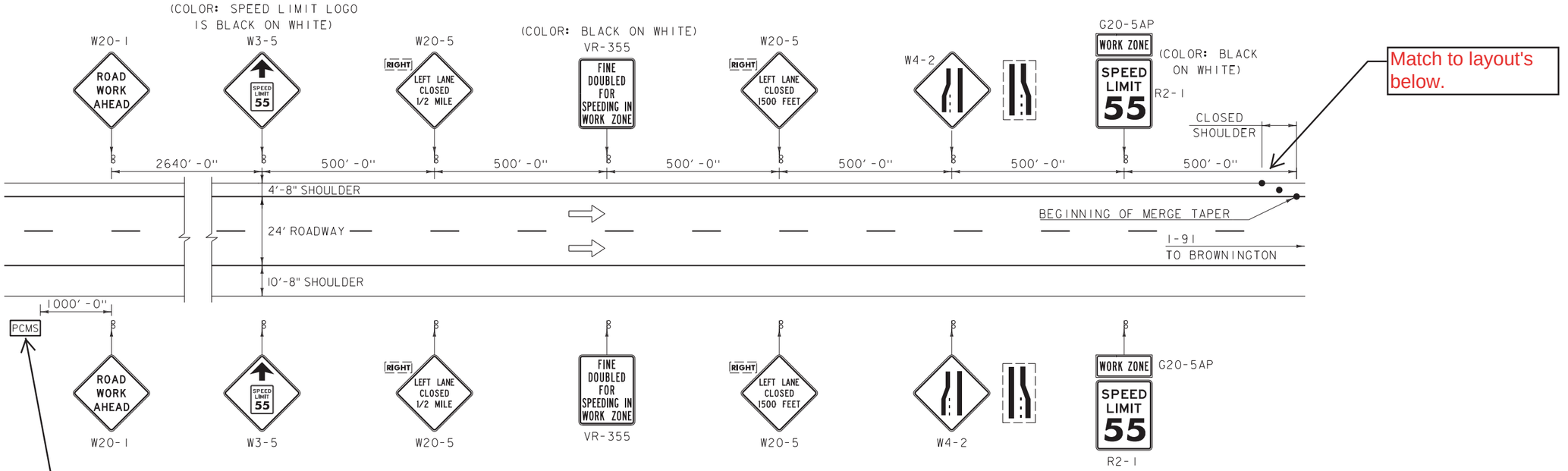
Legend

3.3 Phase 1 Bridge Closure (Left Closure):

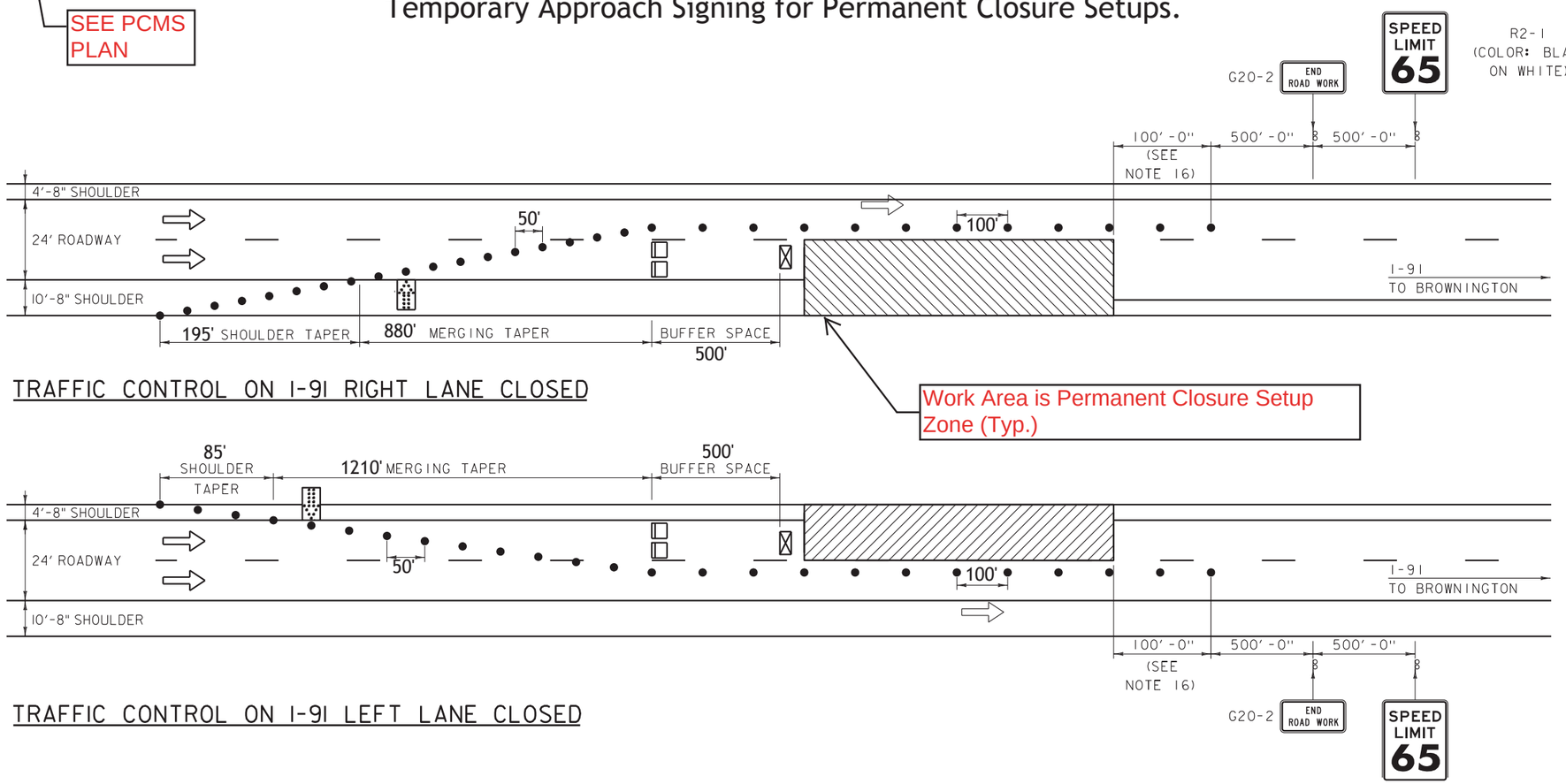
The permanent closures will be phases with the deck replacement. The initial closures will be on the passing lane. Modifications to Traffic Control Sheets 2 and 3 (VTrans Standard T-11 and T-13) will be used for this phase. A temporary closure will be installed in advance of the permanent taper to protect workers during the installation of the temporary edge lines and RPM's.

The work area will include a space 300 feet in advance of the bridge abutment. Barriers will be installed 8 inches from the relocated travel lane on the existing deck. The plans also allow for a 12 inch clear zone between the bridge curb and 12 foot travel lane. The barriers are specially designed for protection against impact since the deck will be removed.

Once the bridge is closed, there will be short term periods where a modified T-16 will be used on the southbound bridge for construction equipment to remove the existing concrete deck, cold planning and paving. A modified T-16 has been included (see page 14).



Temporary Approach Signing for Permanent Closure Setups.



TRAFFIC CONTROL ON I-91 RIGHT LANE CLOSED

TRAFFIC CONTROL ON I-91 LEFT LANE CLOSED

LEGEND

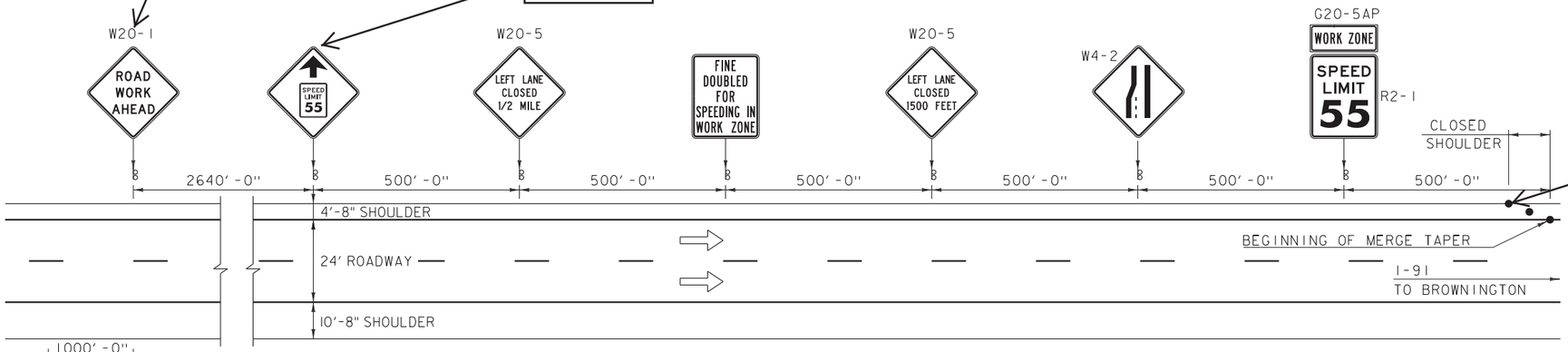
- FLOW OF TRAFFIC
- RETROREFLECTIVE PLASTIC DRUM /Cone
- PORTABLE ARROW BOARD
- TYPE III BARRICADE
- WORK AREA
- UTO
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN (ITEM 641.15)

PROJECT NAME: IRASBURG
PROJECT NUMBER: IM DECK(46)

CLD I5-0223 MODEL: TCP2

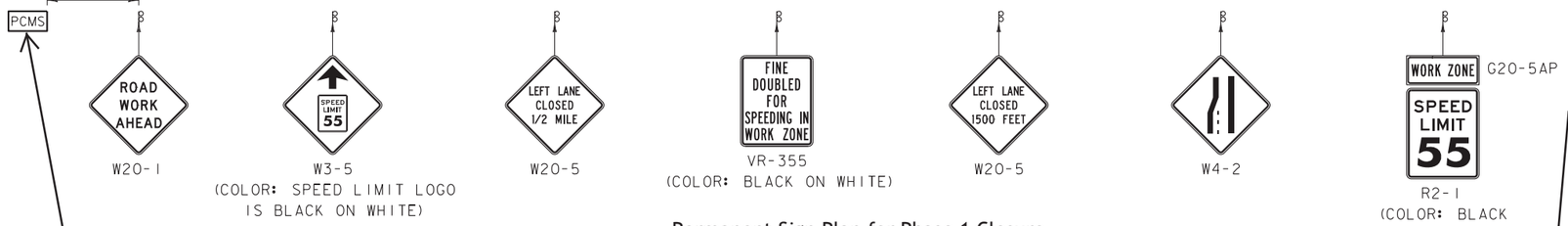
MM 161.5

MM 162.00



Match to plan below.

NOTE:
PRIOR TO UNCOVERING PERMANENT SIGNS, TEMPORARY SIGNS WILL BE USED DURING SETUP. SIGNS AND TEMPORARY LANE CLOSURE WILL BE SETUP ACCORDING TO THE TRAFFIC CONTROL SHEET 2. THE WORK AREA WILL BE CONSIDERED THE POINT THAT CENTERLINE MASKING AND TAPE INSTALLATION IS REQUIRED.



SEE PCMS PLAN

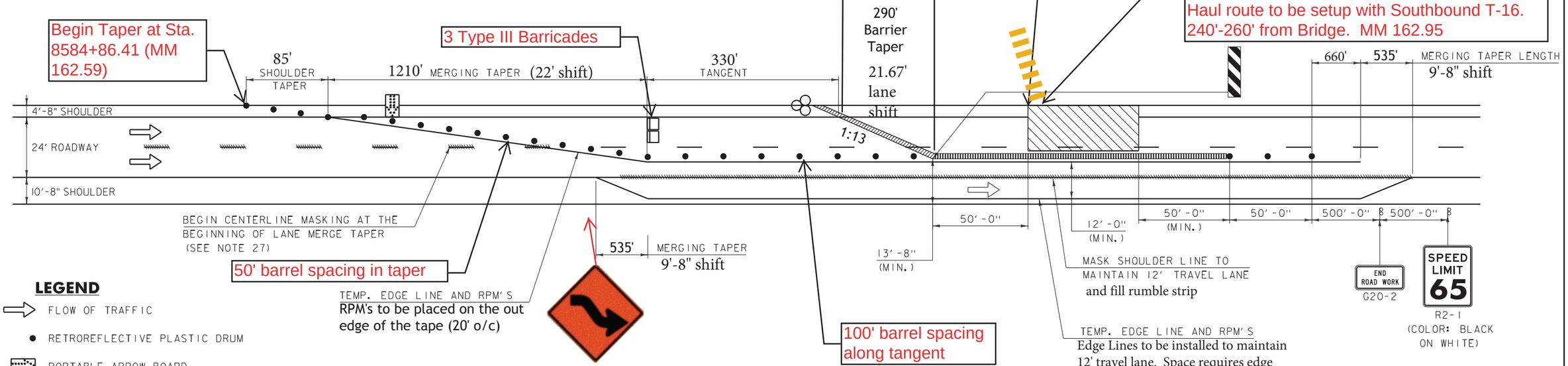
Work Area Begins 300' South of Bridge Sta. 8604 +51.41 (MM 162.96)

Proposed Temporary Work Vehicle Cross Over to I-91 Southbound for worker access and temporary deck waste haul route or concrete pours, etc.
Haul route to be setup with Southbound T-16. 240'-260' from Bridge. MM 162.95

Permanent Sign Plan for Phase 1 Closure

Begin Taper at Sta. 8584+86.41 (MM 162.59)

3 Type III Barricades



LEGEND

- FLOW OF TRAFFIC
- RETROREFLECTIVE PLASTIC DRUM
- PORTABLE ARROW BOARD
- TYPE III BARRICADE
- WORK AREA
- TRUCK-MOUNTED ATTENUATOR
- ENERGY ABSORPTION ATTENUATOR (Install per manufacturers requirements)

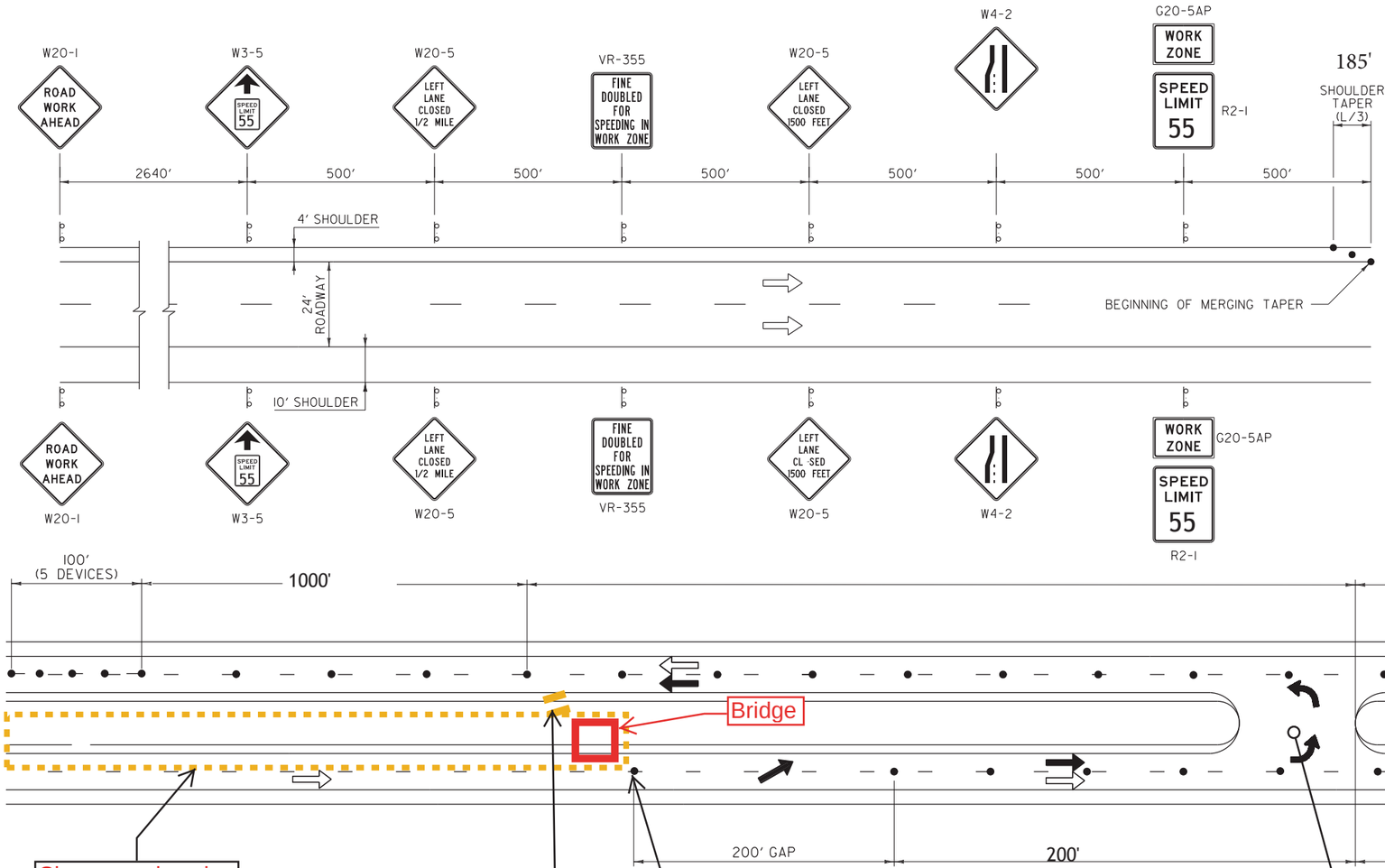
See calculations in the appendix for dimensional requirements.

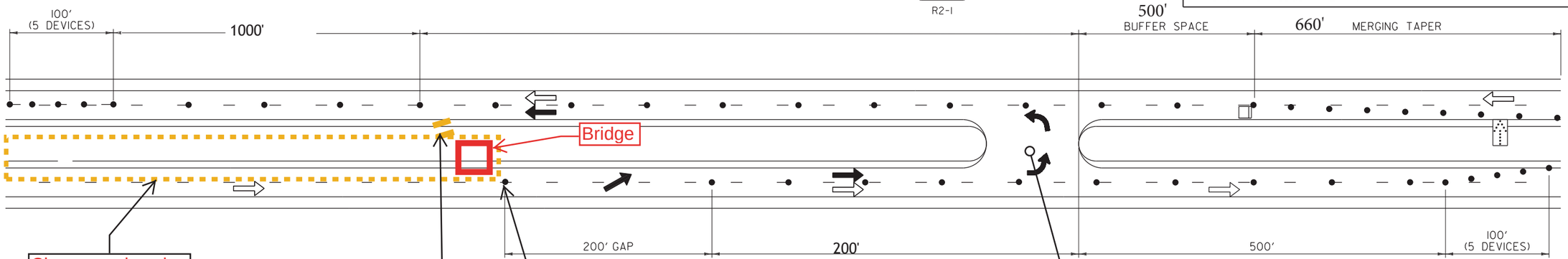
PHASE 1 TRAFFIC CONTROL PLAN

PROJECT NAME:	IRASBURG
PROJECT NUMBER:	IM DECK(46)

MODEL: TCP3

CLD I5-0223





Closure and work area see site specific plan

Limit of Closure Plan (200' Beyond Deck)

U-Turn Mile Marker 163.2

Proposed Temporary Work Vehicle Cross Over to I-91 Southbound for worker access and temporary deck waste haul route or concrete pours, etc. Haul route to be setup with Southbound T-16. 240'-260' from Bridge MM162.95

Begin Temporary Advanced Warning Package for Southbound Closure at Mile Marker 167.85

LEGEND

- THROUGH TRAFFIC
- CONSTRUCTION VEHICLES
- CHANNELIZING DEVICE
- FLASHING ARROW PANEL
- TYPE III BARRICADE

GENERAL NOTES:

1. IF APPLICABLE, THE CONTRACTOR SHALL HAVE SIGNS FOR CLOSURE OF RIGHT AND LEFT LANES ON PROJECT BEFORE WORK COMMENCES.
2. THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS SHALL ONLY BE USED IF A TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED. THE "SPEED LIMIT XX" (R2-1) AND OTHER RELATED SIGNS SHALL BE REMOVED OR COVERED WHEN WORK IS NOT IN PROGRESS AND ROADWAY IS NOT RESTRICTED.
3. "FINE DOUBLED FOR SPEEDING IN WORK ZONE" (VR-355) SHALL ONLY BE USED IF TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED.
4. EXISTING SPEED LIMIT SIGNS SHALL BE COVERED WHEN TEMPORARY SPEED LIMIT SIGNS ARE POSTED.
5. FOR SHORT TERM PROJECTS (THREE CONSECUTIVE DAYS OR LESS) WITH NO OFFICIAL TEMPORARY SPEED LIMIT, THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS MAY BE SUBSTITUTED WITH ADVISORY SPEED PLAQUES (W13-1P) MOUNTED AS SUPPLEMENTAL SIGNS BELOW THE "LANE ENDS" (W4-2) SIGNS.
6. FOR AN ANTICIPATED LONG TERM CLOSURE (GREATER THAN THREE CONSECUTIVE DAYS) WITH A NON-MOVING OPERATION, ALL SIGNS SHALL BE POST MOUNTED.
7. FOR A LONG TERM CLOSURE WITH A MOVING OPERATION, THE "ROAD WORK AHEAD" (W20-1) SIGN SHALL BE POST MOUNTED. THE REMAINING SIGNS MAY BE PORTABLE AND SHALL MOVE AS THE WORK AREA CHANGES.
8. FOR A SHORT TERM PROJECT (THREE CONSECUTIVE DAYS OR LESS), SIGNS MAY BE POST MOUNTED OR PORTABLE.
9. THE "SPEED LIMIT XX" (R2-1) SOLID SUBSTRATE SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING AASHTO M 268 [ASTM D 4956] TYPE III.

GENERAL NOTES:

1. WHEN SIGNING FOR THIS OPERATION INTERFERES WITH WORK ON THE MAINLINE, THE ENGINEER SHALL ESTABLISH THE APPROPRIATE SIGN REQUIREMENTS.
2. CONSTRUCTION VEHICLES USED FOR HAULING MATERIAL AT THE WORK SITE AND TRAVELING ON PUBLIC HIGHWAYS SHALL HAVE A "CONSTRUCTION VEHICLE DO NOT FOLLOW" SIGN (VC-007) MOUNTED ON THE REAR OF THE VEHICLE.

TRAFFIC CONTROL FOR TEMPORARY SHORT TERM
DUMP TRUCK U-TURN AT MILE MARKER 163.2
LEFT LANE DECK REMOVAL

3.4 Phase 2 Bridge Closure (Right Lane Closure)

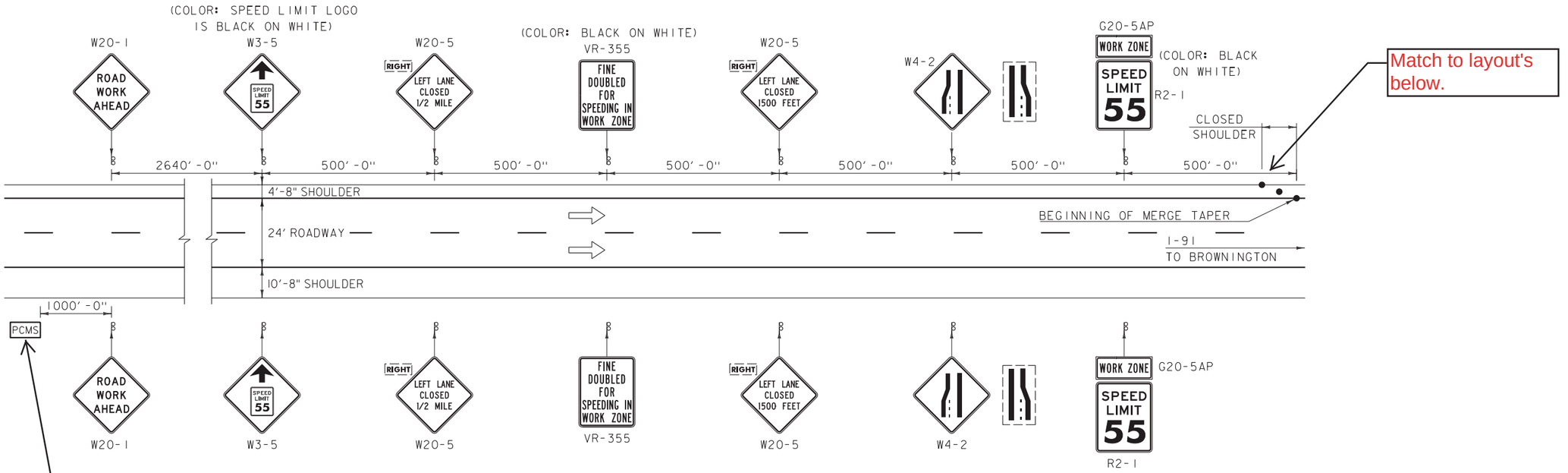
Phase 2 will close the travel lane and shift traffic to the passing lane and left shoulder. The layout is as shown on the Section Sheet for Phase 2. Prior to shifting traffic, the tangent barrier on the bridge will be installed to the crossing or inflection point of the taper barrier from phase 1. The phase 1 taper barrier will be removed to allow for the setup of the phase 2 traffic pattern. Since the phase 1 tangent barrier will remain in place, a rolling closure will be used to allow for time to shift the arrow board and barrel taper.

The rolling closure will support a temporary closure in advance of the permanent taper to protect workers during the installation of the temporary edge lines and RMP's. Energy absorption attenuators will be installed at the end of the barrier until the right lane is closed and the barrier taper is installed.

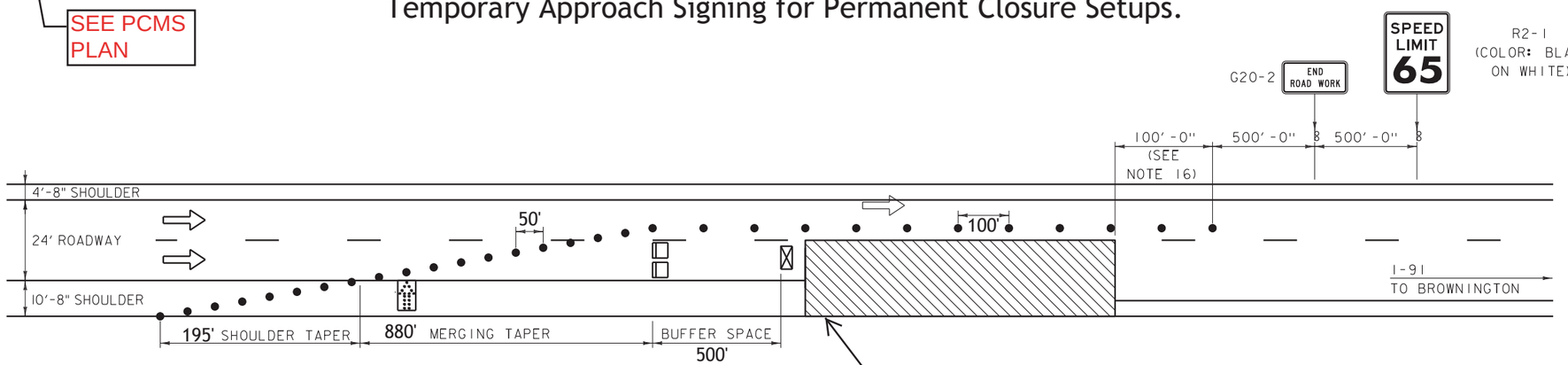
The project has been designed for a 12 foot travel lane, 6 inch clear zone to the left side curb and a 5 inch clear zone to the temporary barrier.

Modifications to Traffic Control Sheets 2 and 3 (VTrans Standard T-11 and T-13) will be setup for the work.

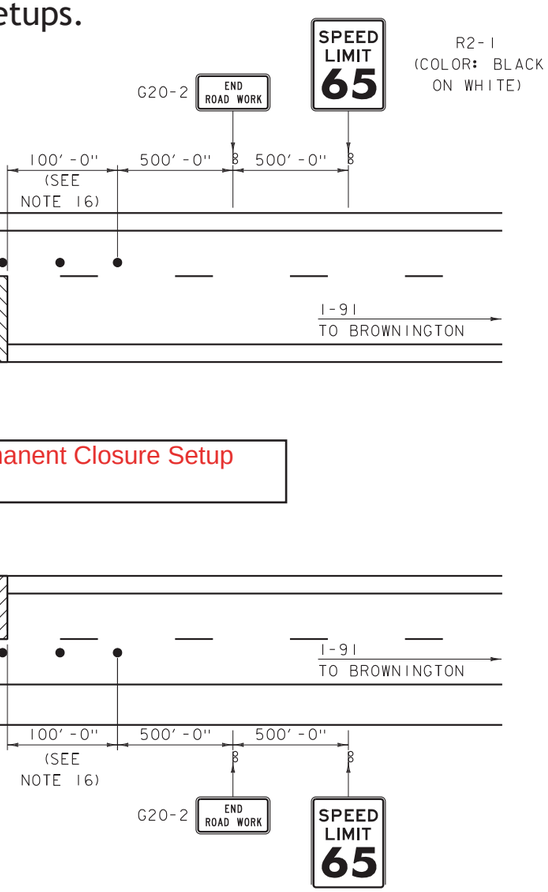
Once the bridge is closed, there will be short term periods where a modified T-16 will be used at U-Turn 166.53. A modified T-16 has been include.



Temporary Approach Signing for Permanent Closure Setups.



TRAFFIC CONTROL ON I-91 RIGHT LANE CLOSED



TRAFFIC CONTROL ON I-91 LEFT LANE CLOSED

LEGEND

- FLOW OF TRAFFIC
- RETROREFLECTIVE PLASTIC DRUM /Cone
- PORTABLE ARROW BOARD
- TYPE III BARRICADE
- WORK AREA
- UTO
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN (ITEM 641.15)

PROJECT NAME: IRASBURG
PROJECT NUMBER: IM DECK(46)

CLD I5-0223 MODEL: TCP2

ADVANCED WARNING FOR ROLLING ROAD BLOCK

BRIDGE

TAPER SHIFT WORK AREA (RIGHT SHIFT TO LEFT SHIFT) MM 162.72

UTO AT NORTHBOUND RAMP GORE

PERMANENT ROAD WORK AHEAD SIGNS MM 161.65

USE "BE PREPARED TO STOP" and "STOP AHEAD" 300' INCREMENTS ON RAMP

USE STANDARD T-10 FOR SIDE ROAD WORK AHEAD SIGNS ON ROUTE 5

NOTES:
SPEED SET AT 20MPH. ROLLING ROADBLOCK IS USED FOR MOVING TAPER BARRELS, ARROW BOARD AND TO COVER LEFT LANE CLOSED SIGNS AND PLACE TEMPORARY RIGHT LANE CLOSED SIGNS UNTIL PERMANENT SIGNS CAN BE MOUNTED OVER PREVIOUS LEFT LANE CLOSED SIGNS.
ROLLING ROAD BLOCK IS INTENDED TO COMPLY WITH VTRANS TEI16-601.
INTENDED TIME FOR WORK ACTIVITY IS 5 MINUTES WHICHREQUIRES 2.4 MILES OF ADVANCED TRAFFIC PACING.
L-2.4 MILES, Lc=0.75 MILES, Lw=1.65MILES

PCMS BOARD #3

ONE WEEK IN ADVANCE OF THE ROLLING ROADBLOCK

	PHASE 1	PHASE 2
1.	ROAD WORK PLANNED	DAY JULY X TIME

2. MESSAGE DURING ROLLING BLOCK

	TRAFFIC STOPPED AHEAD	KEEP SAFE DISTANCE

3. CHANGE WHEN CLOSURE IS COMPLETE.

	ROAD WORK AHEAD	STAY ALERT

UTO's BEGIN ROLLING ROADBLOCK AT MM 158.8 U-TURN. LOCATED 2.85 MILES SOUTH OF PERMANENT "ROAD WORK AHEAD" SIGNS AND EXIT 26 ON RAMP

MM158.6

MM 158.5

MM 157.8

MM 156.8

MM 156.6

PCMS BOARD #3 FOR ROLLING ROAD BLOCK NORTH SIDE OF U-TURN MM 156.5

BE PREPARED TO STOP

SLOW TRAFFIC AHEAD

SPEED REDUCED AHEAD

SLOW TRAFFIC 1 MILE

SLOW TRAFFIC 2 MILES

ROAD WORK AHEAD

Orleans

Orleans Golf Course

Saint Theresa Cem

North Cem

Mount Pleasant Cem

Pleasant View Cem

Baker Pond

Cemetery Hill

Walcom O Brown Cem

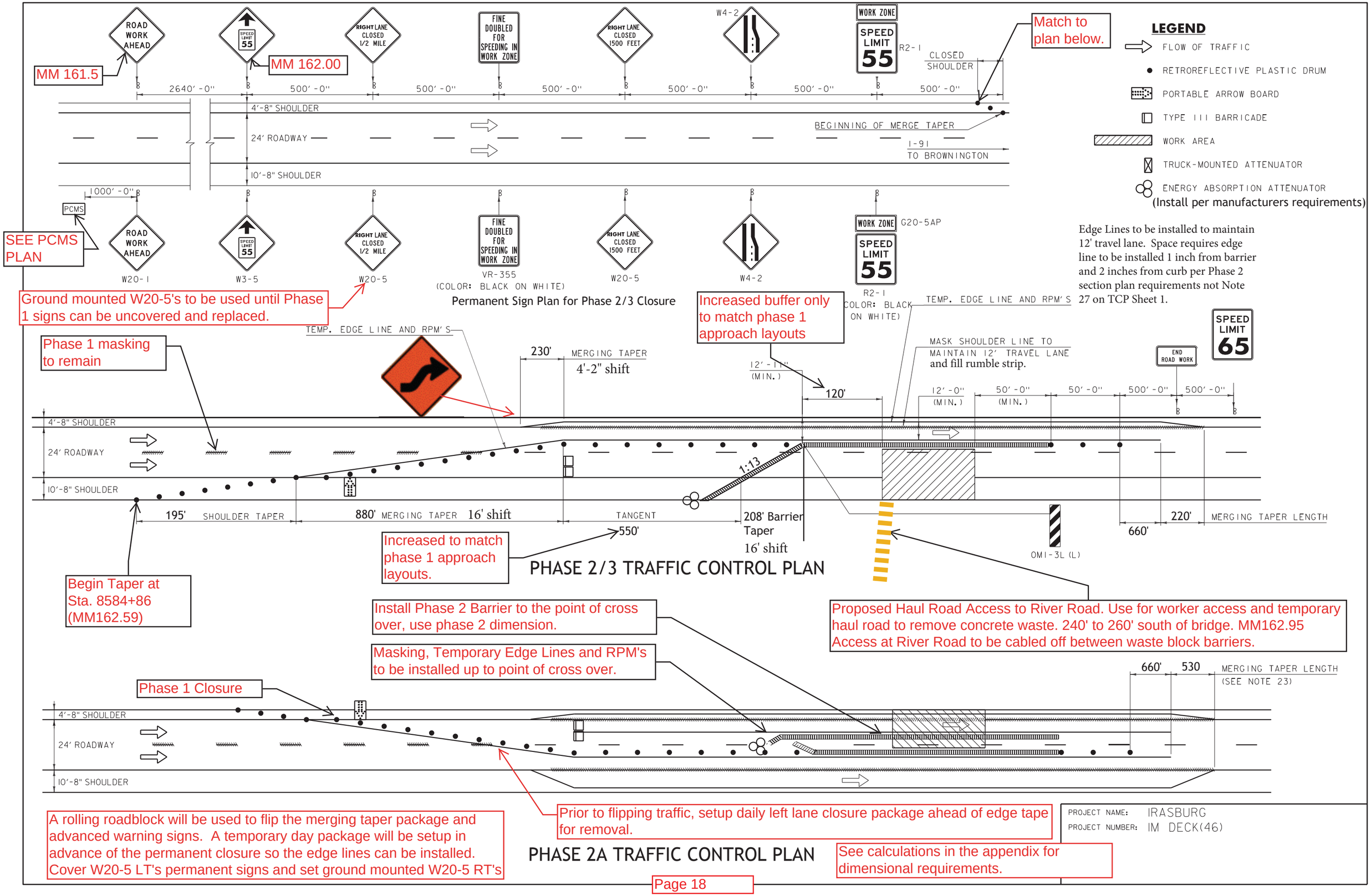
4,667.0 0 2,334.00 4,667.0 Feet

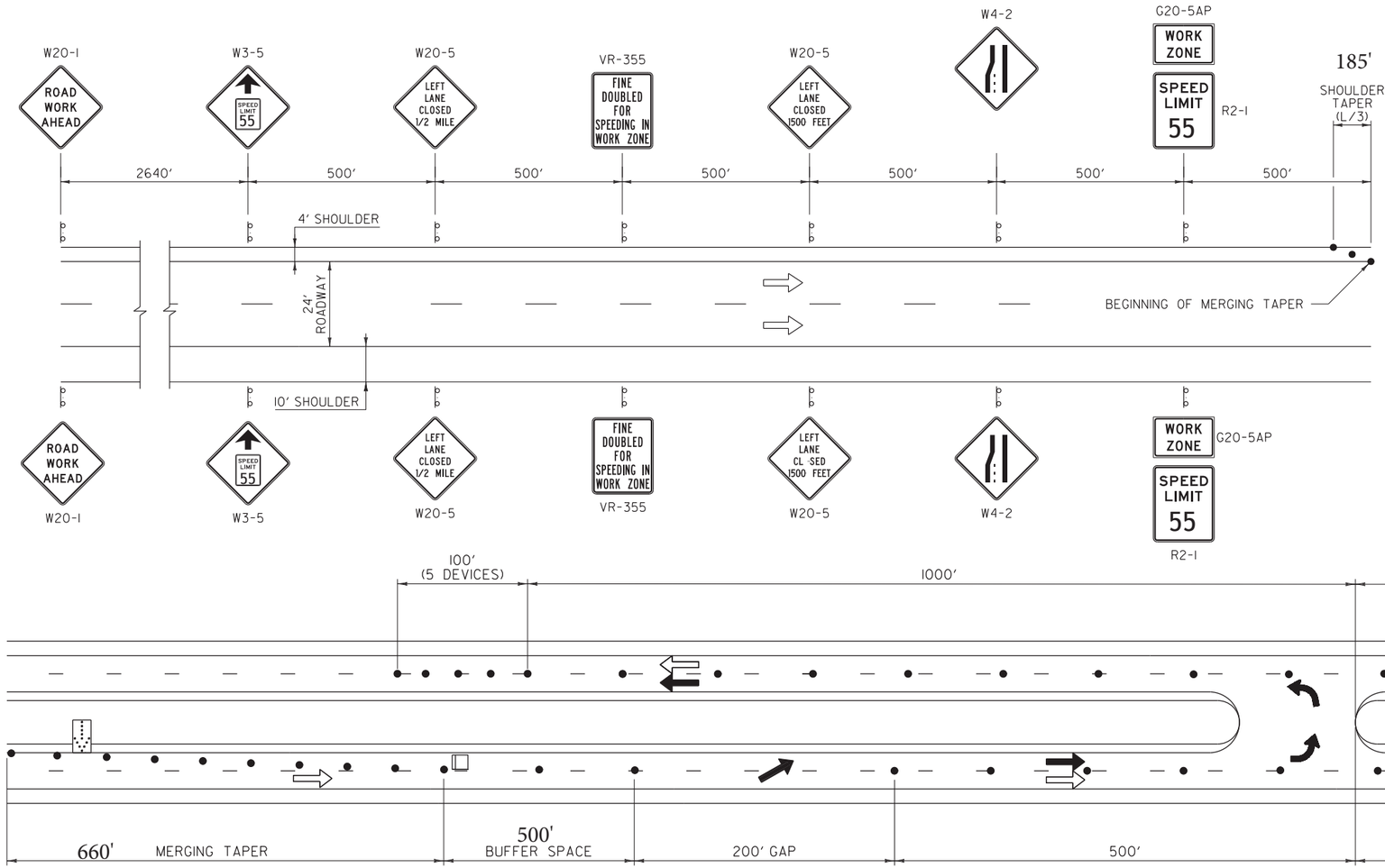
WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 2333 Ft. 1cm = 280 Meters

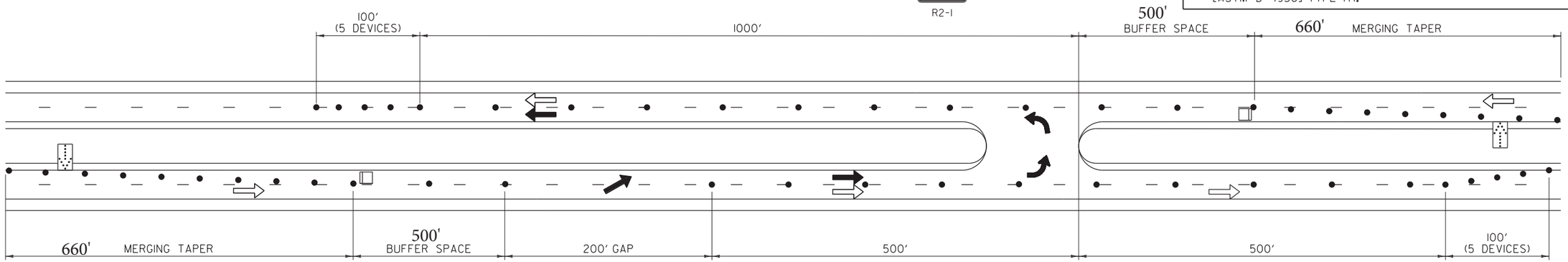
© Vermont Agency of Natural Resources

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.


ROAD WORK AHEAD
SPEED LIMIT 55
RIGHT LANE CLOSED 1/2 MILE
FINE DOUBLED FOR SPEEDING IN WORK ZONE
RIGHT LANE CLOSED 1500 FEET
W4-2
WORK ZONE
SPEED LIMIT 55
R2-1
CLOSED SHOULDER
MM 161.5
MM 162.00
2640'-0"
500'-0"
4'-8" SHOULDER
24' ROADWAY
10'-8" SHOULDER
BEGINNING OF MERGE TAPER
I-91
TO BROWNINGTON
Match to plan below.
LEGEND
FLOW OF TRAFFIC
RETROREFLECTIVE PLASTIC DRUM
PORTABLE ARROW BOARD
TYPE III BARRICADE
WORK AREA
TRUCK-MOUNTED ATTENUATOR
ENERGY ABSORPTION ATTENUATOR
(Install per manufacturers requirements)
1000'-0"
PCMS
SEE PCMS PLAN
W20-1
W3-5
W20-5
VR-355
(COLOR: BLACK ON WHITE)
G20-5AP
Ground mounted W20-5's to be used until Phase 1 signs can be uncovered and replaced.
Permanent Sign Plan for Phase 2/3 Closure
Edge Lines to be installed to maintain 12' travel lane. Space requires edge line to be installed 1 inch from barrier and 2 inches from curb per Phase 2 section plan requirements not Note 27 on TCP Sheet 1.
Phase 1 masking to remain
TEMP. EDGE LINE AND RPM'S
230'
MERGING TAPER
4'-2" shift
Increased buffer only to match phase 1 approach layouts
12'-11" (MIN.)
120'
MASK SHOULDER LINE TO MAINTAIN 12' TRAVEL LANE and fill rumble strip.
END ROAD WORK
SPEED LIMIT 65
12'-0" (MIN.)
50'-0" (MIN.)
50'-0"
500'-0"
1:13
195'
SHOULDER TAPER
880' MERGING TAPER
16' shift
TANGENT
550'
208' Barrier Taper
16' shift
660'
220'
MERGING TAPER LENGTH
OMI-3L (L)
Begin Taper at Sta. 8584+86 (MM162.59)
Increased to match phase 1 approach layouts.
PHASE 2/3 TRAFFIC CONTROL PLAN
Proposed Haul Road Access to River Road. Use for worker access and temporary haul road to remove concrete waste. 240' to 260' south of bridge. MM162.95 Access at River Road to be cabled off between waste block barriers.
Install Phase 2 Barrier to the point of cross over, use phase 2 dimension.
Masking, Temporary Edge Lines and RPM's to be installed up to point of cross over.
660'
530
MERGING TAPER LENGTH
(SEE NOTE 23)
Phase 1 Closure
Prior to flipping traffic, setup daily left lane closure package ahead of edge tape for removal.
A rolling roadblock will be used to flip the merging taper package and advanced warning signs. A temporary day package will be setup in advance of the permanent closure so the edge lines can be installed. Cover W20-5 LT's permanent signs and set ground mounted W20-5 RT's
PHASE 2A TRAFFIC CONTROL PLAN
See calculations in the appendix for dimensional requirements.
PROJECT NAME: IRASBURG
PROJECT NUMBER: IM DECK(46)





GENERAL NOTES:

1. IF APPLICABLE, THE CONTRACTOR SHALL HAVE SIGNS FOR CLOSURE OF RIGHT AND LEFT LANES ON PROJECT BEFORE WORK COMMENCES.
2. THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS SHALL ONLY BE USED IF A TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED. THE "SPEED LIMIT XX" (R2-1) AND OTHER RELATED SIGNS SHALL BE REMOVED OR COVERED WHEN WORK IS NOT IN PROGRESS AND ROADWAY IS NOT RESTRICTED.
3. "FINE DOUBLED FOR SPEEDING IN WORK ZONE" (VR-355) SHALL ONLY BE USED IF TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED.
4. EXISTING SPEED LIMIT SIGNS SHALL BE COVERED WHEN TEMPORARY SPEED LIMIT SIGNS ARE POSTED.
5. FOR SHORT TERM PROJECTS (THREE CONSECUTIVE DAYS OR LESS) WITH NO OFFICIAL TEMPORARY SPEED LIMIT, THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS MAY BE SUBSTITUTED WITH ADVISORY SPEED PLAQUES (W13-1P) MOUNTED AS SUPPLEMENTAL SIGNS BELOW THE "LANE ENDS" (W4-2) SIGNS.
6. FOR AN ANTICIPATED LONG TERM CLOSURE (GREATER THAN THREE CONSECUTIVE DAYS) WITH A NON-MOVING OPERATION, ALL SIGNS SHALL BE POST MOUNTED.
7. FOR A LONG TERM CLOSURE WITH A MOVING OPERATION, THE "ROAD WORK AHEAD" (W20-1) SIGN SHALL BE POST MOUNTED. THE REMAINING SIGNS MAY BE PORTABLE AND SHALL MOVE AS THE WORK AREA CHANGES.
8. FOR A SHORT TERM PROJECT (THREE CONSECUTIVE DAYS OR LESS), SIGNS MAY BE POST MOUNTED OR PORTABLE.
9. THE "SPEED LIMIT XX" (R2-1) SOLID SUBSTRATE SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING AASHTO M 268 [ASTM D 4956] TYPE III.

LEGEND

- THROUGH TRAFFIC
- CONSTRUCTION VEHICLES
- CHANNELIZING DEVICE
- FLASHING ARROW PANEL
- TYPE III BARRICADE
- FLAGGER

Begin Temporary Advanced Warning Package for Northbound Closure at Mile Marker 165.1

.

Begin Temporary Advanced Warning Package for Southbound Closure at Mile Marker 167.85

GENERAL NOTES:

1. WHEN SIGNING FOR THIS OPERATION INTERFERES WITH WORK ON THE MAINLINE, THE ENGINEER SHALL ESTABLISH THE APPROPRIATE SIGN REQUIREMENTS.
2. CONSTRUCTION VEHICLES USED FOR HAULING MATERIAL AT THE WORK SITE AND TRAVELING ON PUBLIC HIGHWAYS SHALL HAVE A "CONSTRUCTION VEHICLE DO NOT FOLLOW" SIGN (VC-007) MOUNTED ON THE REAR OF THE VEHICLE.

TRAFFIC CONTROL FOR TEMPORARY SHORT TERM DUMP TRUCK U-TURN AT MILE MARKER 166.5

3.5 Phase 3 Bridge Closure (Right Closure)

The final phase of permanent closure will be for the final center span replacement. The traffic pattern will not change from the previous phase.

3.6 Removal of Permanent Closures

The permanent closure will be removed. Lane closure signs will be covered or removed unless they are used for the miscellaneous work that requires temporary closures. A temporary lane closure will be setup in advance of the permanent taper to safely remove the temporary edge lines and RPM's. All lane closures beyond this point will use daily closure signs on easels.

3.7 MISC. - Bridge Expansion Joints, Durable Paint Markings, Signs, Clean up and removal of permanent signs.

The final phase of construction will be to complete miscellaneous work including replace the bridge expansion joints that may not be completed behind the permanent closures. This phase will also include any painting or sign installation that did not occur behind the permanent closures.

This miscellaneous work will be completed behind temporary daily closures once the permanent closures have been removed.

Appendix A –Supporting Information

Sign Details

Special Barrier Plan

Energy Absorption Attenuators

Temporary Raised Pavement Markers (RPM’s)

Taper Calculations

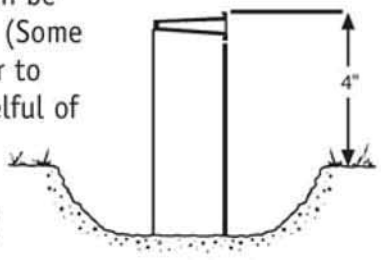
THE LAP SPLICE™ U-CHANNEL BREAKAWAY SYSTEM

Patent No. 5125194

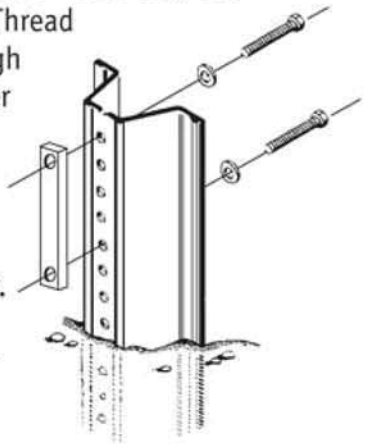
Installation

The LAP SPLICE system consists of two each of these components: cut washers, specially designed Grade 9 bolts, self-locking flange nuts; and a single bar spacer. This system is FHWA approved only when used to lap splice Nucor Steel Marion RIB-BAK® U-channel sign and base posts.

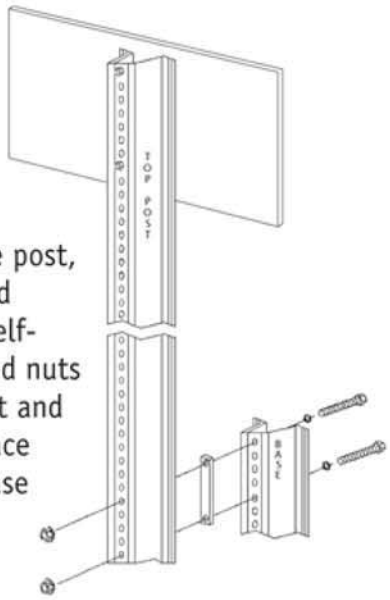
1 Drive base post so that no more than 4" is above the ground. Remove enough soil around base so that the fifth hole is exposed and can be easily reached. (Some installers prefer to remove a shovelful of soil prior to installation of the base post.)

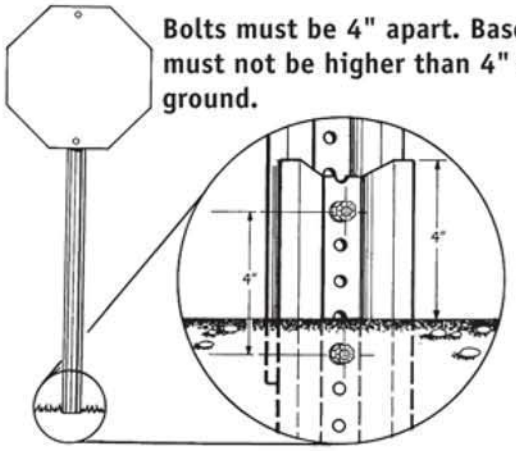


2 Put flat washer on bolt and insert into top hole of base post. (If first hole on top post is less than 1" from end, use second hole.) Thread top bolt through threaded spacer bar. Put flat washer on second bolt and thread into spacer bar. Tighten both bolts in spacer securely.



3 Nest the bottom hole of the top post onto the bottom hole of protruding bolts of the base post. (If the bottom hole of the top post is less than 1" from the end of the post, use the second hole.) Place self-locking flanged nuts onto each bolt and tighten. Replace soil around base post.





Bolts must be 4" apart. Base post must not be higher than 4" above ground.

BAR SPACER SIZE CHART		
Post Size (lbs./ft.)	Bar Color	Bar Size
2 & 2.5	Silver	$\frac{3}{8}$" x $\frac{3}{4}$" x 5"
3 & 4	Gold	$\frac{1}{2}$" x $\frac{3}{4}$" x 5"

Distributed in the United States by

TAPCO®

5100 West Brown Deer Road
Brown Deer, WI 53208

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www.tapconet.com

GSA Contract Holder GS-07F-5924R GS-07F-0234U

When Using Square Tube that is not located behind a guardrail or barrier.

DESIGNOVATIONS, INC.

SNAP'n SAFE Breakaway Sign Post Couplers MFG by Designovations

NEW SNAP'n SAFE™

- **Cost Savings** - *Install or repair sign posts in half the time with one person.*
- **Roads are Safer** - The sign post will no longer strike and penetrate the windshield or roof of a vehicle during a collision.
- **No anchors to repair and no concrete boring** - Minimize crew exposure to traffic, reduced liability.

Breakaway Sign Post Couplers, NCHRP Report 350 Compliant

Designovations now offers new technology with the **SNAP'n SAFE** breakaway sign post couplers. Using a vehicle specified in the existing Report 350, this new technology meets and exceeds the more stringent damage levels contained in the updated NCHRP Report 350 specifications for ground mounted sign supports.

Select a SNAP'n SAFE™ Product Line Below To Learn More

- **SNAP'n SAFE Couplers made from 80% recycled materials**
- **Breakaway Square Sign Post Coupler**
- **Surface Mount Breakaway Square Sign Post Coupler**
- **Breakaway Round Sign Post Coupler**
- **Surface Mount Breakaway Round Sign Post Coupler**
- **U Channel Sign Post Coupler**
- **Surface Mount U Channel Sign Post Coupler**

SNAP'n SAFE™ - MFG Designovations

Breakaway Square Sign Post Coupler

NCHRP 350 COMPLIANT

80%

PATENT PENDING

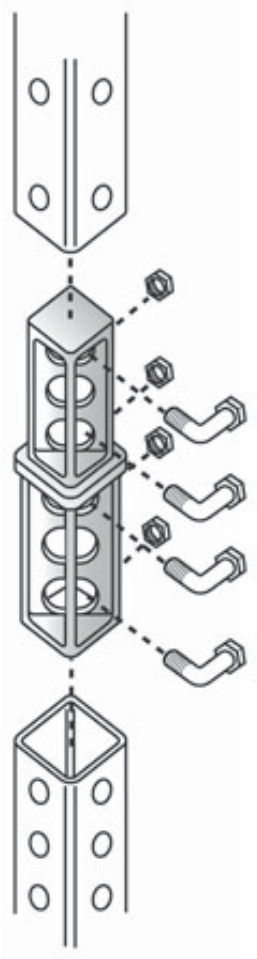
360° Shear Point

SNAP'n SAFE Couplers made from 80% recycled materials

- No anchors to repair.
- Less labor, save 42% or more on repairs.
- Reduces the risk of occupant injury, the sign post will no longer strike and penetrate the windshield or roof of a vehicle during a collision.

The **SNAP'n SAFE™** Coupler is made of cast gray iron, and withstands winds of 120 mph.

Part No.	Wt.	Sign Post Size
S150	2.2 lbs.	1-1/2″
S175	2.8 lbs.	1-3/4″
S200	3.1 lbs.	2″
S225	5 lbs.	2-1/4″
S250	6 lbs.	2-1/2″



EASY INSTALLATION:

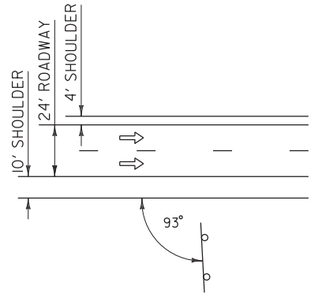
Simply insert **SNAP'n SAFE™** Coupler in anchor and bottom of sign post and assemble with (4) bolts.

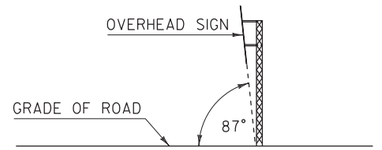
- Installation hardware included.

For Quantity Pricing Please Call Us Toll Free: 1-888-868-6588

Back to Top

SIGN INSTALLATION DETAILS





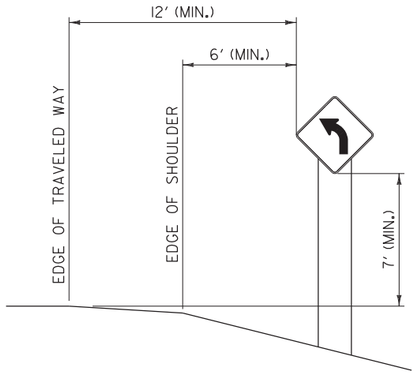
LEGEND

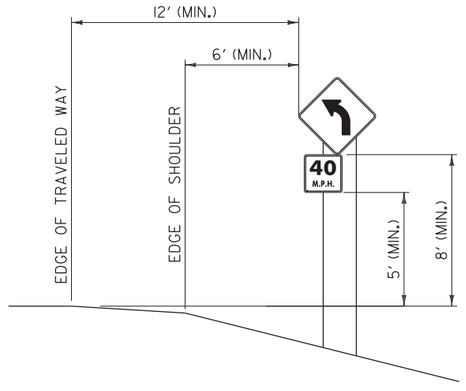
⇨ FLOW OF TRAFFIC

NOTES:

1. SIGNS SHOULD BE MOUNTED AT 93 DEGREES TO THE DIRECTION OF TRAFFIC. ON CURVED ALIGNMENT THE ANGLE OF PLACEMENT SHOULD BE DETERMINED BY THE PATH OF APPROACHING TRAFFIC RATHER THAN BY THE ROADSIDE EDGE AT THE POINT WHERE THE SIGN IS LOCATED.
2. INSTALL OVERHEAD SIGNS 87 DEGREES TO THE GRADE OF THE ROAD.
3. ROADWAY AND SHOULDER WIDTHS MAY VARY.

TYPE A SIGN PLACEMENT





NOTE:

1. THE MINIMUM LATERAL OFFSET FROM THE EDGE OF TRAVELED WAY IS 12 FEET. IF A SHOULDER WIDER THAN SIX FEET EXISTS, THE MINIMUM LATERAL OFFSET FOR POST MOUNTED SIGNS SHOULD BE SIX FEET FROM THE EDGE OF SHOULDER.

G

REV.	DATE	DESCRIPTION
0	OCT. 26, 2015	ORIGINAL APPROVAL

OTHER STANDARDS REQUIRED: NONE

VTRANS AND FHWA APPROVAL ON FILE WITH CONTRACT ADMINISTRATION

SIGN PLACEMENT EXPRESSWAY & FREEWAY

VTrans Working to Get You There
VERMONT AGENCY OF TRANSPORTATION

STANDARD
T-55

General Permanent Sign Installations

Figure 6F-1. Height and Lateral Location of Signs—Typical Installations

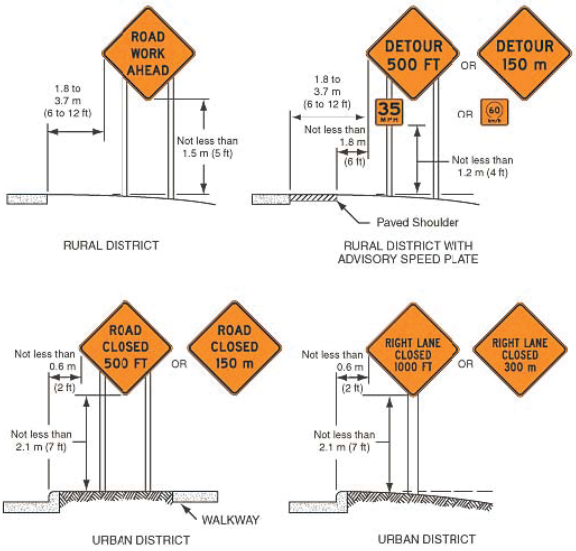


Figure 6F-1. Height and Lateral Location of Signs—Typical Installations

This figure shows four examples of the height and lateral location of signs for typical installations.

The first illustration is labeled "Rural District." The roadway is shown with no shoulder. The sign in this example is a diamond-shaped Road Work Ahead sign. The distance between the edge of the pavement and the near edge of the sign is shown as a dimension of 1.8 to 3.7 m (6 to 12 ft). The distance from the bottom edge of the sign to the level of the edge of the pavement is shown as a dimension not less than 1.5 m (5 ft).

The second illustration is labeled "Rural District with Advisory Speed Plate." The roadway is shown with a paved shoulder. The sign in this example is a diamond-shaped Detour sign with an advisory speed plaque mounted below it, with the metric alternate signs shown to the right. The distance between the outside edge of the roadway and the near edge of the sign is shown as a dimension of 1.8 to 3.7 m (6 to 12 ft). The distance between the outside edge of the paved shoulder and the near edge of the sign is shown as a dimension not less than 1.8 m (6 ft). The distance from the bottom edge of the advisory speed plaque to the level of the edge of the roadway at the inside edge of the shoulder is shown as a dimension not less than 1.2 m (4 ft).

The third illustration is labeled "Urban District." The roadway is shown with a curb along the outside edge of the pavement and a walkway to the right of the sign. The sign in this example is a diamond-shaped Road Closed sign with a metric alternate shown to the right. The distance from the edge of the roadway to the near edge of the sign is shown as a dimension no less than 0.6 m (2 ft). The distance from the bottom edge of the sign to the surface of the curbing is shown as a dimension no less than 2.1 m (7 ft).

The fourth illustration is labeled "Urban District." The roadway is shown with a curb along the outside edge of the pavement. The sign in this example is a diamond-shaped Right Lane Closed sign with a metric alternate shown to the right. The distance from the edge of the roadway to the near edge of the warning sign is shown as a dimension not less than 0.6 m (2 ft). The distance from the bottom edge of the sign to the level of the edge of the travel lane at the top of the curbing is shown as a dimension not less than 2.1 m (7 ft).

TYPICAL SIGN STAND -1

Series 24000

LITTLE BUSTER SIGN STAND

PRODUCT INFORMATION

- Step-n-Drop leg feature enables you to quickly set-up the stand without having to bend over or stoop down. Simply place your foot on the release levers, step down and two legs will drop into position
- Dual spring sign stand is designed to hold 30”, 36” and 48” aluminum, wood or roll up signs in high wind conditions
- All steel construction with powder coated paint to resist rusting
- Rigid signs can achieve bottom heights of 12 to 18 inches. Roll up signs can achieve bottom heights of 12 inches to 5 feet and a 7 foot height can be achieved with optional 77 inch inner mast (RU7)
- A two position leg adjustment allows all four legs to be individually adjusted for uneven terrain
- Ideal for both roll up and rigid signs for city, utility and highway applications
- NCHRP-350 approved when used with Safe Sleeve-350 for .080 aluminum signs
- NCHRP-350 approved with roll up signs and plastic Safe Sign 350

TrafFix Devices, Inc. 160 Ave. La Pata, San Clemente, CA 92673 (949) 361-5663 Fax (949) 361-9205
www.traffixdevices.com

TYPICAL SIGN STAND - 2

93000 Series

TRI-BUSTER SIGN STAND

PRODUCT INFORMATION

- Constructed of corrosion resistant heavy duty galvanized tubing and can be folded for compact storage
- Accommodates 48” x 48” or smaller; plywood, aluminum, aluminum poly laminate, plastic and roll up sign materials
- Three leg design is very stable in windy conditions. Ballasting hook allows sand bags or weights to be hung from sign stand for added stability
- Safety engineered with guards to protect fingers from dangerous “pinch points”
- Optional roll-up sign bracket and leg extending leveling kit may be ordered to enhance Tri-Busters performance
- NCHRP 350 approved with rigid and roll up signs

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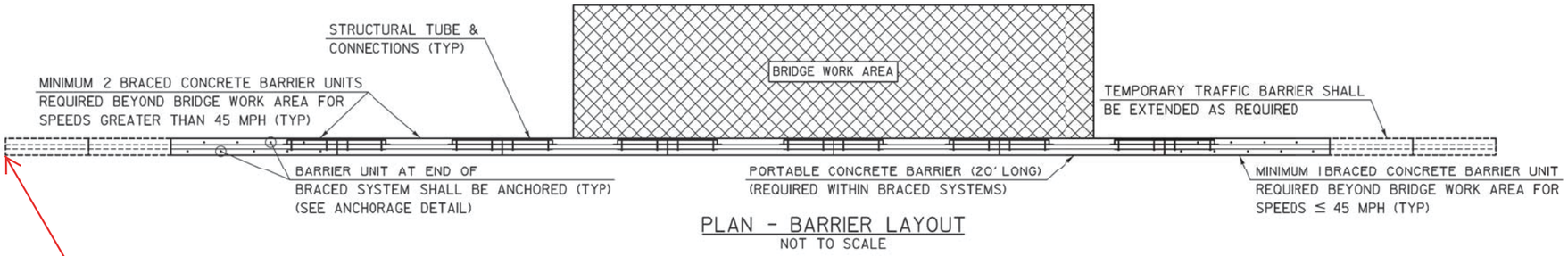


PLAN - BARRIER LAYOUT
NOT TO SCALE

Match to permanent closure barrier plans for continuation.

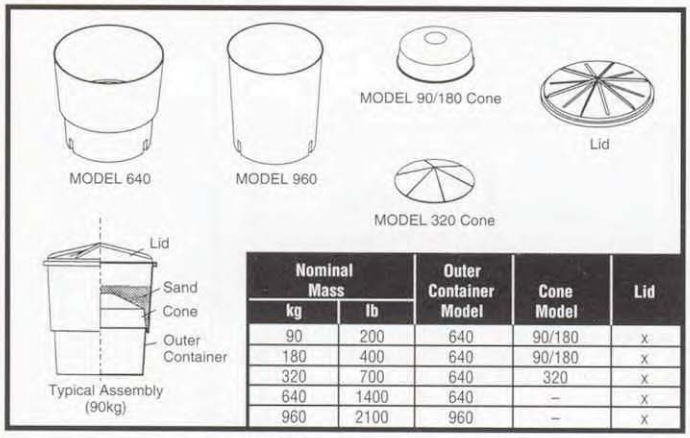
Energite® III/ Fitch® Universal Module Systems

The Easy-To-Install Inertial Barrel Systems

DESIGN

ENERGY ABSORPTION
SYSTEMS, INC.
A Quixote Company

Figure 1A–Energite® III



Nominal Mass		Outer Container Model	Cone Model	Lid
kg	lb			
90	200	640	90/180	x
180	400	640	90/180	x
320	700	640	320	x
640	1400	640	–	x
960	2100	960	–	x

Energite III System Components

Crash Performance

The Energite® III/Fitch® Universal Module Systems have been successfully tested to NCHRP Report 350, Test Level 3 for non-redirective, gating crash cushions. NCHRP 350 differs from NCHRP 230 in that the heavy vehicle is now a pickup truck with a higher center-of-gravity plus the impact severity has increased by 6.7% due to the impact speed of 100 km/h (62 mph).

The inertial barrel systems break up during impact. As the impacting vehicle passes through the array, its speed is slowed by transfer of its momentum to the sand, allowing for safe, steady deceleration.

Caution: Inertial barrels are not recommended for sites where redirective capabilities are warranted.

Figure 1B–Fitch® Universal Module System

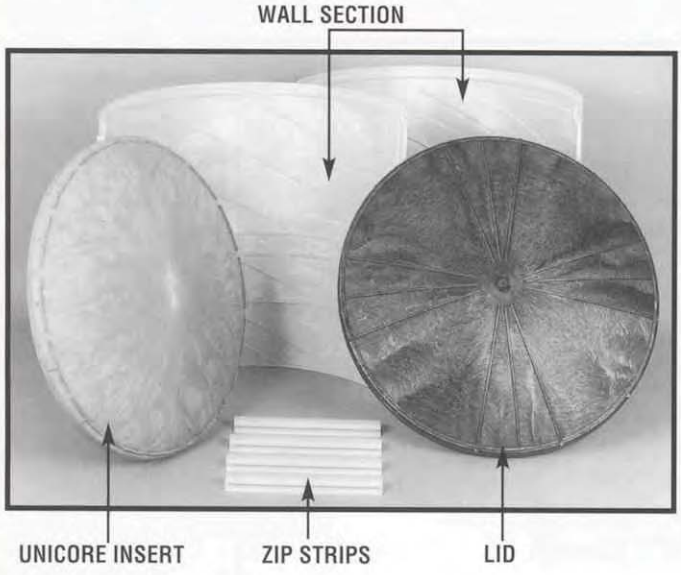
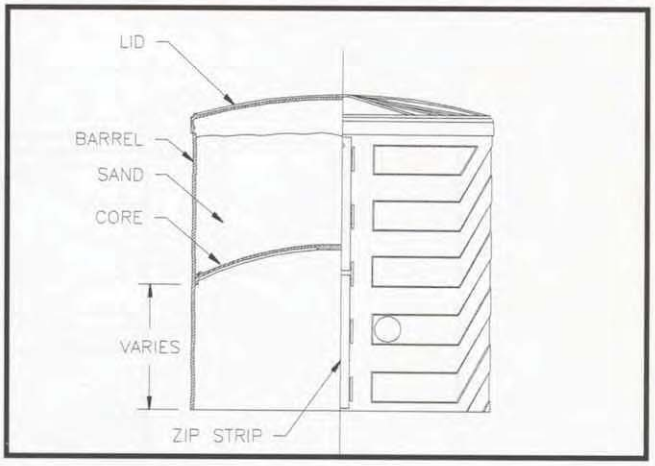


Figure 1C–Fitch® Universal Module System



General Information

General Specification

I. General

The Energite® III/Fitch® Universal Module Systems shall be designed and manufactured by Energy Absorption Systems, Inc. of Chicago, Illinois.

II. Description of System

A. The Energite® III/Fitch® Universal Module Systems modules shall be available in 90, 180, 320, 640 and 960 kg sizes.

B. The 90, 180 and 320 kg Energite® III modules shall consist of three basic components:

1. A Model 640 outer container molded in one piece with a minimum capacity of 0.4 m^3 (14 ft^3). The material shall be durable, weatherproof and shall be formulated to resist deterioration from ultraviolet rays. The standard color shall be yellow. This model must be of continuous molded construction and be nestable.
2. Cone-shaped supporting inserts are used to support 90, 180 and 320 kg sand masses. The height and diameter of the cones shall be such to ensure that the center-of-gravity of each module is at the proper elevation to control the attitude of standard passenger vehicles when filled to the proper level. The cone inserts shall be placed inside the Model 640. The cone inserts shall interface smoothly with the Model 640 "step". The interface shall permit free drainage of excess water contained within the sand mass. Cone inserts shall be of one-piece molded construction and be nestable.
3. A black lid which locks securely over the top lip of the outer container. The material shall be durable, weatherproof and shall be formulated to resist deterioration from ultraviolet rays. Lids shall be nestable.

C. The 640 kg module shall consist of two components:

1. A Model 640 outer container as described previously in II.B.1.
2. A lid as described previously in II.B.3.

D. The 960 kg module shall consist of two components:

1. A Model 960 outer container molded in one piece with a minimum capacity of 0.6 m^3 (21 ft^3). Material is the same as Model 640 described previously in II.B.1.
2. A lid as previously described in II.B.3.

E. Each module of the Fitch Universal Module consists of one set of walls, one core, one lid and four zip strips.

III. Performance Criteria

A. Each Energite® III/Fitch® Universal Module array shall be configured to provide a satisfactory average rate of deceleration (8 G's maximum preferred for each row) for errant vehicles in the weight ranges of 820 to 2000 kg (1810 to 4410 lb). Placement of the modules within an array and the geometric design of the array itself shall be determined by a qualified engineer. Standard size modules shall contain either 90, 180, 320, 640 or 960 kg of sand.

B. The modules shall be designed and manufactured from a frangible polyethylene or polypropylene material which shall shatter upon impact to permit dispersion of the sand mass contained within.

C. The center-of-gravity of each properly-filled module shall be at a height which will aid in controlling the pitch of standard passenger vehicles.

D. The components of the Energite® III/Fitch® Universal Module modules shall interface to prevent leakage of sand contained therein. The interface shall, however, permit drainage of excess water contained within the sand mass.

IV. Testing Criteria

A. An Energite® III/Fitch® Universal Module Systems array shall have been tested to the procedures set forth in NCHRP 350 for TL-3 non-redirective gating crash cushions. For impacting vehicles weighing between 820 to 2000 kg (1810 to 4410 lb) traveling at speeds up to 100 km/h (62 mph), the maximum 60 cm (24") occupant flail space velocity shall be less than 12 m/sec (39 ft/sec) and the vehicles' highest 10 ms occupant ridedown acceleration shall be less than 20 G's.

V. Design and Selection Criteria

A. Design and placement of arrays shall follow guidelines established in:

1. American Association of State Highway and Transportation Officials (AASHTO) publication, *Roadside Design Guide, 2002*.

B. Sand placed into these modules should be washed concrete sand conforming to ASTM-C-33 or equal.

Arrays

Special Site Considerations

Other special considerations warrant consideration in the design and installation of inertial barrier systems. The following conditions and recommendations for treatment are based on performance observations.

1) Freezing Temperatures

In cold climates, sand having a moisture content of 3% or more should be mixed with 5% rock salt (by weight) to prevent the sand from freezing into potentially dangerous solid blocks.

2) Modules Placed on Structures

On structures where the vibrations from moving traffic may cause modules to shift, steel or formed-in-place asphaltic concrete half-rings placed on the downhill side of the modules will prevent such movement. Also, nails or bolts through the bottom of the outer container and into the roadway will prevent module movement.

3) Partial Impacts

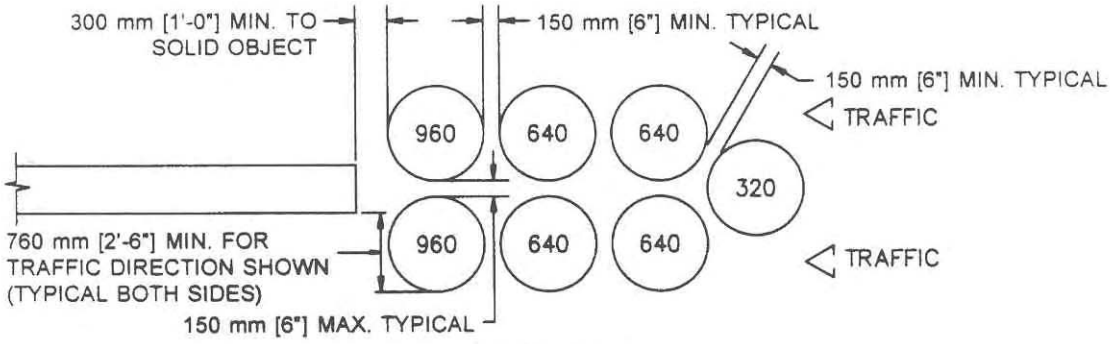
When a vehicle contacts less than the full width of a module, the module's deceleration effectiveness is equivalent to the percentage of the module contacted. If half of a module is impacted, then only 50% of that module's weight is effective and should be kept in mind when placing an array.

4) Other Unique Conditions

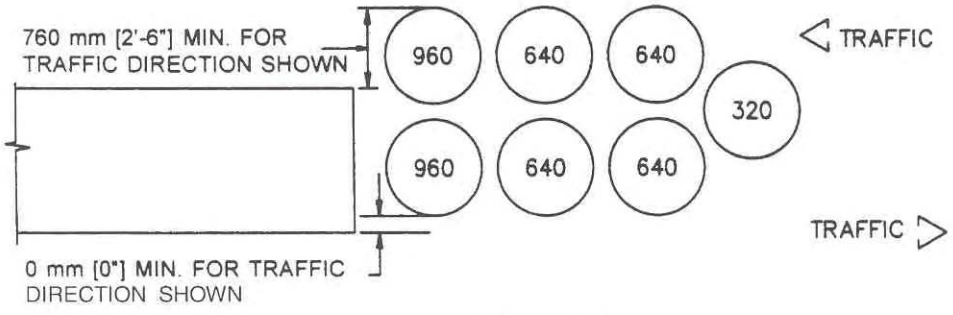
You may find that there are other conditions unique to a particular site that must be considered to ensure a properly designed and functional inertial barrier system.

Standard Arrays

Following are several standard arrays for the Energite® III/ Fitch® Universal Module Systems. They will perform as indicated in the calculations only if hit head-on. Arrays are provided using both metric and English units. Below are typical arrays showing unidirectional and bidirectional configurations. These are minimum arrays and more barrels are recommended and should be used when conditions permit.



Unidirectional

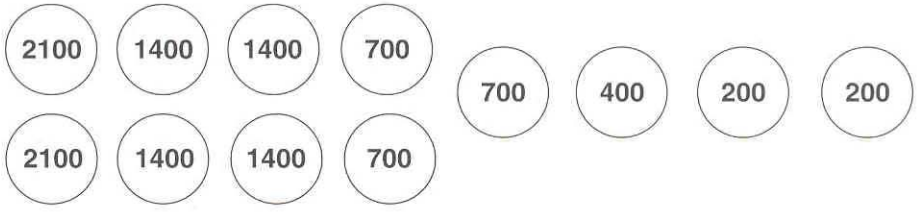


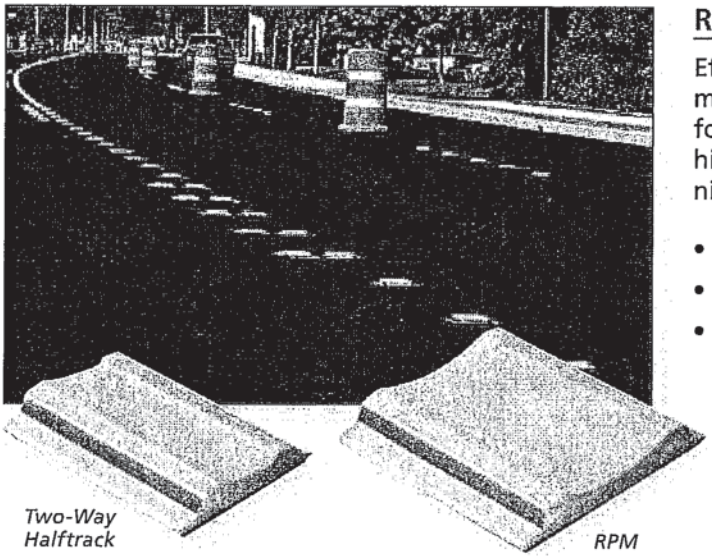
Bidirectional

Arrays Based on English Units (cont.)

DESIGN VELOCITY 55 mph (88 km/h)

ROW	SAND MASS (lbs)	1800 lb vehicle EXIT VEL (mph)	AVE G'S FOR ROW	IMPULSE TIME (sec)	4500 lb vehicle EXIT VEL (mph)	AVE G'S FOR ROW	IMPULSE TIME (sec)
0		55.0			55.0		
1	200	49.5	6.4	0.04	52.7	2.8	0.04
2	200	44.6	5.2	0.04	50.4	2.6	0.04
3	400	36.5	7.3	0.05	46.3	4.4	0.04
4	700	26.2	7.1	0.07	40.1	6.0	0.05
5	1400	14.8	5.2	0.10	30.6	7.5	0.06
6	2800	5.8	2.1	0.20	18.8	6.5	0.08
7	2800	2.3	.3	0.51	11.6	2.5	0.13
8	4200	.7	.1	1.39	6.0	1.1	0.23





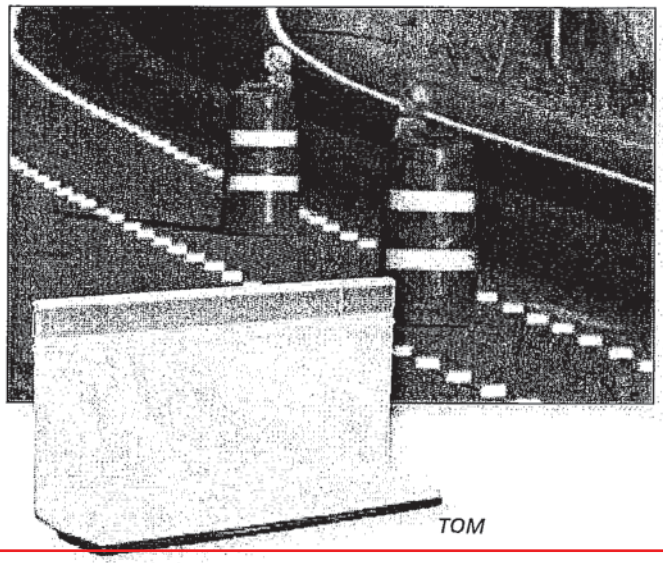
Two-Way Halftrack

RPM

RPMs & Halftracks

Effective and convenient long-term temporary road markers are designed to be long-lasting enough for use in both low volume roads and interstate highways to provide clear guidance to motorist both night and day. Simple to install and remove.

- Two standard colors – white and yellow
- Reflective tape can be applied on one or both sides
- Optional factory applied high tack butyl adhesive pad allows for a peel and stick application to the roadway

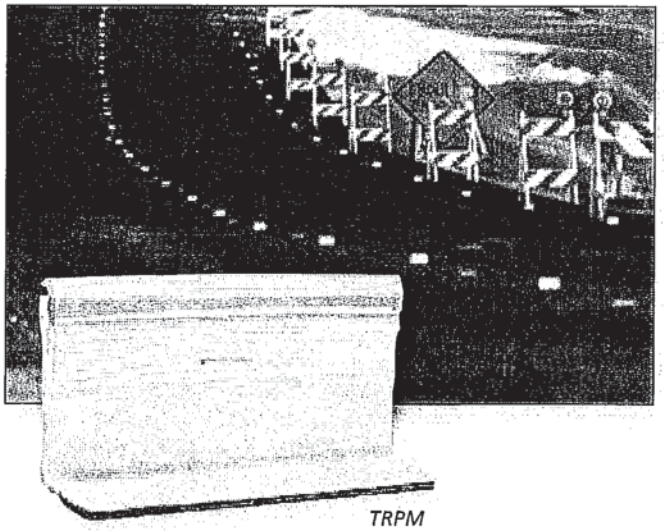


TOM

TOM - Temporary Overlay Markers

Primarily for short-term temporary lane line markings in asphalt paving projects and other construction work zones, these markers are placed after final rolling of the new asphalt. TOMs are engineered for easy application and removal to reduce the amount of time workers are in the roadway.

- Standard colors are yellow and white; additional colors by special order
- Pre-applied butyl pad keeps TOMs in place and are easily removed with a simple tug
- Available with bright and tough cube corner, micro-prismatic sheeting on one or both sides



TRPM

TRPM - Flexible Chip Seal Markers

Easy "Stick and Stomp" TRPMs come with one clear plastic cover or cap which is designed to protect the marker and reflective sheeting from sprayed asphalts or slurry products.

- Standard colors are yellow and white; additional colors by special order
- Special high heat TRPMs formulated to withstand extreme temperatures are available
- Multiple covers and staple configurations available
- Pre-applied butyl pad for "Stick and Stomp" installation
- Available with bright and tough cube corner, micro-prismatic sheeting on one or both sides

4580 MEMORIAL DRIVE,
ST. JOHNSBURY, VT 05819
P 802-748-5898
RES@MYFAIRPOINT.NET

RES
RUGGLES ENGINEERING SERVICES INC.

Analysis Sheet

Date: 4/27/16
By: NRB
Project: JFS - Irasburg IM Deck(46) Sheet 1 of 1

CALCULATIONS FOR TAPERS, ETC.

COWS L = 12 × 55 = 660' TABLES ARE CORRECT

PHASE I

LEFT SHOULDER TAPER = $\frac{4.67' \times 55}{3}$ = 85'

MERGING TAPER = 22' × 55 = 1210'

RIGHT SHOULDER MERGING TAPER (LANE) = 9'-9" SHIFT

9.67' × 55 = 531' USE 535' ✓

TANGENT = $\frac{L}{2}$ = $\frac{12 \times 55}{2}$ = 330' ✓

BARRIER TAPER (PLANS ARE NOT CORRECT, USE 1:13 NOT 1:11)

21'-8" = 21.67 × 13 = 281.7 USE 290'

PHASE II/III

LEFT SHOULDER TAPER (LANE)

4'-6" (6" FROM CURB 4.167 × 55 = 229 SAY 230'

MERGING TAPER (LT) = 16' × 55 = 880'

RIGHT SHOULDER TAPER = 10.67' × 55/3 = 195'

TANGENT = $\frac{L}{2}$ = $\frac{12 \times 55}{2}$ = 330' INCREASED TO 550' WHICH IS GREATER THAN MINIMUM ⇒ OKAY

BARRIER TAPER (USE 1:13 NOT 1:11)

12' + 4' = 16' × 13 = 208'

Appendix B – VTrans Standard Sheets

T-1 – Traffic Control General Notes.

1. TRAFFIC CONTROL DEVICES NOT DETAILED IN THE VERMONT AGENCY OF TRANSPORTATION (VAOT) ''STANDARD DRAWINGS'' OR THE PROJECT PLANS SHALL BE IN ACCORDANCE WITH THE "MANUAL ON TRAFFIC CONTROL DEVICES" (MUTCD) AND THE ''STANDARD HIGHWAY SIGNS AND MARKINGS'' BOOK (SHSM) PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION (FHWA).

2. CONSTRUCTION SIGNS SHALL BE ERECTED BEFORE THE START OF ANY WORK AND SHALL BE COVERED UNTIL WORK COMMENCES, DURING PERIODS OF INACTIVITY OR UPON COMPLETION OF THE WORK. EACH SIGN SHALL BE ERECTED IN A NEAT AND WORKMANLIKE MANNER.

3. CONSTRUCTION SIGN COVERS SHALL CONSIST OF A PANEL, PAINTED FLAT BLACK, THE SAME SIZE AS THE SIGN IT COVERS. THE PANEL SHALL BE OF WOOD, PLYWOOD, HARDBOARD OR ANY MATERIAL SATISFACTORY TO THE ENGINEER. NO MATERIAL WILL BE APPROVED THAT WILL DETERIORATE BY EXPOSURE TO THE WEATHER DURING THE PROJECT. MOUNTING OF THE PANEL SHALL BE DONE IN SUCH A WAY AS NOT TO DAMAGE THE SIGN FACE MATERIAL.

4. SIGNS SHALL BE MAINTAINED IN A CLEAN AND LEGIBLE CONDITION SATISFACTORY TO THE ENGINEER. THEY SHALL BE KEPT PLUMB AND LEVEL, AND ALWAYS PRESENT A NEAT APPEARANCE. DAMAGED, DEFACED OR DIRTY SIGNS SHALL BE REPAIRED, CLEANED OR REPLACED AS ORDERED BY THE ENGINEER.

5. NO CROSS-BRACING OR BACK-BRACING TO KEEP POSTS PLUMB WILL BE ALLOWED. CONCRETE FOUNDATIONS, COLLARS OR SOIL BEARING PLATES ARE NOT PERMITTED. CONSTRUCTION SIGNS SHALL BE PLACED ON TWO POSTS.

6. CONSTRUCTION SIGNS INSTALLED ON POSTS SHALL BE SET SECURELY IN THE GROUND. THE BOTTOM OF A SIGN SHALL BE AT LEAST FIVE FEET ABOVE THE EDGE OF PAVEMENT AND THE NEAREST EDGE OF A SIGN SHALL BE AT LEAST SIX FEET OUTSIDE THE SHOULDER POINT, FOUR FEET OUTSIDE GUARDRAIL, OR TWO FEET OUTSIDE CURBING OR SIDEWALK. THE INSTALLATION OF SIGNS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER. IN URBAN AREAS, THE BOTTOM OF THE SIGN SHALL BE AT LEAST SEVEN FEET ABOVE THE SIDEWALK OR EDGE OF PAVEMENT, WHICHEVER IS HIGHER.

7. PORTABLE SIGNS SHALL BE PLACED ON THE EDGE OF ROADWAY AND A MINIMUM OF ONE FOOT ABOVE THE TRAVELED WAY. ALL VEGETATION THAT INTERFERES WITH VISIBILITY OF THE SIGNS SHALL BE REMOVED. WHEN PLACED BEHIND GUARDRAIL, THE BOTTOM OF THE SIGN FACE SHALL BE ABOVE THE TOP OF THE GUARDRAIL.

8. SIGNS SHALL BE REMOVED UPON COMPLETION OF THE WORK AT THE DISCRETION OF THE ENGINEER.

9. ROLL UP CONSTRUCTION SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING THE "AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS" (AASHTO) M 268 ["AMERICAN SOCIETY FOR TESTING AND MATERIALS" (ASTM) D 4956] TYPE VI AND TYPE VII UNLESS OTHERWISE NOTED.

10. SOLID SUBSTRATE CONSTRUCTION SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING THE "AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS" (AASHTO) M 268 ["AMERICAN SOCIETY FOR TESTING AND MATERIALS" (ASTM) D 4956] TYPE VIII OR IX REQUIREMENTS UNLESS OTHERWISE NOTED.

11. WHERE CONSTRUCTION SIGN INSTALLATIONS ARE NOT PROTECTED BY GUARDRAIL OR OTHER APPROVED TRAFFIC BARRIERS, ALL SIGN STANDS AND POST INSTALLATIONS SHALL MEET "NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM" (NCHRP) REPORT 350 OR THE AASHTO "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH). THE APPROPRIATE RESOURCE SHALL BE DETERMINED AS DESCRIBED IN THE MASH PUBLICATION. NO SIGN POSTS SHALL EXTEND OVER THE TOP OF THE SIGN INSTALLED ON SAID POSTS. WHEN ANCHORS ARE INSTALLED, STUBS SHALL NOT BE GREATER THAN FOUR INCHES ABOVE EXISTING GROUND.

12. ROADWAY AND SHOULDER WIDTHS DEPICTED ON THE STANDARD DRAWINGS MAY VARY.

13. THESE STANDARD DRAWINGS ARE INTENDED TO SERVE AS VTRANS STANDARD OPERATING PROCEDURE. IT IS NOTED THAT COMPONENT PARTS OF A TEMPORARY TRAFFIC CONTROL WORK ZONE MAY BE MODIFIED DUE TO FIELD CONDITIONS, AT THE DISCRETION OF THE ENGINEER.

OTHER STDS. REQUIRED: **NONE**

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

APPROVED

HIGHWAY SAFETY & DESIGN ENGINEER

DIRECTOR OF PROGRAM DEVELOPMENT

Mark D. Richter

FEDERAL HIGHWAY ADMINISTRATION

TRAFFIC CONTROL GENERAL NOTES

VERMONT AGENCY OF TRANSPORTATION

STANDARD

T-1

TRAFFIC CONTROL

1. AS PART OF 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL INCLUSIVE)", THE CONTRACTOR SHALL SUBMIT A SITE SPECIFIC TRAFFIC CONTROL PLAN TO THE PROJECT MANAGER DEPICTING EACH PHASE OF THE PLANNED WORK. PLANS SHALL BE SUBMITTED FOR APPROVAL IN ACCORDANCE WITH SUBSECTION 105.03. THE PLAN SHALL INCLUDE A LAYOUT SHOWING ALL ON- AND OFF-PROJECT SIGNS AND BARRICADES, DETAILS FOR LANE CLOSURES, AND ANY OTHER DETAILS ASSOCIATED WITH THE TRAFFIC CONTROL.

   THE TRAFFIC CONTROL PLANS SHOWN ON TRAFFIC CONTROL SHEETS 2 AND 3, THE TRAFFIC CONTROL BARRIER SHEET ON SHEET 14, AND THE PHASING SECTIONS ON SHEETS 15 AND 16 ARE SCHEMATICS ONLY AND SHOULD BE USED AS REFERENCES. DIMENSIONS SHOWN ARE MINIMUMS BASED ON VTRANS STANDARDS AND THE MUTCD. THESE DIMENSIONS MAY BE REDUCED DUE TO SITE CONSTRAINTS WITH THE ENGINEER'S APPROVAL. ITEMS THAT MAY BE REVISED IN THE SITE SPECIFIC TRAFFIC CONTROL PLAN SUBMITTED BY THE CONTRACTOR INCLUDE, BUT ARE NOT LIMITED TO, APPROACH SIGN SPACING, TAPER LENGTHS/RATES, LANE WIDTHS, BUFFER SPACES, TANGENT LENGTHS, AND LOCATIONS OF PORTABLE CHANGEABLE MESSAGE SIGNS.

2. ALL ITEMS REQUIRED TO PREPARE, SUBMIT, AND IMPLEMENT THE CONTRACTOR'S PLAN, INCLUDING ANY NECESSARY REVISIONS TO THE PLAN, WILL BE INCLUDED IN THE UNIT BID PRICE FOR ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)". THE PAY ITEM INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:

   TRAFFIC CONTROL PLAN
   TEMPORARY TRAFFIC BARRIERS
   BARRICADES
   DRUMS/CONES
   ON PROJECT CONSTRUCTION SIGNING
   TEMPORARY TAPE OR RAISED PAVEMENT MARKERS, TYPE II
   PORTABLE ARROW BOARDS
   ENERGY ABSORPTION ATTENUATORS

   TRAFFIC CONTROL ITEMS NOT PAID FOR IN THE UNIT PRICE BID FOR ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)", AND PAID FOR SEPARATELY INCLUDE THE FOLLOWING:

   ITEM 630.10, "UNIFORMED TRAFFIC OFFICERS"
   ITEM 630.15, " FLAGGERS"
   ITEM 641.15, "PORTABLE CHANGEABLE MESSAGE SIGN"

   THE CONTRACTOR SHALL ALLOW TWO WEEKS FOR REVIEW OF THE TRAFFIC CONTROL PLAN. NO WORK SHALL COMMENCE UNTIL THE CONTRACTOR HAS AN APPROVED TRAFFIC CONTROL PLAN.

3. THE EXISTING SPEED LIMIT IS 65 MPH. THE SPEED LIMIT WILL BE REDUCED TO 55 MPH IN THE WORK ZONE FOR THIS PROJECT. ANY EXISTING SPEED LIMIT SIGNS WITHIN THE SPEED REDUCTION AREA SHALL BE COMPLETELY COVERED.

4. CONSTRUCTION SIGNS SHALL BE INSTALLED SO AS NOT TO OBSTRUCT EXISTING SIGNS.

5. ALL SIGNS SHALL BE IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND THE "STANDARD HIGHWAY SIGNS AND MARKINGS" BOOK (SHSM) PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION (FHWA).

6. SOLID SUBSTRATE CONSTRUCTION SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING "AMERICAN SOCIETY FOR TESTING AND MATERIALS" (ASTM D 4956) TYPE VII, VIII OR IX REQUIREMENTS, UNLESS OTHERWISE NOTED. BLACK AND WHITE REGULATORY SIGNS SHALL BE A MINIMUM OF TYPE III, UNLESS OTHERWISE NOTED.

7. ROLL UP SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING ASTM D 4956 TYPE VI.

8. CONSTRUCTION SIGNS SHALL BE ERECTED BEFORE THE START OF ANY WORK AND SHALL BE COVERED UNTIL WORK COMMENCES, DURING PERIODS OF INACTIVITY OR UPON COMPLETION OF THE WORK. EACH SIGN SHALL BE ERECTED IN A NEAT AND WORKMANLIKE MANNER. SIGNS SHALL BE REMOVED UPON COMPLETION OF THE WORK AT THE DISCRETION OF THE ENGINEER.

TRAFFIC CONTROL (CONTINUED)

9. FIXED SIGNS SHALL BE SET SECURELY IN THE GROUND. THE BOTTOM OF A SIGN SHALL BE AT LEAST SEVEN FEET ABOVE THE EDGE OF PAVEMENT. THE NEAREST EDGE OF A SIGN SHALL BE AT LEAST SIX FEET OUTSIDE THE SHOULDER POINT OR FOUR FEET OUTSIDE GUARDRAIL.

10. PORTABLE SIGNS SHALL BE PLACED ON THE EDGE OF ROADWAY AND ONE FOOT MINIMUM ABOVE TRAVELED WAY. ALL VEGETATION THAT INTERFERES WITH VISIBILITY OF THE SIGNS SHALL BE REMOVED AT THE CONTRACTOR'S EXPENSE. WHEN PLACED BEHIND GUARDRAIL, THE BOTTOM OF THE SIGN FACE SHALL BE ABOVE THE TOP OF THE GUARDRAIL.

11. WHERE SIGN INSTALLATIONS ARE NOT PROTECTED BY GUARDRAIL OR OTHER APPROVED TRAFFIC BARRIERS, ALL SIGN STANDS AND POST INSTALLATIONS SHALL BE "NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM" (NCHRP) REPORT 350 COMPLIANT. NO SIGN POSTS SHALL EXTEND OVER THE TOP OF THE SIGN INSTALLED ON SAID POST(S). WHEN ANCHORS ARE INSTALLED, STUB SHALL NOT BE GREATER THAN FOUR INCHES ABOVE EXISTING GROUND.

12. THE CONTRACTOR SHALL HAVE SIGNS FOR CLOSURE OF RIGHT AND LEFT LANES ON PROJECT BEFORE WORK COMMENCES.

13. THE TRAFFIC CONTROL CONFIGURATIONS SHOWN ON TRAFFIC CONTROL SHEET 2 MAY BE UTILIZED FOR ALL WORK REQUIRING A LANE CLOSURE OF 3 DAYS OR LESS SUCH AS MEMBRANE AND PAVING OPERATIONS THAT DO NOT REQUIRE OPEN DECK WORK. ANY WORK REQUIRING A LANE CLOSURE LONGER THAN 3 DAYS OR INCLUDES OPEN DECK WORK SUCH AS DECK REMOVAL AND REPLACEMENT OPERATIONS SHALL UTILIZE THE TRAFFIC CONTROL CONFIGURATIONS SHOWN ON TRAFFIC CONTROL SHEET 3.

14. CHANNELIZING DEVICES OTHER THAN RETROREFLECTIVE PLASTIC DRUMS SHALL BE ALLOWED ALONG THE BUFFER SPACE AND WORK AREA FOR MEMBRANE AND PAVING OPERATIONS ONLY. THE TYPE OF DEVICE SHALL BE CONSISTENT THROUGHOUT THE BUFFER SPACE AND WORK AREA AND SHALL REMAIN STABLE WHILE UNATTENDED.

15. THE NUMBER OF CHANNELIZING DEVICES, TYPE III BARRICADE AND OTHER TRAFFIC CONTROL DEVICES SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. THE ACTUAL NUMBER REQUIRED ARE TO BE DETERMINED BASED ON INDIVIDUAL DETOUR CONDITIONS (TAPERS, SPEED LIMITS, LENGTH OF DETOUR, CURVE, ETC.). WARNING LIGHTS SHALL NOT BE USED ON CHANNELIZING DEVICES.

16. PLACE LAST CHANNELIZING DEVICE A MINIMUM 100 FEET BEYOND THE ANTICIPATED WORK ZONE TERMINAL POINT EACH DAY FOR MEMBRANE AND PAVING OPERATIONS ONLY.

17. THE ARROW PANEL SHALL BE PLACED ON THE SHOULDER OF THE ROADWAY AS CLOSE AS PRACTICAL TO THE BEGINNING OF THE MERGING TAPER.

18. THE PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) SHALL BE USED AT THE DISCRETION OF THE ENGINEER AND WILL BE PAID FOR UNDER ITEM 641.15, "PORTABLE CHANGEABLE MESSAGE SIGN)". THE PCMS SHALL BE PLACED AS SHOWN IN THE "CONSTRUCTION APPROACH SIGNING ON I-91" DETAIL ON TRAFFIC CONTROL SHEET 2. THE PCMS SHALL BE USED IN ACCORDANCE WITH SECTION 6F.60 OF THE MUTCD. THE PCMS SHALL READ "LEFT (OR RIGHT) LANE CLOSED AHEAD, PLEASE MERGE EARLY".

19. TRAVEL LANE SHALL BE A MINIMUM OF 12 FEET WIDE.

20. DURING MEMBRANE AND PAVING OPERATIONS, THE CONTRACTOR MAY REDUCE TRAFFIC TO ONE LANE DURING WORKING HOURS IN ACCORDANCE WITH THIS SHEET. ALL EQUIPMENT SHALL BE MOVED TO A LOCATION OFF PAVED SHOULDERS AND OUTSIDE THE CLEAR ZONE (MINIMUM 30 FEET) DURING NON-WORK PERIODS AND PROTECTED BY BARRELS OR CONES, UNLESS PROTECTED BY TRAFFIC BARRIER OR GUARDRAIL.

21. AT THE DISCRETION OF THE ENGINEER, MERGING TAPER, BUFFER SPACE, AND TANGENT LENGTHS MAY BE EXTENDED BEYOND MINIMUM VALUES, ESPECIALLY IN CLOSE PROXIMITY TO INTERCHANGE RAMPS, CURVES, OR OTHER INFLUENCING FACTORS.

22. EXTEND MERGING TAPER TO ACCOUNT FOR REQUIRED LANE SHIFT OFFSET.

23. PROVIDE MERGING TAPER LENGTH AS REQUIRED FOR LANE SHIFT.

TEMPORARY TRAFFIC BARRIER

24. TEMPORARY TRAFFIC BARRIER SHALL BE A CONCRETE MEDIAN BARRIER (CMB) TYPE. STEEL BEAM GUARDRAIL WILL NOT BE ALLOWED FOR USE AS A TEMPORARY TRAFFIC BARRIER. PLACEMENT OF CMBs AND REMOVING AND RESETTING CMBs WILL BE CONSIDERED INCIDENTAL TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".

25. THE END OF THE BARRIER FACING APPROACHING TRAFFIC SHALL MEET THE FOLLOWING REQUIREMENTS.

   A. WHEN NO GUARDRAIL IS PRESENT, A 30' OFFSET SHALL BE USED FROM THE EDGE OF TRAVELED WAY. IF A 30' OFFSET IS NOT ATTAINABLE, THEN AN ENERGY ABSORPTION ATTENUATOR SHALL BE LOCATED AT THE END OF THE BARRIER.

   B. IF GUARDRAIL IS PRESENT, THEN TEMPORARY CONCRETE TRAFFIC BARRIER SHALL BE CONNECTED TO EXISTING GUARDRAIL. PAYMENT WILL BE CONSIDERED INCIDENTAL TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)". (COSTS FOR DISMANTLING BARRIER CONNECTION AND RESTORING EXISTING BARRIER TO ORIGINAL CONFIGURATION WILL BE CONSIDERED INCIDENTAL TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".) SEE BARRIER RAIL DETAILS ON SHEET 14. AN ENERGY ABSPORTION ATTENUATOR SHALL BE LOCATED AT THE END OF THE BARRIER.

26. THE CONTRACT INCLUDES AN ESTIMATED QUANTITY OF THREE ENERGY ABSORPTION ATTENUATORS, WHICH INCLUDES ONE BACKUP ATTENUATOR TO BE USED IN THE EVENT AN IN-SERVICE ATTENUATOR IS DAMAGED AND NEEDS TO BE REPLACED. PAYMENT FOR THE ATTENUATORS AND TO MOVE ATTENUATORS FOR SHIFTING LANE CLOSURES WILL BE CONSIDERED INCIDENTAL TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)". PAYMENT FOR ENERGY ABSORPTION ATTENUATORS USED FOR ANY OTHER TRAFFIC CONTROL SETUP WILL BE CONSIDERED INCIDENTAL TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".

27. TEMPORARY TAPE EDGELINES SHALL BE APPLIED AND SHALL MAINTAIN A ONE FOOT MINIMUM DISTANCE FROM THE BARRIER WITH TWO FEET BEING DESIRABLE. ALL TEMPORARY TAPE EDGE LINES AND PAVEMENT MARKING MASKS WILL BE CONSIDERED INCIDENTAL TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".

28. THE RAISED PAVEMENT MARKERS (RPM'S), TYPE II SHALL BE PLACED TO THE OUTSIDE OF THE TEMPORARY TAPE PAVEMENT MARKINGS. THE RPM'S SHALL BE SPACED AT A MINIMUM OF 20 FEET AND WILL BE CONSIDERED INCIDENTAL TO ITEM 900.645, "SPECIAL PROVISION (TRAFFIC CONTROL, ALL-INCLUSIVE)".

29. DASHED LINE REMOVAL SHALL BEGIN A MINIMUM OF 750 FEET IN ADVANCE OF THE BEGINNING OF THE SHOULDER TAPER FOR TRAFFIC CONTROL WITH TEMPORARY BARRIER PROTECTION.

CLD 15-0223 MODEL: TCP1

PROJECT NAME: IRASBURG
PROJECT NUMBER: IM DECK(46)

FILE NAME: z15all6tcp-107N.dgn
PROJECT LEADER: J. BYATT
DESIGNED BY: S. BEAUMONT
TRAFFIC CONTROL SHEET 1

PLOT DATE: 3/8/2016
DRAWN BY: S. BEAUMONT
CHECKED BY: L. GREER
SHEET 11 OF 49

LEGEND

(A) ROAD WORK AHEAD — W20-1

(B) ROAD WORK 500 FT — W20-1

(C) SIDE ROAD WORK AHEAD — VC-869

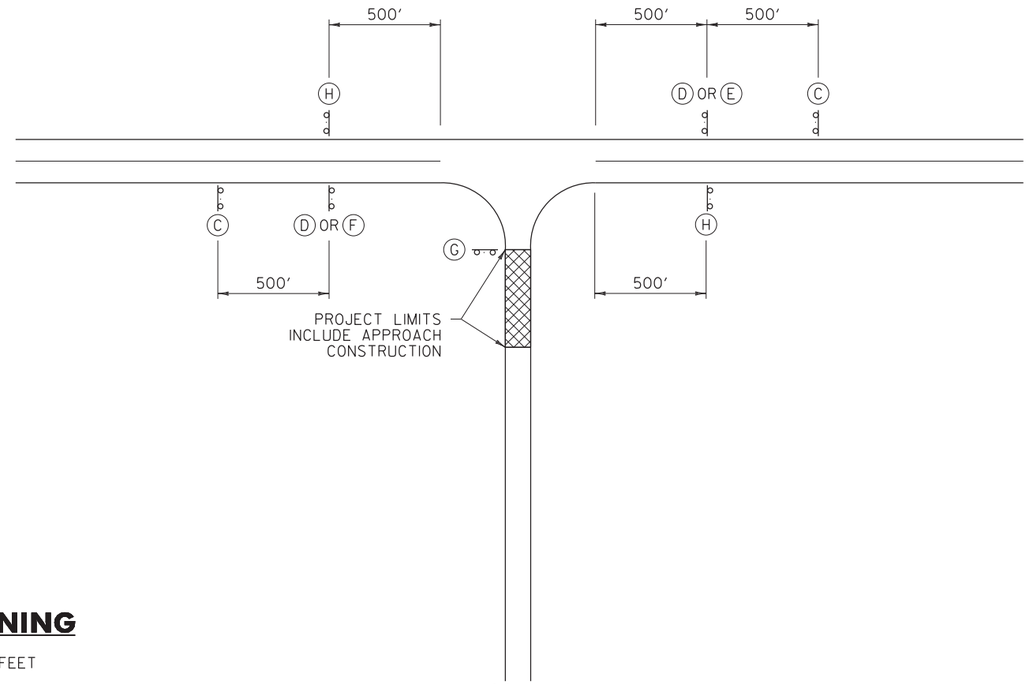
(D) SIDE ROAD WORK 500 FT — VC-869

(E) SIDE ROAD WORK LEFT — VC-869

(F) SIDE ROAD WORK RIGHT — VC-869

(G) ROAD WORK NEXT XX MILES — G20-1

(H) END ROAD WORK — G20-2



I91 Northbound Ramp

SIDE ROAD APPROACH SIGNING

TO BE USED WHEN CONSTRUCTION IS UP TO 1000 FEET FROM THE INTERSECTION. FIELD CONDITIONS MAY DICTATE THE ACTUAL PLACEMENT.

GENERAL NOTES:

1. SIGNS SHOWN ON THIS SHEET ARE INTENDED FOR USE IN PROVIDING ADVANCE WARNING AND INFORMATION ON CONSTRUCTION PROJECTS OVER WHICH TRAFFIC WILL BE MAINTAINED. WHEN ADDITIONAL APPROACH SIGNS OR OTHER TYPES OF ADVANCE SIGNING OR CONTROL ARE NECESSARY, THE PLANS AND/OR THE SPECIFICATIONS FOR THAT PROJECT WILL GIVE THE DETAILS OF THE SIGNS AND DEVICES REQUIRED. FOR ON-PROJECT CONSTRUCTION SIGNS, REFER TO APPROPRIATE STANDARD SHEETS.
2. THE ''ROAD WORK NEXT XX MILES'' SIGN (G20-1) SHALL BE INSTALLED IN ADVANCE OF TEMPORARY TRAFFIC CONTROL ZONES THAT ARE MORE THAN TWO MILES IN LENGTH OR AS DIRECTED BY THE ENGINEER. DISTANCES SHALL BE STATED TO THE NEAREST WHOLE MILE.
3. SIGNS SHALL BE LOCATED AS DETAILED ON THIS SHEET OR AS OTHERWISE SHOWN ON THE PLANS. THEY SHALL APPEAR AT EACH END OF THE HIGHWAY UNDER CONSTRUCTION AND ON ALL INTERSECTING PUBLIC HIGHWAYS. THE ENGINEER SHALL DETERMINE THE EXACT LOCATIONS.

OTHER STDS. REQUIRED: **T–1, T–28**

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

APPROVED

HIGHWAY SAFETY & DESIGN ENGINEER

DIRECTOR OF PROGRAM DEVELOPMENT

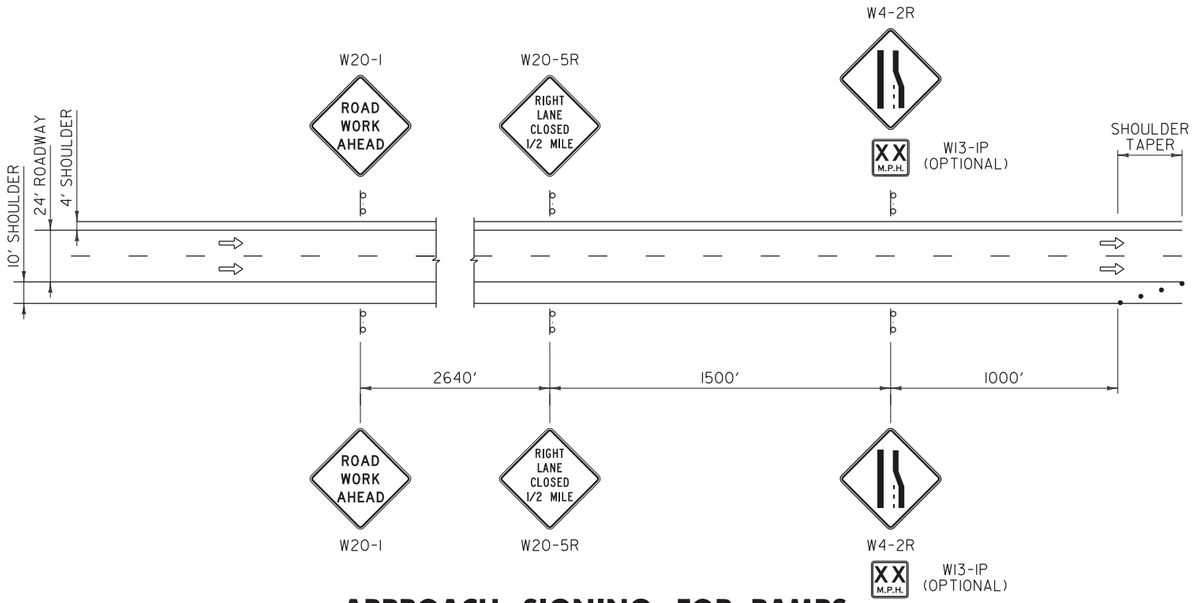
Mark D. Richter

FEDERAL HIGHWAY ADMINISTRATION

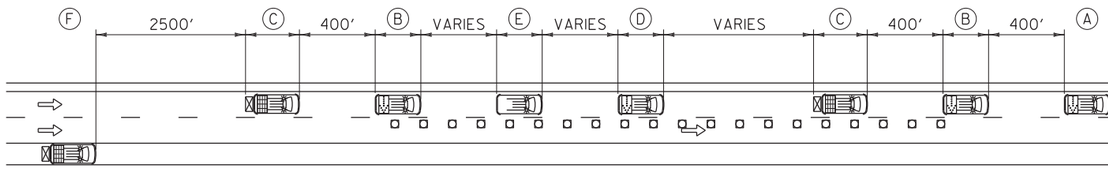
CONVENTIONAL ROADS CONSTRUCTION APPROACH SIGNING

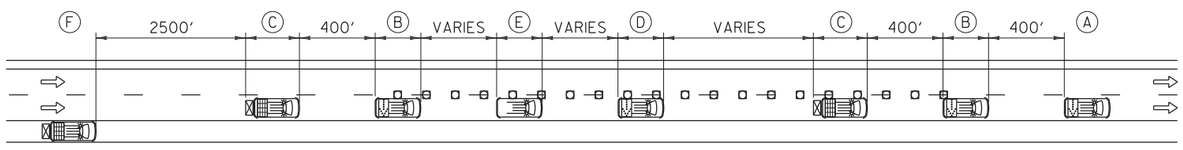
VERMONT AGENCY OF TRANSPORTATION

STANDARD T-10

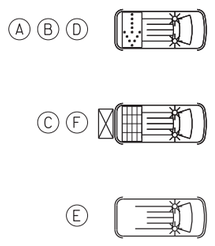


APPROACH SIGNING FOR RAMPS





EDGE LINE MARKING OPERATION



OPERATION VEHICLE SYMBOLOGY

LEGEND

- FLOW OF TRAFFIC
- RETROREFLECTIVE PLASTIC DRUM
- CONE
- FLASHING ARROW PANEL
- CHANGEABLE MESSAGE BOARD
- TRUCK MOUNTED ATTENUATOR
- PAVEMENT MARKING OPERATION VEHICLE
- (A) PAVEMENT MARKING VEHICLE WITH FLASHING ARROW PANEL
- (B) CONE TRUCK WITH FLASHING ARROW PANEL
- (C) PROTECTION VEHICLE WITH CHANGEABLE MESSAGE SIGN AND TRUCK MOUNTED ATTENUATOR
- (D) SUPPLY TRUCK WITH FLASHING ARROW PANEL AND MOUNTED SIGN (OPTIONAL)
- (E) UNIFORMED TRAFFIC OFFICER (OPTIONAL)
- (F) ADVANCED WARNING VEHICLE WITH CHANGEABLE MESSAGE SIGN AND TRUCK MOUNTED ATTENUATOR

GENERAL NOTES:

1. ALL WORK VEHICLES SHALL DISPLAY HIGH-INTENSITY ROTATING, FLASHING, OSCILLATING, OR STROBE LIGHTS, IN ADDITION TO VEHICLE HAZARD LIGHTS.
2. CONE SPACING SHALL BE TWICE THE SPEED LIMIT, IN FEET.
3. THE SECOND CONE TRUCK SHALL NOT RETRIEVE CONES UNTIL THE NEW PAVEMENT MARKINGS ARE DRY.
4. THE NUMBER OF CHANNELIZING DEVICES AND OTHER TRAFFIC CONTROL DEVICES SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. THE ACTUAL NUMBER REQUIRED ARE TO BE DETERMINED BASED ON INDIVIDUAL DETOUR CONDITIONS (TAPERS, SPEED LIMITS, LENGTH OF DETOUR, CURVE, ETC.). WARNING LIGHTS SHALL NOT BE USED ON CHANNELIZING DEVICES.
5. ALL DISTANCES ARE DESIRABLE MINIMUMS, FIELD CONDITIONS SHALL CONTROL THE ACTUAL PLACEMENT.
6. CONE VEHICLES SHALL HAVE CAGES TO PROTECT THE PERSON PLACING AND RETRIEVING CONES.
7. APPROACH SIGNING IS FOR MAINLINE CLOSURE AT ENTRANCE RAMPS AND EXIT RAMPS AND WHEN THE ADVANCED WARNING VEHICLE IS NOT USED. APPROACH SIGNING SHALL BE USED FOR THE APPROPRIATE LANE CLOSURE. SIGNS SHALL BE ERECTED BEFORE THE START OF ANY WORK AND SHALL BE COVERED UNTIL WORK COMMENCES, DURING PERIODS OF INACTIVITY OR UPON COMPLETION OF THE WORK. EACH SIGN SHALL BE ERECTED IN A NEAT AND WORKMANLIKE MANNER.
8. RAMP SIGNING SHALL BE IN PLACE PRIOR TO BEGINNING MAINLINE PAVEMENT MARKING OPERATIONS.
9. MAXIMUM ALLOWABLE LANE CLOSURE IS THREE MILES.

OTHER STDS. REQUIRED: **T–1, T–12, T–23**

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

APPROVED

HIGHWAY SAFETY & DESIGN ENGINEER

DIRECTOR OF PROGRAM DEVELOPMENT

Mark D. Richter

FEDERAL HIGHWAY ADMINISTRATION

TRAFFIC CONTROL FOR PAVEMENT MARKING ON DIVIDED HIGHWAY

VERMONT AGENCY OF TRANSPORTATION

STANDARD

T-22

Appendix C – Rolling Roadblock TEI 16-601

General Information:

Rolling roadblocks are used when short duration roadway construction activities are taking place in/or above all lanes of a limited access highway, thus requiring traffic to be temporarily slowed rather than completely stopped. Traffic is paced at a safe speed (not less than 20 mph on freeways/expressways) to provide a gap in traffic that allows the work activities to be performed. The pacing of traffic is controlled by pilot vehicles (law enforcement vehicles with blue lights flashing) driven by uniformed law enforcement personnel. Any on-ramps between the beginning point of the pacing area and the work area shall be blocked until the pilot vehicle has passed. Two-way radio contact is necessary to provide constant communication between the pilot vehicle, contractor's workers, flaggers stationed at the on-ramp locations, and the project engineer. Advance warning signs are necessary to provide adequate warning to motorist of the traffic pacing area and the potential for a stopped condition.

USE FOR TRAFFIC CROSS OVER BETWEEN PHASE 1 and PHASE 2 BRIDGE DECK REMOVAL

Traffic Control Requirements

1. Rolling roadblocks shall only be conducted on limited access highways within the State of Vermont.

2. All traffic control devices used to warn or guide traffic shall comply with the latest Manual on Uniform Traffic Control Devices (MUTCD), Vermont State Standards, and their latest revisions or any additional traffic control deemed necessary by the Project Manager. Failure to utilize proper measures shall be considered sufficient grounds to order cessation of the work immediately.

3. All diamond shaped signs shall be 48"x48" black legend and border on fluorescent orange background.

4. All roll-up sign material shall have retroreflective sheeting equal to or exceeding the American Association of State Highway and Transportation Officials (AASHTO) M 268 [American Society of Testing and Materials (ASTM) D 4956] Type VI and Type VII unless otherwise noted.

5. All sign stands shall meet National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for assessing Safety Hardware (MASH). The appropriate resource shall be determined as described in the MASH publication.

6. Portable signs shall be placed on the edge of the roadway a minimum of one foot above the travelled way. All vegetation that interferes with visibility of the signs shall be removed. When placed behind guardrail, the bottom of the sign face shall be above the top of the guardrail.

7. If it is anticipated that traffic will back-up beyond the lead warning sign, then a Uniform Traffic Officer (UTO) with operating blue lights shall be parked ½ mile or more prior to where the traffic is expected to back-up. (During design, the anticipated queue length shall be checked to verify if stopping sight distance is adequate to the anticipated back-of-queue; additional measures may be necessary to ensure back-of-queue vehicular safety).

8. All traffic control personnel and personnel that are present to work within the highway shall all wear ANSI Class 2 retroreflective vests or an approved equivalent (law enforcement) for the duration of the operation.

Typical Special Conditions - to be included in the 1111 permit or adapted for use in the project plans (in which case the term Contractor should be substituted for Permit Holder, and notes that are not applicable should be omitted).

1. All work shall be accomplished in accordance with the attached plan dated, _____

2. Failure to complete all the work, approved under this permit, by the "work completion date" may result in suspension of the permit (by separate correspondence) until work is completed and approved by the Vermont Agency of Transportation.

3. Permit Holder shall perform work *within a set area at a specified time*, not during inclement weather, and only during off-peak hours when traffic volumes are at their lowest. *(Insert specific details in this note)*

4. All emergency service providers shall be notified of the planned closure and notified immediately following reopening to traffic.
    a. All on-call emergency response vehicles (i.e. fire, police, ambulances, etc.) shall be allowed unrestricted passage through the Work Zone.

5. The Permit Holder shall provide the District Transportation Administrator and the Work Zone Traffic Management Engineer with a traffic control plan showing the method to control to control traffic. This plan must be approved by the District Transportation Administrator.

6. The length of the rolling roadblock should be designed to accommodate the planned work period without stopping traffic. However, if this is not viable then traffic shall NOT be stopped for more than ten (10) minutes.

7. A pre-construction/preparation meeting with all parties involved must be held prior to the Permit Holder's employees or contractor beginning work to discuss how the project will

be completed. All logistics including communication issues and scheduling issues shall be resolved during this meeting. Note that the Permit Holder is required to notify the District Transportation Administrator five (5) working days in advance of such meeting.

8. The Permit Holder shall provide uniformed traffic officers (State Police, local authorities, or sheriffs) to stop traffic during the closure.

9. The District Transportation Administrator and the appropriate unit of the State Police/Sherriff's department are to be notified a minimum of 72 hours, prior to commencement of work.

10. Except by special permission from the District Transportation Administrator, the only vehicles allowed within the highway right-of-way for construction purposes will be necessary to support the work that is being performed.

11. It is the responsibility of the Permit Holder to verify the appropriate safety measures needed, prior to construction, so proper traffic control devices and/or personnel are available when and as necessary.

12. Additional restrictions and conditional requirements necessary to achieve the work associated with the rolling roadblock can be found in 19 VSA Section 1111 authorized state highway access and work permit and/or the special provisions form the contract document for the project.

Typical Implementation Sequence

1. Portable Changeable Message Signs (PCMS) shall be installed seven (7) days in advance of the closure. These shall be placed at or in advance of the beginning of the rolling roadblock. See Layout Plan

2. Prior to the start of work, place all necessary signs faced down on the shoulder as per approved traffic control plan, in advance of implementing the rolling roadblock.

3. The day of the event, all signs placed face down earlier are to be installed as to be visible to approaching traffic.

4. At the beginning of the rolling roadblock, one UTO (blue lights flashing) per lane shall begin escorting traffic toward the work area, stopping1500 feet in advance of the work area if necessary.

5. Prior to the release of the blue light escort, all Flaggers stationed at ramp locations will stop all traffic from entering the main line

6. Once the blue lights begin escorting the traffic to the work area the contractor shall provide a sweep vehicle in each direction of travel with amber strobe lights activated to follow the last vehicle traveling in advance of the rolling roadblock to ensure there are no

parked vehicles and no open ramps or other access points and that the roadway is clear before the work is to begin.

7. PCMS board are to be changed to their event messages once sweep vehicle movement begins.

8. All uniform traffic officers (UTOs), sweep vehicles, and on-site supervisors shall be in direct radio contact in case something unexpected should happen. Cell phones or walkie-talkies, if radios are not workable, shall be used to communicate during the rolling roadblock implementation.

9. A contingency plan shall be coordinated for concerns which could stop the rolling roadblock or delay the operation shall be made. (Planners and designers should pay special attention to possible ways to detour or clear traffic if needed. This plan should be developed as part of the Traffic Control Plan (TCP) as part of the rolling roadblock).

10. Once permit work is completed the roadway will return to normal conditions. If additional work is required on the shoulder then additional traffic control devices and signs will be required.

11. When work is completed the PCMS board messages shall be changed to the after-event messages or be turned off.

12. Deployment and pick up of all traffic control devices shall conform to the current MUTCD, Part 6 guidance.

13. If multiple closures are required to achieve the work at hand, then a successive rolling roadblock should not be started until the traffic from the preceding rolling roadblock has been sufficiently cleared from the work location.

Pacing Design Considerations

The design shall evaluate the actual distance required for the pacing operation based on site specific features such as: roadway geometrics, pacing speeds, regulatory speeds, interchange spacing, work duration, availability of traffic control officers, traffic volumes and maximum queue length.

The starting point of a traffic pacing operation must consider the following factors: the speed of the pacing vehicles, the location of entrance ramps, and horizontal and vertical alignment of the facility.

In some cases it may be necessary to close a lane at the work site to position a crane(s) and the materials to be lifted. All material to be installed shall be on-site before the traffic pacing operation begins.

It may be necessary to install temporary barrier walls to protect pre-positioned and assembled materials in the right of way.

The **minimum speed allowed** for a pacing operation is 10 mph, with 20 mph the preferred speed.
The **maximum allowed work duration** is ½ hour (30 minutes).
The **maximum practical pacing operation length** is 10 miles.

S_r = Regulatory speed (mph) S_p = Pacing speed (mph) t_w = work duration (min)

$$L = \frac{t_w}{60} S_p \left(\frac{S_p}{S_r - S_p} + 1 \right)$$

L = Total pacing distance in miles L_c = distance paced vehicles must travel L_w = distance paced vehicle before the vehicles at regulatory speed travel while work is performed have cleared the work zone.

$$L = L_c + L_w$$

$$L_c = \left(\frac{\frac{t_w}{60} \times S_p^2}{S_r - S_p} \right)$$

$$L_w = \left(\frac{t_w}{60} \times S_p \right)$$

Project Design

Traffic Pacing Distances (miles)

Regulatory Speed (MPH)	Total Time Allowed for Work Activity (minutes)					
	5	10	15	20	25	30
70	2.3 miles	4.7 miles	7 miles	9.3 miles	*	*
65	2.4 miles	4.8 miles	7.2 miles	9.6 miles	*	*
60	2.5 miles	5 miles	7.5 miles	10 miles	*	*
55	2.6 miles	5.2 miles	7.9 miles	*	*	*
50	2.8 miles	5.6 miles	8.3 miles	*	*	*

+ Site-specific design required.

Notes: The time allowed for work activity starts just after the last vehicle traveling at the pre-pacing regulatory speed clears the work area and ends just as the pacing operation reaches the work area. The time allowed for work must include the time required to clear the roadway of equipment, materials, and personnel.

The selection of the speed of the roadblock should consider the work duration and the location of upstream on-ramps which need to be closed, should generally be 15 mph or greater. Example: a 15 minute duration would require the pace vehicle to travel 5 miles while the work is perform at a 20 mph pace plus an additional 2.2 miles must be traveled to include buffer space, set-up and deceleration distance before the vehicles traveling at the regular speed have cleared the work zone. This distance does not include the 1500 feet before the work area where traffic would be required to stop if work was not completed as scheduled.

Work will include flipping the barrel taper and the arrow board for shifting the lane closure package. This work area is 1.07 miles beyond the permanent road work ahead signs which measure as the end of the 2.4 mile rolling roadblock. Traffic will need to stop 0.78 miles beyond the permanent road work ahead signs if the movement of the sign and barrels is not completed within 5 minutes.
An additional minute will be required to clear the advanced warning package. This will give an overall rolling road block of 3.18 miles.

SAMPLE PCMS Messages*:

The message one week in advance of activity:

Phase - 1	*Phase - 2*
UTILITY	SUNDAY
WORK	NOV 12
PLANNED	7AM-9AM

or

Phase - 1
ROLLING
RD BLOCK
PLANNED

The message while closure is in progress:

Phase - 1	*Phase - 2*
TRAFFIC	KEEP
STOPPED	SAFE
AHEAD	DISTANCE

The message when closure is completed and work activities continue:

Phase - 1	*Phase - 2*
UTILITY	BE
WORK	PREPARED
AHEAD	TO STOP

or

Phase - 2
STAY
ALERT

*All messages to be centered on PCMS not left justified

SAMPLE Sign progression (gate-posted):

Option 1	Option 2
ROAD WORK AHEAD	UTILITY WORK AHEAD
TRAFFIC STOPPED 2 MILES	UTILITY WORK 2 MILES
REDUCE SPEED AHEAD	UTILITY WORK 1 MILE
TRAFFIC STOPPED 1 MILE	BE PREPARED TO STOP
BE PREPARED TO STOP	UTILITY WORK ½ MILE
STOP AHEAD (SYMBOL)	UTILTY WORK 1500 FT

SEE SITE SPECIFIC MAP

Rolling Roadblock Planning Check list

Note that Roadblocks shall not be performed during periods of fog, rain or snow or other inclement weather conditions. Rolling Roadblocks are preferred to occur during off-peak hours, those times when traffic volumes are at their lowest

Purpose

Description where, when, why work is to take place.

Town
Route
Direction (NB,SB,EB,WB)
When (early AM, nighttime, weekends)
Date
Days of the Week
Times of the Day
Number of lanes to be blocked
Vehicle Volume
Entity Performing Work
Brief description of work

Communication Plan

Advance planning meeting to be held 1-2 weeks in advance to define everyone's responsibilities and make sure activities required for accomplishing the task will be in place for the event.

Advance Planning meeting conducted on
Lead coordinator
Press release (responsible party)
Date of Press Release
Newspaper(s)
Television Station(s)
Web Page
Traffic Operation Center (contact date)
Other

Resources

Essential tools for a successful event.

Portable Changeable Message Sign -(QTY)
PCMS- Before Message
PCMS – During Message
PCMS – After Message
Traffic Control Plan (attach layout)
# of Law Enforcement Vehicles
# of Sweep Vehicles with strobe lights
# of contractor vehicles with strobe lights to assist in closing off U-Turns within pace area
# of Flaggers to assist in managing on-ramp traffic within pace area
# of individuals with radios to communicate event plan
Other

Emergency Management

Notification to emergency management (persons responsible; a list of contacts; and written notification is recommended).

Fire
Ambulance
Police
Other

Project Contact List

Essential personnel necessary coordinate with for this event.

Contractor
AOT-Project Manager
AOT-District Representative
Person Coordinating work area

Event Operations

Pace vehicles provided by law enforcement only. Means of communication with each entity at time of event and a list of contact information

Contractor
Sub-Contract
AOT-District Representative
AOT-Designer
AOT-Construction Personnel
AOT-Other
Law Enforcement Officer(s)
Traffic Control Provider