University of Florida Transportation Institute
Florida Transportation Technology Transfer (T2) Center
UNIVERSITY *of* FLORIDA

Advanced Temporary Traffic Control

Participant Workbook

FDOT

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Advanced Temporary Traffic Control FY 2023-24

Participant Workbook

Table of Contents

FDOT

Advanced

Temporary Traffic Control Training

Florida Department of Transportation

1

FDOT

Session I

Introductions
Course Overview
Policies

Florida Department of Transportation

2

FDOT

Introductions

Instructor	Participants
Name	Name
Organization	Organization
WZ Experience	WZ Experience

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Course Goal

Upon completion of this Course, you will be able to:

- Analyze
- Design
- Implement
- Maintain Traffic Control Plans (TCP)

All in a clear and concise fashion.

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Course Organization

1. Introductions, Course Overview &Training Policies
2. Fundamental Principles
3. Temporary Traffic Control Devices and Index 102-600
4. Temporary Traffic Control Zones
5. Set up and removal of a Traffic Control Zone

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Course Organization

6. Other Considerations
7. Transportation Management Plans
8. Pay Items
9. Flagging Operations
10. Construction Project Administration

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Testing

- Open Book and Notes
- 2 hours
- Multiple Choice
- 70% score to pass

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Federal Policy Requirements (23 CFR 630 Subpart J)

- Transportation Management Plans (TMP)
- Responsible DOT and Contractor person to ensure that work zone safety is properly administered
- Pay items for work zone devices
- Training for everyone responsible for the design, implementation, or inspection of traffic control
- Annual process reviews

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State Policy Requirements

Applies to all personnel responsible for the development, design, implementation, operation, enforcement and inspection of work zone related transportation management and temporary traffic control on streets and highways within the State Highway System right-of-way.

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MOT Training Courses

Flagger

Required for those who have responsibility for flagging traffic

- Covers Flagger Control in the MUTCD and Standard Plans Index 102-600
- Participant must demonstrate knowledge and proficiency in flagging operations
- Field demonstration/dexterity test using hand signaling devices for flagging operations

Intermediate

Required for those who supervise or inspect the placement, operation, or maintenance of work zone devices

- Covers TTC devices, set-up and break down of traffic control zones, flagger operations and training, and working with the Standard Plans, Standard Specifications and MUTCD.
- Participant must pass 50 question qualification test

Advanced

Required for those developing TTC plans, performing Worksite Traffic Supervisor duties, or who supervise or inspect the placement, operation, or maintenance of work zone devices including temporary barrier wall and crash cushion

- Covers Intermediate topics in further depth to include temporary barrier wall and crash cushion
- Covers TTC design and problem solving
- 60 Question qualification test

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State Policy Requirements

Refresher Courses:

Training or refresher courses, for all category levels are required every four years for all persons to be qualified to perform their assigned duties.

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Participant Responsibilities

- Maintain a valid Maintenance of Traffic qualification
- Keep updated on all changes to standards and related documents

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End of Session 1

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Session 2

Fundamental Principles of Temporary Traffic Control Zones

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National Manuals


Manual on Uniform Traffic Control Devices (MUTCD)


Roadside Design Guide (RDG)


Policy on Geometric Design of Highways and Streets (AASHTO Green Book)

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State of Florida Manuals

Standard Plans
- Standard Plans Revision

FDOT Design Manual
- Design Bulletins

Standard Specifications
- Special Provisions & Supplements

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State of Florida Manuals


Basis of Estimates (BOE) Handbook


Drainage Manual


Construction Project Administration Manual (CPAM)

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Designed to Work Together

Manual on Uniform Traffic Control Devices (MUTCD) + FDOT Design Manual (FDM) +

Standard Plans + Standard Specifications = Florida TTC Criteria

You may need to use more than one of these when implementing your work zone!

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Principles of Traffic Control
Design for Safety

- Workers
- Motorist
- Bicyclist
- Pedestrian, including disabled
- Enforcement/Emergency Officials
- Transit Needs (Bus, Rail, etc.)

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Principles of Traffic Control

All projects and works on highways, roads, and streets must have a Temporary Traffic Control Plan.



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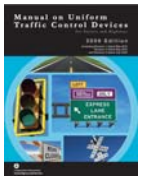
Traffic Control Plan (TCP) Standards

- FDOT Standard Plans are the minimum standards for the use in the development of all TCPs on the State Highway System in the state of Florida.
- The MUTCD, Part 6 is the minimum national standard for traffic control for highway construction, maintenance, and utility operations
- The basic principles and minimum standards in these documents are to be followed for:
  - Design
  - Application
  - Installation
  - Maintenance
  - Removal of all traffic control devices
  - Warning devices
  - Barriers

FDOT
FY 2023-24 STANDARD PLANS



Refer to Specification Section 102-5.1

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Principles of Traffic Control
Selection of Devices

- Fulfill a Need
- Command Attention
- Convey a Clear & Simple Meaning
- Command Respect
- Provide Adequate Response Time

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Principles of Traffic Control
Selection of Devices

FDOT Device Uniformity

Design of Device	Placement of Device	Maintenance of Device
• Specifications • Approved Products List (APL)	• Contract Plans • Standard Plans • MUTCD	• Spec 102 • ATSSA Quality Guidelines

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Principles of Traffic Control

Design Considerations

Guide Traffic and Maintain Work Zone
Provide adequate warning, delineation, and channelization to assist in guiding road users
Remove or cover inappropriate devices or markings
Monitor work zones under varying conditions
Keep clear zone free of equipment and materials
Maintain good communication with public and agencies

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Human Factors

- **Driver Experience**
  - sum total of knowledge and experience the driver possesses

- **Expectancy**
  - driver anticipation of occurrence or non-occurrence of events and situations

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Human Factors

- **Decisions**
  - formulation of a driver course of action based on information received
- **Advanced Warning**
  - displaying information to driver about events and situations prior to occurrence and giving adequate time to react
- **Ambiguity**
  - information that creates uncertainty or has more than one meaning

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Human Factors

- **Redundancy**
  - presenting same message in two or more different ways


W4-2

W20-5

- **Repetition**
  - displaying important information in several successive locations for emphasis


W6-3

R2-1

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End of Session 2

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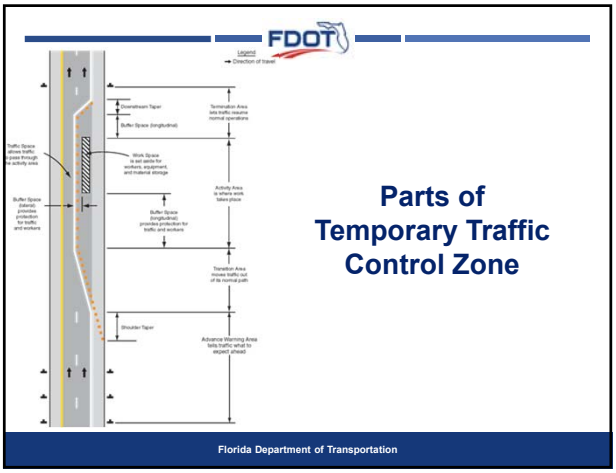
FDOT
Parts of Temporary Traffic Control Zone
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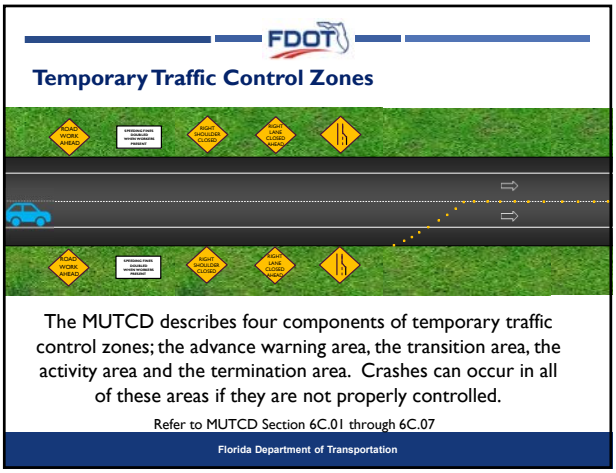
FDOT
Temporary Traffic Control Zones
The MUTCD describes four components of temporary traffic control zones; the advance warning area, the transition area, the activity area and the termination area. Crashes can occur in all of these areas if they are not properly controlled.
Refer to MUTCD Section 6C.01 through 6C.07
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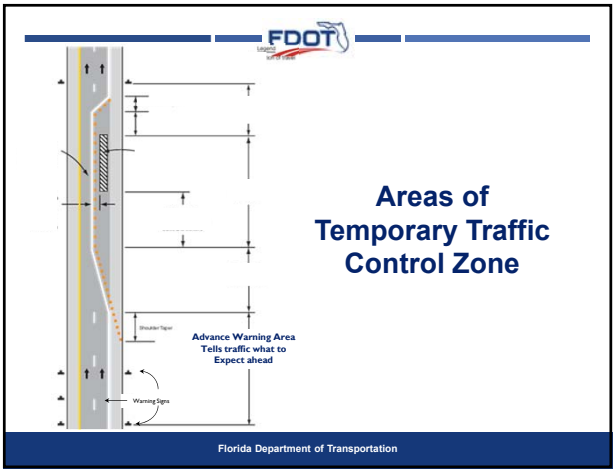
FDOT
Areas of Temporary Traffic Control Zone
Advance Warning Area
Tells traffic what to Expect ahead
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Advance Warning Area

- First indication to motorists of unusual situation; alerts them work operations will occur short distance ahead.
- Signs properly positioned and spaced to give motorists adequate time to respond.

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Advance Warning Area

The advance warning area alerts drivers as to what's coming. In this area, traffic control devices may vary from a series of signs starting a mile or more in advance of the work area, to a single sign or flashing lights on a vehicle. The advance warning area from the first sign to the start of the transition area should be long enough to give the motorists enough time to respond to the traffic control devices.

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Warning Signs

- Placed where visible but not blocking view of existing signs
- Conform to 102-600 Series in Standard Plans
- Cover or move existing signs not applicable to work activity
- Use sign symbols for motorists not familiar with English language

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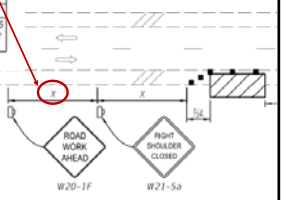
Minimum Distance

TABLE 3
WORK ZONE SIGN SPACING "X"

Road Type	Min. Spacing (feet)
Arterials and Collectors with Work Zone Speed ≤ 40 mph	200
Arterials and Collectors with Work Zone Speed ≥ 45 mph	500
Limited Access Roadways *	1,500

* For Limited access roadways with work zone speed ≤ 55 mph, the minimum spacing may be reduced in accordance with the MUTCD and as approved by the Engineer.



"X" Used To Identify Spacing Between Signs

Distance Between Signs Based on the Temporary Regulatory Posted Speed

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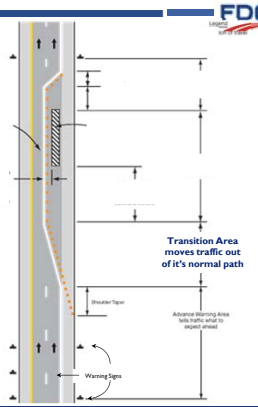

Areas of Temporary Traffic Control Zone

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Transition Area

Directs motorist from one lane to another in a smooth and gradual transition with channelizing devices

Use shadow vehicle during moving operations to warn and guide traffic in proper lane

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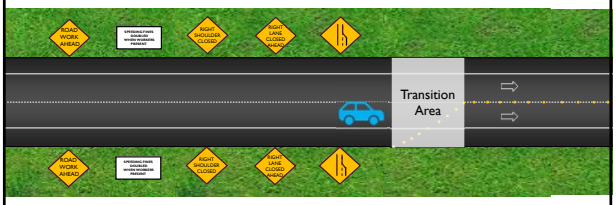
Transition Area



In the transition area, traffic is channeled from the normal highway lanes to a new path, which is required to move traffic around the work area. Most often, this is accomplished with tapers to close the lanes. Transitions should be obvious to drivers. The correct path should be clearly marked with channelizing devices so that drivers will not make a mistake and follow the old path. If the existing pavement markings create confusion, temporary markings should be used.

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Taper

- Series of channelizing devices and/or pavement markings placed on angle to move traffic out of or into normal path.

TABLE 2
TAPER LENGTH "L"

Work Zone Speed (mph)	Min. Length (feet)
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	$L = WS$

Where: W = width of offset in feet
S = speed in mph

- Formula to calculate taper length found in Table 2 of Index 102-600.

Refer to MUTCD Section 6C.08

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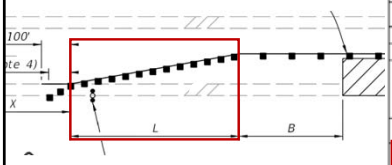
Calculating Taper Length



Taper Length Based on Speed "S" and Offset "W"

TABLE 2
TAPER LENGTH "L"

FORMULAS

S ≤ 40	$L = (WS^2)/60$
S ≥ 45	$L = WS$

Where:
L = Taper Length in feet
W = Width of Offset in feet
S = Work Zone Speed in mph

EXAMPLE "L" VALUES

S	W		
	5	10	12
25	52	104	125
35	102	204	245
45	225	450	540
55	275	550	660
65	325	650	780

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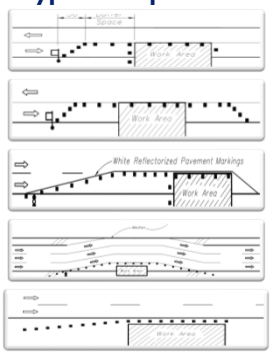
5 Types of Tapers



- Two-lane two-way taper
- Downstream taper
- Merging taper
- Shifting taper
- Shoulder closure taper

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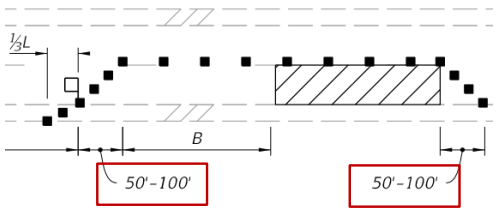
Two-Lane Two-Way / Downstream Taper



Two-Lane Two-way Taper - Used for flagging operations

Down Stream Taper – used at the downstream end of work area to direct drivers to move back into lane that was closed

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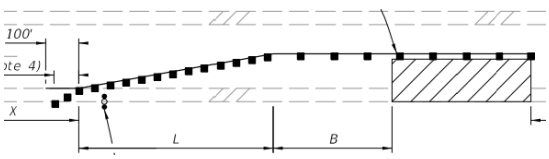
Merging Taper



A merging taper is used to close a lane on a multilane roadway and to direct traffic in the closed lane to merge into the adjacent lane.

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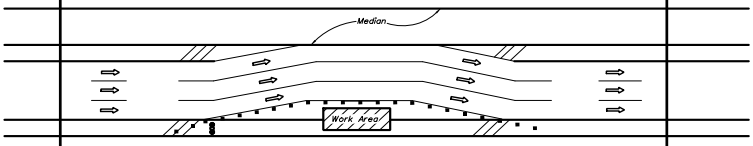
Shifting Taper



A shifting taper is used to move traffic into a different travel path when a merge is not required.

Shifting Taper Length = .5L

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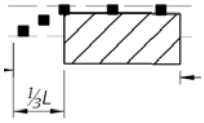
Shoulder Closure Taper



A shoulder taper is used to close a shoulder.

Shoulder Taper = L/3

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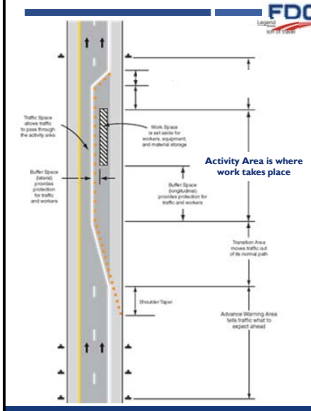

Areas of Temporary Traffic Control Zone

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Activity Area

The activity area includes the traffic space, the buffer space and the work area.

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Buffer Space

The buffer space is the open or unoccupied space between the transition area and the work area. It provides a margin of safety for both traffic and workers by providing recovery space for an errant vehicle.

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Buffer Space

If a driver doesn't see the advanced warning devices or fails to negotiate the transition, a buffer space provides room to stop a vehicle before it actually enters the work space.

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Buffer Space

- **Longitudinal Buffer Space**
  - Allows motorists extra space to regain control if they missed warning signs
  - Provides room for motorist to stop before reaching work area
- **Lateral Buffer Space**
  - Used to separate traffic space from the workspace and provides protection for traffic and workers
- **Keep buffer space free of equipment, workers, materials, and workers' vehicles**

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Buffer Space

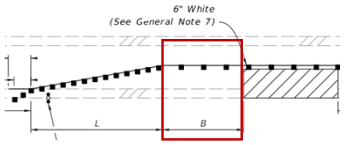

TABLE 4
BUFFER LENGTH "B"

Work Zone Speed (mph)	Min. Length (feet)
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730

Note: When Buffer Length "B" cannot be attained due to geometric constraints, use the greatest length possible, but not less than 155 feet.

Buffer Space is based on speed

Refer to Table 4 in Index 102-600

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Traffic Space

The traffic space is the portion of the highway in which road users are routed through the activity area.

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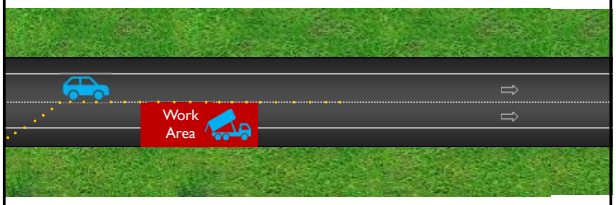
Work Area



The work area is that portion of the roadway which contains the work activity. It is closed to traffic, and is set aside exclusively for workers, equipment and construction materials. The work area may be stationary or may move as work progresses.

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Work Area

- **Workspace/ Work Area**
  - Portion of roadway closed to traffic where work takes place
  - May be stationary or moving
  - May be several workspaces within the project limits
  - Size of work area largely determined by available right-of-way
  - Avoid gaps in work area

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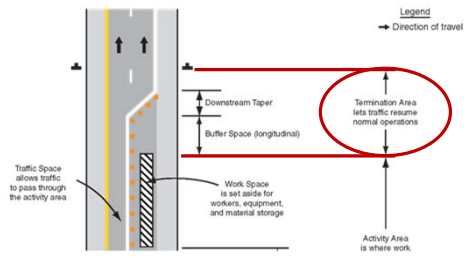
Termination Area

- **Provides short distance for traffic to clear work area and return to normal traffic lanes**



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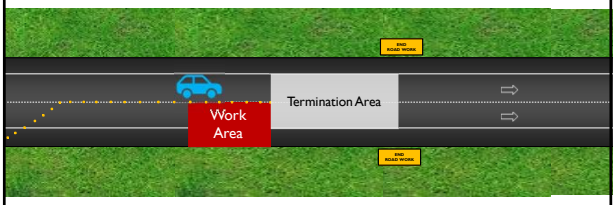
Termination Area



The termination area provides a short distance for traffic to clear the work area and to return to the normal traffic lane. It extends from the downstream end of the work area to the End Road Work sign. A downstream taper may be placed at the termination area.

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End of Session 3

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Session 4

Temporary Traffic Control Devices and Index 102-600

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INSTRUCTOR - Click Book to Launch Standard Plans Index 102-600 PowerPoint Presentation

FDOT Standard Plans

Students - Open your copy of the Standard Plans to Index 102-600

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Temporary Traffic Control Devices

All temporary traffic control devices shall be on the Department's Approved Products List (APL). Ensure the appropriate APL number is permanently marked on the device in a readily visible location.

- Refer to Specifications Section 102-9

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Approved Products List (APL)

Products approved for use in Florida based on:

Specifications

Standard Plans

Vendor Drawing

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Function of Channelizing Devices

- Warn road users of conditions created by work activities in or near the roadway.
- Guide and direct drivers, bicyclist and pedestrians safely through the work zone.

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Channelizing Devices

- Cones, Drums
- Temporary Tubular Markers
- Longitudinal Channelizing Devices (LCD's)
- Vertical Panels
- Barricades ,Types 1 & 2
- Barricades, Direction Indicator
- Barricades, Type 3

Refer to MUTCD Section 6F.63

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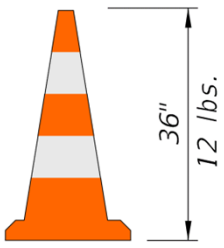
Cones



CONE SIZE: Florida requires 36-inch, 12-lb cones on state roads

Shall only be used in active work zones where workers are present

Refer to MUTCD Section 6F.64

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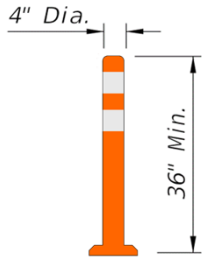
Temporary Tubular Marker

Temporary tubular markers must be a minimum of 36" high and 4" in diameter.



Refer to Section 6F.65

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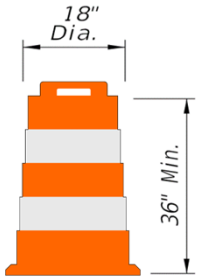
Drums



Drums are highly visible devices, have good target value and give the appearance of being formidable obstacles; therefore they command the respect of motorist.

Refer to MUTCD Section 6F.67

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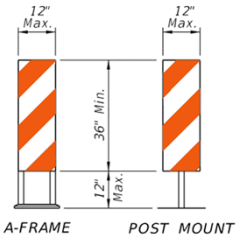
Vertical Panel

Vertical panels may be used for channelization and are particularly appropriate for traffic separation or in other locations where lateral space is restricted.



Refer to MUTCD Section 6F.66

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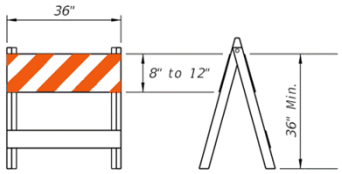
Type I Barricade

Refer to MUTCD Section 6F.68

One horizontal retroreflective rail
Minimum length of three feet



General: Markings shall slope downward at a 45° angle toward the direction to which traffic is to pass.

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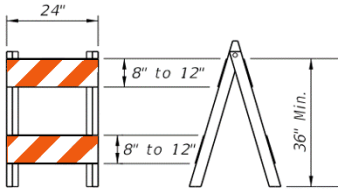
Type II Barricade

Two horizontal retroreflective rails
Minimum length of two feet



General: Ballast shall not be placed on top rails or any striped rails or higher than 13 inches above the driving surface.

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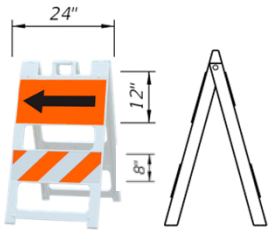
Direction Indicator Barricade

May be used in tapers
and transitions
If used, shall be in a series



Refer to MUTCD Section 6F.69

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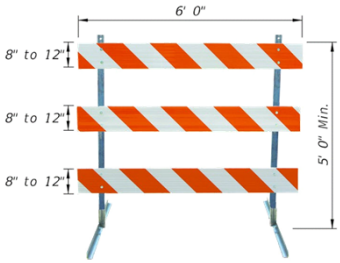
Type III Barricade



If road closure signs are mounted on a Type III Barricade they shall be installed in accordance with manufacturer's vendor drawing shown on the APL.

Refer to Specification Section 102-9.21

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Pedestrian Longitudinal Channelizing Devices (LCDs)

- Minimum 8" continuous detectable edging above walkway
- Minimum 32" height and minimum footprint of 2'

OR

- Minimum 42" height and be anchored or ballasted to withstand a 200lb point load

Refer to MUTCD Section 6F.71

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Arrow Boards

- Supplement other warning devices
- Provide additional advance warning
- Used for lane closures on multi-lane roadways

- Refer to Specifications Section 102-9.10
- Refer to MUTCD Section 6F.61

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Arrow Boards

- Multiple lane closures use multiple arrow boards
- Reduce intensity of flashers during darkness
- Delineate with temporary traffic control devices

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Portable Changeable Message Signs (PCMS)

- Programmable messages that advise the road user of unexpected situations
- Provide additional advance warning

- Refer to Specifications Section 102-9.10.2
- Refer to MUTCD Section 6F.60

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Portable Changeable Message Signs (PCMS)

Typical Uses:

- Speed is expected to drop substantially
- Queuing and delays expected
- Changes in alignment or surface condition
- Advance notice of closures (ramp, lane..)
- Changes in road user pattern

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Portable Changeable Message Signs (PCMS)

Message Design

- Message Panel
  - 8 characters per line
  - 3 lines per phase
  - Each message shall consist of either 1 or 2 phases
- Each phase conveys a single thought
- Phase Layout
  - Top line - Present the problem
  - Center Line - Present the location of distance ahead
  - Bottom line - Present recommended driver action

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79

Radar Speed Display Unit

Used as part of the Motorist Awareness System

Driver Speed Display

Regulatory Speed Limit Sign

'Your Speed' Sign

- Refer to Specification Section 102-9.13

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80

Portable Regulatory Sign

Used as part of the Motorist Awareness System

Flashing Lights

Regulatory Speed Limit Sign

When Flashing Sign

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81

Truck/Trailer Mounted Attenuators (TMA'S)

- Truck or Trailer Mounted
  - Listed on APL
- Index 102-607
- Mounted by Manufacturer's Recommendations
  - Refer to Specification Section 102-9.16

82

Temporary Lane Separator

Refer to MUTCD Section 6F.72

83

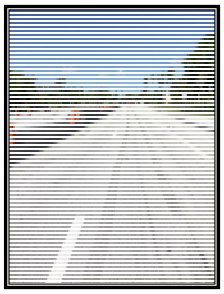
Painted Pavement Markings

Centerlines, lane lines, edge lines, stop bars and turn arrows will be required in work zones prior to opening the road to traffic.

84

Pavement Markings - Conflicting Markings

Remove all pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) that conflict with the adjusted vehicle or pedestrian paths.



Refer to Specification Section 102-5.8

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85

Temporary Signals

- **Traffic Signals**
  - Temporary
  - Existing

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86

Temporary Signalization and Maintenance

- **Provide temporary signals and maintain signalization at existing, temporary, and new intersections including, but not limited to:**
  - Installation of temporary poles and span wire assemblies as shown in the plans
  - Temporary portable traffic signals as shown in the plans
  - Adding or shifting signal heads
  - Trouble calls
  - Maintaining intersection and coordination timing and preemption devices
- **It is important to:**
  - Restore any loss of operation within 12 hours after notification
  - Provide alternate temporary traffic control until the signalization is restored
  - Provide temporary pedestrian signalization in accordance with the TTCP and maintain pedestrian signalization at existing, temporary, and new intersections.

Refer to Specification Section 102-9.14

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87

Work Zone Signs

Warning

Regulatory

Guide

88

Warning Signs

- Diamond is basic shape
- Temporary warning signs black legend and border on fluorescent orange background
- Must be at least 48 inches X 48 inches
- Permanent warning signs yellow background with black legend may remain in work zone if still applicable

Refer to MUTCD Section 6F.16

89

Regulatory Signs

- Generally rectangular with longer vertical dimension black legend and border on white background
- Impose legal obligations and/or restrictions on all traffic
- STOP, YIELD, DO NOT ENTER, and WRONG WAY signs have white legend on red background

Refer to MUTCD Section 6F.05-6F.06

90

Guide Signs

- Rectangular shape with long horizontal dimension
- Basic color white on green
- At work zones may be black on orange to indicate routing changes due to maintenance activity

Refer to MUTCD Section 6F.55

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Sign Placement

Sign supports must not be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic.

Refer to MUTCD Section 6F.03

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92

Work Zone Sign Supports

Temporary Post-Mounted
Work operations exceed 1 day

Temporary Portable
Work operations less than 1 day

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Temporary Barriers

- Refer to Specifications Section 102-9.5 through Section 102-9.5.2.4

4 Types

- 32” Precast Concrete
- Low Profile Precast Concrete
- Water Filled
- 32” Steel

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Temporary Barriers

- **Testing**
  - National Cooperative Highway Research Program (NCHRP) 350
    - Purchased before January 1, 2020
    - May be used on projects until January 1, 2030
    - Manual for Assessing Safety Hardware (MASH)
    - Purchased or Manufactured after January 1, 2020

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Precast Concrete

2 Types of 32” Precast Concrete

- **Type K**
  - F-shape generic barrier developed by FDOT for both roadway and bridge applications
  - Segments are joined with a steel connecting loop and pin
- **Proprietary**
  - Must be listed on the Approved Products List
  - Meet the requirements for “Alternate Designs” in Index 102-100 or meet the requirements of Index 102-110

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Proprietary Barriers – Index 102-100

2 Types on APL

- JJ Hooks
- Quickchange Moveable

97

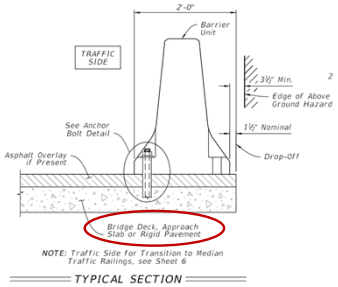
32" Precast Concrete Barriers – General Information

Installation	• Anchored • Free Standing
Surface	• Rigid Pavement (Concrete) • Flexible Pavement (Asphalt) • Cross Slope of 1 : 10 or flatter
Transitions	• Required Between Type K Freestanding, Bolted, Staked and Back Filled • Required Between Other Types of Barriers
Setback Distance	• Varies by type of Installation • Defined in Index 102-100, Sheet 1 as distance to the edge of flexible or rigid pavement

98

Type K Barrier – Bolted

Index 102-110, Sheet 2

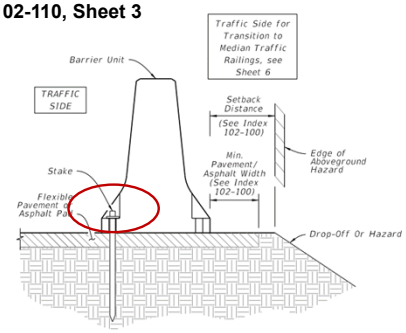


TYPICAL SECTION

99

Type K Barrier – Staked

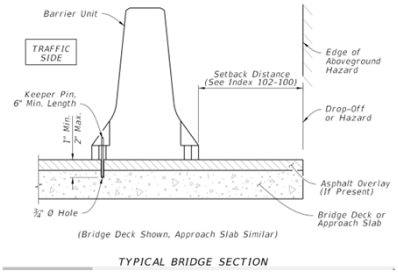
Index 102-110, Sheet 3



100

Type K Barrier – Freestanding (Bridge)

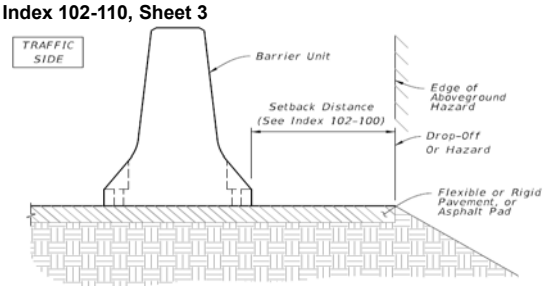
Index 102-110, Sheet 3



101

Type K Barrier – Freestanding (Roadway)

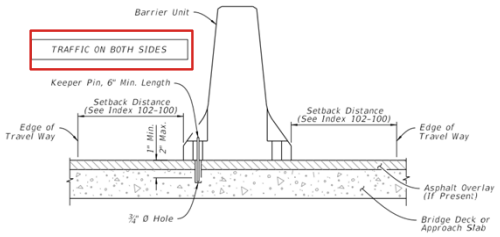
Index 102-110, Sheet 3



102

Type K Barrier – Freestanding (Median)

Index 102-110, Sheet 3

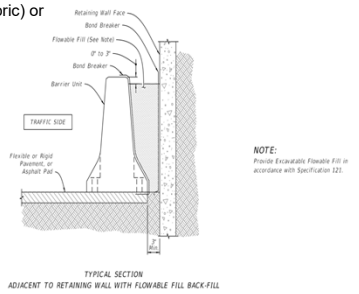


This application applies to bridge decks, approach slabs, asphalt pads, flexible or rigid pavement

103

Type K Barrier – Back Filled

- Soil (compacted using filter fabric) or Flowable Fill
- This is only to reduce damage to the retaining wall



TYPICAL SECTION
ADJACENT TO RETAINING WALL WITH FLOWABLE FILL BACK-FILL

104

Transitions

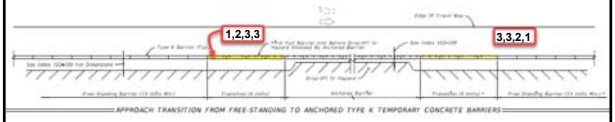
Transition Types

- Type K - Index 102-110, Sheets 5 and 6
  - From Freestanding Type K Barrier to Bridge Median Traffic Railing or Roadway Median Concrete Barrier Wall
  - From Freestanding Type K Barrier to Bridge Traffic Railing or Roadway Concrete Barrier Wall
  - From Anchored Type K Barrier to Bridge Traffic Railing or Roadway Concrete Barrier Wall
- Overlapping transitions between other types of barriers are governed by Index 102-100

105

Type K Barrier – Transitions

- Required Between Semi-Rigid (Freestanding) and Rigid (Bolted, Staked or Back Filled) Conditions
- Required Between Other Types of Barriers
- Most Common Type of Transition is Semi-Rigid to Rigid
  - Bolt or stake pattern for transition units is shown below



106

Low Profile Barrier

Intended for use in lower speed roadways where site distance for side streets and driveways may be a problem

107

Low Profile Barrier

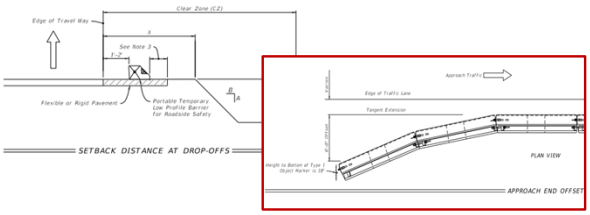
Application	Posted Speeds of 45 mph or less
Surface	Cross Slope of 1 : 10 or flatter
Supplemental Devices	Along the run of barrier: • Tubular Markers • 50' cc tangent; 25' cc radii Approach end: • Type 1 Object Marker
Deflection Distance & Offset	Deflection Distance – 9 inch min Approach End Offset – 6 foot min

108

Low Profile Barrier

- **Setback Distance & Offset**
  - Setback Distance – 9 inch min
  - Approach End Offset – 6 foot min

WORK ZONE SPEED	LATERAL OFFSET	SETBACK DISTANCE
45 MPH OR LESS	1' MIN, 2' PREFERRED	9"



109

Low Profile Barrier

- **Supplemental Devices**
  - Allows drivers to clearly see barrier's location
    - Orange tubular markers
    - Along the run of barrier:
      - 50' cc Tangent; 25' cc radii
    - Approach end:
      - Type 1 Object Marker

110

Barrier Wall Inspection

- **FDOT Temporary Concrete Barrier Evaluation Guide**
  - Helps personnel determine when a traffic control device has outlived its usefulness
  - Device condition may be acceptable or unacceptable
    - **FDOT does not allow the use of units in "unacceptable" condition (Specification 102-9.1)**
  - May be downloaded at https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/programmanagement/implemented/urlinspecs/files/docs/default-source/content-docs/programmanagement/implemented/urlinspecs/files/temporaryconcretebarrierguide.pdf.pdf?sfvrsn=343b4c97_10
- **The Department no longer uses the Quality Guidelines for Temporary Traffic Control Devices and Features, published by American Traffic Safety Services Association (ATSSA) for barrier wall inspection criteria.**

111

Barrier Wall Inspection

- **Acceptable**
  - The barrier is completely intact and has only minor blemishes or imperfections, which may include superficial gouges or minor cracks. The barrier has no structural cracks or cracks that exist through the entire cross-section.
  - Minor spalls with a depth of 1.5 inches or less, and no exposed rebar (excluding anchor slots).
  - The unit-to-unit connection assemblies are functional with no damage, are all intact, and fixed in their positions.
  - Temporary Concrete Barrier previously repaired in accordance with Specification 102.

112

Barrier Wall Inspection

- **Unacceptable**
  - The barrier has multiple cracks throughout, structural cracks or cracks through the entire cross-section.
  - Spalls with a depth greater than 1.5 inches; any location with exposed rebar or rebar protruding from the barrier (excluding anchor slots); or bolts protruding from the barrier face.
  - Cracked or broken concrete that could easily be dislodged if hit, resulting in either of the two conditions above.
  - Anchored barrier with broken concrete with shear cracks.
  - The unit-to-unit connection assemblies are deformed, bent, broken, or no longer in a fixed position.

113

Barrier Wall Inspection

- **Unacceptable wall may be repaired in accordance with Specification 102-9.6.2.4 Temporary Concrete Barrier Repair**
  - Repairs must restore the barrier to original shape and dimensions
  - Repairs are NOT allowed for units that have:
    - Structural cracking
    - Cracks that exist through the entire cross-section
    - Broken unit-to-unit connection assemblies or anchor slots
    - Unit-to-unit connection assemblies or anchor slots no longer in a fixed position

114

Steel Barriers

- BarrierGuard 800
- Vulcan Barrier
- ZoneGuard
- Check APL for Vendor Drawings

115

Water Filled Barriers

- 3 Systems:
  - Triton
  - Guardian
  - Yodock
- Only allowed with prior approval from Roadway Design Office
- See APL for Vendor Drawings

116

Crash Cushions

- **Redirective (Non-Gating)**
  - The principle device to shield approach ends of barrier wall
- **Non-redirective (Gating)**
  - Require approval from FDOT to use

- Refer to Specifications Section 544
- Refer to MUTCD Section 6F.86

117

Crash Cushions

- **Testing**
  - NCHRP 350
    - Purchased before January 1, 2020
    - May be used on projects until January 1, 2030
  - MASH
    - Purchased or Manufactured after January 1, 2020

118

Crash Cushions

- **Testing**
  - TL-2
    - Speeds of ≤ 44 mph
  - TL-3
    - Speeds of ≤ 62 mph
  - No TL-4 to TL-6 crash cushions on the market
    - Use a TL-3 device for speeds greater than 62 mph

119

Crash Cushions

- **Approved Products List**
  - Photos
  - Manufacturer Drawings
  - Installation and Maintenance Manuals

120

End of Session 4

121

Standard Plans Typical Applications

Session 5

122

Situations Not Covered

For situations or field conditions not addressed by the Plans, follow the Standard Plans.

For other applications, comply with the MUTCD and Standard Plans, Index 102-600.

Refer to Specification Section 102-5.2

123

Temporary Traffic Control Plans- Typical Applications (Standard Plans Indexes)

Let's look at some of Standard Index traffic control plans.

124

End of Session 5

125

126

General Principles of TCZ Implementation

- Follow Plans, Standard Plans and MUTCD
- Minimize traffic conflicts
- Close and re-open lanes as soon as practical
- Speed reductions can only be made due to changes in design geometry or the use of the Motorist Awareness System

127

General Principles of TCZ Implementation

- Avoid traffic delays that could cause backups
- Avoid scheduling work during peak hours, weekends, and holidays
- Give high priority passage to emergency vehicles

128

Safety Principles of TCZ Implementation

- Maintain access to emergency services, such as police, fire stations, fire hydrants, and hospitals
- Equip work vehicles with flashing lights
- Keep equipment in good condition, replacing or repairing as needed

129

Safety Tips for TCZ Implementation

- Stay alert.
- Do not turn your back on traffic.
  - Use a spotter, if needed.
- Have a bail-out plan in case of an errant vehicle.
- Always wear High Visibility Safety Apparel when working with the right of way.
- Install the traffic control devices from the shoulder, if possible.
- Ensure that proper lighting is used during nighttime operations.

130

Clothing Requirements

- ANSI/ISEA 107-2004/107-2010 or newer High-Visibility Safety Apparel:
  - Standard Class 2 for Day
- Required within Right-of Way
- Hard hat (recommended)

131

TCZ Set-up Procedure

- Phase I - Preparation
  - Prior to beginning work
- Phase II - Implementation
  - Basic steps for set-up and removal of work zone
- Phase III- Maintenance

132

TCZ Set-up Procedure

- **PHASE I - Preparation**
  - Visit the location to survey geometric conditions and identify potential issues
  - Review the traffic control plans or the appropriate 102 Series Index
  - Inventory the devices you plan to use
  - Verify that the crew has the proper training and brief them on their responsibilities

133

TCZ Set-up Procedure

- **PHASE II - Implementation**
  - If possible, pull all vehicles and equipment at least 15 feet off the roadway while preparing for the set-up operation
  - Set up the work zone using the traffic control plans or the proper 102 Series Index
  - Review the installation and make any adjustments needed

134

TCZ Set-up Procedure

- **PHASE II – Basic Lane Closure Set Up**
  - Locate and mark the beginning of work area, buffer space, and taper
  - Beginning from the taper, measure and mark sign spacing distances
  - Install advance warning signs
  - Install traffic control devices with the flow of traffic

135

TCZ Set-up Procedure

- **PHASE II – Basic Lane Closure Take Down**
  - Remove traffic control devices starting with the termination area first
  - Remove advance warning signs
    - Remove first advance warning sign last
  - Store removed devices outside the clear zone

136

TCZ Set-up Procedure

- **PHASE II – Basic Detour Setup/Take Down**
  - Set-Up
    - Install last sign first
    - Work backwards toward the beginning of the detour
  - Take Down
    - Remove first sign at the beginning of the detour
    - Remove remaining signs with flow of traffic

137

TCZ Set-up Procedure

- **PHASE III – Maintenance**
  - Inspect the work zone
    - Document observations and any deficiencies
    - Correct deficiencies
  - Ensure devices are always in the correct position, properly oriented, clearly visible, and clean
  - Maintain devices to meet the classification of "Acceptable" in the appropriate quality guidelines
  - Immediately repair, replace or clean damaged, defaced or dirty devices.

138

TCZ Set-up Procedure

- **PHASE III – Maintenance (Quality Guidelines)**
  - Devices to meet the classification of "Acceptable"
    - ATSSA Quality Guidelines
    - FDOT Pedestrian LCD Evaluation Guide
    - FDOT Temporary Concrete Barrier Evaluation Guide

139

End of Session 6

140

Session 7

Other Considerations

141

Other Considerations – Lane Closures

Lane Closure Analysis
- Used to determine when lane closures should be allowed without excessive delay.
- Required whenever lane closure is considered

Daytime Closures
- Some Districts do not allow daytime lane closures unless approved in writing by upper management. Check with the District early in the design process.

Interstate and Limited Access Facilities
- No lane closures in excess of 1 calendar day are permitted unless approved by the District Secretary.

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Other Considerations

- Intersecting road signs and signals
- Sight distance
- Lane Widths

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Other Considerations

Detours
- Temporary rerouting onto another roadway

Refer to FDM 240.2.1.8

Diversions & Lane Shifts
- Maintain traffic using existing or temporary pavement

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144

Other Considerations

Narrow Bridges

Drop Offs

Drainage Design

145

Other Considerations – Traffic Pacing

Technique to slow but not stop traffic to facilitate short duration work operations without an elaborate and difficult detour or diversion

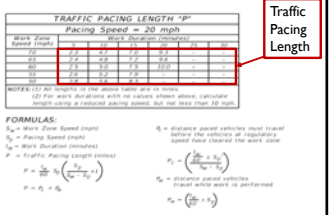
Refer to Index 102-655

146

Traffic Pacing

- **Include a pacing plan outlining:**
  - The expected equipment and number of traffic control officers required
  - The proposed traffic pacing lengths and durations
    - Do NOT exceed a work duration on 30 minutes or traffic pacing length of 10 miles
  - Available exiting egresses in the event of an emergency
  - A contingency plan in the event of equipment failure

Refer to Specification 102-3.3.1



Traffic Pacing Length

147

Traffic Control Officer

Provide uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when the following types of work is necessary on projects:

- When directing traffic/overriding the signal in a signalized intersection
- Nighttime mobile operations on freeway facilities with work within the travel lane
- Traffic pacing
- Pulling conductor/cable above an open traffic lane on limited access facilities
- Temporary road closures
- Nighttime lane closures roadways with posted speed limits 55 mph or greater

At no additional expense to the Department, traffic control officers may be used for operations other than those listed above

Refer to Specification Section 102-7

148

Other Considerations

Motorist Awareness System

Work Area Access

Railroad Crossings

149

Other Considerations - Pedestrians and Bicycles

Tools to Minimize Impacts:

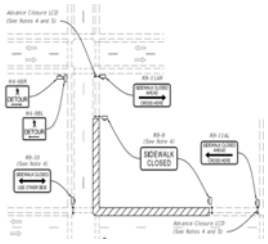
- Phasing of Construction
- Staging of Work at Location
- Alternate Routes
- Public Information
  - Contact Facility Managers, Public Service Providers
  - Web Sites for Trails, Long Distance Routes
  - Mapping Detours
- Seasonal Scheduling of Work
  - Schools, Parks
- Alternate Maintenance Techniques

Refer to FDM 240.2.1.9 for additional guidance

150

Pedestrian Accommodations

- Pedestrians must be accommodated with a safe, accessible travel path around work sites separated from mainline traffic in compliance with the Americans with Disabilities Act (ADA) Standards.
- Appropriate signs and sign placement must be made for advanced notification of sidewalk closures and marked detours.



- Refer to Specification Section 102-3.4

151

Bicycle Accommodations

Accommodations for the closure of bicycle facilities (i.e., marked bicycle lanes or paved outside shoulders 4 feet or greater in width on non-limited roadways)

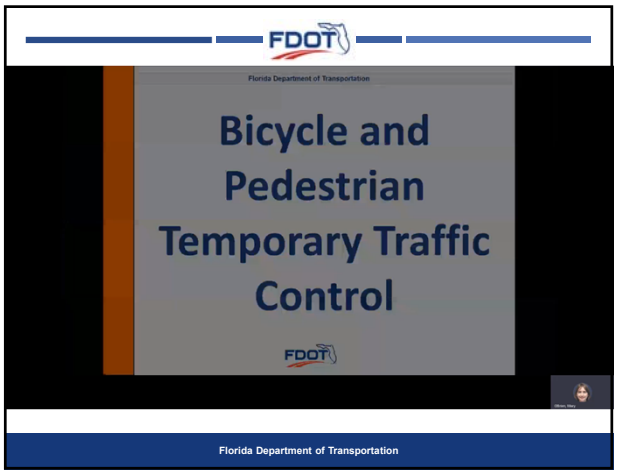
Refer to Specification Section 102-3.4

152

Temporary Traffic Control for Bicycles and Pedestrians (Video)

Let's take a closer look at the accommodations to consider for bicycles and pedestrians in the workzone.

153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Florida Department of Transportation
Bicycle and Pedestrian Temporary Traffic Control
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Florida Department of Transportation

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FDOT
End of Session 7
STOP
Florida Department of Transportation

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FDOT
Session 8
Transportation Management Plans
Florida Department of Transportation

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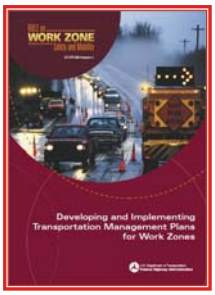
Transportation Management Plan (TMP)

(FDOT Design Manual, Chapter 240)

Method to:

- Minimize Traffic Delay
- Minimize Crashes
- Innovative Public Information
- Innovative Demand Management
- Innovative Construction Strategies
- Alternate Routes



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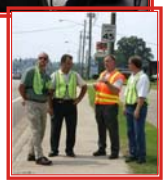
TMP Team Members

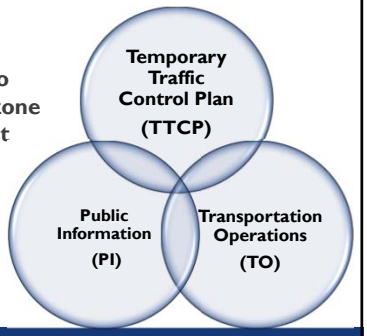
- Project Development and Environment (PD&E)
- Design
- Traffic Operations
- Construction
- Transit
- Federal Highway Administration (FHWA)
- Local Government Officials
- Public Information
- Others, as necessary (Police, hospitals, etc.)



158

What is a Transportation Management Plan?

- **Set of strategies to manage the work zone impacts of a project**



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When must I develop a TMP?

- **All projects**
- **'Significant' projects may require a more complex TMP**
  - Anticipated to cause sustained work zone impacts
  - Interstate Project
    - Within a Transportation Management Area (TMA)
    - Occupying a location for more than 3 days
    - With lane closures

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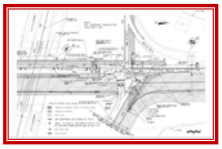
Temporary Traffic Control Plan (TTCP)

- **Required for <u>ALL</u> work zones**
- **Set of Plan Sheets containing:**
  - References to Specific Standard Plans Index Drawing(s)
  - Project Specific Details and Notes
  - Information describing how traffic will controlled in the work zone
- **Refer to FDM 240**

FDOT Standard Plans



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TTCP Development

I. **Understand project**

II. **Develop project specific objectives**

III. **Brainstorm TTCP alternatives**

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TTCP Development

IV. **Develop construction phasing concept**

V. **Examine alternatives that meet objectives for each phase**

VI. **Develop detailed TTCP**

163

TTCP Details

- Level of detail depends on project complexity
- General Notes
- Phasing Notes
- Phasing Typical Sections
- Phasing Plan-Profile Sheets
- Signalization Plans
- Special Details
- Temporary Cross Sections

Standard Plans Indexes may be used whenever appropriate

164

TTCP Sheet Details

- Work Zone Speed
- Lane widths and shoulder widths
- Lane closure restrictions
- Traffic pacing restrictions
- PCMS message for each phase

165

TTCP Sheet Details

- Temporary geometry for all road users (e.g., all necessary special details or phasing plans to provide a pedestrian detour or temporary pedestrian way)
- Locations or notes describing locations of temporary traffic control devices
  - Advance warning signs
  - Portable Changeable Message Signs (PCMS)
  - Arrow boards
  - Temporary signals
  - Temporary barrier wall
  - Crash cushion
  - Channelizing devices at special locations
- Temporary drainage design or permanent drainage design phasing

166

TTCP Sheet Details

- Signal timing for each phase, including temporary actuation, to maintain all existing actuated or traffic responsive mode signal operations for main and side street movements
- Work, by location, to be accomplished during each phase of construction
- Project-specific requirements (e.g., school zones, railroads, waterborne vessels)
- Provide appropriate quantities and pay items

167

Transportation Operations Plan (TOP)

- Strategies to Mitigate Work Zone Impacts
  - Demand Management
  - Corridor/Network Management
  - Safety Management and Enforcement
  - Work Zone Traffic Management

168

TO Strategy Demand Management

Transit Services Improvements and Transit Incentives

Shuttle Services

Ridesharing/Carpooling Incentives

Park-n-Ride Promotions

High Occupancy Vehicle (HOV) Lanes

Variable Work Hours And Telecommuting

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TO Strategy Corridor/Network Management

Signal Timing/Coordination Improvements

Temporary Traffic Signals

Intersection Improvements

Bus Turnouts

Turn Restrictions

Truck Restrictions

Dynamic Lane Closure Systems

Ramp Closures

Railroad Crossing Controls

Florida Department of Transportation

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TO Strategy Safety Management & Enforcement

Motorist Awareness System

Temporary Barriers

Temporary Crash Cushions

Automated Flagger Assistance Devices

On-site Safety Training

TMP Inspection Team Meetings

Florida Department of Transportation

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TO Strategy
Work Zone Traffic Management

Intelligent Transportation System (ITS) for Monitoring and Management

Transportation Management Center (TMC)

Aerial Surveillance

Mile Post Markers

Service Patrol

Local Detour Routes

Incident Response Plan

Law Enforcement

Florida Department of Transportation

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Public Information Plan (PIP)

Communication Strategies About the Expected Work Zone Impacts to Inform:

- Road Users
- General Public
- Residences
- Businesses
- Public Entities

May be included in the District's Community Awareness Plan (CAP)

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Public Information (PI) Key Steps

- Determine the appropriate size and nature of the public information and outreach campaign.
- Identify Resources
- Identify Partners
- Identify Target Audiences
- Develop the message(s)
- Determine communication strategies
- Determine communication timing

Florida Department of Transportation

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End of Session 8

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Session 9

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MOT Pay Items

Pay Item: A number representing work in accordance with the FDOT Standard Specifications for Road and Bridge Construction or Contract Documentation.

No.	Description
102-1	Maintenance of Traffic (MOT), LS/DA
102- 2- AA	Special Detour, MIXED
102- 3	Commercial Material For Temporary Driveway Maintenance, CY
102- 14	Traffic Control Officer, HR
999-102- A	Speed and Law Enforcement Officer, by contract with FDOT
102- 60	Work Zone Signs, ED

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MOT Pay Items

No.	Description
102- 61	Business Signs, EA
102- 71- AB	Barrier Wall (Temporary), LF
102- 73	Guardrail (Temporary), LF
102- 74- A	Channelizing Device, MIXED
102- 76	Advance Warning Arrow Boards, ED
102- 78	Temporary Retroreflective Pavement Marker, EA
102- 81- A	Temporary Crash Cushion-Gating
102- 89- A	Temporary Crash Cushion (Redirective), LO

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MOT Pay Items

No.	Description
102- 94- AB	Glare Screen, LF
102- 98- A	Barricade Type III (to remain), EA
102- 99	Portable Changeable Message Sign, ED
102-104- A	Temporary Signalization and Maintenance of Intersection, ED
102-107	Temporary Traffic Detection and Maintenance of Intersection, ED
102-150- 1	Portable Regulatory Sign, ED
102-150- 2	Radar Speed Display Unit, ED

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MOT Pay Items

No.	Description
102-913- A	Removable Tape Pavement Markings, MIXED
710- 1A-BCD	Painted Pavement Markings, MIXED

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End of Session 9

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The Fun Begins

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Session 10

FLAGGER OPERATIONS

(Flagger Training)

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Objectives

1. Perform as Flagger
2. Implement Emergency Procedures
3. Plan Flagging Operations
4. Select potential Flaggers
5. Train Flaggers

Refer to Specification Section 105-8.3

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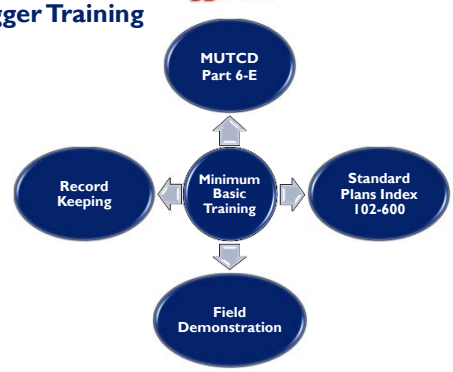
Flagger Training



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Flagger Responsibilities

Public Safety

Communication

Traffic Control

Maneuver

Guidance

Recognize/ Warn

Florida Department of Transportation

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Flagger Priorities

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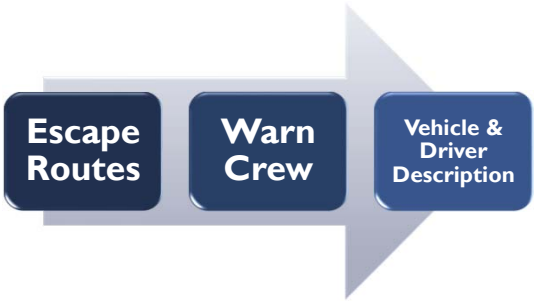
Emergency Procedures



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Flagging Tips

- **Alert**
- **Facing Oncoming Traffic**
  - Highly Visible Location
- ***NEVER*** **in path of Approaching Vehicles**

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Flagging Tips

NEVER turn back to Traffic

NO other activities while Flagging

Breaks

- Notify Supervisor/ Crew Leader

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Rules of Conduct

Be alert to needs of emergency vehicles and crews	If driver refuses to obey instructions, report car information to supervisor
Remove or cover Flagger sign when Flagger is not present	Do not lean on any vehicle, always stand alone; never mingle with work crew, traveling public, or other people

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Flagger Station

- **Site Conditions**
  - Curves, Intersections, etc.
- **Visibility**
  - Sight Distance
- **Speed**
- **Traffic Volume**
- **Road Conditions & Work Type**

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Two Flaggers

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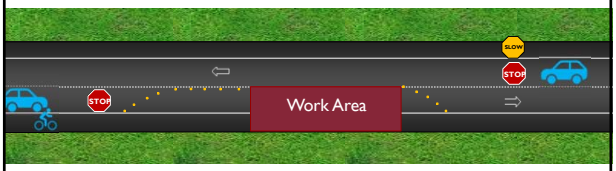
Two Flaggers – Accommodations for Bicyclists



After bicyclists have crossed, release opposing traffic.

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Flagger Clothing

- ANSI/ISEA 107-2004/107-2010or newer High-Visibility Safety Apparel:
  - Standard Class 2 for Day
  - Standard Class 3 for Night
- Required within Right-of Way
- Hard hat (recommended)

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Flagger Equipment

24" Stop Slow Paddle

Night Illuminated

196

Stop/Slow Paddle

Stop Proceed Slow Down

197

Right Equipment for Right Time

- The Stop/Slow paddle is the primary traffic control device.
- Flag use is limited to immediate emergencies, intersections, and when working on the centerline or shared left turn lanes where two (2) flaggers are required and there is opposing traffic in the adjacent lanes.
- Flashlight, lantern or other lighted signal that will display a red warning light shall be used at night.

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Using Flags

STOP

SLOW DOWN

199

Flagging Administration

Administration file includes:

- **Qualification of instructor**
- **Copy of course material**
- **Keep record of:**
  - Date of training
  - Individuals trained

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Flagging Video

Let's look at some typical flagging operations.

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FDOT
STOP
FLAGGING
7/27/2015
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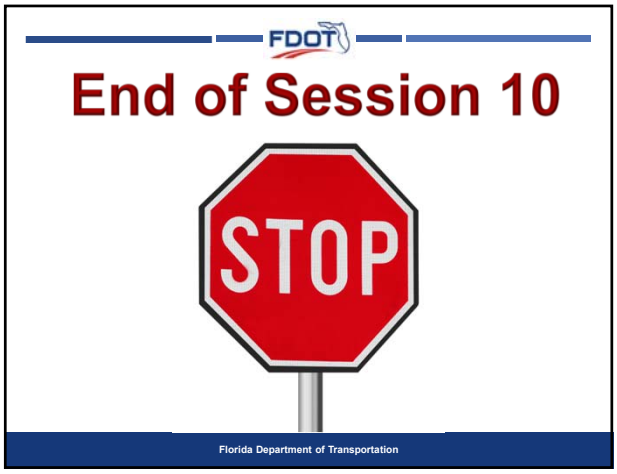
FDOT
End of Session 10
STOP
Florida Department of Transportation

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FDOT
Session 11
Construction Project Administration
Florida Department of Transportation

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Selection of Traffic Control Plan (TCP)

Contractor provides letter stating if they plan to use an alternate TCP or TCP in contract

- Alternate TCP
- TCP in Contract
- Signed & Sealed

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Worksite Traffic Supervisor (WTS) Duties

- On site during all set up and take down
- Performs drive thru inspections immediately after set up
- On site during all nighttime operations
- Immediately corrects all safety deficiencies
- Available on a 24-hour per day basis and present within 45 minutes
- Conducts daily daytime and weekly nighttime inspections

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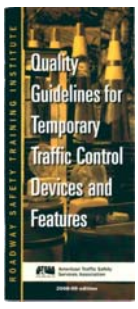
Worksite Traffic Supervisor (WTS) Duties



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End of Session 11

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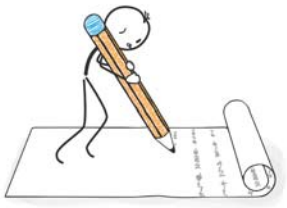
Session 12

Questions, Review and Qualification Exam



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Referenced Webpage Links

Maintenance of Traffic Related Webpage Links

Description	Web page link
MUTCD	http://mutcd.fhwa.dot.gov/
Florida Department of Transportation	http://www.fdot.gov/
Standard Plans	http://www.fdot.gov/design/StandardPlans/DS.shtm
MOT Training Course Providers	https://www.motadmin.com/find_course/
FDOT Design Manual	http://www.fdot.gov/roadway/FDM/
Specification Book	http://www.fdot.gov/programmanagement/Specs.shtm
APL (Approved Products List)	https://fdotwp1.dot.state.fl.us/ApprovedProductList/Specifications
Survey Safety Handbook	http://www.fdot.gov/geospatial/documentsandpubs/surveysafetyhandbook.pdf
Maintenance of Traffic Training Procedure	http://fdotwp1.dot.state.fl.us/ProceduresInformationManagementSystemInternet/FormsAndProcedures/ViewDocument?topicNum=625-010-010
MOT Administration Website	https://www.motadmin.com/

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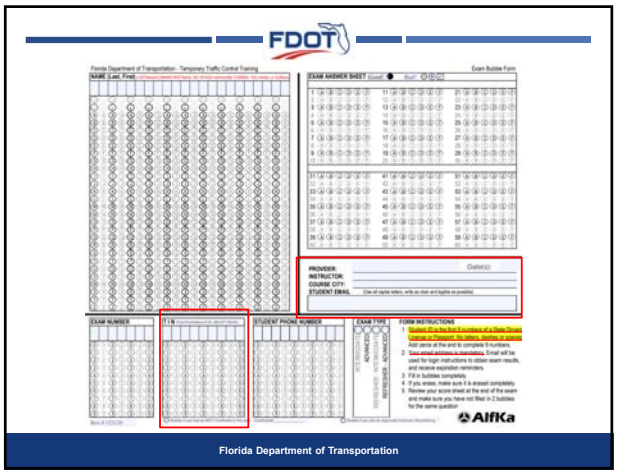
FDOT
EXAM ANSWER SHEET
PROVIDER:
INSTRUCTOR:
COURSE CITY:
STUDENT EMAIL:
EXAM NUMBER
PIN
STUDENT PHONE NUMBER
EXAM TYPE
FORM INSTRUCTIONS
AlfKa
Florida Department of Transportation

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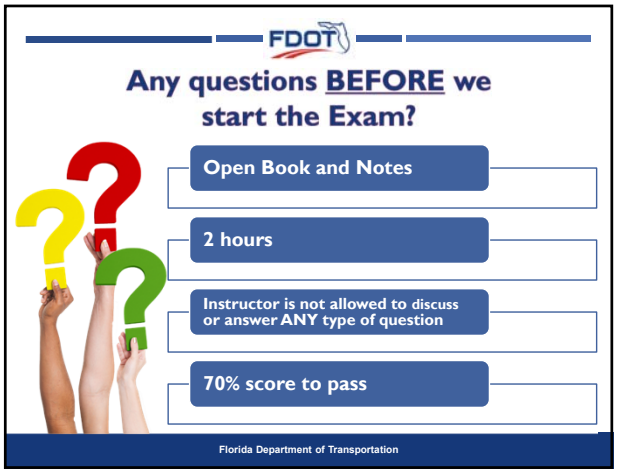
FDOT
Any questions BEFORE we start the Exam?
Open Book and Notes
2 hours
Instructor is not allowed to discuss or answer ANY type of question
70% score to pass
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FDOT Specifications

SECTION 102
MAINTENANCE OF TRAFFIC

102-1 Description.

Maintain traffic within the limits of the project for the duration of the construction period, including any temporary suspensions of the work. Construct and maintain detours. Provide facilities for access to residences, businesses, etc., along the project. Furnish, install and maintain traffic control and safety devices during construction. Furnish and install work zone pavement markings for maintenance of traffic (MOT) in construction areas. Provide any other special requirements for safe and expeditious movement of traffic specified in the Temporary Traffic Control Plans. MOT includes all facilities, devices and operations as required for safety and convenience of the public within the work zone.

Do not maintain traffic over those portions of the project where no work is to be accomplished or where construction operations will not affect existing roads. Do not obstruct or create a hazard to any traffic during the performance of the work, and repair any damage to existing pavement open to traffic.

102-2 Materials.

Meet the following requirements:

Raised Pavement Marker Adhesive*	Section 706
Paint*	Section 710
Pavement Marking Materials*	Section 971
Temporary Raised Pavement Markers*	Section 990
Temporary Traffic Control Device Materials*	Section 990
Retroreflective and Nonreflective Sheeting for Temporary Traffic Control Devices*	Section 994

*Use products listed on the Department's APL.

102-2.1 Temporary Traffic Control Devices: Use only the materials meeting the requirements of Section 990, Section 994, Standard Plans and the Manual on Uniform Traffic Control Devices (MUTCD).

102-2.2 Detour: Provide all materials for the construction and maintenance of all detours.

102-2.3 Commercial Materials for Driveway Maintenance: Provide materials of the type typically used for base, including reclaimed asphalt pavement (RAP) material, and having stability and drainage properties that will provide a firm surface under wet conditions.

102-3 Specific Requirements.

102-3.1 Beginning Date of Contractor's Responsibility: Maintain traffic starting the day work begins on the project or on the first day Contract Time is charged, whichever is earlier.

102-3.2 Worksite Traffic Supervisor: Provide a Worksite Traffic Supervisor who is responsible for initiating, installing, and maintaining all temporary traffic control devices as described in this Section and the Contract Documents. Provide all equipment and materials needed to set up, take down, and maintain temporary traffic control, and handle traffic-related situations. Provide the Worksite Traffic Supervisor or designee with a tablet or smartphone with

internet access for recording information into the Department's lane closure notification system. Use approved alternate Worksite Traffic Supervisors when necessary.

The Worksite Traffic Supervisor must meet the personnel qualifications specified in Section 105.

The Worksite Traffic Supervisor is to perform the following duties:

1. On site direction of all temporary traffic control on the project.

2. Is on site during all set up and take down, and performs a drive through inspection immediately after set up. During operations with lane closures, the Worksite Traffic Supervisor or on-site designee shall record lane closure information into the Department's lane closure notification system in accordance with 102-3.3.

3. Is on site during all nighttime operations ensuring proper temporary traffic control.

4. Immediately corrects all safety deficiencies and corrects minor deficiencies that are not immediate safety hazards within 24 hours.

5. Is available on a 24 hour per day basis and present at the site within 45 minutes after notification of an emergency situation and is prepared to respond to maintain temporary traffic control or to provide alternate traffic arrangements.

6. Conducts daily daytime and weekly nighttime inspections of projects with predominately daytime work activities, and daily nighttime and weekly daytime inspections of projects with predominantly nighttime work activities of all traffic control devices, traffic flow, pedestrian, bicyclist, and business accommodations.

Advise the project personnel of the schedule of these inspections and give them the opportunity to join in the inspection as deemed necessary.

The Department may disqualify and remove from the project a Worksite Traffic Supervisor who fails to comply with the provisions of this Section. The Department may temporarily suspend all activities, except traffic, erosion control and such other activities that are necessary for project maintenance and safety, for failure to comply with these provisions.

102-3.3 Lane Closures: Approval for all lane closures, mobile operations, and traffic pacing operations is required. Submit routine requests to the Engineer 14 calendar days in advance of planned lane closures, mobile operations, and traffic pacing operations. For unforeseen events that require cancelling or rescheduling lane closures, mobile operations, and traffic pacing operations, revise the lane closure request as soon as possible.

Record information for planned lane closures, including but not limited to begin and end lane closure times and locations, into the Department's lane closure notification system. Closure information is to be recorded within five minutes of placing the first channelizing device and removing the last channelizing device associated with the closure.

At the preconstruction conference, submit a request for access to the Department's lane closure notification system to the Engineer. Include the WTS's or designees' name, email address, and a copy of the individual's certification of training for the Department's lane closure notification system. For change of access requests, submit a request to the Engineer at least ten calendar days in advance of when the change is needed.

Information recorded in Department's lane closure system is for public information purposes and will not be used for contract administration.

102-3.3.1 Traffic Pacing: In addition to dates and locations, include a pacing plan outlining the expected equipment and number of traffic control officers required, the

proposed traffic pacing lengths and durations, the available existing egresses in the event of an emergency, and a contingency plan in the event of an equipment failure.

102-3.4 Pedestrian and Bicycle Accommodations: Provide accommodations for pedestrians as shown in the Temporary Traffic Control (TTC) plans or as directed by the Engineer. Accommodate pedestrians with a safe, accessible travel path around work sites separated from mainline traffic in compliance with the Americans with Disabilities Act (ADA) Standards for Transportation Facilities (i.e., stable, firm, slip-resistant, and free of any obstruction or hazards such as holes, debris, mud, construction equipment, and stored material. When a work operation requires a sidewalk or pedestrian way closure for 60 minutes or greater, provide a pedestrian detour or temporary pedestrian way. Provide and maintain pedestrian detours and temporary pedestrian ways that are ADA-compliant as described above. Provide appropriate signs for advanced notification of sidewalk closures and marked detours. Only approved pedestrian longitudinal channelizing devices may be used to close or delineate a pedestrian walkway.

Provide accommodations for the closure of bicycle facilities (i.e., marked bicycle lanes or paved outside shoulders 4 feet or greater in width on non-limited access roadways) as shown in the TTC plans or as directed by the Engineer.

Existing businesses in work areas are to be provided with adequate entrances for vehicular and pedestrian traffic during business hours.

102-4 Alternative Temporary Traffic Control Plan.

The Contractor may propose an alternative Temporary Traffic Control Plan (TTCP) to the plan presented in the Contract Documents. The Contractor's Engineer of Record must sign and seal the alternative TTCP and submit to the Engineer. Prepare the alternative TTCP in conformance with and in the form outlined in the current version of the FDOT Design Manual. Provide a TTCP foreach phase of activities. Take responsibility for identifying and assessing any potential impacts to a utility that may be caused by the alternate TTCP proposed by the Contractor, and notify the Department in writing of any such potential impacts to utilities.

For projects with nighttime lane closure restrictions where paving is expected to extend into the winter months, the Contractor may propose an alternative TTCP allowing for daytime lane closures for friction course paving. The alternative TTCP must be a lane closure analysis based on actual traffic counts and prepared in accordance with the FDOT Design Manual.

The Engineer's approval of the alternate TTCP does not relieve the Contractor of sole responsibility for all utility impacts, costs, delays or damages, whether direct or indirect, resulting from Contractor initiated changes in the design or construction activities from those in the original Contract Documents and which effect a change in utility work different from that shown in the Utility Plans, joint project agreements or utility relocation schedules.

The Department reserves the right to reject any alternative TTCP. Obtain the Engineer's written approval before beginning work using an alternative TTCP. The Engineer's written approval is required for all modifications to the alternative TTCP. The Engineer will only allow changes to the TTCP in an emergency without the proper documentation.

The Contractor may propose to extend lane closure times up to one hour in advance of the lane closure start times shown in the Plans for the following conditions:

1. Limited Access roadways with a traffic count of less than 1,300 vehicles per hour per lane
2. Arterials and Collector roadways with a traffic count of less than 1,550 vehicles per hour per lane.

To determine traffic count, record the number of vehicles in the direction of the closure during a 15-minute period. Multiply the number of vehicles by four and divide by the number of lanes in the direction of the closure.

102-5 Traffic Control.

102-5.1 MUTCD: Comply with the requirements in Part 6 of the MUTCD.

102-5.2 Temporary Traffic Control Plan: The Temporary Traffic Control Plan (TTCP) is the portion of the Plans describing the measures to be used for conveying road users through the work zone. Use the TTCP to maintain traffic for the duration of the work.

For situations or field conditions not addressed by the TTCP follow the Standard Plans. For all other applications, comply with the MUTCD and Standard Plans, Index 102-600. Device location or the number of devices, may be adjusted as recommended by the Work Zone Traffic Supervisor and approved by the Engineer.

102-5. 3 Maintenance of Roadway Surfaces: Maintain all lanes that are being used for the MOT, including those on detours and temporary facilities, under all weather conditions. Keep the lanes reasonably free of dust, potholes and rutting. Provide the lanes with the drainage facilities necessary to maintain a smooth riding surface under all weather conditions.

102-5. 4 Number of Traffic Lanes: Maintain one lane of traffic in each direction. Maintain two lanes of traffic in each direction at existing four (or more) lane cross roads, where necessary to avoid undue traffic congestion. Do not allow traffic control and warning devices to encroach on lanes used for MOT.

The Engineer may allow the Contractor to restrict traffic to one-way operation for short periods of time provided that the Contractor employs adequate means of traffic control and does not unreasonably delay traffic. When a construction activity requires restricting traffic to one-way operations, locate the flaggers within view of each other when possible. When visual contact between flaggers is not possible, equip them with 2-way radios, official, or pilot vehicles, or use traffic signals.

102-5 Crossings and Intersections: Provide and maintain adequate accommodations for intersecting and crossing traffic. Provide signing for the control of traffic entering and leaving work zones by way of intersecting cross roads to make drivers aware of work zone conditions. Do not block or unduly restrict any median opening, road or street crossing the project unless approved by the Engineer. Before beginning any construction, submit to the Engineer the names and phone numbers of persons that can be contacted when signal operation malfunctions.

102-6 Access for Residences and Businesses: Provide continuous access to all residences and all places of business.

102-5.7 Protection of the Work from Damage by Traffic: Where traffic would damage a base course, surface course, or structure constructed as a part of the work, control all traffic to remain outside the limits of such areas until the potential for damage no longer exists.

102-5.8 Flagger: Provide flaggers to control traffic when traffic in both directions must use a single lane and in other situations as required.

102-5.9 Conflicting Pavement Markings: Remove all existing pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) that conflict with temporary paths of vehicles, bicycles or pedestrians when the conflict will exceed 24 hours. Use any method, other than paint or sprayed asphalt, approved by the Engineer to remove existing pavement markings. Remove conflicting pavement markings using a method that will not damage the surface texture of the pavement and which will eliminate the previous marking pattern regardless of weather and light conditions.

Remove all pavement markings that will conflict with "the next phase of operation" for vehicle, bicycle, and pedestrian paths as described above, before opening to vehicle or bicycle traffic or use by pedestrians.

Cost for removing conflicting pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) to be included in Maintenance of Traffic, lump sum.

102-5.10 Vehicle and Equipment Visibility: Equip all pickups and automobiles used on the project with a minimum of one Class 2 warning light that meets the Society of Automotive Engineers Recommended Practice SAE J595, dated November 1, 2008, or SAE J845, dated December 1, 2007, and incorporated herein by reference. Existing lights that meet SAE J845, dated March, 1992, or SAE J1318, dated April, 1986, may be used to their end of service life. The warning lights must be a high intensity amber or white rotating, flashing, oscillating or strobe light. Lights must be unobstructed by ancillary vehicle equipment such as ladders, racks or booms and be visible 360 degrees around the vehicle. If the light is obstructed, additional lights will be required. The lights must be operating when the vehicle is in a work area where a potential hazard exists, when operating at less than the average speed for the facility while performing work activities, making frequent stops or called for in the Plans or Standard Plans.

Equip all other vehicles and equipment with a minimum of 4 square feet of retroreflective sheeting or warning lights.

102-5.11 No Waiver of Liability: Conduct operations in such a manner that no undue hazard results due to the requirements of this Article. The procedures and policies described herein in no way acts as a waiver of any terms of the liability of the Contractor or his surety.

102-5.12 Work Zone Speed: Use the work zone speed in the TTCP. When field conditions warrant work zone speeds different from those in the TTCP, submit signed and sealed documentation to justify reducing the work zone speed limit to the Engineer for approval, or the Engineer may request the District Traffic Operation Engineer to investigate the need.

Sign work zone speed reductions in accordance with Standard Plans, Index 102-600 and the TTCP.

102-5.13 Limited Access Temporary Openings: When required by the Contract Documents, **c**onstruct temporary openings in accordance with the Standard Plans. Submit a written request identifying the specific locations within the project limits to the Engineer.

Locate temporary openings in areas with adequate sight distance. Do not locate temporary openings with 1.5 miles of interchanges or within 2,000 feet of the acceleration-deceleration lanes at rest areas, median openings, other access openings, or other highway service areas. Do not remove existing guardrail or barrier for temporary openings.

Use temporary pavement for the acceleration-deceleration lane surface of the temporary opening. Commercial material may be used for the driveway surface of the temporary opening. Install a gate at the limited access fence and keep the gate locked when the temporary opening is not in use.

Do not use temporary openings to transport materials to or from any other project.

Failure to comply with this Section and the Standard Plans, 102 Series shall be cause for the Engineer to terminate usage of the temporary opening. When the temporary opening is no longer needed, remove immediately and restore the area to pre-construction condition.

102-6 Detours.

102-6.1 General: Construct and maintain detour facilities wherever it becomes necessary to divert traffic, including pedestrians and bicyclists, from any existing facility, or wherever construction operations block the flow of traffic.

102-6.2 Construction: Plan, construct, and maintain detours for the safe passage of traffic in all conditions of weather. Provide the detour with all facilities necessary to meet this requirement.

Install detectable warnings on temporary ramps in accordance with Section 522.

When the Plans call for the Department to furnish detour bridge components, construct the pile bents in accordance with the Plans, unless otherwise authorized by the Engineer.

Provide two Contractor representatives, who will be directly involved in the erection of Department-owned temporary bridging, to attend a mandatory one-day training session to be conducted at the Department's storage facility. No bridging will be released to the Contractor prior to the completion of this training.

Submit the following: company name, phone number, office address, project contact person, names of the representatives who will attend the training described above, project number, detour bridge type, bridge length, span length, location and usage time frames, to the Engineer at least 30 calendar days before the intended pick-up date, to obtain the storage facility location and list of components for the project. Upon receipt, the Engineer will, within 10 calendar days submit an approved material list to the Contractor and the appropriate Department storage yard.

Submit the name of the representative with authority to pick up components, to the Engineer at least 10 calendar days before the proposed pick-up date. The Department is not obligated to load the bridge components without this notice. Take responsibility and sign for each item loaded at the time of issuance.

Provide timber dunnage, and transport the bridge components from the designated storage facility to the job site. Unload, erect, and maintain the bridge, then dismantle the bridge and load and return the components to the designated storage facility.

Notify the Engineer in writing at least 10 calendar days before returning the components. Include in this notice the name of the Contractor's representative authorized to sign for return of the bridge components. The yard supervisor is not obligated to unload the bridge components without this notice.

The Department will provide equipment and an operator at the Department's storage facility to assist in loading and unloading the bridge components. Furnish all other labor and equipment required for loading and unloading the components.

The Department's representative will record all bridge components issued or returned on the Detour Bridge Issue and Credit Ticket. The tickets must be signed by a Department and a Contractor representative, after loading or unloading each truck to document the quantity and type of bridging issued or returned.

Bind together all bridge components to be returned in accordance with the instructions given by the storage facility. The yard supervisor will repack components that are not packed in compliance with these instructions. Upon request, written packing instructions will be made available to the Contractor, before dismantling of the bridge for return to the Department's storage facility.

Assume responsibility for any shortage or damage to the bridge components. Monies due the Contractor will be reduced at the rate of $35.00 per hour plus materials for repacking, repairs or replacement of bridge components.

The skid resistance of open steel grid decking on the detour bridge may decrease gradually after opening the bridge to traffic. The Department will furnish a pneumatic floor scabbler machine for roughening the roadway surface of the detour bridge decking. Provide an air compressor at the job site with 200 cubic feet per minute capacity, 90 psi air pressure for the power supply of the machine, and an operator. Transport the scabbler machine to and from the Department's structures shop. Repair any damage to the scabbler machine caused by operations at no expense to the Department. Perform scabbling when determined necessary by the Engineer. The Department will pay for the cost of scabbling as Unforeseeable Work in accordance with 4-4.

Return the bridge components to the designated storage facility beginning no later than 10 calendar days after the date the detour bridge is no longer needed, the date the new bridge is placed in service, or the date Contract Time expires, whichever is earliest. Return the detour bridging at an average of not less than 200 feet per week. Upon failure to return the bridge components to the Department within the time specified, compensate the Department for the bridge components not returned at the rate of $5.00 per 10 feet, per day, per bridge, for single lane; and $10.00 per 10 feet, per day, per bridge, for dual lane until the bridge components are returned to the Department.

102-6.3 Construction Methods: Select and use construction methods and materials that provide a stable and safe detour facility. Construct the detour facility to have sufficient durability to remain in good condition, supplemented by maintenance, for the entire period that the detour is required.

102-6.4 Removal of Detours: Remove detours when they are no longer needed and before the Contract is completed. Take ownership of all materials from the detour and dispose of them, except for the materials on loan from the Department with the stipulation that they are returned.

102-6.5 Detours Over Existing Roads and Streets: When the Department specifies that traffic be detoured over roads or streets outside the project area, do not maintain such roads or streets. However, maintain all signs and other devices placed for the purpose of the detour.

102-6.6 Operation of Existing Movable Bridges: The Department will maintain and operate existing moveable bridges that are to be removed by the Contractor until such time as they are closed to traffic. During this period, make immediate repairs of any damage to such structures caused by use or operations related to the work at no expense to the Department, but do not provide routine repairs or maintenance. In the event that use or operations result in damage to a bridge requiring repairs, give such repairs top priority to any equipment, material, or labor available.

102-6.7 Special Detour: A special detour is defined as a diversion or lane shift for vehicular traffic that requires temporary pavement.

102-6.8 Pedestrian or Bicycle Special Detour: A pedestrian or bicycle special detour is defined as a temporary pedestrian or bicycle way that requires temporary pavement or other stable, firm, slip-resistant surface.

102-7 Traffic Control Officer.

Provide uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when the following types of work is necessary on projects:

1. When directing traffic/overriding the signal in a signalized intersection.
2. When nighttime mobile operations are used on freeway facilities (interstates, toll roads, and expressways) for work within the travel lane.
3. When traffic pacing is called for in the TTCP or approved by the Engineer.
4. When pulling conductor/cable above an open traffic lane on limited access facilities, when called for in the TTCP or approved by the Engineer.
5. When a Temporary Road Closure is used.
6. When performing lane closures during nighttime operations on roadways with posted speed limits 55 mph or greater.

At no additional cost to the Department, traffic control officers may be used for operations other than those listed above.

The Department will not consider any claim arising from the failure of a traffic control officer to be present or available on the project. A noncompensable time extension may be granted when a state or local emergency requires all area law enforcement officers to be on-duty and not available for hire.

102-8 Driveway Maintenance.

102-8.1 General: Ensure that each residence and business has safe, stable, and reasonable access.

102-8.2 Construction Methods: Place, level, manipulate, compact, and maintain the material, to the extent appropriate for the intended use.

As permanent driveway construction is accomplished at a particular location, the Contractor may salvage and reuse previously placed materials that are suitable for reuse on other driveways.

102-9 Temporary Traffic Control Devices.

102-9.1 General: Use only devices that are listed on the APL and use in conformance with the APL drawings. Immediately remove or cover, using any method of covering approved by the Engineer, any existing or temporary devices (e.g., signs) that do not apply to current conditions.

The use of NCHRP Report 350 Recommended Procedures for the Safety Performance Evaluation of Highway Features devices purchased prior to January 1, 2020 is permitted on projects let prior to January 1, 2030. All devices manufactured or purchased on or after January 1, 2020, must be MASH compliant in accordance with Section 990.

The APL number is to be permanently marked on the device at a readily visible location. Sheeting used on devices and pavement markings are exempt from this requirement.

Notify the Engineer in writing of any scheduled operation that will affect traffic patterns or safety sufficiently in advance of commencing such operation to permit review of the plan for the proposed installation of temporary traffic control devices.

Assign an employee the responsibility of maintaining the position and condition of all temporary traffic control devices throughout the duration of the Contract. Keep the Engineer advised at all times of the identification and means of contacting this employee on a 24-hour basis.

Maintain temporary traffic control devices in the correct position, properly oriented, clearly visible and clean, at all times. All applicable temporary traffic control devices must meet the classification category of Acceptable as defined in the American Traffic Safety Services Association (ATSSA) Quality Guidelines for Temporary Traffic Control Devices and Features. Temporary concrete barriers must meet the classification category of Acceptable defined in the Department's Temporary Concrete Barrier Evaluation Guide, which may be viewed at the following URL: https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/programmanagement/implemented/urlinspecs/files/docs/default-source/content-docs/programmanagement/implemented/urlinspecs/files/temporaryconcretebarrierguide.pdf.pdf?sfvrsn=343b4c97_10. Pedestrian Longitudinal Channelizing Devices (LCDs) must meet the classification category of Acceptable as defined in the Pedestrian LCD Evaluation Guide, which may be viewed at the following URL: https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/programmanagement/implemented/urlinspecs/files/lcdevaluationguide.pdf?sfvrsn=166e0f16_2. Immediately repair, replace or clean damaged, defaced or dirty devices. Traffic control devices must not be cleaned while installed/used. Use of warning lights on any temporary traffic control device is prohibited, with the exception of the trailer mounted portable regulatory signs.

Employ an approved independent Channelizing Device Supplier (CDS) to provide and maintain the condition of the following non-fixed channelizing devices: drums, cones, vertical panels, barricades, temporary tubular markers, and pedestrian longitudinal channelizing devices. Cones may be provided and maintained by the Contractor.

The CDS shall not be affiliated with the Contractor and must be approved by the Department. Department approved CDSs are listed on the State Construction Office website. CDSs seeking inclusion on the list must meet the requirements of 102-9.1.1. The CDS shall submit a monthly certification on letterhead that the channelizing devices mentioned above installed/used within the work zone meet classification category of Acceptable as defined in the Pedestrian LCD Evaluation Guide and the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features. The CDS shall submit the monthly certification on letterhead for channelizing devices installed/used within the work zone. The CDS certification shall include the following statement, "I certify that I have provided and maintained the following devices <list devices covered under the certification> in accordance with Pedestrian LCD Evaluation Guide and the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features." If the Contractor chooses to provide and maintain cones, the Contractor must submit a monthly Contractor certification on letterhead that all cones installed/used within the work zone meet acceptable standards as outlined in the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features. The Contractor certification shall include the following statement, "I certify that I have provided and maintained cones in accordance with the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features."

102-9.1.1 Approved Independent Channelizing Device Supplier (CDS) Requirements: Submit the following documents to the State Construction Office for review and approval

1. A letter on company letterhead signed and dated by the owner of the company or company officer with the following information and statements:

a. The company's owners, stockholders, and officers.

b. A statement declaring that the company will not perform as a CDS on any project where there is common ownership, directly or indirectly, between the company and the Contractor.

c. A statement declaring that the company will furnish and maintain the condition of all channelizing devices with the exception of cones as required in 102-9.1 with its own forces.

d. A statement declaring at least five years of experience in providing channelizing device supplier services, with its own inventory of channelizing devices.

e. On a separate sheet, list a sample project history of the company's experience as a channelizing device supplier for the five years declared in item 1(d) above including the following information:

1. Project name and number and a brief description of CDS work performed,
2. Beginning and ending date of CDS project activities,
3. Location of project (city, state),
4. Monetary amount of CDS work on project,
5. Owner of project, contact person and phone number with area code,
6. Name of Contractor (client) that the work was performed for and phone number with area code.

2. A maintenance plan for approval by the Department that outlines the frequency and methods for maintaining the condition of all channelizing devices, except cones owned and maintained by the Contractor, installed/used in the work zone.

102-9.2 Work Zone Signs: Use work zone signs in accordance with the TTCP and Standard Plans.

102-9.2.1 Post Mounted Signs: Meet the requirements of 990-8.

102-9.2.2 Portable Signs: Portable signs may be used when the work zone condition will be in place for 24 hours or less, or as approved by the Engineer.

102-9.2.3 Barrier-Mounted Signs: If post mounting criteria cannot be achieved and a barrier or traffic railing exists, attach work zone signs to barrier or traffic railing in accordance with the Standard Plans. Use Standard Plans, Index 700-012 only when mounting the sign to the top of the barrier or traffic railing places the sign panel closer than two feet from the traveled way.

102-9.3 Business Signs: Use business signs in accordance with the TTCP and Standard Plans. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

102-9.4 Channelizing Devices: Use channelizing devices in accordance with the TTCP, Standard Plans, and MUTCD.

102-9.4.1 Cones: Use cones in active work zones where workers are present.

Use cone collars at night designed to properly fit the taper of the cone when installed. Collars may be removeable or attached permanently. Place the upper 6-inch collar a uniform 3-1/2 inches distance from the top of the cone and the lower 4-inch collar a uniform 2 inches distance below the bottom of the upper 6-inch collar.

102-9.4.2 Pedestrian Longitudinal Channelizing Devices (LCDs): Use LCDs listed on the APL for pedestrian use and meeting the requirements of Section 990 and the Standard Plans. Pedestrian LCDs must be interlocked except for the stand-alone unit placed perpendicular to a sidewalk. Ballast pedestrian LCDs as shown on the APL.

Ensure that joints on the pedestrian LCDs are free of sharp edges and have a maximum offset of 1/2 inch in any plane.

102-9.5 Temporary Barrier: Use temporary barrier in accordance with the TTCP and Standard Plans. Obtain and use precast temporary concrete barrier from a manufacturing plant that is on the Department's Production Facility Listing. Temporary concrete barrier must meet the material and construction requirements of Section 521 unless noted otherwise in the Standard Plans. Proprietary temporary concrete, steel, or water filled barrier used must be listed on the APL.

The maximum allowable height increase between consecutive temporary barrier units in the direction of traffic is one inch.

Temporary barrier must comply with Standard Plans, Index 102-100 or 102-120. Install temporary barriers as either anchored or freestanding as shown in the TTCP or the Standard Plans. An anchored unit is defined as having at least one stake or bolt into the underlying pavement or bridge deck. All other units, including those with keeper pins, are considered freestanding.

Remove temporary asphalt pads and repair all attachment scars to permanent structures and pavements after barrier removal. Make necessary repairs due to defective material, work, or Contractor operations at no cost to the Department. Restore barrier damaged by the traveling public within 24 hours after notification as authorized by the Engineer.

Trailer mounted barriers listed on the APL may be used in lieu of temporary barriers or positive protection the option of the Contractor. Trailer mounted barriers listed on the APL must have an FHWA eligibility letter and be successfully crash tested in accordance with MASH TL-3 criteria. All trailer mounted barriers must be equipped with an APL listed truck mounted attenuator, an APL listed vehicle mounted arrow board and vehicle warning lights in accordance with this Section.

102-9.5.1 Temporary Barrier Meeting the Requirements of Standard Plans, Index 102-120 and 102-110: Ensure the marking requirements of the respective Index are met.

102-9.5.1.1: Proprietary Precast Temporary Concrete Barrier Fabricated prior to 2005: Submit a certification stating that all unmarked barrier units meet the requirements of the Specifications and the Standard Plans. Certifications will be project specific and non-transferable.

102-9.5.1.2 Proprietary Precast Temporary Concrete Barrier Fabricated in 2005 or later: Ensure each barrier unit has permanent clear markings, showing the manufacture date, serial number, manufacturer's name or symbol, and the APL number. Label the markings on a plate, plaque, or cast in the unit. Proprietary barrier fabricated prior to 2016 and marked with the "INDX 521" in lieu of the APL number will be permitted.

102-9.5.1.3 Temporary Concrete Barrier Repair: Before beginning the repair, remove all laitance, loose material, and any other deleterious matter to sound concrete or a minimum depth of one inch. Additionally, when reinforcing bars, inserts or weldments are exposed, remove the concrete to provide a minimum one-inch clearance all around. Fill the repair area with an approved high performance concrete repair material in accordance with 930-5 and the manufacturer's recommendations. Restore surfaces and edges to the original dimensions and shape of the barrier.

Repairs are not allowed on barrier units that have one or more of the following deficiencies: structural cracking or cracks that exist through the entire cross-section; unit-to-unit connection assemblies or anchor slots are broken or no longer in a fixed position.

Do not paint repaired barriers.

102-9.6 Barrier Delineators: Use barrier delineators on top of temporary barriers in accordance with the Standard Plans and the requirements of Section 705.

102-9.7 Temporary Glare Screen: Use temporary glare screens listed on the APL that meet the requirements of Section 990.Use screen systems in conjunction with temporary barrier at locations identified in the Plans.

When glare screen is utilized on temporary barrier, barrier delineators will not be required.

102-9.8 Temporary Crash Cushion (Redirective or Gating): Use temporary crash cushions in accordance with the details and notes shown in the TTCP, Standard Plans, and requirements of the pre-approved alternatives listed on the APL.

Temporary crash cushions can be either new or used functionally sound refurbished devices. Performance of intended function is the only condition for acceptance. All metallic components must be galvanized in accordance with Section 967.

Anchor abutting temporary barrier in accordance the Standard Plans or APL drawings, as required. Bidirectional installations must have a transition panel installed between the crash cushion and the abutting barrier. Delineate the crash cushion in accordance with Section 544. Maintain the crash cushions until their authorized removal. Do not place any materials or equipment within the length of the crash cushion.

Remove temporary asphalt or concrete pads and repair all attachment scars to permanent structures and pavements after crash cushion removal. Make necessary repairs due to defective material, work, or Contractor operations at no cost to the Department. Restore crash cushions damaged by the traveling public within 24 hours after notification as authorized by the Engineer.

102-9.9 Temporary Guardrail: Use temporary guardrail in accordance with the TTCP and Standard Plans. Install the temporary guardrail in accordance with the Section 536.

102-9.10 Trailer Mounted Devices:

102-9.10.1 Arrow Board: Use arrow boards in accordance with the TTCP, Standard Plans, and that meet the requirements of Section 990. Ensure that the arrow board display panel is raised to a fully upright position and is fully visible to motorists. Use Type B arrow boards on roadways with an existing posted speed of 45 MPH or less for maintenance and mobile operations on any speed facility. Use Type C arrow boards for all other operations on roadways with an existing posted speed of 50 MPH or greater, and may be substituted for Type B arrow boards on any speed facility.

102-9.10.2 Portable Changeable Message Sign (PCMS): Use PCMSs or truck mounted changeable message signs in accordance with the TTCP, Standard Plans and Section 990 to supplement other temporary traffic control devices used in work zones. Ensure that the PCMS display panel is raised to a fully upright position and is fully visible to motorists. Reduce the intensity of the flashers when using PCMS at night. Use PCMS with a minimum letter height of 18 inches. For facilities with posted speed limits of 45 mph or less, PCMS with a minimum letter height of 12 inches may be used.

For roadways with speed limits greater than 45 mph, the message displayed on the PCMS must be unobstructed from 800 feet. For roadways with speed limits of 45 mph or less, the message displayed must be unobstructed from 650 feet.

Messages must have no more than two phases. The display time for each phase must be at least two seconds but no more than three seconds. The sum of the display time must be a maximum of six seconds.

102-9.10.3 Portable Regulatory Signs (PRS): Use PRSs in accordance with the TTCP, Standard Plans, and. Section 990. Ensure that the PRS sign panel is raised to a fully upright position and is fully visible to motorists.

Activate portable regulatory signs only during active work activities and deactivate when no work is being performed.

102-9.10.4 Radar Speed Display Unit (RSDU): Use RSDUs in accordance with the TTCP, Standard Plans and Section 990 to inform motorists of the posted speed and their actual speed. Ensure that the RSDU display panel is mounted in accordance with the manufacturer's recommendations.

Activate the radar speed display unit only during active work activities and deactivate when no work is being performed.

102-9.11 Temporary Signalization and Maintenance: Provide and maintain temporary signals and signalization at existing, temporary, and new intersections including, but not limited to, the following:

1. Installation of temporary poles and span wire assemblies as shown in the TTCP,
2. Temporary portable traffic signals as shown in the TTCP,
3. Adding or shifting signal heads,
4. Trouble calls,
5. Maintaining intersection and coordination timing and preemption devices. Coordination timing will require maintaining functionality of system communications.

Phase and time signals in accordance with the Plans. Obtain approval from the District Traffic Operations Engineer for any timing changes that are either reoccurring or last longer than 24 hours.

Restore any loss of operation within 12 hours after notification. Provide alternate temporary traffic control until the signalization is restored.

Provide temporary pedestrian signalization in accordance with the TTCP, and maintain pedestrian signalization at existing, temporary, and new intersections.

Provide traffic signal equipment that meets the requirements of the Standard Plans and 603-2. The Engineer may approve used signal equipment if it is in acceptable condition. Replacement components for traffic signal cabinet assemblies will be provided by the maintaining agency.

102-9.11.1 Temporary Signals for Lane Closures on Two-Lane, Two-Way Roadways: Temporary signals may be used, at the Contractor's option, as an alternate to flaggers for lane closure operations on two-lane, two-way roadways in accordance with Standard Plans, Index 102-606. The Contractor's Engineer of Record must provide the signal timing for the temporary signals. The District Traffic Operations Engineer must approve the installation and timing of temporary signals prior to beginning work. Adjust timing based on changing field conditions as approved by the Worksite Traffic Supervisor. Submit to the Engineer any timing changes that are reoccurring or last longer than 24 hours for District Traffic Operations Engineer's approval Temporary signals can either be portable signals or span wire signals and must be listed on the APL. Provide two signal faces for each approach.

102-9.12 Temporary Traffic Detection and Maintenance: Provide and maintain temporary traffic detection at existing, temporary, and new signalized intersections. Ensure that vehicle detectors and systems can detect vehicles in each movement on each approach and call the correct vehicle phase when vehicle demand is present. Ensure adjacent lanes and opposing movements do not place false calls. Provide temporary pedestrian detection in accordance with the TTCP, and maintain pedestrian detection at existing, temporary, and new intersections. Ensure pedestrian detectors call the correct pedestrian phase when pedestrian demand is present.

Provide temporary traffic detection equipment listed on the APL.

Restore any loss of detection within 12 hours. If permanent traffic detection cannot be restored within 12 hours, provide temporary detection. Ensure 90% accuracy per signal phase, measured at the initial installation and after any lane shifts, by comparing sample data collected from the detection system with ground truth data collected by human observation. Collect the sample and ground truth data for a minimum of five minutes during a peak and five minutes during an off-peak period with a minimum three detections for each signal phase. Perform the test in the presence of the Engineer.

102-9.13 Existing ITS Maintenance: Provide maintenance at existing ITS locations. Diagnose any loss of functionality within 8 hours. Restore any loss of functionality within 24 hours. The Engineer may extend the allowable downtime beyond 24 hours. Configure and install Department furnished equipment as necessary. Ensure that all stand-alone functions of replaced ITS devices are tested as detailed in the Contract Documents and as approved by the Engineer. Perform the test in the presence of the Engineer.

102-9.14 Truck Mounted Attenuators and Trailer Mounted Attenuators: Use truck mounted and trailer mounted attenuators in accordance with the manufacturer's recommendations and Standard Plans.

For existing posted speeds of 50 mph or greater, use either truck mounted attenuators or trailer mounted attenuators that meet TL-3 criteria. For existing posted speeds of 45 mph or less, use either truck mounted attenuators or trailer mounted attenuators that meet TL-2 or TL-3 criteria.

102-9.15 Temporary Raised Rumble Strip Set: Use temporary raised rumble strips per the manufacturer's recommendations and in accordance with Standard Plans, Index 102-603.

The temporary raised rumble strip may be either a removable striping type or a portable type. Use a consistent type and color throughout the work zone.

102-9.16 Automated Flagger Assistance Devices (AFAD): Furnish, install, maintain, remove, and relocate AFADs in accordance with the Plans, Standard Plans, Index 102-603, and APL vendor drawings.

Position AFADs where they are clearly visible to oncoming traffic. AFADs may be placed on the centerline if they have been successfully crash tested in accordance with MASH TL-3 criteria. A gate arm is required in accordance with Section 990 if a single AFAD is used on the shoulder to control one direction of traffic.

The devices may be operated either by a single flagger at one end of the traffic control zone, from a central location, or by a separate flagger near each device location. Use only flaggers trained in accordance with Section 105 and in the operation of the AFAD. When in use, each AFAD must be in view of, and attended at all times by, the flagger operating the device.

Provide two flaggers on-site and use one of the following methods in the deployment of AFADs:

1. Place an AFAD at each end of the temporary traffic control zone, or

2. Place an AFAD at one end of the temporary traffic control zone and a flagger at the opposite end.

A single flagger may simultaneously operate two AFADs as described in (1) or a single AFAD as described in (2) if all of the following conditions are met:

1. The flagger has an unobstructed view of the AFAD(s),

2. The flagger has an unobstructed view of approaching traffic in both directions,

3. In the event of an AFAD malfunction, restore normal flagging operations with flaggers or immediately cease the flagging operation and reopen the roadway.

AFADs may be either a remotely controlled Stop/Slow AFAD mounted on either a trailer or a movable cart system, or a remotely controlled Red/Yellow Lens AFAD.

Illuminate the flagging station when the AFAD is used at night. When the AFAD is not in use, remove or cover signs and move the AFAD device outside the clear zone or shield it with a barrier.

AFADs will not be paid for separately. AFADs may be used as a supplement or an alternate to flaggers in accordance with the Plans, Standard Plans, Index 102-603, and the APL vendor drawings. Include the cost for AFADs in Maintenance of Traffic, Lump Sum.

102-9.17 Temporary Lane Separator: Use temporary lane separators (asphalt or portable) in accordance with the TTCP and Standard Plans.

When using portable temporary lane separators, anchor the portable temporary lane separator with a removable anchor bolt. Use epoxy on bridge decks where anchoring is not allowed. Remove the epoxy from the bridge deck by hydroblasting or other method approved by the Engineer.

Repair any damage to the existing pavement caused by the removal of temporary lane separator.

102-9.18 Type III Barricades: Use type III barricades in accordance with the TTCP and Standard Plans. Ensure stripes are sloping downward in the direction road users are to pass. Mount sign panels in accordance with the manufacturer's instructions. Do not place ballast on any rails, or higher than 13 inches above the driving surface. Do not splice the retroreflective sheeting.

102-10 Work Zone Pavement Marking.

102-10.1 Description: Furnish and install work zone pavement markings for MOT in construction areas and in close conformity with the lines and details shown in the Plans and Standard Plans.

Centerlines, lane lines, edge lines, stop bars, standard crosswalks, and turn arrows will be required in work zones prior to opening the road to traffic.

102.10.2 Painted Pavement Markings:

102-10.2.1 General: Use painted pavement markings meeting the requirements of Section 710. Use standard paint unless otherwise identified in the Plans or approved by the Engineer.

102-10.3 Removable Tape:

102-10.3.1 Application: Apply removable tape with a mechanical applicator to provide pavement lines that are neat, accurate and uniform. Equip the mechanical applicator with a film cut-off device and with measuring devices that automatically and accumulatively measure the length of each line placed within an accuracy tolerance of plus or minus 2%. Ensure

removable tape adheres to the road surface. Removable tape may be placed by hand on short sections, 500 feet or less, if it is done in a neat accurate manner.

102-10.3.2 Retroreflectivity: Apply white and yellow removable tape pavement markings that will attain an initial retroreflectivity of not less than 300 mcd/lx·m^2 for white and not less than 250 mcd/lx·m^2 for yellow markings. Black portions of contrast tapes and black masking tapes must have a retroreflectance of less than 20 mcd/lx·m^2.

Measure, record and certify on the Department approved form and submit to the Engineer, the retroreflectivity of white and yellow removable tape pavement markings in accordance with FM 5-541.

102-10.3.3 Removability: Provide removable tape capable of being removed from bituminous concrete and portland cement concrete pavement intact or in substantially large strips after being in place for a minimum of 90 days, either manually or by a mechanical roll-up device, at temperatures above 40ºF, without the use of heat, solvents, grinding or blasting.

102-10.4 Temporary Raised Pavement Markers (RPMs): Use Class B RPMs except for work that consists of ground-in rumble strips at centerline locations. For ground-in rumble strips at centerline locations, use temporary RPMs in accordance with Section 710. Install all markers in accordance with the manufacturer's recommendations, the Standard Plans, and Section 706. After initial installation, replace broken or missing temporary RPMs in locations where more than three consecutive temporary RPMs are broken or missing at no expense to the Department.

102-11 Method of Measurement.

102-11.1 General: Devices installed/used on the project on any calendar day or portion thereof, within the Contract Time, including time extensions which may be granted, will be paid for at the Contract unit price for the applicable pay item. Include the cost of any work that is necessary to meet the requirements of the Contract Documents for MOT under Maintenance of Traffic, lump sum when separate payment is not provided.

102-11.2 Traffic Control Officers: The quantity to be paid for traffic control officers will be at the Contract unit price per hour (4 hour minimum) for the actual number of officers certified to be on the project site, including any law enforcement vehicles and all other direct and indirect costs. Payment will be made only for those traffic control officers specified in the Plans and authorized by the Engineer.

102-11.3 Special Detours: When a special detour is shown in the Plans, the work of constructing, maintaining, and subsequently removing such detour facilities will be paid for under Special Detour, lump sum. However, traffic control devices, warning devices, barriers, signing, pavement markings, and restoration to final configuration will be paid for under their respective pay items.

102-11.4 Commercial Material for Driveway Maintenance: The quantity to be paid for will be the certified volume, in cubic yards, of all materials authorized by the Engineer, acceptably placed and maintained for driveway maintenance. The volume, which is authorized to be reused, and which is acceptably salvaged, placed, and maintained in other designated driveways will be included again for payment. Commercial Material used for Temporary Openings will not be included for separate payment.

102-11.5 Work Zone Signs: The number of temporary post-mounted signs (temporary regulatory, warning and guide) certified as installed/used on the project will be paid for at the Contract unit price for work zone signs. When multiple signs are located on single or multiple

posts, each sign panel will be paid individually. Signs greater than 20 square feet and detailed in the Plans will be paid for under Maintenance of Traffic, lump sum.

Temporary portable signs (excluding mesh signs) and vehicular mounted signs will be included for payment under work zone signs, only if used in accordance with the Standard Plans.

The number of temporary barrier mounted signs (temporary regulatory, warning and guide) certified as installed/used on the project will be paid for at the Contract unit price for barrier mounted work zone signs.

Work zone signs may be installed fourteen days prior to the start of Contract Time with the approval of the Engineer and at no additional cost to the Department.

102-11.6. Business Signs: The number of business signs certified as installed/used on the project will be paid for at the Contract unit price for business signs.

102-11.7 Channelizing Devices: The number of drums, vertical panels, and Type I, Type II, or direction indicator barricades, certified as installed/used on the project meeting the requirements of Standard Plans, Index 102-600 and have been properly maintained will be paid for at the Contract unit prices for channelizing device.

Payment for drums, vertical panels, and Type I, Type II, and direction indicator barricades will be paid per each per day.

Payment for vehicular LCDs will be paid as the length in feet installed divided by the device spacing for barricades, vertical panels, and drums and certified as installed/used on the project meeting the requirements of Standard Plans, Index 102-600 and have been properly maintained will be paid for at the Contract unit price for channelizing device.

Payment for pedestrian LCDs, certified as installed/used on the project and properly maintained, will be paid per linear foot per day. Placement of pedestrian LCDs at locations not shown in the TTCP, or not authorized by the Engineer, will be at the Contractor's expense. Payment for pedestrian LCD mounted signs will be made under Work Zone Signs.

Payment will not be made for channelizing devices unsatisfactorily maintained, as determined by the Engineer. Payment will be made for each channelizing device that is used to delineate trailer mounted devices. Payment will be made for channelizing devices delineating portable changeable message signs during the period beginning 14 working days before Contract Time begins as authorized by the Engineer.

102-11.8 Temporary Barrier: The quantity to be paid for will be the length, in feet, of freestanding units or anchored units certified as installed/used on the project. The quantity to be paid for relocating barrier will be based on the relocated installation type. No separate payment will be made for the asphalt pad. For freestanding units transitioned to a crash cushion, the cost of anchoring the transition units will be included in the cost of the temporary crash cushion in accordance with 102-11.11.

102-11.9 Barrier Delineators: No separate payment will be made for barrier delineators installed on top of temporary barrier . Include the cost for barrier delineators in the cost of the barrier.

102-11.10 Temporary Glare Screen: The certified quantity to be paid for will be determined by the number of sections times the nominal length of each section.

102-11.11 Temporary Crash Cushions: No separate payment will be made for the concrete or asphalt pad.

102-11.11.1 Redirective: The quantity to be paid for will be the number of temporary crash cushions (redirective) certified as installed/used and maintained on the project,

including anchoring of temporary barrier necessary for transition to the crash cushion and delineation.

102-11.11.2 Gating: The quantity to be paid for will be the number of temporary crash cushions (gating) certified as installed/used and maintained on the project, including anchoring of temporary barrier necessary for transition to the crash cushion and delineation.

102-11.12 Temporary Guardrail: The quantity to be paid for will be the length, in feet, of temporary guardrail constructed and certified as installed/used on the project. The length of a run of guardrail will be determined as a multiple of the nominal panel lengths.

102-11.13 Arrow Board: The quantity to be paid at the contract unit price will be for the number of arrow boards certified as installed/used on the project on any calendar day or portion thereof within the Contract Time. Payment will be made for up to two inactive days where the arrow board is used on the two days preceding and following the inactive days as authorized by the Engineer. Payment for additional days may be authorized by the Engineer due to inclement weather.

102-11.14 Portable Changeable Message Sign: The quantity to be paid at the Contract unit price will be for the number of PCMSs or truck mounted changeable message signs certified as installed/used on the project on any calendar day or portion thereof within the Contract Time. Payment will be made for each portable changeable message sign that is used during the period beginning 14 working days before Contract Time begins as authorized by the Engineer. Payment will be made for up to two inactive days where the portable changeable message sign is used on the two days preceding and following the inactive days as authorized by the Engineer. Payment for additional days may be authorized by the Engineer due to inclement weather.

102-11.15 Portable Regulatory Signs: The quantity to be paid for will be the number of portable regulatory signs certified as installed/used on the project on any calendar day or portion thereof within the Contract Time, will be paid for the Contract unit price for portable regulatory sign. Payment will be made for up to two inactive days where the portable regulatory sign is used on the two days preceding and following the inactive days as authorized by the Engineer. Payment for additional days may be authorized by the Engineer due to inclement weather.

102-11.16 Radar Speed Display Unit: The quantity to be paid for will be the number of radar speed display units certified as installed/used on the project on any calendar day or portion thereof within the Contract Time, will be paid for the Contract unit price for radar speed display unit. Payment will be made for up to two inactive days where the radar speed display unit is used on the two days preceding and following the inactive days as authorized by the Engineer. Payment for additional days may be authorized by the Engineer due to inclement weather.

102-11.17 Temporary Signalization and Maintenance: For existing intersections, the certified quantity to be paid for will be the number of signalized intersections per day for the full duration of the Contract. For temporary intersections, the certified quantity to be paid for will be the number of signalized intersections per day for the duration of the temporary intersection. No separate payment will be made for temporary signalization and maintenance at new intersections.

102-11.18 Temporary Traffic Detection and Maintenance: For existing intersections, the certified quantity to be paid for will be the number of signalized intersections per day beginning the day Contract Time begins and ending on the day the permanent detection is operational and the final lane configuration is in place. For temporary and new intersections, the certified quantity to be paid for will be the number of signalized intersections per day beginning the day the temporary detection is functional and ending the day: the permanent detection is

operational and the final lane configuration is in place for a new intersection; or, when the detection is removed for a temporary intersection.

102-11.19 Existing ITS Maintenance: For existing ITS locations, the certified quantity to be paid for will be the number of calendar days from Contract Time start to Final Acceptance.

102-11.20 Work Zone Pavement Markings: Painted pavement markings will be paid as specified in 710-10. The quantity of removable tape to be paid for solid, 10'-30' skip, 3'-9' dotted, 6'-10' dotted, and 2'-4' dotted lines will be the length, in gross miles, authorized and acceptably applied under this Section and certified as installed/used on the project. The quantity of removable tape to be paid for transverse lines will be the length, in linear feet, authorized and acceptably applied under this Section and certified as installed/used on the project. The quantity of removable tape to be paid for pavement messages, symbols, and arrows will be per each, authorized and acceptably applied under this Section and certified as installed/used on the project. The quantity of temporary RPMs to be paid will be the number of RPMs authorized and acceptably applied. No separate payment will be made for the cost of removing conflicting pavement markings. Payment for removing conflicting pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) will be included in Maintenance of Traffic, lump sum.

102-11.21 Temporary Raised Rumble Strips: The quantity to be paid for will be the number of calendar days, or portions thereof, that temporary raised rumble strips are certified as installed/used on the project within the Contract Time. No adjustment will be made to the per day measurement for the number of strips or sets used, or for the number of times the sets are relocated.

102-11.22 Temporary Lane Separator: The quantity to be paid for will be the field measure, in feet, of temporary lane separator certified as installed/used on the project, including drainage gaps, completed and accepted. The cost of any pavement repairs due to removal is included in the cost of Maintenance of Traffic, lump sum.

102-11.23 Temporary Signals for Lane Closures on Two-Lane, Two-Way Roadways: The quantity to be paid for will be the number of temporary signals per day installed/used at the locations shown in the TTCP. Temporary signals installed/used at the Contractor's option as an alternative to flaggers will be included in Maintenance of Traffic, lump sum.

102-11.24 Temporary Highway Lighting: When temporary highway lighting is required by the Plans, the work of constructing, maintaining, and removing the temporary highway lighting, including all materials and any necessary design work, will be paid for under temporary highway lighting, lump sum.

102-11.25 Pedestrian or Bicycle Special Detours: When a pedestrian or bicycle special detour is shown in the Plans, the work of constructing, maintaining, and subsequently removing such detour facilities will be paid for under pedestrian or bicycle special detour, lump sum. However, traffic control devices, warning devices, barriers, signing, pavement markings, and restoration to final configuration will be paid for under their respective pay items.

102-11.26 Type III Barricades: The number of type III barricades certified as installed/used on the project will be paid for at the Contract unit price for type III barricades.

102-11.27 Limited Access Temporary Openings: Include all construction, maintenance, removal, and restoration costs of temporary openings in Maintenance of Traffic, lump sum. No separate payment will be made for commercial material, gates, or fence.

102-12 Submittals.

102-12.1 Submittal Instructions: Prepare a certification of quantities, using the Department's current approved form, for certified MOT payment items for each project in the Contract. Submit the certification of quantities to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

102-12.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities no later than Twelve O'clock noon Monday after the estimate cut-off date or as directed by the Engineer, based on the amount of work done or completed. Ensure the certification consists of the following:

1. Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

2. The basis for arriving at the amount of the progress certification, less payments previously made and less an amount previously retained or withheld. The basis will include a detail breakdown provided on the certification of items of payment in accordance with the Basis of Payment. After the initial setup of the MOT items and counts, the interval for recording the counts will be made weekly on the certification sheet unless there is a change. This change will be documented on the day of occurrence. Some items may necessitate a daily interval of recording the counts.

102-13 Basis of Payment.

102-13.1 Maintenance of Traffic (General Work): When an item of work is included in the proposal, price and payment will be full compensation for all work and costs specified under this Section except as may be specifically covered for payment under other items.

102-13.2 Traffic Control Officers: Price and payment will be full compensation for the services of the traffic control officers.

102-13.3 Special Detours: Price and payment will be full compensation for providing all detour facilities shown in the Plans and all costs incurred in carrying out all requirements of this Section for general MOT within the limits of the detour, as shown in the Plans.

102-13.4 Commercial Materials for Driveway Maintenance: Price and payment will be full compensation for all work and materials specified for this item, including specifically all required shaping and maintaining of driveways.

102-13.5 Work Zone Signs: Price and payment will be full compensation for all work and materials for furnishing signs, supports and necessary hardware, installation, relocating, maintaining, covering, and removing signs.

102-13.6. Business Signs: Price and payment will be full compensation for all materials and labor required for furnishing, installing, relocating, maintaining, and removing the signs as well as the cost of installing any logos provided by business owners.

102-13.7 Channelizing Devices: Prices and payment will be full compensation for furnishing, installing, relocating, maintaining and removing the channelizing devices.

102-13.8 Temporary Barrier: Price and payment will be full compensation for furnishing, installing, maintaining, and removing the barrier and asphalt pad. When called for, temporary barrier (relocate) will be full compensation for relocating the barrier.

102-13.9 Temporary Glare Screen: Price and payment will be full compensation for furnishing, installing, maintaining, and removing the glare screen certified as installed/used on the project. When called for, glare screen (relocate) will be full compensation for relocating the glare screen.

102-13.10 Temporary Crash Cushion (Redirective or Gating): Price and payment will be full compensation for furnishing, installing, maintaining, and removing crash cushions, object markers, and concrete or asphalt pads.

102-13.11 Temporary Guardrail: Price and payment will be full compensation for furnishing all materials required for a complete installation, including end anchorage assemblies and any end connections to other structures and for installing, maintaining and removing guardrail.

102-13.12 Arrow Board: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing arrow boards.

102-13.13 Portable Changeable Message Sign: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing portable changeable message signs.

102-13.14 Portable Regulatory Signs: Price and payment will be full compensation for furnishing, installing, relocating, operating, maintaining and removing a completely functioning system as described in these Specifications.

Payment will include all labor, materials, incidentals, repairs and any actions necessary to operate and maintain the unit at all times that work is being performed or traffic is being affected by construction and/or MOT operations.

102-13.15 Radar Speed Display Unit: Price and payment will be made only for a completely functioning system as described in these Specifications. Payment will include all labor, hardware, accessories, signs, and incidental items necessary for a complete system. Payment will include any measurements needed to ensure that the unit conforms to all Specification requirements.

Payment will include all labor, materials, incidentals, repairs and any actions necessary to operate and maintain the unit at all times that work is being performed or traffic is being affected by construction and MOT operations. Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing radar speed display unit.

102-13.16 Temporary Signalization and Maintenance: Price and payment will constitute full compensation for furnishing, installing, operating, maintaining and removing temporary traffic control signals including all equipment and components necessary to provide an operable traffic signal. Payment will be withheld for each day at each intersection where the temporary signalization is not operational within 12 hours after notification.

102-13.17 Temporary Traffic Detection and Maintenance: Price and payment will constitute full compensation for furnishing, installing, operating, maintaining and removing temporary traffic detection including all equipment and components necessary to provide an acceptable signalized intersection. Take ownership of all equipment and components. Payment will be withheld for each day at each intersection where the temporary detection is not operational within 12 hours after notification.

102-13.18 Existing ITS Maintenance: Price and payment will constitute full compensation for diagnosing, troubleshooting, configuring, installing, operating, maintaining, and removing existing ITS devices including all auxiliary equipment and device components. Payment will be withheld for each day where the ITS device is not operational within the allowable downtime, beginning at the time of notification. Payment will not be withheld for days of delay when the Department or Maintaining Agency is unable to furnish the replacement ITS device to the Contractor.

102-13.19 Work Zone Pavement Markings: Price and payment will be full compensation for all work specified including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Removable tape or durable paint may be substituted for standard paint at no additional cost to the Department.

Payment for temporary RPMs used to supplement line markings will be paid for under temporary raised pavement markers. Install these RPMs as detailed in the Standard Plans.

102-13.20 Temporary Raised Rumble Strips: Price and payment will be full compensation for all work and materials described in this Section, including all cleaning and preparing of surfaces, disposal of all debris, furnishing of all materials, application, curing, removal, reinstalling and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work.

102-13.21 Temporary Lane Separator: Price and payment will be full compensation for all work specified in this Section.

102-13.22 Temporary Signals for Lane Closures on Two-Lane, Two-Way Roadways: Price and payment will be full compensation for furnishing, installing, operating, maintaining and removing temporary traffic signal including all equipment and components necessary to provide an operable portable traffic signal.

102-13.23 Temporary Highway Lighting: Price and payment will be full compensation for providing all temporary highway lighting shown in the Plans.

102-13.24 Pedestrian or Bicycle Special Detours: Price and payment will be full compensation for providing all pedestrian or bicycle special detours shown in the Plans.

102-13.25 Type III Barricades: Prices and payment will be full compensation for furnishing, installing, relocating, maintaining and removing the type III barricades.

102-13.26 Payment Items: Payment will be made under:

Item No. 102- 1-	Maintenance of Traffic - lump sum.
Item No. 102- 2-	Special Detour - lump sum.
Item No. 102- 3-	Commercial Material for Driveway Maintenance - per cubic yard.
Item No. 102- 4-	Pedestrian or Bicycle Special Detour - lump sum.
Item No. 102- 14-	Traffic Control Officer - per hour.
Item No. 102- 30-	Temporary Highway Lighting - lump sum.
Item No. 102- 60-	Work Zone Sign - per each per day.
Item No. 102- 61-	Business Sign - each.
Item No. 102- 62-	Barrier Mounted Work Zone Sign – per each per day
Item No. 102- 71-	Temporary Barrier - per foot.
Item No. 102- 75-	Temporary Lane Separator - per foot
Item No. 102- 73-	Temporary Guardrail - per foot.
Item No. 102- 74-	Channelizing Devices
Item No. 102- 76-	Arrow Board - per each per day.
Item No. 102- 78-	Temporary Raised Pavement Markers - each.
Item No. 102- 81-	Temporary Crash Cushion, Gating - per location.
Item No. 102- 89-	Temporary Crash Cushion, Redirective - per location.
Item No. 102- 94-	Glare Screen - per foot.

Item No. 102- 99-	Portable Changeable Message Sign - per each per day.
Item No. 102-104-	Temporary Signalization and Maintenance - per intersection per day.
Item No. 102-107-	Temporary Traffic Detection and Maintenance - per intersection per day.
Item No. 102-ABC-	Existing ITS Maintenance – per day
Item No. 102-115-	Type III Barricade - per each per day.
Item No. 102-120-	Temporary Signal for Lane Closures on Two-Lane, Two-Way Roadways – per each per day.
Item No. 102-150-	Portable Regulatory Sign - per each per day.
Item No. 102-150-	Radar Speed Display Unit - per each per day.
Item No. 102-909-	Temporary Raised Rumble Strips - per day.
Item No. 102-913-	Removable Tape.
Item No. 710-	Painted Pavement Markings.
Item No. 711-	Thermoplastic Pavement Markings.

SECTION 105
CONTRACTOR QUALITY CONTROL GENERAL REQUIREMENTS

105-1 General.

105-1.1 Quality Control Documentation:

105-1.1.1 Submission of Materials Certification and Reporting Test Results: Submit certifications prior to placement of materials. Report test results at completion of the test and meet the requirements of the applicable Specifications.

105-1.1.2 Databases: Obtain access to the Department's databases prior to testing and material placement. Database access information is available through the Department's website. Enter all required and specified documentation and test results into the Department's databases.

105-1.1.3 Worksheets: Make available to the Department, when requested, worksheets used for collecting test information. Ensure the worksheets at a minimum contain the following:

1. Project Identification Number,
2. Time and Date,
3. Laboratory Identification and Name,
4. Training Identification Numbers (TIN) and initials,
5. Record details as specified within the test method.

105-1.1.4 Earthwork Records System: Record QC test results directly into the Earthwork Records System (ERS) section of the Department's database. If authorized by the Engineer due to ERS inaccessibility in the field, collect the data in the field on Department approved forms and enter the data in the ERS section of the Department's database. Submit the original forms by uploading into the Department's database.

105-1.2 Inspections to Assure Compliance with Acceptance Criteria:

105-1.2.1 General: The Department is not obligated to make an inspection of materials at the source of supply, manufacture, or fabrication. Provide the Engineer with unrestricted entry at all times to such parts of the facilities that concern the manufacture, fabrication, or production of the ordered materials. Bear all costs incurred in determining whether the material meets the requirements of these Specifications.

105-1.2.2 Quality Control (QC) Inspection: Provide all necessary inspection to assure effective QC of the operations related to materials acceptance. This includes but is not limited to sampling and testing, production, storage, delivery, construction and placement. Ensure that the equipment used in the production and testing of the materials provides accurate and precise measurements in accordance with the applicable Specifications. Maintain a record of all inspections, including but not limited to, date of inspection, results of inspection, and any subsequent corrective actions taken. Make available to the Department the inspection records, when requested.

105-1.2.3 Notification of Placing Order: Order materials sufficiently in advance of their incorporation in the work to allow time for sampling, testing and inspection. Notify the Engineer prior to placing orders for materials.

Submit to the Engineer a fabrication schedule for all items requiring commercial inspection at least 30 days before beginning fabrication. These items include steel bridge components, moveable bridge components, pedestrian bridges, castings, forgings, structures erected either partially or completely over the travelled roadway or mounted on

bridges as overhead traffic signs (some of these may be further classified as cantilevered, overhead trusses, or monotubes) or any other item identified as an item requiring commercial inspection in the Contract Documents.

105-2 Additional Requirements for Lump Sum Projects.

Prepare and submit to the Engineer a project-specific list of material items and quantities to be used on the project as a Job Guide Schedule in the same format as the current Sampling, Testing, and Reporting Guide 21 calendar days prior to commencement of construction. Submit up-to-date quantities for the items on the Job Guide Schedule to the Engineer with each monthly progress estimate. The Department may not authorize payment of any progress estimate not accompanied by updated Job Guide Schedule quantities. Maintain the Job Guide Schedule throughout the project including the quantity placed since the previous submittal, and total to date quantity and any additional materials placed. Do not commence work activities that require testing until the Job Guide Schedule has been reviewed and accepted by the Engineer. At final acceptance, submit a final Job Guide Schedule that includes all materials used on the project in the same format as the monthly reports.

105-3 Quality Control Program.

Certain operations require personnel with specific qualifications. Certain materials require production under an approved Quality Control (QC) Plan to ensure that these materials meet the requirements of the Contract Documents. Applicable materials include hot mix asphalt, portland cement concrete (structural), earthwork, cementitious materials, timber, steel and miscellaneous metals, galvanized metal products, prestressed and/or precast concrete products, drainage products, and fiber reinforced polymer products. For all applicable materials included in the Contract, submit a QC Plan prepared in accordance with the requirements of this Section to the Engineer. Do not incorporate any of these materials into the project prior to the Engineer's approval of the QC Plan.

Steel and Miscellaneous Metal products, including aluminum, are defined as the metal components of bridges**,** including pedestrian and moveable bridges, overhead and cantilevered sign supports, ladders and platforms, bearings, end wall grates, roadway gratings, drainage items, expansion joints, roadway decking, shear connectors, handrails, galvanized products, fencing, guardrail, light poles, high mast light poles, standard mast arm assemblies and Monotube assemblies, stay in-place forms, casing pipe, strain poles, fasteners, connectors and other hardware.

105-4 Producer Quality Control Program.

105-4.1 General: When accreditation or certification is required, make supporting documents from the two previous inspections performed by the accrediting or certifying agency available to the Department upon request.

Obtain Department approval prior to beginning production. Meet and maintain the approved Producer Quality Control Program requirements at all times. Production of these products without the Department's prior acceptance of the Producer Quality Control Program may result in rejection of the products. Continued approval will be subject to satisfactory results from Department evaluations, including the Independent Assurance program. In cases of non-compliance with the accepted Producer Quality Control Program, identify all affected material and do not incorporate or supply to the Department projects. The following conditions may result in suspension of a Producer Quality Control Program:

1. Failure to timely supply information required.

2. Repeated failure of material to meet Standard Specification requirements.

3. Failure to take immediate corrective action relative to deficiencies in the performance of the Producer Quality Control Program.

4. Certifying materials that are not produced under an accepted Producer Quality Control Program for use on Department projects.

5. Failure to correct any deficiencies related to any requirement of the Producer Quality Control Program, having received notice from the Department, within the amount of time defined in the notice.

105-4.2 Producer Quality Control Program Requirements:

105-4.2.1 Hot Mix Asphalt, Portland Cement Concrete (Structural), Earthwork, Cementitious Materials, Timber, Steel and Miscellaneous Metals, Galvanized Metal Products, Prestressed and/or Precast Concrete Products, Drainage Products, and Fiber Reinforced Polymer Products Quality Control Program: Have an accepted Producer Quality Control Program, developed in accordance with this Section, during the production of materials to be used on Department projects.

105-4.2.2 Prestressed Concrete Quality Control Program: Have a current certification from a Department approved precast prestressed concrete plant certification agency and a Department accepted Producer Quality Control Plan, meeting the requirements of this Section. The list of Department approved certification agencies is available on the website of the State Materials Office (SMO).

105-4.2.3 Steel and Miscellaneous Metals Quality Control Program: Have an accepted Producer Quality Control Plan, developed in accordance with this Section and a current American Institute for Steel Construction (AISC) certification, provided that AISC certification program is available for the category of the fabrication products.

105-4.3 Submittal: Depending on the type of products, producers shall submit their proposed Producer Quality Control Programs to the SMO or to the District Materials Office, as described below:

105-4.3.1 State Materials Office (SMO): Producers of cementitious materials, steel and miscellaneous metals, galvanized metal products, aggregates, timber, flexible pipe, and fiber reinforced polymer (FRP) products must submit their proposed Producer Quality Control Program to the SMO for review and acceptance.

105-4.3.2 District Materials Office: Producers of hot mix asphalt, portland cement concrete (structural), earthwork, and precast/prestressed concrete products and must submit their proposed Producer Quality Control Program to the local District Materials Office for acceptance. Producers located outside the State must contact the SMO for address information of the District Materials Office responsible for the review of the proposed Quality Control Program.

105-4.4 Compliance with the Materials Manual:

Producers of Polymer Slurry shall meet the requirements of Section 2.4, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/implemented/URLinSpecs/Section24V2.shtm.

Producers of Asphalt Emulsion shall meet the requirements of Section 3.4 Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/implemented/URLinSpecs/Section34V2.shtm.

Producers of Asphalt Binder shall meet the requirements of Section 3.5, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/implemented/URLinspecs/Section35V2.shtm.

Producers of Flexible Pipe shall meet the requirements of Section 6.1, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section61V2.shtm.

Producers of Precast Concrete Pipe shall meet the requirements of Section 6.2, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section62V2.shtm.

Producers of Precast Concrete Drainage Structures shall meet the requirements of Section 6.3, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section63V2.shtm.

Producers of Precast Prestressed Concrete Products shall meet the requirements of Sections 8.1 and 8.3, Volume II of the Department's Materials Manual, which may be viewed at the following URLs: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section81V2.shtm https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section83V2.shtm.

Producers of Precast Prestressed Concrete Products using Self Consolidating Concrete shall meet the requirements of Section 8.4, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinspecs/Section84V2.shtm

Producers of Precast/Prestressed Concrete Products using Flowing Concrete shall meet the requirements of Section 8.6, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinspecs/Section86V2.shtm

Producers of Incidental Precast/Prestressed Concrete Products shall meet the requirements of Section 8.2, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section82V2.shtm.

Producers of Portland Cement Concrete shall meet the requirements of Section 9.2, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinspecs/Section92V2.shtm.

Producers of Paving Concrete produced by Central Mix Plants shall meet the requirements of Section 9.3, Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section93V2.shtm

Specialty Engineers preparing, submitting, and implementing Mass Concrete Control Plans shall meet the requirements of Section 9.4 Volume II of the Department's Materials Manual, which may be viewed at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinspecs/Section94V2.shtm.

Producers of Structural Steel and Miscellaneous Metal Components shall meet the requirements of Sections 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6 of the Department's Materials Manual, which may be viewed at the following URLs: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section111V2.shtm.

https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section112V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section113V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section114V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section115V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section116V2.shtm.

Producers of Fiber Reinforced Polymer Composites shall meet the requirements of Section 12-1, Volume II of the Department's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section121V2.shtm.

105-4.5 Producer Quality Control (QC) Plan Review and Acceptance: The Department will respond to the producer within 21 calendar days of receipt of the proposed Producer Quality Control Program. The Department may perform evaluation activities to verify compliance with submitted documents prior to acceptance.

If the Producer Quality Control Program must be revised for any reason, including non-compliance, submit the revision to the Department. The Department will respond to the producer within seven calendar days of receipt of the revised Producer Quality Control Program.

105-4.6 Producer's Quality Control (QC) Plan: Submit detailed policies, methods and procedures to ensure the specified quality of all applicable materials and related production operations. Include other items in addition to these guidelines as necessary.

105-4.6.1 Personnel:

105-4.6.1.1 Qualifications: Submit the Training Identification Numbers (TINs) or any other information which will be traceable to the certification agency's training location and dates for all technicians performing sampling, testing and inspection for both field and laboratory tests. Submit the names of the Construction Training and Qualification Program (CTQP) certifications and other pertinent certifications held and the expiration dates for each certification for each technician. Include employed and subcontracted technicians.

105-4.6.1.2 Level of Responsibility: Identify the primary contact for the Department. Identify roles and responsibilities of various personnel involved in the QC process.

105-4.6.2 Raw Materials:

105-4.6.2.1 Source: Identify the sources of raw materials. Submit locations and plant or mine numbers when applicable.

105-4.6.2.2 Certification: Submit methods of verifying compliance of certification with the Specifications.

105-4.6.2.3 Disposition of Failing Materials: Describe the system for controlling non-conforming materials, including procedures for identification, isolation and disposition.

105-4.6.3 Storage Facilities for Raw Materials: Describe measures and methods, including bedding details, for preventing segregation, contamination and degradation.

Describe methods of identifying individual materials. Where applicable, submit a site plan showing the locations of various materials.

105-4.6.4 Production Equipment: Describe calibration frequencies, maintenance schedule and procedures for production equipment.

105-4.6.5 Plant Requirements:

105-4.6.5.1 Plant Identification: For those facilities producing materials listed in 105-3, submit the mailing address, physical address including county and X,Y (latitude

and longitude) coordinates of the plant, telephone and fax numbers, email address, primary contact at the plant, responsible person in charge, facility number provided by the Department, owner information including parent company, vendor number, designed production capacity, and other information as required.

105-4.6.5.2 Process Control System: Describe the methods and measures established to ensure Contract compliance for the produced materials that are supplemental to the QC sampling and testing program described in the Contract Documents. These methods and measures will include, but are not limited to, inspection schedule, additional sampling and testing, maintenance schedule, etc.

105-4.6.5.3 Loading and Shipping Control: Describe the methods and measures for preventing segregation, contamination and degradation during loading and shipping operations. Describe the methods established for materials to be in compliance with the Specifications at the point of use.

105-4.6.5.4 Types of Products Generated: Describe the products the plant is approved to produce under Department guidelines.

105-4.7 Other Requirements:

105-4.7.1 Submittal of Certification: Submit certifications issued by the plant/Contractor for the applicable products approved by the Department.

105-4.7.2 Statement of Compliance: Include a statement of compliance with all quality requirements set forth by the Department in the Contract Documents and Department manuals.

105-4.7.3 Documentation Storage: Identify location of document storage to enable Department review. Include QC charts, qualification and accreditation records, inspection reports, and other pertinent supporting documents.

105-4.8 Final Manufactured Product - Plant Operations: Describe inspection schedule and methods for identifying defects and non-compliance with the Specifications. Describe corrective actions and methods to resolve them.

105-4.8.1 Storage: When storage of the produced materials is required and it is not defined in the Contract Documents, describe the methods and duration for storage. Include measures and methods for preventing segregation, contamination and degradation during storage.

105-4.8.2 Disposition of Failing Materials: When not described in the Specifications, describe the methods and measures for identifying and controlling the failing materials. Include preventive and corrective measures. Describe disposition of failing materials.

105-4.9 Testing Laboratories: Identify the laboratories performing testing. Ensure that the testing laboratories comply with the Laboratory Qualification Program requirements of this Section or other applicable requirements.

105-4.10 Department Inspection Access: Include a statement in the Quality Control Plan allowing the Department inspectors access to the production facility to perform the inspections of the production process and the products produced for the Department.

105-5 Contractor Quality Control (QC) Plan.

105-5.1 General: Submit the Contractor QC Plan in the Department's database seven days prior to beginning work on any QC material as defined in this Section. The QC Plan may be submitted as a whole or in portions for the work related to the Contract.

Update the QC Plan at least five working days prior to the implementation of any changes.

If at any time the Work is not in compliance with the Contract Documents, the Engineer may suspend operations in accordance with 8-6.1.

105-5.2 Personnel Qualification: Submit the Training Identification Numbers for all technicians performing sampling, testing and inspection for field tests. Include employed and subcontracted technicians.

105-5.3 Production Facilities: Identify the producers of materials listed in 105-4.4 for the project. Include the Department's facility ID number as part of the identification. All producers must have accepted Producer's Quality Control Program and be listed on the Department's Production Facility Listing**.**

105-5.3.1 Structural Concrete Mix Designs: Identify the approved structural concrete mix designs for each structural concrete production facility for review and approval by the Engineer. Do not begin work on the material without the Engineer's approval. The Engineer will review and respond within five calendar days of submittal.

105-5.4 Testing Laboratories: Identify the laboratories performing testing. Ensure that the testing laboratories comply with the Laboratory Qualification Program requirements of this Section.

105-6 Contractor Certification of Compliance.

Provide the Engineer with a notarized monthly certification of compliance with the Contract Documents, to accompany each progress estimate, on a form provided by the Engineer. The Department may not authorize payment of any progress estimate not accompanied by an executed certification document.

Final payment in accordance with 9-8 will not be made until a final notarized certification summarizing all QC exceptions has been submitted.

105-7 Lab Qualification Program.

Testing laboratories participating in the Department's Acceptance Program must have current Department qualification when testing materials that are used on Department projects. In addition, they must have one of the following:

1. Current AASHTO (AAP) accreditation.
2. Inspected on a regular basis per ASTM D3740 for earthwork, ASTM D3666 for asphalt and ASTM C1077 for concrete for test methods used in the Acceptance Program, with all deficiencies corrected, and under the supervision of a Specialty Engineer.
3. Current Construction Materials Engineering Council (CMEC) program accreditation or other independent inspection program accreditation acceptable to the Engineer and equivalent to (1) or (2) above.

After meeting the criteria described above, submit a Laboratory Qualification Application to the Department. The application is available from the Department's website: https://www.fdot.gov/materials/quality/programs/laboratoryqualification/index.shtm. Obtain the Department's qualification prior to beginning testing. The Department may inspect the laboratory for compliance with the accreditation requirements prior to issuing qualification.

Meet and maintain the qualification requirements at all times. Testing without Department's qualification may result in a rejection of the test results. Continued qualifications are subject to satisfactory results from Department evaluations, including Independent Assurance evaluations. In case of suspension or disqualification, prior to resumption of testing, resolve the issues to the Department's satisfaction and obtain reinstatement of qualification. The following conditions may result in suspension of a laboratory's qualified status:

1. Failure to timely supply required information.
2. Loss of accredited status.
3. Failure to correct deficiencies in a timely manner.
4. Unsatisfactory performance.
5. Changing the laboratory's physical location without notification to the accrediting agency and the Engineer.
6. Delays in reporting the test data in the Department's database.
7. Incomplete or inaccurate reporting.
8. Using unqualified technicians performing testing.

Should any qualified laboratory falsify records, the laboratory qualification will be subject to revocation by the Engineer. Falsification of project-related documentation will be subject to further investigation and penalty under State and Federal laws.

It is prohibited for any contract laboratory or staff to perform Contractor QC testing and any other Acceptance Program testing on the same contract.

105-8 Personnel Qualifications.

105-8.1 General: Provide qualified personnel for sampling, testing and inspection of materials and construction activities. Ensure that qualifications are maintained during the course of sampling, testing and inspection.

Construction operations that require a qualified technician must not begin until the Department verifies that the technician is on the CTQP list of qualified technicians. The CTQP lists are subject to satisfactory results from periodic Independent Assurance evaluations.

105-8.2 Quality Control (QC) Manager: Designate a QC Manager who has full authority to act as the Contractor's agent to institute any and all actions necessary to administer, implement, monitor, and as necessary, adjust quality control processes to ensure compliance with the Contract Documents. The QC Manager must speak and understand English. The QC Manager must be on-site at the project on a daily basis or always available upon four hours' notice. Ensure that the QC Manager is qualified as such through the Construction Training and Qualification Program. The QC Manager and the Superintendent must not be the same individual.

Under the direction of the QC Manager, ensure that the QC test data is entered into the Department's database on a daily basis. Use Department approved programs to generate the plots for the ERS. Maintain all QC related reports and documentation for a period of three years from final acceptance of the project. Make copies available for review by the Department upon request.

105-8.3 Temporary Traffic Control (Maintenance of Traffic) Personnel: Worksite Traffic Supervisors, flaggers, and other personnel responsible for work zone related transportation management and traffic control must obtain training and certification in accordance with the Department's Temporary Traffic Control (Maintenance of Traffic) Training Handbook located at the following URL address: https://www.fdot.gov/roadway/TTC/Default.shtm.

Worksite Traffic Supervisors or designees must obtain training and certification for the Department's lane closure notification system available at the following URL address: https://info.one.network/fdot-live-link-resources.

105-8.4 Earthwork Quality Control (QC) Personnel:

105-8.4.1 Earthwork Level 1: Ensure the technician who samples the soil and earthwork materials from the roadway project, takes earthwork moisture and density readings,

and records those data into the ERS section of the Department's database, holds a CTQP Earthwork Construction Inspection Level 1 qualification.

105-8.4.2 Earthwork Level 2: Ensure the technician responsible for determining the disposition of soil and earthwork materials on the roadway, and for interpreting and meeting Contract Document requirements holds a CTQP Earthwork Construction Inspection Level 2 qualification.

105-8.5 Asphalt Quality Control (QC) Personnel:

105-8.5.1 Plant Technicians: For asphalt plant operations, provide a QC technician, qualified as a CTQP Asphalt Plant Level 2 Technician, available at the asphalt plant at all times when producing mix for the Department. Perform all asphalt plant related testing with a CTQP Asphalt Plant Level 1 Technician. As an exception, measurements of temperature may be performed by someone under the supervision of a CTQP Plant Level 2 technician.

105-8.5.2 Paving Technicians: For paving operations (with the exception of miscellaneous or temporary asphalt), keep a qualified CTQP Asphalt Paving Level 2 Technician on the roadway at all times when placing asphalt mix for the Department, and perform all testing with a CTQP Asphalt Paving Level 1 Technician. As an exception, measurements of cross-slope, temperature, and yield (spread rate) can be performed by someone under the supervision of a CTQP Paving Level 2 Technician at the roadway.

105-8.5.3 Mix Designer: Ensure all mix designs are developed by individuals who are CTQP qualified as an Asphalt Hot Mix Designer.

105-8.5.4 Documentation: Document all QC procedures, inspection, and all test results and make them available for review by the Engineer throughout the life of the Contract. Identify in the asphalt producer's QC Plan the QC Managers and Asphalt Plant Level 2 technicians responsible for the decision to resume production after a quality control failure.

105-8.6 Concrete QC Personnel:

105-8.6.1 Concrete Field Technician - Level 1: Ensure technicians performing plastic property testing on concrete for materials acceptance are qualified CTQP Concrete Field Technicians Level 1. Plastic property testing will include but not be limited to slump, temperature, air content, water-to-cementitious materials ratio calculation, and making and curing concrete cylinders. Duties will include initial sampling and testing to confirm specification compliance prior to beginning concrete placements, ensuring timely placement of initial cure and providing for the transport of compressive strength samples to the designated laboratories. Ensure that personnel performing plastic property testing on self-consolidating concrete (SCC) possess an ACI Self-Consolidating Concrete Testing Technician Certification.

105-8.6.2 Concrete Field Inspector - Level 2: Ensure field inspectors responsible for the quality of concrete being placed on the following structure types are qualified CTQP Concrete Field Inspectors Level 2:

1. Moveable bridges
2. Bridges over a water opening of 1,000 feet or more
3. Bridges with a span of 190 feet or more
4. Cable supported or cable stayed bridges
5. Post-tensioned bridges
6. Steel girder or steel truss bridges
7. Multi-level roadways

With the exception of concrete traffic railing and bridge approach slab placements, a Level 2 Inspector must be present on the jobsite during all concrete placements.

Prior to the placement of concrete, the inspector will inspect the element to be cast to ensure compliance with Contract Documents. A Level 2 Inspector's duties may include ensuring that concrete testing, inspection, and curing in the field are performed in accordance with the Contract Documents. The QC Inspector will inform the Verification Inspector of anticipated concrete placements and LOT sizes.

105-8.6.3 Concrete Laboratory Technician – Level 1: Ensure technicians testing cylinders and recording concrete strength for material acceptance are qualified CTQP Concrete Laboratory Technicians Level 1. Duties include final curing, compressive strength testing, and the recording/reporting of all test data.

105-8.7 Structural Concrete Production Facility Quality Control (QC) Personnel:

Ensure that each portland cement structural concrete production facility (plant), has designated personnel including plant manager of QC, concrete mix designer, concrete batch plant operator, and testing technicians to provide QC inspections and testing.

Upon Department approval, the functions of the above positions may be performed by the same person when it can be demonstrated that the plant's operation and quality of concrete will not be detrimentally affected and personnel have the qualifications required herein.

105-8.7.1 Plant Manager of QC: Ensure that the plant manager of QC has at least three years of concrete related experience and the following training certifications:

1. CTQP Concrete Laboratory Technician - Level 1 certificate.
2. CTQP Concrete Field Technician - Level 1 certificate.
3. Concrete Batch Plant Operator certification in accordance with 105-8.7.4.

As alternatives to these certifications, the Department will accept, one of the following:

a. Prestressed Concrete Institute (PCI) QC Personnel Certification Level III.

b. Precast Concrete Pipe, Box Culverts, Drainage Structures or Incidental Precast Concrete Plants Level II QC Inspector Certifications.

c. National Ready Mixed Concrete Association (NRMCA) Certified Concrete Technologist Level 2.

105-8.7.2 Concrete Mix Designer: Ensure that the concrete mix designer has the CTQP Concrete Laboratory Technician Level 2 certification. As an alternative, the Department will accept any of the following qualifications:

1. PCI QC Personnel Level III Certification, for concrete mix designs of prestressed concrete products.
2. National Ready Mix Concrete Association (NRMCA) Certified Concrete Technologist Level 3.
3. Any of the Level II QC certifications in accordance with 105-8.9.2.2.

105-8.7.3 Qualified Testing Technicians: Ensure that the testing technicians have the following certifications, as appropriate:

1. ACI Concrete Field Testing Technician Grade I, for personnel performing concrete plastic property tests and ACI Self-Consolidating Concrete Testing Technician if testing self-consolidating concrete (SCC).
2. ACI Concrete Strength Testing Technician, for personnel performing tests on hardened properties of concrete.

105-8.7.4 Concrete Batch Plant Operator: Ensure that the concrete batch plant operator has a CTQP Concrete Batch Plant Operator Certification. As an alternative, the Department will accept the following certifications:

1. Precast Concrete Structures Association (PCSA) Batch Plant Operator,
2. NRMCA Certified Concrete Technologist Level 3, or
3. NRMCA Plant Manager Certification.

For dry cast concrete pipe and dry cast drainage structures/box culverts, the Department will accept American Concrete Pipe Association (ACPA) Concrete Pipe/Precast Box Culvert Batch Plant Operator or Quality School Certification.

105-8.8 Prestressed Concrete Plant Quality Control (QC) Personnel: Obtain personnel certifications from Department accredited training providers. The list of Department approved courses and their accredited providers is available on the SMO website at the following URL:https://www.fdot.gov/materials/administration/resources/training/structural/concrete-prestressed.shtm.

Ensure each prestressed concrete plant has an onsite production manager, an onsite plant QC manager, a plant engineer, and adequate onsite QC testing personnel to provide complete QC inspections and testing.

105-8.8.1 Plant QC Manager: Ensure the plant QC manager has at least five years of related experience and the following certifications:

1. ACI Concrete Field Testing Technician Grade I certification.
2. PCI QC Personnel Certification Level III.
3. CTQP Prestressed Concrete Field Inspector/Technician certificate.

105-8.8.2 QC Inspector/Technician: Ensure that the QC inspector/technician has the following certifications:

1. ACI Concrete Field Testing Technician Grade I certification.
2. PCI QC Personnel Certification Level II.
3. CTQP Prestressed Concrete Field Inspector/Technician certificate.

105-8.8.3 QC Concrete Central Mix Testing Technician: Ensure that QC testing personnel meet the requirement of 105-8.7.3.

105-8.8.4 Batch Plant Operator: Ensure that the batch plant operator meets the requirement of 105-8.7.4.

105-8.9 Pipe and Precast Concrete Products Manufacturing Facilities Quality Control (QC) Personnel:

105-8.9.1 General: Obtain personnel certifications from Department accredited training providers. The list of Department approved courses and their accredited providers is available on the SMO website at the following URL: https://www.fdot.gov/materials/administration/resources/training/structural/index.shtm.

105-8.9.2 Precast Concrete Drainage Structures, Precast Concrete Box Culvert, Precast Concrete Pipe, and Incidental Precast Concrete Manufacturing Facilities Quality Control (QC) Personnel:

105-8.9.2.1 Level I Quality Control Inspectors: Ensure that the Level I Inspectors have the following certifications:

105-8.9.2.1.1 Precast Concrete Drainage Technician Level I: PCI Quality Control Technician Level I certification. As an alternative, a current Precast

Concrete Quality Control Technician Level I certification in the respective work area will be accepted.

105-8.9.2.1.2 Incidental Precast Concrete Technician Level I: PCI Quality Control Technician Level I certification. As an alternative, a current Precast Concrete Quality Control Technician Level I certification in the respective work area will be accepted.

105-8.9.2.1.3 Precast Concrete Pipe Technician Level I: Precast Concrete Pipe Technician Level I certification.

105-8.9.2.2 Level II Quality Control Inspectors: Ensure that Level II Inspectors have the following certifications:

105-8.9.2.2.1 Precast Concrete Drainage Technician Level II:

1. Precast Concrete Drainage Technician Level I, in accordance with 105-8.9.2.1.1.
2. PCI Quality Control Technician Level II certification. As an alternative, a current Precast Concrete Quality Control Technician Level II certification in the respective work area will be accepted.
3. CTQP Concrete Field Technician Level 1, if the plant produces structural concrete in accordance with Section 346.

105-8.9.2.2.2 Incidental Precast Concrete Technician Level II:

1. Incidental Precast Concrete Technician Level I, in accordance with 105-8.9.2.1.2.
2. PCI Quality Control Technician Level II certification. As an alternative, a current Precast Concrete Quality Control Technician Level II in the respective work area will be accepted.
3. CTQP Concrete Field Technician Level 1.
4. Level II technicians who will perform quality control of incidental prestressed products must have a current certificate of completion of Section 450 Specification examination.

105-8.9.2.2.3 Precast Concrete Pipe Technician Level II:

1. Precast Concrete Pipe Technician Level I, in accordance with 105-8.9.2.1.3.
2. Precast Concrete Pipe Technician Certification Level II.

105-8.9.2.3 Plant Quality Control Manager: Ensure that the QC manager has a minimum of two years construction related experience in the specific work area and has the following certifications:

105-8.9.2.3.1 Precast Concrete Drainage Facilities:

Precast Concrete Drainage Technician Level II in accordance with 105-8.9.2.2.1.

105-8.9.2.3.2 Incidental Precast Concrete Facilities:

1. Incidental Precast Concrete Technician Level II in accordance with 105-8.9.2.2.2.
2. Section 450 Specification Certification if the plant produces incidental prestressed products.

105-8.9.2.3.3 Precast Concrete Pipe Facilities:

Precast Concrete Pipe Technician Level II in accordance with 105-8.9.2.2.3.

105-8.9.2.4 Additional Requirements for Quality Control (QC) Personnel of Precast Concrete Drainage Structures and Box Culverts, Precast Concrete Pipe, and Incidental Precast Concrete Manufacturing Facilities:

105-8.9.2.4.1 Testing Personnel: Ensure testing technicians meet the requirement of 105-8.7.3.

105-8.9.2.4.2 Batch Plant Operator: Ensure the batch plant operator meets the requirement of 105-8.7.4.

105-8.10 Supervisory Personnel – Post-Tensioned and Movable Bridge Structures:

105-8.10.1 General: Provide supervisory personnel meeting the qualification requirements only for the post-tensioned and movable bridge types detailed in this Article. Submit qualifications to the Engineer at the pre-construction conference. Do not begin construction until the qualifications of supervisory personnel have been approved by the Engineer.

105-8.10.2 Proof of License or Certification: Submit a copy of the Professional Engineer license current and in force issued by the state in which registration is held. The license must be for the field of engineering that the construction work involves such as Civil, Electrical or Mechanical. Under certain circumstances Florida registration may be required.

Submit a copy of the license issued by the State of Florida for tradesmen that require a license indicating that the license is in force and is current. Submit a copy of the certification issued by the International Society of Automation for each Certified Control Systems Technician.

105-8.10.3 Experience Record: Submit the following information for supervisory personnel to substantiate their experience record. The supervisor (project engineer, superintendent/manager or foreman) seeking approval must provide a notarized certification statement attesting to the completeness and accuracy of the information submitted. Submit the following experience information for each individual seeking approval as a supervisor:

Project owner’s name and telephone number of an owner’s representative, project identification number, state, city, county, highway number and feature intersected.

Detailed descriptions of each bridge construction experience and the level of supervisory authority during that experience. Report the duration in weeks, as well as begin and end dates, for each experience period.

The name, address and telephone number of an individual that can verify that the experience being reported is accurate. This individual should have been an immediate supervisor unless the supervisor cannot be contacted in which case another individual with direct knowledge of the experience is acceptable.

105-8.10.4 Concrete Post-Tensioned Segmental Box Girder Construction: Ensure the individuals filling the following positions meet the minimum requirements as follows:

105-8.10.4.1 Project Engineer-New Construction: Ensure the project engineer is a registered Professional Engineer with five years of bridge construction experience. Ensure a minimum of three years of experience is in segmental box girder construction engineering and includes a minimum of one year in segmental casting yard operations and related surveying, one year in segment erection and related surveying, including post-tensioning and grouting of longitudinal tendons and a minimum of one year as the project engineer in responsible charge of segmental box girder construction engineering. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

105-8.10.4.2 Project Engineer-Repair and Rehabilitation: Ensure the project engineer is a registered Professional Engineer with five years of bridge construction experience. Ensure a minimum of three years of experience is in segmental box girder construction engineering and includes one year of post-tensioning and grouting of longitudinal tendons and a minimum of one year as the project engineer in responsible charge of segmental box girder rehabilitation engineering or segmental box girder new construction engineering.

105-8.10.4.3 Project Superintendent/Manager-New Construction: Ensure the project superintendent/manager has a minimum of ten years of bridge construction experience or is a registered Professional Engineer with five years of bridge construction experience. Ensure that a minimum of three years of experience is in segmental box girder construction operations and includes a minimum of one year in the casting yard operations and related surveying, one year in segment erection and related surveying including post-tensioning and grouting of longitudinal tendons and a minimum of one year as the project superintendent/manager in responsible charge of segmental box girder construction operations. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

105-8.10.4.4 Project Superintendent/Manager-Repair and Rehabilitation: Ensure the project superintendent/manager has a minimum of five years of bridge construction experience or is a registered Professional Engineer with three years of bridge construction experience. Ensure that a minimum of two years of experience is in segmental box girder construction operations and includes a minimum of one year of experience performing post-tensioning and grouting of longitudinal tendons and a minimum of one year as the project superintendent/manager in responsible charge of segmental box girder rehabilitation operations or segmental box girder new construction operations.

105-8.10.4.5 Foreman-New Construction: Ensure that the foreman has a minimum of five years of bridge construction experience with two years of experience in segmental box girder operations and a minimum of one year as the foreman in responsible charge of segmental box girder new construction operations. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

105-8.10.4.6 Foreman-Repair and Rehabilitation: Ensure the foremen has a minimum of five years of bridge construction experience with two years of experience in segmental box girder operations and a minimum of one year as the foreman in responsible charge of segmental box girder rehabilitation operations or segmental box girder new construction operations.

105-8.10.4.7 Geometry Control Engineer/Manager: Ensure that the geometry control engineer/manager for construction of cast-in-place box segments is a registered Professional Engineer with one year of experience, a non-registered Engineer with three years of experience or a registered Professional Land Surveyor with three years of experience in geometry control for casting and erection of cast-in-place box segments. Credit for experience in cast-in-place box girder geometry control will be given for experience in precast box girder geometry control but not vice versa.

Ensure that the geometry control engineer/manager for precast box segments is a registered Professional Engineer with one year of experience or non-registered with three years of experience in casting yard geometry control of concrete box segments.

The geometry control engineer/manager must be responsible for and experienced at implementing the method for establishing and maintaining geometry control for segment casting yard operations and segment erection operations and must be experienced with the use of computer programs for monitoring and adjusting theoretical segment casting curves and geometry. This individual must be experienced at establishing procedures for assuring accurate segment form setup, post-tensioning duct and rebar alignment and effective concrete placement and curing operations as well as for verifying that casting and erection field survey data has been properly gathered and recorded. Ensure this individual is present at the site of construction, at all times while cast-in-place segmental box girder construction is in progress or until casting yard operations and segment erection is complete.

105-8.10.4.8 Surveyor: Ensure that the surveyor in charge of geometry control surveying for box segment casting and/or box segment erection has a minimum of one year of bridge construction surveying experience. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

105-8.10.5 Movable Bridge Construction: Ensure the individual filling the following positions meet the minimum requirements as follows:

105-8.10.5.1 Electrical Journeyman: Ensure the electrical journeyman holds, an active journeyman electrician's license and has at least five years' experience in industrial electrical work, or is a certified control systems technician. A certified control systems technician will not be permitted to perform electrical power work including, but not limited to, conduit and wire-way installation or power conductor connection. Ensure the electrical journeyman has successfully completed the installation of one similar movable bridge electrical system during the last three years.

105-8.10.5.2 Control Systems Engineer and Mechanical Systems Engineer: Ensure the control systems engineer and mechanical systems engineer are both registered Professional Engineers with a minimum of 10 years supervisory experience each in movable bridge construction. Ensure the engineers have working knowledge of the movable bridge leaf motion control techniques, mechanical equipment and arrangements specified for this project. Ensure that each engineer has been in responsible control of the design and implementation of at least three movable bridge electrical control and machinery systems within the past 10 years of which, at least one of the three bridges was within the last three years. Ensure that a minimum of one of the three bridge designs incorporated the same type of leaf motion control and machinery systems specified for this project.

105-8.10.6 Concrete Post-Tensioned Other Than Segmental Box Girder Construction: Ensure the individual filling the following positions meet the minimum requirements as follows:

105-8.10.6.1 Project Engineer: Ensure the project engineer is a registered Professional Engineer with five years of bridge construction experience. Ensure that a minimum of three years of experience is in concrete post-tensioned construction. Ensure that the three years of experience includes experience in girder erection, safe use of cranes, stabilization of girders; design of false work for temporary girder support, post-tensioning and grouting operations, and a minimum of one year as the project engineer in responsible charge of post-tensioning related engineering responsibilities.

105-8.10.6.2 Project Superintendent/Manager: Ensure the project superintendent/manager has a minimum of ten years of bridge construction experience or is a

registered Professional Engineer with five years of bridge construction experience and has a minimum of three years of supervisory experience in girder erection, safe use of cranes, stabilization of girders; design of falsework for temporary girder support post-tensioning, grouting operations and a minimum of one year as the project superintendent/manager in responsible charge of post-tensioning related operations.

105-8.10.6.3 Foreman: Ensure the foremen has a minimum of five years of bridge construction experience with two years of experience in post-tensioning related operations and a minimum of one year as the foreman in responsible charge of post-tensioning related operations.

105-8.10.7 Post-Tensioning (PT) and Filler Injection Personnel Qualifications: Perform all stressing and filler injection operations in the presence of the Engineer and with personnel meeting the qualifications of this article. Coordinate and schedule all PT and filler injection activities to facilitate inspection by the Engineer.

105-8.10.7.1 Post-Tensioning: Perform all PT field operations under the direct supervision of a Level 2 CTQP Qualified PT Technician who must be present at the site of the post-tensioning work during the entire duration of the operation. For the superstructures of bridges having concrete post-tensioned box or I girder construction, provide at least two CTQP Qualified PT Technicians, Level 1 or 2, on the work crew. The supervisor of the work crew, who must be a Level 2 CTQP Qualified PT Technician, may also be a work crew member, in which case, the supervisor shall count as one of the two CTQP qualified work crew members. For PT operations other than the superstructures of post-tensioned box or I girder construction, perform all PT operations under the direct supervision of a Level 2 CTQP Qualified PT Technician who must be present at the site of the PT work during the entire duration of the operation. Work crew members are not required to be CTQP qualified.

105-8.10.7.2 Grouting: Perform all grouting field operations under the direct supervision of a Level 2 CTQP Qualified Grouting Technician who must be present at the site of the grouting work during the entire duration of the operation. For the superstructures of bridges having concrete post-tensioned box or I girder construction, provide at least two CTQP Qualified Grouting Technicians, Level 1 or 2, on the work crew. The supervisor of the work crew, who must be a Level 2 CTQP Qualified Grouting Technician, may also be a work crew member, in which case, the supervisor shall count as one of two CTQP qualified work crew members. For grouting operations other than the superstructures of post-tensioned box or I girder construction, perform all grouting operations under the direct supervision of a Level 2 CTQP Qualified Grouting Technician who must be present at the site of the grouting work during the entire duration of the operation. Work crew members are not required to be CTQP qualified.

Perform all vacuum grouting operations under the direct supervision of a crew foreman who has been trained and has experience in the use of vacuum grouting equipment and procedures. Submit the crew foreman's training and experience records to the Engineer for approval prior to performing any vacuum grouting operation.

105-8.10.7.3 Flexible Filler Injection: Perform all filler injection operations under the direct supervision of a filler injection foreman who has American Segmental Bridge Institute (ASBI) certification in the flexible filler process. Provide at least two CTQP Qualified Grouting Technicians with ASBI certification in the flexible filler process, one of whom must be a Level 2 CTQP Qualified Grouting Technician. Both technicians must be present at the site of the flexible filler injection work during the entire duration of the operation.

Provide a filler injection quality control (QC) inspector who has ASBI certification in the flexible filler process. The filler injection QC inspector must be present at the site of the flexible filler injection work during the entire duration of the operation.

Verifiable experience performing injection of similar flexible filler on at least two projects is acceptable in lieu of ASBI certification in the flexible filler process.

Perform all flexible filler repair operations under the direct supervision of a crew foreman who has been trained and has verifiable experience in the use of vacuum flexible filler repair equipment and procedures. Submit the crew foreman's training and experience records to the Engineer prior to performing any flexible filler operation.

105-8.10.8 Failure to Comply with Bridge Qualification Requirements: Make an immediate effort to reestablish compliance. If an immediate effort is not put forth as determined by the Engineer, payment for the bridge construction operations requiring supervisors to be qualified under this Specification will be withheld up to 60 days. Cease all bridge construction and related activities (casting yard, etc.) if compliance is not met within 60 days, regardless of how much effort is put forth. Resume bridge construction operations only after written approval from the Engineer stating that compliance is reestablished.

105-8.11 Signal Installation Inspector: Provide an inspector trained and certified by the International Municipal Signal Association (IMSA) as a traffic signal inspector to perform all signal installation inspections. Use only Department approved signal inspection report forms during the signal inspection activities. Ensure all equipment, materials, and hardware is in compliance with Department Specifications and verify that all equipment requiring certification is listed on the Department's Approved Product List (APL). Submit the completed signal inspection report forms, certified by the IMSA traffic signal inspector to the Engineer.

The Department's approved inspection report forms are available at the following URL: http://www.fdot.gov/traffic/.

105-8.12 Structural Steel and Miscellaneous Metals Fabrication Facility Quality Control Personnel: Ensure each fabrication facility has an onsite production manager, an onsite facility manager for QC, a plant engineer, and onsite QC inspectors/technicians to provide complete QC inspections and testing.

Ensure that the facility manager for QC and QC inspectors/technicians meet the certification requirements set forth in the latest version of AASHTO/NSBA Steel Bridge Collaboration S 4.1, Steel Bridge Fabrication QC/QA Guide Specification, including the years of experience required in Table 105-1 below. The facility manager for QC must meet the requirements of Table 105-1 for every structural steel member type produced by a plant with QC being managed by the facility manager for QC. The facility manager for QC will report directly to the plant manager or plant engineer and must not be the plant production manager nor report to or be the subordinate of the plant production manager. QC inspectors/technicians must be the employees of and must report directly to the facility manager for QC.

Table 105-1
Experience Requirements for QC Inspectors/Technicians
And Facility Manager for Quality Control

Structural Steel Member Type	Minimum Years of Experience Required	
	QC Inspector/Technician	Facility Manager for QC
Rolled beam bridges	1 year	3 years

Table 105-1 Experience Requirements for QC Inspectors/Technicians And Facility Manager for Quality Control		
Structural Steel Member Type	Minimum Years of Experience Required	
	QC Inspector/Technician	Facility Manager for QC
Welded plate girders (I sections, box sections, etc.)	2 years	4 years
Complex structures, such as trusses, arches, cable stayed bridges, and moveable bridges	3 years	5 years
Fracture critical (FC) members	3 years	5 years

SECTION 990
TEMPORARY TRAFFIC CONTROL DEVICE MATERIALS

990-1 General.

This Section specifies the material requirements for temporary traffic control devices.

990-2 Retroreflective Sheeting for Temporary Traffic Control Devices.

990-2.1 Bands for Temporary Tubular Markers, Vertical Panels, Barricades, and other Devices: Bands for temporary tubular markers, vertical panels, barricades, and other devices shall meet the requirements of ASTM D4956 for Type III or higher retroreflective sheeting materials identified in Section 994.

990-2.2 Collars for Traffic Cones: Collars for traffic cones shall meet the requirements of ASTM D4956 Type III or higher retroreflective prismatic sheeting materials identified in Section 994 including supplementary requirements for reboundable sheeting. The outdoor weathering shall be for 6 months for all sheeting types.

990-2.3 Drums: Drums shall meet the requirements of ASTM D4956 for Type III or higher retroreflective sheeting materials identified in Section 994 including supplementary requirements for reboundable sheeting.

990-2.4 Sign Panels: Meet the requirements of 990-8.

990-3 Portable Devices (Arrow Boards, Changeable Message Signs, Regulatory Signs, Radar Speed Display Units and Truck Mounted Changeable Message Signs), Automated Flagger Assistance Devices).

990-3.1 General: All portable devices shall meet the physical display and operational requirements of the Manual on Uniform Traffic Control Devices (MUTCD) and be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product must submit the following:

1. Certification showing that the product meets the requirements of this Section.

2. Drawings of the device along with technical information necessary for proper application, field assembly, and installation.

Portable devices shall meet the following requirements:

3. Ensure that all assembly hardware less than 5/8 inch in diameter, including nuts, bolts, external screws and locking washers are Type 304 or 316 passivated stainless steel. Stainless steel bolts, screws and studs shall meet ASTM F593. Nuts shall meet ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter shall be galvanized. Bolts, studs, and threaded rod shall meet ASTM A307. Structural bolts shall meet ASTM F3125, Grade A325.

4. The controllers and associated on-board circuitry shall meet the requirements of the Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise by Class A digital devices. All electronic assemblies shall meet the requirements of NEMA TS-4-2016 Section 2.

5. The controller and associated on-board circuitry shall not be affected by mobile radio, or any other radio transmissions.

6. An operator's manual shall be furnished with each unit.

7. All portable devices shall be permanently marked with, manufacturer's name or trademark, model/part number, and date of manufacture or serial number.

8. Portable devices and trailers shall be delineated on a permanent basis by affixing retroreflective sheeting in a continuous line on the face of the trailer as seen by oncoming road users.

990-3.1.1 Electrical Systems:

990-3.1.1.1 Solar Powered Unit: The solar powered unit shall meet the following:

1. The unit shall provide automatic recharging of power supply batteries to normal operating levels with meters showing charge.

2. Solar array recovery time for arrow boards and regulatory signs shall be accomplished in a maximum of three hours.

3. Arrow boards and changeable message signs shall be designed to provide 180 days of continuous operation with minimum onsite maintenance.

990-3.1.1.2 Battery Life Test: Meet the following:

1. The photovoltaic unit shall be designed to provide 21 days of continuous operation without sunlight with a minimum of onsite maintenance for arrow boards and changeable message signs, or 10 days of continuous operation without sunlight with a minimum of onsite maintenance for regulatory signs and radar speed display units, or 2 days of continuous operation without sunlight with a minimum of onsite maintenance for Automated Flagger Assistance Devices signs.

2. The battery shall be equipped with a battery controller to prevent overcharging and over-discharging. An external battery level indicator shall be provided.

3. The battery, controller, and power panel shall be designed to be protected from the elements and vandalism.

4. Automatic recharging of power supply batteries shall be provided with charge indicator meter.

5. An AC/DC battery charger unit shall be provided.

990-3.1.2 Display Panel and Housing:

1. The display housing assembly shall be weather-tight.

2. Except for Automated Flagger Assistance Devices, the display assembly shall be equipped with an automatic dimming operational mode capable of a minimum of 50% dimming and a separate manual dimmer switch

3. The display panel background and frame for the display assembly shall be painted flat black and shall meet Federal Specification TT-E-489.

4. The display panel for arrow boards and changeable message signs, when raised in the upright position, shall have a minimum height of 7 feet from the bottom of the panel to the ground, in accordance with the MUTCD. The display panel for radar speed display units, when raised in the upright position, will have a minimum height of 5 feet from the bottom of the panel to the ground.

5. The regulatory speed sign panel for regulatory signs and radar speed display units, when raised in the upright position, shall have a minimum height of 7 feet from the bottom of the regulatory sign panel to the ground.

6. The unit shall have an accessible mechanism to easily raise and lower the display assembly. A locking device shall also be provided to ensure the display panel will remain in the raised or lowered position.

7. The display panel for changeable message signs shall have a safety system to protect against the panel falling from the trailer to the roadway should the panel separate from the lift system.

990-3.1.3 Controller: The Controller shall meet the following:

1. Controller and control panel shall be housed in a weather, dust, and vandal resistant lockable cabinet.

2. Controller and associated on-board circuitry shall meet the requirements of the FCC Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise by Class A digital devices.

3. For changeable message signs and arrow boards ensure that the sign control software provides an on-site graphical representation that visibly depicts the message displayed on the sign face.

4. For changeable message signs, if remote communication is included, ensure that the sign controller is addressable through the Ethernet communications network using software that complies with the National Transportation Communications for ITS Protocol (NTCIP) 1101 base standard, including all amendments as published at the time of contract letting, the NTCIP Simple Transportation Management Framework, and conforms to Compliance Level 1. Ensure that the software implements all mandatory objects in the supplemental requirement SR-700-4.1.1-01, FDOT Dynamic Message Sign NTCIP Requirements, as published on the FDOT State Traffic Engineering and Operations Office web site at the time of contract letting. Ensure that the sign complies with the NTCIP 1102v01.15, 2101 v01.19, 2103v02.07, 2201v01.15, 2202 v01.05, and 2301v02.19 standards. Ensure that the sign complies with NTCIP 1103v02.17, section 3. Ensure that additional objects implemented by the software do not interfere with the standard operation of mandatory objects.

990-3.1.4 Support Chassis: The support chassis shall meet the following:

1. The support chassis shall be self-contained and self-supporting without the use of additional equipment or tools.

2. Both trailer and truck-mounted units are allowed for arrow boards and changeable message signs. Trailer mounted units are required for regulatory signs and radar speed display units. Automated Flagger Assistance Devices may be trailer or non-trailer units.

a. Trailer mounted unit:

1. The sign, power supply unit and all support systems shall be mounted on a wheeled trailer.

2. The trailer shall be equipped with Class A lights, using a plug adaptor.

3. The trailer shall be equipped with adjustable outrigger leveling pads, one on each of the four frame corners.

4. The trailer shall be designed to be set up at the site with its own chassis and outriggers, without being hitched to a vehicle.

5. The trailer shall be equipped with fenders over the tires and shall be made from heavy-duty material sufficient to allow a person to stand and operate or perform maintenance on the unit.

6. The trailer shall meet all equipment specifications set forth in Chapter 316 of the Florida Statutes, and by such rule, regulation or code that may be adopted by the Department of Highway Safety and Motor Vehicles.

990-3.2 Portable Arrow Board:

990-3.2.1 Arrow Board Matrix:

1. The minimum legibility distance for various traffic conditions are based on the decision-sight distance concept. The minimum legibility distance is the distance at which a driver can comprehend the arrow board message on a sunny day or a clear night. The arrow board size that is needed to meet the legibility distance is listed as follows:

Table 990-1

Type	Minimum Size	Minimum Number of Elements	Minimum Legibility Distance
B	30 by 60 inches	13	3/4 mile
C	48 by 96 inches	15	1 mile

Type B arrow boards may be used on low to intermediate speed (0 mph to 50 mph) facilities or for maintenance or moving operations on any speed facility. Type C arrow boards shall be used for all other operations on high-speed (50 mph and greater) facilities and may be substituted for Type B arrow boards on any speed facility.

2. Devices shall meet all arrow board displays identified in the MUTCD.

3. The element lens should be 5-3/4 inches in diameter. Smaller element lens diameters are permissible only if they provide an equivalent or greater brightness indication and meet the legibility criteria in 990-3.2.1(a).

4. The color of the light emitted shall be in accordance with the MUTCD.

5. There shall be a 360 degree hood for close-up glare reduction.

6. For solar powered arrow boards the bulbs shall provide a 350 candle power intensity for day use and an automatic reduction or dimming capacity for night use. The dimmed night operation shall provide adequate indication without excessive glare.

7. The flashing rate of the element shall not be less than 25 flashes or more than 40 flashes per minute as required in the MUTCD.

8. The minimum element “on time” shall be 50% for the flashing arrow and 25% for the sequential chevron.

990-3.3 Portable Changeable Message Sign:

990-3.3.1 Message Matrix:

1. Message matrix panel shall be a maximum height of 7 feet by a maximum width of 146 inches.

2. The matrix must be capable of displaying three lines of 8 characters using an 18 inch or 12 inch font. PCMS with a minimum font size of 18 inches shall be used on any speed facility. PCMS with a minimum font size of 12 inches may be used on facilities with speed limits of 45 mph or less.

3. The matrix must display characters that meet or exceed the numeral and letter sizes prescribed in the MUTCD and SHS (Standard Highway Signs) companion document. Fonts and graphics must mimic the characteristics of fonts and graphics defined in NEMA TS4, the MUTCD, and SHS.

4. Similar components shall be interchangeable.

990-3.3.2 Operation and Performance:

1. The message shall be displayed in upper case except when lower case is project specific and is allowed by the MUTCD.

2. The message matrix panel shall be visible from one-half mile.

3. The 18 inch letter height message shall be legible from 650 feet for nighttime conditions and 800 feet for normal daylight conditions.

4. The 12 inch letter height message shall be legible from 650 feet for nighttime conditions and 650 feet for normal daylight conditions.

5. Under variable light level conditions the sign shall automatically adjust its light source to maintain legibility.

6. The message panel shall have adjustable display rates, so that the entire message can be read at least twice at the posted speed.

7. The control panel shall have the capability to store a minimum 50 pre-programmed messages.

8. The controller in the control panel shall be able to remember messages during non-powered conditions.

9. The controller shall allow the operator to generate additional messages on site via the keyboard.

10. All messages shall be flashed or sequenced. In the sequence mode, the controller shall have the capability to sequence three line messages during one cycle.

990-3.4 Portable Regulatory Signs:

990-3.4.1 Sign Panel Assembly: The sign panel assembly shall consist of a 24 inches by 30 inches "SPEED LIMIT XX" sign panel and a "WHEN FLASHING" sign panel, intended to notify oncoming traffic the speed limit where workers are present. The sign panel assembly shall meet the following minimum physical requirements:

1. The sign panel shall fold down and be pinned in place for towing. Maximum travel height shall be 80 inches.

2. Construct the sign panel and light housing to allow the unit to be operated in the displayed position at speeds of 30 mph. Design the sign panel assembly to withstand transport speeds of 65 mph.

3. Construct the sign panel such that, when in the raised position, the sign panel will have a height of 7 feet from the bottom of the lowest panel to the ground, in accordance with the MUTCD.

4. Provide the unit with a mechanism to raise and lower the sign panel. Provide the unit with a device to lock the sign panel in the raised and lowered position.

990-3.4.2 Flashing Lights: Provide a pair of hooded PAR 46 LED advance warning flashing lamps on each side of the top of the sign panel. These lamps shall be visible day or night at a distance of one mile with a flash rate of approximately 55 flashes per minute.

The lamp lens should be at least 5-3/4 inches in diameter. Smaller diameter lens are permissible if they provide an equivalent or greater brightness indication and meet the legibility criteria above.

The color of the light emitted shall be in accordance with the MUTCD. For solar powered units, the bulbs shall provide a 350 candlepower intensity for day use and an automatic reduction or dimming capacity for night use. The dimmed night operation shall provide adequate indication without excessive glare.

990-3.5 Portable Radar Speed Display Unit:

990-3.5.1 Display Unit Panel and Housing: Meet the requirements of 990-3.1.2 and the following physical requirements as a minimum:

1. Provide capability to mount a 24 inches by 30 inches regulatory sign with interchangeable numbers showing the posted speed limit above the message display.
2. Provide legend "YOUR SPEED" either above or below the message display.

990-3.5.2 Message Display: The message display shall meet the following physical requirements as a minimum:

1. Provide a bright LED, two-digit speed display on a flat black background with bright yellow LEDs.
2. Each digit shall contain either a seven-segment layout or matrix-style design. Each digit shall measure a minimum 18 inches in height.
3. Speed display shall be visible from a distance of at least one-half mile and legible from a distance of at least 650 feet under both day and night conditions.
4. Display shall adjust for day and night operation automatically with a photocell.

990-3.5.3 Radar: The radar unit shall not be affected by normal radio transmissions and meet the following physical requirements as a minimum:

1. Approach-Only sensor.
2. Equipped with a low power K-Band transmitter.
3. Part 90 FCC acceptance, 3 amps, 10.8 V_{DC} to 16.6 V_{DC}. Fuse and reverse polarity protected.
4. Range of 1,000 feet for mid-size vehicle, capable of accurately sensing speeds of 10 mph to 99 mph with over speed function that operates when a vehicle approaches over the posted speed limit.

990-3.6 Truck Mounted Changeable Message Sign:

990-3.6.1 General: Truck mounted changeable message signs shall meet the physical display and operational requirements of the MUTCD and be listed on the APL.

1. Sign shall be secured on the vehicle for normal operation.
2. A fault light shall be located on rear of the sign and operate whenever the sign is displaying a message. The light shall flash at the same rate as the message being displayed.
3. An operator's manual shall be furnished with each sign.
4. The manufacturer name, model or part number, and date of manufacture or serial number shall be permanently affixed to the sign housing.

990-3.6.2 Display Panel and Housing:

1. The housing maximum size shall not exceed a width of 96 inches.
2. The housing shall be designed to withstand exposure to the elements and include a locking device to secure the housing from unauthorized entry.
3. Provisions (by convection or fan) shall be made for heat dissipation within the unit.
4. The message matrix panel background and frame for the dynamic message assembly shall be painted flat black, Federal Specification TT-E-489.
5. The face of the display shall be easily opened from the front. Faces that open up shall be locked to stay open far enough to allow for servicing of all message panel components.

6. The face of the sign shall be covered by an impact resistant polycarbonate face that aids against glare and includes an ultraviolet inhibitor to protect from fading and yellowing.

7. The display panel support structure, when raised in the upright position, shall be designed to allow for a minimum height of 7 feet from the bottom of the panel to the ground.

8. The unit shall have a manual and automatic control mechanism to raise and lower the display assembly. A locking device shall also be provided to ensure the display panel will remain in the raised or lowered position.

990-3.6.3 Message Matrix:

1. The matrix shall utilize light emitting diodes (LED).

2. LEDs used shall be amber (590 nm dominate wavelength) and shall meet the visibility requirements of this specification. LEDs shall have a viewing angle no less than 30 degrees. LED intensity shall not fall below 80 percent within three years.

3. All display modules shall be identical and interchangeable.

4. The matrix shall be capable of displaying a minimum of two lines of eight characters each, using a 10 inch font that meets the height to width ratio and character spacing requirements in the MUTCD, Section 2L.04 (paragraphs 05, 06, and 08) and Section 6F.60, paragraph 15.

5. The matrix shall provide variable letter, graphic and symbol sizes from 10 to 36 inches. The matrix must display characters that meet or exceed the numeral and letter sizes prescribed in the MUTCD and SHS companion document. Fonts and graphics must mimic the characteristics of fonts and graphics defined in NEMA TS4, the MUTCD, and SHS.

990-3.6.4 Electrical System:

1. The power supply shall be a 12 V_{DC} system designed to operate the sign with a dedicated battery that is charged by the vehicle electrical system, but isolated so it does not drain the vehicle battery.

2. All internal sign components shall be treated with a protective, weather-resistant polyurethane or silicone conformal coating to protect against the adverse effects of humidity and moisture.

990-3.6.5 Sign Controller:

1. The sign controller shall be housed inside the sign and shall be equipped with a security lockout feature to prevent unauthorized use.

2. An external weather-resistant, hand-held control keypad shall be used to display the message on the sign.

3. The sign controller shall have the capability to provide a predetermined or blank default message upon loss of controller function.

990-3.6.6 Operation and Performance:

1. The message shall be displayed in upper case.

2. The message matrix panel shall be visible from one-half mile. With a 10 inch character displayed, the sign shall be legible from a distance of 400 feet in both day and night conditions. Under variable light level conditions, the sign shall automatically adjust its light source to meet the 400 foot visibility requirement.

3. The sign shall have the capability to store a minimum of 40 common messages and graphics of which a minimum of 30 shall be user-programmable messages.

4. All messages shall be capable of being flashed or sequenced. In the sequence mode, the message shall consist of no more than two phases, with each phase consisting of no more than three lines of text. Both message dwell time and message flash rate shall be individually programmable.

990-3.7 Automated Flagger Assistance Devices (AFAD):

990-3.7.1 General: AFAD's shall meet the physical display and operational requirements in the MUTCD and be listed on the APL. Manufacturers seeking evaluation of their product for the APL must include detailed vendor drawings, signed and sealed by a Professional Engineer registered in the State of Florida, showing typical application of the device in accordance with Standard Plans, Index 102-603. All electronic assemblies shall meet the requirements of NEMA TS-5-2017 Section 4.

990-3.7.2 Stop/Slow Automated Flagger Assistance Devices: Provide a remotely operated Stop/Slow AFAD including a Stop/Slow sign that alternately displays the stop face and the slow face of a Stop/Slow paddle.

When a gate arm is used, ensure that the gate arm descends to a down position across the approach lane of traffic when the stop face is displayed and then ascends to an upright position when the slow face is displayed.

Ensure the gate arm is fully retroreflectorized on both sides, with vertical alternating red and white stripes at 16 inch intervals measured horizontally in accordance with the MUTCD. When the arm is in the down position blocking the approach lane:

1. The minimum vertical aspect of the arm and sheeting shall be 2 inches; and,

2. The end of the arm shall reach at least to the center of the lane being controlled.

990-3.7.3 Red/Yellow Lens Automated Flagger Assistance Devices: Provide a remotely operated Red/Yellow Lens AFAD that alternately displays a steadily illuminated circular red lens and a flashing circular yellow lens to control traffic.

Ensure that the Red/Yellow Lens AFAD includes a gate arm that descends to a down position across the approach lane of traffic when the steady circular red lens is illuminated and then ascends to an upright position when the flashing circular yellow lens is illuminated.

Ensure that the gate arm is fully retroreflectorized on both sides, with vertical alternating red and white stripes at 16 inch intervals measured horizontally in accordance with the MUTCD. When the arm is in the down position blocking the approach lane:

1. The minimum vertical aspect of the arm and sheeting shall be 2 inches; and,

2. The end of the arm shall reach at least to the center of the lane being controlled.

Do not provide a change interval between the display of the steady circular red indication and the display of the flashing circular yellow indication. Provide a steady illuminated circular yellow indication, with at least a 5 second duration, between the transition from flashing circular yellow indication and the display of the steady circular red indication. The Engineer may approve a different duration, provided it falls within the range recommended by the MUTCD.

990-4 Removable Tape.

990-4.1 General: Removable tape shall be one of the products listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6. Evaluation of Removable Tape will utilize data from an independent laboratory or data from the National Transportation Product Evaluation Program (NTPEP).

990-4.2 Composition: Removable tape shall be one of the products listed on the APL. The pavement stripes and markings shall consist of high quality plastic materials, pigments, and glass spheres or other retroreflective materials uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres or other retroreflective material embedded in the top surface. No foil type materials shall be allowed.

990-4.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and 250 mcd/lx·m^2, respectively. Black pavement markings shall have a retroreflectance of less than 20 mcd/lx·m^2. The retroreflectance of the white and yellow pavement markings at the end of the six-month period shall not be less than 150 mcd/lx·m^2.

990-4.4 Thickness: The APL will list the specified thickness of each approved product.

990-4.5 Durability and Wear Resistance: When properly applied, the material shall provide neat, durable stripes and markings. The materials shall provide a cushioned resilient substrate that reduces sphere crushing and loss. The film shall be weather resistant and, through normal wear, shall show no significant tearing, rollback or other signs of poor adhesion. Durability is the measured percent of pavement marking material completely removed from the pavement. The pavement marking material line loss must not exceed 5.0% of surface area.

990-4.6 Conformability and Resealing: The stripes and markings shall be capable of conforming to pavement contours, breaks and faults under traffic at pavement temperatures recommended by the manufacturer. The film shall be capable of use for patching worn areas of the same types of film in accordance with the manufacturer's recommendations.

990-4.7 Tensile Strength: The stripes and markings shall have a minimum tensile strength of 40 psi when tested according to ASTM D638. A rectangular test specimen 6 inches by 1 inch by 0.05 inches minimum thickness shall be tested at a temperature range of 40°F to 80ºF using a jaw speed of 0.25 inches per minute.

990-4.8 Elongation: The stripes and markings shall have a minimum elongation of 25% when tested in accordance with ASTM D638.

990-4.9 Plastic Pull test: The stripes and markings shall support a dead weight of 4 pounds for not less than five minutes at a temperature range of 70°F to 80ºF. Rectangular test specimen size shall be 6 inches by 1 inch by 0.05 inches minimum thickness.

990-4.10 Adhesive: Precoat removable tape with a pressure sensitive adhesive capable of being affixed to asphalt concrete and portland cement concrete pavement surfaces without the use of heat, solvents, and other additional adhesives or activators. Ensure that the adhesive does not require a protective liner when the removable tape is in rolled form for shipment. Ensure that the adhesive is capable of temporarily bonding to the roadway pavement at temperatures of 50ºF and the above without pick-up distortion by vehicular traffic.

990-4.11 Color: Meet the requirements of 971-1.6.

990-4.12 Removability: Ensure that the manufacturer shows documented reports that the removable tape is capable of being removed intact or in substantially large strips after being in place for a minimum of 90 days and under an average daily traffic count per lane of at least

5,000 vehicles per day at temperatures above 40ºF, without the use of heat, solvents, grinding or blasting.

990-5 Temporary Raised Pavement Markers (RPMs).

Temporary RPMs shall meet the requirements of Section 970.

990-6 Temporary Glare Screen.

990-6.1 Design and Installation: Manufactured glare screen systems may be modular or individual units listed on the APL and shall meet the following requirements:

1. Glare screen units shall be manufactured in lengths such that when installed the joint between any one modular unit will not span barrier sections. Color shall be green, similar to FED-STD-595-34227.

2. Blades, rails and/or posts shall be manufactured from polyethylene, fiberglass, plastic, polyester or polystyrene, and be ultraviolet stabilized and inert to all normal atmospheric conditions and temperature ranges found in Florida.

3. For paddle type designs, the blade width shall not be more than 9 inches. Blades or screen for individual or modular systems shall be 24 inches to 30 inches high and capable of being locked down at an angle and spacing to provide a cut-off angle not less than 20 degrees.

4. For glare screen mounted on temporary concrete barrier, a strip (minimum 3 inch width and minimum 72 square inches) of reflective sheeting as specified in 994-2 must be placed on each side of a panel, centered in each barrier section (at a spacing not to exceed 15 feet) and positioned in such a manner as to permit total right angle observation by parallel traffic.

5. Prior to approval an impact test shall be performed by the manufacturer to verify the safety performance of the proposed system. The minimum impact strength of the posts, blades, rail and the barrier attachment design shall be sufficient to prevent the unit from separating from the barrier when impacted by a 3 inches outside diameter steel pipe traveling at 30 mph and impacting mid-height on the glare screen assembly.

6. All hardware shall be galvanized in accordance with ASTM A123 or stainless steel in accordance with AISI 302/305.

7. The anchorage of the glare screen to the barrier must be capable of safely resisting an equivalent tensile load of 600 pounds per foot of glare screen with a requirement to use a minimum of three fasteners per barrier section.

Alternative designs for temporary glare screen may be submitted as a Cost Savings Initiative Proposal in accordance with 4-3.9.

990-7 Temporary Traffic Control Signals.

990-7.1 General: Temporary traffic control signals shall meet the physical display and operational requirements of conventional traffic signal described in the MUTCD for portable traffic signals and be listed on the APL. The standard includes but is not limited to the following:

1. Use signal heads having three 12 inch vehicular signal indications (Red, Yellow and Green). Ensure there are two signal heads for each direction of traffic.

2. The traffic signal heads on this device will be approved by the Department.

3. Department approved lighting sources will be installed in each section in accordance with the manufacturer's permanent directional markings, that is, an "Up Arrow", the word "UP" or "TOP," for correct indexing and orientation within a signal housing.

4. The masts supporting the traffic signal heads will be manufactured with the lowest point of the vehicular signal head as follows:

a. Eight feet above finished grade at the point of their installation for "pedestal" type application or

b. Seventeen to 19 feet above pavement grade at the center of roadway for "overhead" type application.

5. The yellow clearance interval will be programmed 3 seconds or more. Under no condition can the yellow clearance interval be manually controlled. It must be timed internally by the controller as per Department specifications.

6. The green interval must display a minimum of 5 seconds before being advanced to the yellow clearance interval.

7. The controller will allow for a variable all red clearance interval from 0 seconds to 999 seconds.

8. Portable traffic control signals will be either manually controlled or traffic actuated. Indicator lights for monitoring the signal operation of each approach will be supplied and visible from within the work zone area.

9. When the portable traffic control signals are radio actuated the following will apply:

a. The transmitter will be FCC Type accepted and not exceed 1 watt output per FCC, Part 90.17. The manufacturer must comply with all "Specific limitations" noted in FCC Part 90.17.

b. The Controller will force the traffic signal to display red toward the traffic approach in case of radio failure or interference.

10. The trailer and supports will be painted construction/maintenance orange enamel in accordance with the MUTCD color.

11. Ensure the certification number is engraved or labeled permanently on equipment.

12. Ensure the device has an external, visible, water resistant label with the following information: "Certification of this device by the Florida Department of Transportation allows for its use in Construction Zones Only".

13. All electronic assemblies shall meet the requirements of NEMA TS-5-2017 Section 4.

990-8 Work Zone Signs.

990-8.1 Post Mounted Sign Supports:

990-8.1.1 General: Provide steel u-channel posts that conform to ASTM A499 Grade 60. For each u-channel post, punch or drill 3/8 inch diameter holes on 1 inch centers through the center of the post, starting approximately 1 inch from the top and extending the full length of the post. Ensure that the weight per foot of a particular manufacturer's post size does not vary more than plus or minus 3.5% of its specified weight per foot. Taper the bottom end of the post for easier installation. Machine straighten the u-channel to a tolerance of 0.4% of the length.

990-8.2 Portable Sign Stands: Provide portable sign stands that meet the requirements of MASH TL-3.

990-8.2.1 Product Application: Manufacturers seeking inclusion on the APL must submit the following:

1. Product Drawing, which at a minimum includes:

a. Model Number
b. Sign panel size
c. Allowable sign panel substrate material
d. Height to bottom of sign panel
e. Any field assembly details and technical information necessary for proper application and installation

2. Crash testing reports.
3. All relevant FHWA Eligibility Letters.

990-8.3 Sign Panels: Use signs that meet the material and process requirements of ASTM D4956 and Section 994. Use Type VI sheeting for vinyl signs. Mesh signs must meet the color, daytime luminance, and non-reflective requirements of Section 994, Type VI. Use Type IV sheeting for fluorescent orange work zone signs. Use Type IV and Type XI sheeting for all other work zone signs.

990-9 Temporary Raised Rumble Strips.

990-9.1 General: Temporary raised rumble strips shall meet the physical display and operational requirements in the MUTCD for temporary raised rumble strips and be listed on the APL. The temporary raised rumble strip may be either a removable striping type or a portable type described below:

990-9.1.1 Removable Striping Type:

Table 990-2	
Characteristic	Requirement
Composition:	Removable Polymer Striping Tape with pre-applied adhesive
Color:	White, Black or Orange
Cross-section:	0.25 in. to 0.50 in. (height) x 4 in. (wide)

990-9.1.2 Portable Type:

Table 990-3	
Characteristic	Requirement
Composition:	Molded Engineered Polymer, Steel or Aluminum
Weight	Internally ballasted to a minimum of 100 lbs. to maintain position in use without the use of adhesives or mechanical fasteners
Color:	White, Black or Orange
Shape	Beveled on the leading edge
Cross-section:	0.625 in. to 0.875 in. (height) x 12 in. to 14 in. (wide)

990-10 Temporary Barrier.

Producers of temporary concrete barrier seeking inclusion on the Department's Production Facility Listing shall meet the requirements of Section 105.

Manufacturers seeking evaluation of proprietary temporary barrier systems for inclusion on the APL must meet MASH TL-3 criteria and submit the following:

1. Product drawings, signed and sealed by a Professional Engineer registered in the State of Florida, which at a minimum must include:

a. Freestanding and anchored details, as appropriate

b. Section views and tables showing required setback distance (deflection space) for all installation configuration options

c. Alignment and Length of Need requirements

d. Transition and overlap details

e. End treatment details

2. Installation manuals

3. Crash testing reports

4. All relevant FHWA Eligibility Letters

990-11 Temporary Crash Cushion (Redirective or Gating).

Manufacturers seeking evaluation of crash cushions for inclusion on the APL must meet MASH TL-2 or TL-3 criteria and submit the following:

1. Product drawings, signed and sealed by a Professional Engineer registered in the State of Florida, which at a minimum must include:

a. Anchorage details for both the crash cushion and abutting temporary barrier

b. Tables showing the relevant system information and lengths for all options

c. Length of need location

d. Transition details

e. List of all components

2. Installation manuals

3. Crash testing reports

4. All relevant FHWA Eligibility Letters

990-12 Truck Mounted Attenuators and Trailer Mounted Attenuators:

Equip truck mounted and trailer mounted attenuator units with lights and reflectors in compliance with applicable Florida motor vehicle laws, including turn signals, dual tail lights, and brake lights. Ensure that lights are visible in both the raised and lowered positions if the unit is capable of being raised.

Install either alternating black with yellow or white with orange sheeting on the rear of trailer mounted attenuators and truck mounted attenuators in both the operating and raised position. Use Type III (work zone) or Type IV sheeting consisting of 4 or 6 inch wide stripes installed to form chevrons that point upward. All sheeting except black must be retroreflective.

Manufacturers seeking evaluation of truck mounted attenuators or trailer mounted attenuators for inclusion on the APL must meet the MASH TL-2 or TL-3 criteria and submit the following:

1. Minimum and maximum support vehicle weights

2. User manuals

3. Crash testing reports

4. All relevant FHWA Eligibility Letters

990-13 Channelizing Devices.

990-13.1 General: Provide channelizing devices in accordance with the MUTCD and the dimensions shown in the Standard Plans.

990-13.2 Product Application: Manufacturers seeking inclusion of channelizing devices on the APL shall submit the following:

1. For Cones, Drums, and Temporary Tubular Markers:
    a. Photographs
    b. Drawings of sufficient detail to distinguish between similar devices
    c. Manufacturer self-certification of MASH compliant
2. For Barricades and Vertical Panels:
    a. Installations Instructions
    b. Photographs
    c. Drawings (may be included in Installation Instructions) of sufficient detail to distinguish between similar devices
    d. Any field assembly details and technical information necessary for proper application and installation
    e. Crash testing reports demonstrating the device meets MASH TL-3
    f. All relevant FHWA Eligibility Letters

990-14 Pedestrian Longitudinal Channelizing Devices.

990-14.1 General: Provide pedestrian Longitudinal Channelizing Devices (LCDs) in accordance with the MUTCD and the Standard Plans.

990-14.2 Product Application: Manufacturers seeking inclusion of pedestrian LCDs on the APL must submit the following:

1. Installations Instructions
2. Photographs
3. Drawings (may be included in Installations Instructions) of sufficient detail to distinguish between similar devices
4. Any field assembly details and technical information necessary for proper application and installation
5. Crash testing reports demonstrating the device meets MASH TL-3
6. All relevant FHWA Eligibility Letters

990-15 Flagger Equipment.

990-15.1 STOP/SLOW Paddles: Provide STOP/SLOW paddles with rigid handles in accordance with the MUTCD and the Standard Plans.

990-15.1.1 Product Application: Manufacturers seeking inclusion of STOP/SLOW Paddles on the APL must submit the following:

a. Photographs or drawings of sufficient detail to distinguish between similar devices
b. Manufacturer self-certification of MASH compliance

990-16 Portable Temporary Lane Separator.

990-16.1 General: Provide portable temporary lane separator in accordance with the Standard Plans and must come in connectable sections of 36 inches to 48 inches in length.

990-16.2 Product Application: Manufacturers seeking inclusion of portable temporary lane separator on the APL shall submit the following:

1. Installations Instructions
2. Photographs
3. Drawings (may be included in Installation Instructions) of sufficient detail to distinguish between similar devices

4. Any field assembly details and technical information necessary for proper application and installation

5. Crash testing reports demonstrating the device meets MASH TL-3

6. All relevant FHWA Eligibility Letters

990-17 Type III Barricade.

990-17.1 General: Provide type III barricades in accordance with the requirements of the MUTCD and the dimensions shown in the Standard Plans.

990-17.2 Product Application: Manufacturers seeking inclusion of type III barricades on the APL shall submit the following:

1. Installations Instructions

2. Photographs

3. Drawings (may be included in Installation Instructions) of sufficient detail to distinguish between similar devices

4. Any field assembly details and technical information necessary for proper application and installation

5. Crash testing reports demonstrating the device meets MASH TL-3

6. All relevant FHWA Eligibility Letters

240 Transportation Management Plan

240.1 General

A Transportation Management Plan (TMP) is required for minimizing activity-related traffic delay and crashes. The goal of a TMP is to reduce congestion during construction by managing traffic through the project area. For TMPs, significant projects are defined as:

(1) A project that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts.

(2) All Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures.

Significant projects may require a multi-discipline TMP team to plan, coordinate, implement, monitor, and evaluate the details of TMP elements. Depending on the project logistics, the team composition may include FHWA, local government, and business representatives.

Complete the Transportation Management Plan Form, ***Form 240*** (See ***FDM 103***). This form is required for all projects (significant or not) to document compliance with the ***CFR 23, Part 630, Subpart J***.

240.1.1 TMP Reference Documents

Comply with the following documents for the development of TMPs:

(1) ***Manual on Uniform Traffic Control Devices for Streets and Highways***, (***MUTCD***), ***Part VI***

(2) ***Policy on Geometric Design of Highways and Streets, AASHTO***

(3) ***Roadside Design Guide, AASHTO, Chapter 9***

(4) ***Standard Plans***, ***102 Series*** and ***711-002***

(5) ***FDOT Standard Specifications for Road and Bridge Construction*** (***Standard Specifications***)

(6) ***Basis of Estimates Manual***

(7) ***FDOT Accessing Transit Handbook, Chapter 4.6.***

(8) ***AASHTO Guide for the Development of Bicycle Facilities, 4th Edition, Chapter 7***

(9) ***Traffic Analysis Handbook***

240.1.2 TMP Components

A TMP consists of strategies to manage the work zone impacts of a project. The scope, content, and degree of detail will vary based upon the expected work zone impacts of the project. A TMP may include the following three components:

- Temporary Traffic Control Plan
- Transportation Operations Plan
- Public Information Plan

240.2 Temporary Traffic Control Plan

A Temporary Traffic Control Plan (TTCP) is required for all work zones within, or adjacent to highways, roads and streets as specified by Florida Statute and Federal regulations. Typical applications of some commonly encountered situations are shown in the MUTCD. Some of these typical applications have been modified by the ***Standard Plans, 102 Series***. Most work zones will require further development of the typical applications to address project-specific conditions.

240.2.1 TTCP Details

240.2.1.1 Emergency Shoulder Use

The requirements for Emergency Shoulder Use (ESU) outlined in ***FDM 211.4.6*** must be maintained during all phases of construction. A Design Variation to omit ESU evacuation requirements for any phase of construction must be approved by the Chief Engineer.

240.2.1.2 Work Zone Speed

Work zone speed is used with the ***Standard Plans, 102 Series***, and to select geometric elements within the project limits.

Work zone speed should be the existing posted speed. The existing posted speed is defined as the posted speed prior to the start of any work zone activity. A reduction from

the existing posted speed should only be made when geometric constraints make it necessary or when implementing the Motorist Awareness System (MAS) in accordance with ***FDM 240.2.2.12*** and ***Standard Plans, 102 Series***. Include the justification for reduction in existing posted speed in the project documentation (see ***FDM 111.7***). The TTCP and the project documentation will suffice as a traffic and engineering investigation.

A work zone speed more than 10 mph below the existing posted speed requires the approval of the District Traffic Operations Engineer, and the District Director of Transportation Operations.

A work zone speed below the minimum statutory speed for the class of facility is prohibited.

For projects with interspaced work activities (such as interstate resurfacing), locate speed reductions in proximity to those activities which merit a reduced speed, and not "blanketed" for the entire project.

240.2.1.3 Tapers

Transitions and tapers should be obvious to drivers. If sight distance is restricted (e.g., a sharp vertical or horizontal curve), the taper should begin well in advance of the view obstruction.

Temporary traffic control devices at intersections must provide sight distances for the road user to perceive potential conflicts and to traverse the intersection safely.

See the ***Standard Plans, 102 Series*** for taper length requirements.

See ***FDM 210*** for required sight distance using the work zone speed.

240.2.1.4 Superelevation

The minimum radii where superelevation is not necessary are provided in ***Table 240.2.1.***

When superelevation is provided, specify the superelevation in accordance with ***FDM 210***.

Table 240.2.1 Minimum Radii for Normal 0.02 Cross Slopes

Minimum Radii for Normal Cross Slopes (Feet)									
Work Zone Speed (mph)									
25	30	35	40	45	50	55	60	65	70
290	430	610	820	1080	1390	1840	2400	3130	4090

For Turnpike Projects, use superelevation criteria described in ***FDM 210*** and ***211***.

240.2.1.5 Lane Widths

See ***Standard Plans*****, *102 Series*** for lane width requirements.

240.2.1.6 Lane Closure Analysis

Lane closure analysis is a process used to calculate the peak hour traffic volume and the restricted capacity for open road and signalized intersections. The analysis will determine if a lane closure should be allowed and the times during which a lane closure can occur without causing excessive travel delay.

Common uses for lane closures include:

- Reconstruction, rehabilitation, or resurfacing of travel lanes or shoulders
- Provide lateral offset to the work area
- Staging of construction equipment
- Bicycle and pedestrian accommodations

Many roadways have directional peak hour traffic volumes, with inbound morning traffic, and outbound afternoon traffic. A composite lane closure analysis would, in many cases, require night work or create very short allowable lane closure periods. If a lane closure analysis is calculated for inbound and outbound separately, night work may be avoided and longer lane closure periods may be allowed.

On limited access facilities, include a traffic analysis of any ramp affected by the lane closure.

When a closure of one or more lanes is necessary, provide an allowable lane closure duration of at least one ten-hour period per 24-hour work period. Approval by the State Roadway Design Engineer is required when at least one ten-hour-period per 24-hour work period cannot be provided.

A lane closure duration of more than one calendar day on limited access facilities is prohibited. If a lane closure duration of more than one calendar day on limited access facilities is unavoidable, obtain approval from the District Secretary or Turnpike Executive Director.

See ***FDM 241*** for the lane closure analysis process and worksheet example.

240.2.1.7 Traffic Pacing

Traffic pacing is a temporary traffic control technique that allows short duration work operations by pacing traffic at a slow speed upstream of the work zone. The Department frequently allows this technique for:

- Installing overhead sign structures
- Replacing sign panels
- Placing bridge beams
- Installing utility crossings

See the ***Standard Plans*** for additional traffic pacing information.

Specify traffic pacing restrictions for all multilane roadways with a work zone speed of 50 mph or greater. See ***FDM 242*** for the procedure for calculating the traffic pacing restrictions.

Obtain District Traffic Operations Engineer approval prior to adding traffic pacing into the TTCP.

For limited access roadways, include a contingency plan in the event that the construction activities last longer than the allowable pacing timeframe. This plan must note that it will only be used at the direction of the Construction Project Manager.

240.2.1.8 Detours, Diversions, and Lane Shifts

Detour: A redirection of motorized and non-motorized traffic onto an alternate route, using state roads or local (county or city) roads, to bypass the work zone.

Diversion: A redirection of motorized and non-motorized traffic onto temporary pavement adjacent to the existing or permanent roadway.

Lane Shift: The redirection of motorized and non-motorized traffic onto a different section of the permanent roadway or shoulder.

Design detours, diversions, and lane shifts in accordance with ***FDM 240.2.1.9*** and the following:

- Maintain existing shoulder width where practicable, but no less than:
  - 2 feet for limited access roadways or roadways with existing pave shoulders less than 4 feet, or
  - 4 feet (i.e., maintain bicycle facility) for all other roadways.
- For offsets to barriers and special considerations (e.g., refuge areas or emergency vehicle access), see ***FDM 215***.
- Special detours from a divided highway to an undivided condition must separate opposing traffic using either temporary barrier or temporary lane separators in accordance with the ***Standard Plans***. The use of striping, RPMs, and complementary signing, either alone or in combination is not considered acceptable for separation purposes.
- Minimize interruption of local transit operations and coordinate with emergency services.
- For diversions on high-speed multilane facilities, place cross-slope break overs on lane lines except when the lane is actively transitioning.
- Meet the requirements in ***FDM 211*** for lane cross slopes on limited access facilities.
- Pavement drop offs must be no more than 2 inches away from a lane line.
- Check spread to verify that the provided shoulder width complies with the criteria in ***Chapter 3.9.1*** of the ***FDOT Drainage Manual***.

Ramps that service tandem trucks must entirely accommodate the WB-109D truck turning radius within the longitudinal pavement markings of each lane.

In addition to the requirements above, design detours in accordance with the following:

- Detour signing must convey clear direction allowing users to safely traverse the entire detour and return to the original path of travel.
- When developing a detour, consider the type of motorized traffic being routed (e.g., vertical clearance for large vehicles). Do not route large vehicles through a U-turn.

- Consider the structural capacity of the detour pavement.
- Obtain concurrence from the local agency when detours are to utilize local roadways.
- Include truck turning templates and AutoTurn Analysis in the TTCP design documentation.

240.2.1.9 Bicycle, Pedestrian, and Transit Accommodation

Include accommodations for the following road users of all ages and abilities in the TTCP:

- Pedestrians
- Bicyclists
- Transit users

Provide accommodations on Florida National Scenic Trail and SUN Trail.

ADA requirements apply during TTC. Include provisions for the disabled at the same level of accessibility as the existing facility or greater. See ***Standard Specifications*****, *Section 102*** and ***FDM 222, 225*** for more information.

Minimize impacts to existing bicycle, pedestrian, and transit facilities by preserving the following to the extent feasible:

- Safety features
- Connectivity of the facilities to and through the project
- Directness of the routes

Incorporate the following requirements into the TTCP:

Design Principles for Temporary Bicycle and Pedestrian Facilities:

(1) Provide like-for-like bicycle and pedestrian facilities to the maximum extent possible. When this cannot be accomplished for bicycle facilities, separate motorized traffic from bicycle traffic whenever possible. The higher the volumes of motorized traffic or percentage of truck traffic and the longer the duration of construction, the more substantial the separation should be.

Specify temporary bicycle ways that replicate the geometric characteristics of the existing bicycle way. For example, a separated bicycle facility should remain

separated during construction. See ***FDM 223*** for more information on separated bicycle facilities.

(2) Phase the construction plans to ensure bicycle and pedestrian facilities are only closed when necessary. See ***FDM 921*** for more information on phasing.

(3) See ***Standard Plans, Series 102*** for additional information and requirements on pedestrian facilities in work zones.

(4) Provide temporary barrier per ***FDM 215*** where temporary pedestrian ways divert pedestrian traffic to be immediately adjacent to vehicular traffic (e.g., a paved shoulder) or when a separated bike lane has been moved. This does not apply to temporary pedestrian ways behind curb.

(5) Ensure work zones adjacent to sidewalks or temporary pedestrian ways provide separation between pedestrians and the work area.

Location of Temporary Routes for Pedestrians and Bicyclists:

(1) Do not lead pedestrians or bicyclists into direct conflicts with vehicles, equipment, or operations.

(2) Keep detour lengths and diversions as short as practicable.

(a) Detours should not create more than a 30% increase in the length of the non-motorized facility, or not longer than 0.5 miles for bicyclists or 0.25 miles for pedestrians.

(b) To minimize the detour length, consider providing a temporary mid-block crosswalk instead of detouring pedestrians to the nearest signalized intersection or existing crosswalk.

(3) The order of preference for routing:

(a) Maintain facility on the same side of the road.

i. Narrow the temporary bicycle way or temporary pedestrian way if needed.

ii. Consider closing one lane of motorized traffic to accommodate non-motorized traffic of bicycle or pedestrian facilities with high usership. Separate motorized traffic from pedestrians by providing a temporary barrier where feasible per ***FDM 215,*** or by providing LCDs to delineate the temporary pedestrian path.

iii. If the existing bicycle facility is a shared use path or separated bike lane and separation for bicyclists, such as a temporary bike lane, is

not possible, then bicyclists may be directed onto a temporary or permanent pedestrian way of a min. width of 8 feet.

iv. When the existing bike facility is a bicycle lane, marked shoulder, or paved outside shoulder 4' or greater in width, and the work zone speed is 35 mph or less, then bicyclists may be directed onto the travel lane. Provide portable changeable message signs (PCMS) letting motorists know bicyclists will be detoured onto the road, per ***FDM 243***. For example:

- Bike Facility Closed, Bicycles on Road
- Bike Detour Ahead, Bicycles on Road

(b) Diversion to the opposite side of the road. Return to original side of road as soon as possible. For two-lane two-way work within the traveled way, additional bicycle accommodations are not necessary. Standard flagging procedures allow bicyclists to use the opposite shoulder.

i. Phase the construction so bicycle or pedestrian facilities will be open on the other side of the road if facilities cannot be provided on the same side of the road.

ii. Choose crossing points with adequate stopping sight distance.

iii. If using temporary midblock crossings, meet the criteria in the ***TEM*** for permanent midblock crosswalks. Consider the use of temporary traffic signals or RRFBs with temporary midblock crossings. See ***FDM 240.2.2.8*** and the ***TEM*** for more information.

iv. Warn motorized and non-motorized traffic there are extra pedestrian or bicycle crossings through portable changeable message signs (PCMS) per ***FDM 243***. For example:

- Bike Detour Ahead, Ped Detour Ahead
- Use Caution, People Crossing Ahead
- Use Caution, Bicycle Crossing Ahead
- Use Caution, Ped Bike Crossing Ahead
- Use Caution, New Xwalks Ahead
- Use Caution, New Cross Walks
- Use Caution, New Xwalks 500 Ft

v. Facilitate left turns for bicyclists. Consider whether accommodations can be made for two-stage left turns where appropriate.

(c) Detour to another road. Return to original road and side of road as soon as possible.

i. Coordinate with the owner of the facility pedestrians or bicyclists will be detoured onto.

ii. Notify motorists on the detoured road through portable changeable message signs (PCMS) per ***FDM 243*** if there are additional crossings or if bicyclists will be detoured to a shared lane condition. Motorists may not be aware of the construction project that has caused the need for re-routing. For example:

- Bike Facility Closed, Bicycles on Road
- Bike Detour Ahead, Bicycles on Road
- Use Caution, People Crossing Ahead
- Use Caution, Bicycle Crossing Ahead
- Use Caution, Ped Bike Crossing Ahead
- Use Caution, New Ped Xing Ahead
- Use Caution, New Cross Walks
- Use Caution, New Xwalks 500 Ft

Transit Users:

Ensure provision is made to allow transit users to access transit stops, and to board and depart transit vehicles safely. Temporary transit access must include provisions for the disabled at the same level of accessibility as the existing facility or greater. See FDOT's ***Accessing Transit Handbook*** for guidance on transit stops.

240.2.1.10 Railroads

Ensure that the TTCP does not cause queuing of traffic across railroad tracks. Evaluate the signal timing, tapers, lane closures and distance to intersections as compared to projected peak traffic volumes. Evaluate the effects of the TTCP on interconnected traffic signals and railroad signals to avoid conflicting or ineffective signal controls.

240.2.1.11 Utilities

If contract utility work is anticipated in conjunction with or during the highway construction, the TTCP must account for and adequately protect all work activities. The phasing of construction activities must be compatible with the utility work. Utilities, whose work affects traffic, are required by FHWA to provide a TTCP. This requires early and effective coordination with utilities.

240.2.1.12 Existing Traffic Signals

Adjust signal heads to maintain proper position when lane shifts are necessary and determine the need for temporary vehicle detection. Coordinate required modifications to existing traffic signal operations with the District Traffic Operations Engineer and show signal adjustments in the TTCP.

Provide signal installation plans that specify the preliminary phasing and timing for each phase of construction in the TTCP. Include project specific requirements (e.g., equipment harmonization or operational responsibilities), in the Technical Special Provisions. Signal displays and location must meet ***MUTCD*** requirements.

240.2.1.13 Roadside Hazards

See ***FDM 215*** and ***Standard Plans, 102 Series*** for information on the shielding of roadside hazards.

240.2.1.14 Drop-offs in Work Zones

See ***Standard Plans, 102 Series*** for requirements related to drop-offs in work zones.

240.2.1.15 Bridge Construction

To facilitate the development of an optimal design minimizing traffic disruption and construction costs, the roadway engineer and structures engineer must collaborate with each other prior to completion of Phase I roadway plans or the Bridge Development Report (BDR), whichever is earlier. For very complex urban projects, this collaboration should begin as early as the PD&E phase of the project.

Modification for Non-Conventional Projects:
Delete ***FDM 240.2.1.15*** and replace with the following: **240.2.1.15 Bridge Construction** To facilitate the development of an optimal design minimizing traffic disruption and construction costs, collaboration between the roadway engineer and structures engineer is required.

240.2.1.16 Emergency Pull Off Area

For long-term TTC operations on Limited Access roadways, include a paved emergency pull off area when the shoulder width is reduced to less than eight feet for a distance of one mile or more. The preferred location is to the right of the outside travel lane. Coordinate these locations with the District Traffic Operations Engineer to accommodate road users and emergency personnel.

The emergency pull off area must meet the following:

- Minimum of twelve feet wide and 500 feet long
- Located every ½ to 1 mile, but not closer than ½ mile from an interchange
- Maintain the adjacent lane or paved shoulder cross slope
- Include chevron pavement markings at 60-foot spacing
- Do not locate an emergency pull off area near an ingress/egress location for the contractor.

240.2.2 Temporary Traffic Control Devices

The ***MUTCD*** contains detailed instructions on the use of traffic control devices. Special design considerations applicable to Florida are discussed in the following sections.

Temporary traffic control devices should not be placed in locations where they will block or interfere with transit stops, pedestrians, or bicycle traffic.

240.2.2.1 Signs

The following types of signs are encountered in temporary traffic control:

- Work Zone Signs
- Existing Signs

Work Zone Signs:

Work zone signs are typically post mounted in accordance with ***Standard Plans***, ***102 Series***.

Signing for the control of traffic entering and leaving work zones by way of intersecting roadways must be adequate to inform drivers, cyclists, and pedestrians of work zone conditions. At a minimum, provide a "Road Work Ahead" sign.

If the work zone interrupts the continuity of an existing bicycle or pedestrian way, then provide signs directing non-motorists alongside or around the work zone and back to the bicycle or pedestrian way.

See the ***Standard Plans***, *102 Series* for required work zone signs and placement.

Existing Signs:

Specify covering, removing, or relocating existing regulatory or warning signs that conflict with the TTCP, or to complement the work zone conditions (e.g., if a stop sign on an existing side road is needed, use the existing sign and show the location that it is to be relocated to).

Modify existing guide signs to show changes made necessary by the construction operations. If existing guide signs are to be removed during construction, make provisions for temporary guide signing. The temporary sign should be black on orange with the legend designed in accordance with ***MUTCD*** requirements for permanent guide signing.

240.2.2.2 Work Zone Pavement Markings

Specify the use of work zone pavement markings in accordance with ***FDM 230*** and ***Standard Specifications, Section 102***.

240.2.2.3 Temporary Raised Pavement Markers

Temporary Raised Pavement Markers (RPMs) are used to supplement work zone pavement markings in accordance with ***Standard Plans*****, *102 Series*** and ***Standard Specifications*****, *Section 102***.

240.2.2.4 Channelizing Devices

Channelizing devices direct road users through the work zone. Specify the use of channelizing devices in accordance with the ***Standard Plans*****, *102 Series*** and ***Standard Specifications*****, *Section 102***.

240.2.2.5 Pedestrian Longitudinal Channelizing Devices

Specify the use of pedestrian Longitudinal Channelizing Devices (LCDs) for the following situations:

- At each closed pedestrian way location, for the full width of the pedestrian way
- In locations where a drop-off hazard exists (see ***Standard Plans*****, *102 Series*)**
- In locations where the active work zone is within 2 feet of the sidewalk or pedestrian walkway
- Along both sides of a temporary pedestrian way
    - Pedestrian LCDs are not required on sides where an existing or temporary barrier delineates the temporary pedestrian way.

240.2.2.6 Arrow Boards

Specify the use of arrow boards to supplement other devices for lane closures on multilane roadways. Refer to the ***MUTCD*** for further information.

240.2.2.7 Portable Changeable Message Signs

Specify the use of Portable Changeable Message Signs (PCMS) as a supplemental device to provide road users with the following information:

(1) Construction schedules

(2) Alternate routes

(3) Expected delays

(4) Detours, diversions, and lane shifts

A PCMS is not to be used to replace any required sign or other device. See ***FDM 243*** for requirements in determining the appropriate uses and messages for the PCMS.

240.2.2.8 Temporary Traffic Signals

Design and detail temporary poles and span wire assemblies for temporary traffic signals using the following criteria:

(1) Design temporary signal supports for an 80-mph wind speed. See ***Structures Manual, Volume 3*** for additional requirements.

(2) See Lateral Offset Criteria in ***FDM 215*** for placement of temporary traffic signal supports.

Provide sufficient signal timing for pedestrians where a pedestrian crossing is present.

Include temporary traffic signals in the TTCP in accordance with ***FDM 240.2.1.12***.

240.2.2.9 Type III Barricades

Specify the use of type III barricades to close or partially close a roadway or ramp. Two barricades are typically used for a 12-foot-wide lane. One barricade should be used for lanes less than 12 feet in width.

240.2.2.10 Temporary Barrier

See ***Standard Plans, 102 Series*** and ***FDM 215*** for temporary barrier requirements.

240.2.2.11 Law Enforcement Officers

Law enforcement officers are used to heighten the awareness of passing vehicular traffic and to improve safety through the work zone. The following types of law enforcement officer are used in temporary traffic control:

- Speed and Law Enforcement Officer
- Traffic Control Officer

Speed and Law Enforcement Officer:

Speed and law enforcement officers are used to control the speed of motorists in the work zone. Speed and law enforcement officers should be considered for the following work zone conditions:

(1) Speed reductions

(2) Temporary barrier adjacent to through traffic

(3) Nighttime work

(4) Workers exposed to high-speed traffic

For limited access facilities, coordinate with District Construction when encountering the above criteria. Speed and law enforcement officer use on arterials and collectors requires approval from the District Director of Transportation Operations.

Traffic Control Officer:

Traffic control officers are used to increase the visibility of the work zone or work operation. Uniformed law enforcement officers are respected by motorists, cyclists, and pedestrians. Utilize traffic control officers as a supplement to traffic control devices to assist in traffic movements and provide a safer work zone.

Specify the use of traffic control officers in accordance with ***Standard Specifications*, *Section 102***.

240.2.2.12 Motorist Awareness System

A Motorist Awareness System (MAS) is used to alert motorists to the presence of an active work zone and to emphasize reduced speed limits. A MAS consists of the following devices:

- Portable Regulatory Sign
- Radar Speed Display Unit

Specify the use of a MAS in accordance with ***Standard Plans* 102-613.**

For a posted speed of 65 mph or greater, reduce the work zone speed by 10 mph. For a posted speed of 60 mph, use a work zone speed of 55 mph.

Portable Regulatory Sign:

A Portable Regulatory Sign (PRS) is used to highlight the work zone speed. A portable regulatory sign consists of a speed limit sign with flashing lights mounted on a portable trailer. The flashing lights are intended to draw attention to the speed limit sign.

Radar Speed Display Unit:

A Radar Speed Display Unit (RSDU) is used to display a motorist's current speed. A radar mounted on the unit detects the speed and relays it to a LED display panel adjacent to a static speed limit sign.

240.2.2.13 Temporary Raised Rumble Strips

Temporary raised rumble strips are used to warn vehicular traffic of the upcoming work zone. Specify the use of temporary raised rumble strips when both of the following conditions occur:

- Lane closure on a two-lane, two-way roadway
- Existing posted speed prior to construction is 55 mph or greater

240.2.2.14 Temporary Lane Separator

Temporary lane separator should be used to separate opposing traffic on previously divided roadways with a work zone speed of 45 mph or less.

See ***Standard Plans*, *102 Series*** for temporary lane separator details.

240.2.2.15 Temporary Highway Lighting

When practical, existing highway lighting is to remain in service during all phases of construction or until new lighting is installed and placed in service. Temporary highway lighting is not required where it is necessary to remove existing lighting before new lighting is placed in service.

Use temporary highway lighting at the District's discretion. For example, Districts may determine that temporary highway lighting is warranted for areas such as interchanges or other large roadways with complex vehicle movements. When temporary highway lighting is used, provide plans content per ***FDM 943*** and comply with the following:

(1) Meet the lighting criteria in ***Table 231.2.1,*** except that the illumination levels may be lowered to a range of 0.8 to 1.0 foot-candles at the District's discretion. Leeway may be given for lighting values given the temporary nature.

(2) Position lights as high as practical, with consideration for avoiding glare.

(3) Meet minimum lateral offset criteria in ***Table 215.2.2***.

(4) Utilize structural supports that are crashworthy or shielded by a crashworthy barrier that was installed for other purposes.

(5) Utilize structural supports that are attached to and located behind permanent or temporary concrete barriers (or traffic railings) as follows:

(a) Do not install temporary barrier for the sole purpose of supporting or protecting the temporary lighting system.

(b) Do not locate structural supports for temporary lighting on the back side of permanent or temporary barriers/traffic railings; i.e., which face away from traffic, where the back side of the barriers/traffic railings are within the work zone clear zone (per ***Standard Plans, 102 Series***) of other traffic lanes.

(c) Attach structural supports to the back face of temporary and permanent barriers/traffic railings using brackets that do not protrude above the top of the barrier/traffic railing.

(d) Use undercut anchor systems designed in accordance with ***Structures Design Guidelines*** ***Section 1.6*** to attach brackets to barriers/traffic railings. Position anchors so as to avoid the reinforcing steel within the barrier/traffic railing.

(e) Design the luminaire pole, support brackets, and anchors for an 80-mph wind speed.

(f) Do not design luminaire pole, support brackets and anchors for vehicular impact loads.

(g) For structural supports attached behind permanent concrete barriers/traffic railings, provide a minimum setback distance from the top edge of the traffic face of the barrier/traffic railing to the traffic face of the luminaire pole in accordance with ***FDM 215***.

(h) For structural supports attached to and located behind ***Standard Plans, 102 Series*** (Type K Temporary Concrete Barriers), provide a minimum setback distance of 1'-6" from the top edge of the traffic face of the barrier to the traffic face of the luminaire pole, mounted behind the barrier. To minimize the potential for damaging reinforcing steel during the installation of the anchors, attach brackets within the middle portion, where there is

large spacing between the vertical steel reinforcing bars, of the Type K Barrier Unit.

(i) Temporary lighting must only be attached to a continuously anchored Type K Temporary Concrete Barrier System.

(j) The supports attached to Type K Temporary Concrete Barrier must not encroach into the required deflection distance when the barrier is protecting an above ground hazard.

(6) For temporary highway lighting near a wildlife area of concern (as determined by the Environmental Management Office), comply with the Wildlife-Sensitive Lighting criteria in ***FDM 231***.

240.2.2.16 Overhead Bridge Related Construction Activities

There are several overhead work activities that must be executed without traffic below. ***Table 240.2.2*** provides typical work durations for common overhead bridge related work activities. The work activity durations given in the table assume a best-case scenario in which the Contractor has optimized resources and work planning in advance to minimize traffic disruption.

Table 240.2.2 Typical Durations for Overhead Bridge Work

Work Activity	Duration
Bridge Demolition	2 to 3 days per span
Beam Placement Simple Span	30 minutes per beam
Beam Placement Continuous Steel I-Beam	60 minutes per beam
Beam Placement Continuous Steel Box Girder	90 minutes per girder, depending on the complexity of the connections
Form Placement	4 hours per lane
Deck Concrete Placement	3 hours per span
Span Sign Structure Placement	20 to 25 minutes per structure
Segment Placement from Land Based Cranes (Balanced Cantilever)	2.5 hours per segment

240.2.2.17 Temporary Structures

The use of temporary structures is often required to allow for the installation of the permanent structure. Temporary structures commonly used for the construction of highway structures include temporary stability towers and temporary sheet pile walls.

Temporary stability towers are commonly used for the erection of segmental bridges constructed in balanced cantilever, steel plate girders, and steel box girders. Temporary sheet pile walls are commonly used for the construction of pier footings or to facilitate the installation of MSE wall straps. It is important to show the location of all temporary structures in each phase of the TTCP to assure there are no conflicts. See ***FDM 215*** to determine if temporary structures must be shielded.

240.2.2.18 Temporary ACROW Bridge

When using a temporary ACROW bridge, include "Legal Weight Only" sign in accordance with ***Standard Plans, Index 700-102*** and ***Index 700-107***. Specify "Slippery When Wet" (W8-5) signs in advance of all temporary ACROW bridges when an asphalt overlay is not used. See ***Standard Plans, 102 Series*** and the associated ***Standard Plans Instructions*** (***SPI 102-200 for the 300 Series and 102-201 for the 700 Series***) for more information.

For limited access facilities, the ACROW Series 700 bridging must be used. All temporary bridges require a project-specific foundation design.

Coordinate with the State Maintenance Office in a timely fashion because there is a limited quantity of Department-owned temporary ACROW bridges available.

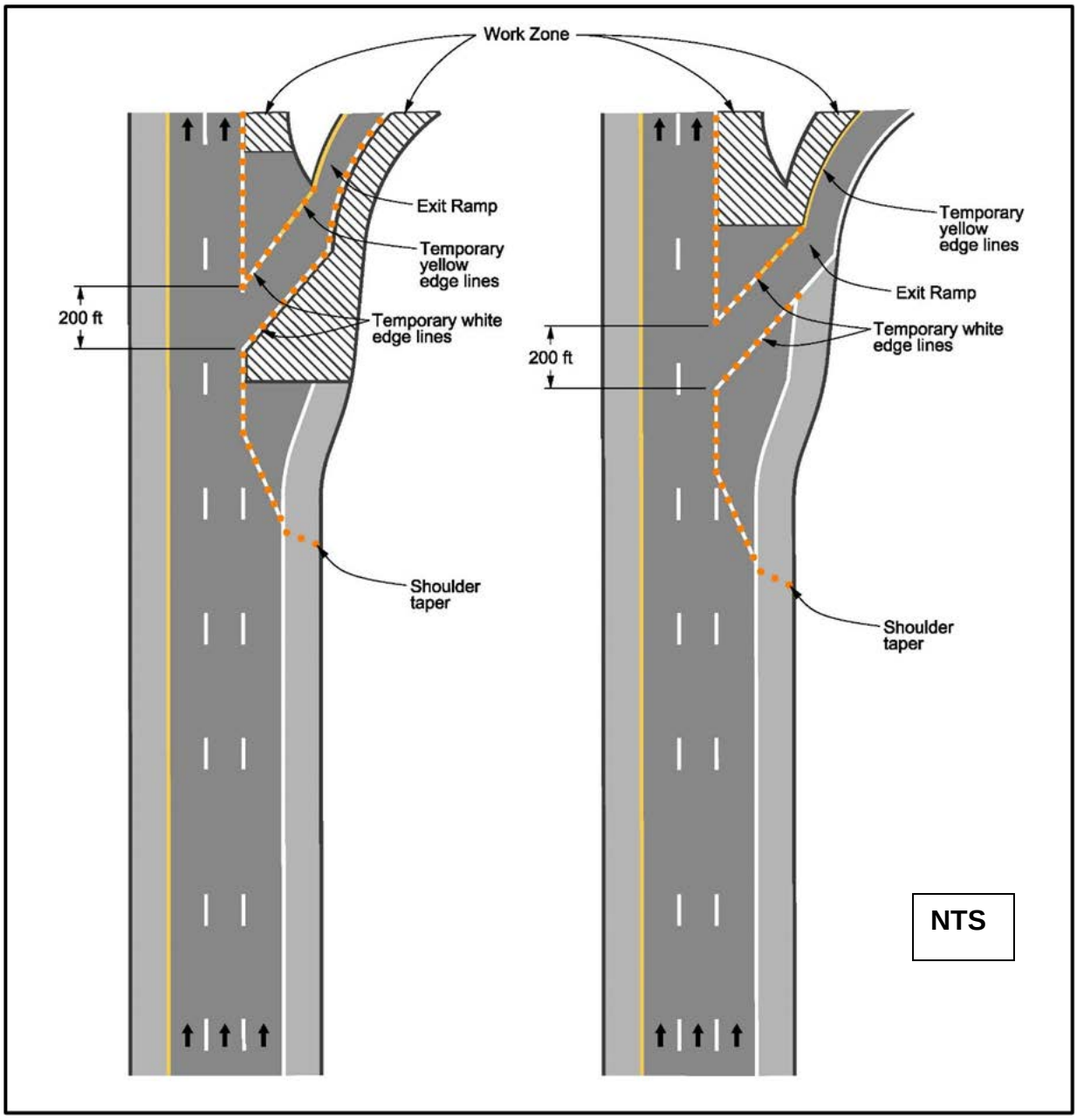
240.2.2.19 Short-Term Raised Rumble Strip Sets

In locations with existing raised rumble strip sets (e.g., intersections, approaches to horizontal curves, toll plazas), maintain or replace the raised rumble strip sets throughout construction. Provide short-term raised rumble strip sets when existing raised rumble strip sets are removed for construction activities, until the permanent raised rumble strip sets are installed. Short-term raised rumble strip sets must be installed prior to opening the road to traffic; therefore, quantities may include multiple applications due to construction phasing. Refer to ***Standard Plans***, ***Index 546-001*** and ***Standard Specifications, Section 546*** for additional requirements and information.

240.2.2.20 Limited Access Exit Ramp Opening

Meet the requirements of the ***MUTCD*, Part 6** for work near a limited access facility exit ramp and include a minimum ramp opening of 200 feet. See ***Figure 240.2.1***.

Figure 240.2.1 Work in the Vicinity of an Exit Ramp



240.2.2.21 Temporary Drainage

Refer to the ***FDOT Drainage Manual*** for temporary drainage criteria. Additional guidance can be found in the ***Drainage Design Guide***.

240.3 Transportation Operations Plan

The Transportation Operations Plan (TOP) contains strategies to improve mobility, work zone access, and safety. Strategies will include items such as work zone Intelligent Transportation System (ITS) components and incident management. ***Table 240.3.1*** provides common TOP items.

A TOP should be considered for significant projects, as defined in ***FDM 240.1***.

Table 240.3.1 Transportation Operations Strategies

Category			
Demand Management	**Corridor/Network Management**	**Work Zone Traffic Management**	**Safety Management and Enforcement**
Transit services improvements	Signal timing/ coordination improvements	Speed limits reduction or variable speed limits	ITS for traffic monitoring and management
Transit incentives	Temp. traffic signals	Temp. traffic signal	Transportation Management Center (TMC)
Shuttle services	Intersection improvements	Temp. barrier	Aerial surveillance
Ridesharing/ carpooling incentives	Bus turnouts	Crash Cushions	Milepost markers
Park-and-Ride promotion	Turn restrictions	Automated flagger assistance devices (AFAD)	Service patrol
HOV lanes	Truck restrictions	On-site safety training	Local detour routes
Variable work hours	Dynamic lane close system	TMP inspection team meetings	Contract support for incident management
Telecommuting	Ramp closures		Incident/emergency response plan
	Railroad crossing controls		Law enforcement
			Emergency Access, Emergency Pull Off Areas, Glare Screens

240.4 Public Information Plan

The Public Information Plan (PIP) describes how project information will be communicated to affected parties, traveling public, and project stakeholders prior to and during construction. The PIP will also describe the most efficient method of communicating this information (e.g., local media, business groups, message signs). The PIP should be integrated into the project's Community Awareness Plan (CAP) when the CAP is to include communication strategies.

A PIP should be considered for significant projects, as defined in ***FDM 240.1***.

See the following for additional information on public involvement and CAP requirements:

(1) ***FDM 104***

(2) ***Public Involvement Handbook***

(3) ***PD&E Manual***

240.5 Temporary Traffic Control Training

The Department has prescribed temporary traffic control training requirements outlined in the ***Temporary Traffic Control (Maintenance of Traffic) Training Handbook***.

241 Lane Closure Analysis

241.1 General

See ***FDM 240*** for requirements and criteria concerning lane closures.

241.2 Lane Closure Excel Program

An Excel file is available to assist in the preparation of the Lane Closure Worksheet. The program can be found at the Department's TTC Resources web page: ***TTC Resource Download Library***. The Excel worksheet is based on the methods presented in this chapter; Districts may require alternate methods.

The Excel worksheet also illustrates two examples: a widening project and a resurfacing project.

241.3 Lane Closure Symbols and Definitions

The following symbols and definitions provide detail and guidance on the variables to be entered into the Input Data Sheets. The number provided in the circle corresponds to the circled number found on the Lane Closure Worksheet in ***FDM 241.5***.

(1) ATC — Actual Traffic Counts. Use current traffic counts. Traffic counts can be obtained from the Office of Planning, or you may need to get traffic counts done. The designer needs hourly traffic volumes with a total traffic volume for a 24-hour period (see ***Figure 241.7.1***).

(2) P/D — Peak Traffic to Daily Traffic Ratio. Highest hourly volume divided by the total 24-hour volume. Convert the percentage to a decimal on the Lane Closure Worksheet (see ***Figure 241.7.1***).

(3) D — Directional Distribution of peak hour traffic on multilane roads. This factor does not apply to a two-lane roadway converted to two-way, one-lane. The directional distribution can be obtained from the Office of Planning.

(4) PSCF — Peak Season Conversion Factor. Many counties in Florida have a significant variance in seasonal traffic. Use the PSCF for the week in which the actual traffic count was conducted. The ***Transportation Statistics Office*** has tables showing Peak Season Conversion Factors for every county in Florida. These tables are found in the ***Florida Traffic***

Online mapping application by selecting “Traffic Reports” from the toolbar on the right side of the screen.

(5) RTF — Remaining Traffic Factor is the percentage of traffic that will not be diverted onto other facilities during a lane closure. Convert the percentage to a decimal on the Lane Closure Worksheet. This is an estimate that the designer must make on his own, or with help from the Office of Planning. Range: 0% for all traffic diverted to 100% for none diverted.

(6) G/C — Ratio of Green to Cycle Time. This factor is to be applied when lane closure is through or within 600 ft. of a signalized intersection. The Office of Traffic Engineering has timing cycles for all traffic signals.

(7) V — Peak Hour Traffic Volume. The designer calculates the peak hour traffic volume by multiplying the actual traffic count, times peak to daily traffic ratio, times directional factor, times peak seasonal factor, times remaining traffic factor. This calculation will give the designer the expected traffic volume of a roadway at the anticipated time of a lane closure.

(8) C — Capacity of a 2L, 4L 6L, or 8L roadway with one lane closed, and the remaining lane(s) unrestricted by lateral obstructions. The capacity of a 4L, 6L, or 8L roadway is based on lane closure in only one direction.

(9) RC — Restricting Capacity of the above facilities by site specific limitations detailed in the Temporary Traffic Control plans which apply to travel lane width, lateral clearance and the work zone factor. The work zone factor only applies to two lane roadways (see the tables in ***FDM 241.6*** to obtain the Obstruction Factor and Work Zone Factor).

(10) OF — Obstruction Factor which reduces the capacity of the remaining travel lane(s) by restricting one or both of the following components: Travel lane width less than 12 ft. and lateral clearance less than 6 ft. (see Obstruction Factor Table in ***FDM 241.6***).

(11) WZF — Work Zone Factor (WZF) is directly proportional to the work zone length (WZL). The capacity is reduced by restricting traffic movement to a single lane while opposing traffic queues. The WZF and WZL only apply to a two lane roadway converted to two way, one lane (see the Work Zone Factor Table in ***FDM 241.6***).

(12) TLW — Travel Lane Width is used to determine the obstruction factor (see the Obstruction Factor Table in ***FDM 241.6***).

(13) LC Lateral Clearance is the distance from the edge of the travel lane to the obstruction. The lateral clearance is used to determine the obstruction factor (see the Obstruction Factor Table in ***FDM 241.6***).

241.4 Lane Closure Worksheet Instructions

General Instructions are as follows:

(1) ***Lane Closure Symbols and Definitions*** (see ***FDM 241.3***) provide guidance on where to find the necessary information to fill out the lane closure worksheets.

(2) Fill out the top part of the lane closure worksheet and complete the formulas to calculate the hourly percentage of traffic at which a lane closure will be permitted.

(3) Transfer the calculated percentages to the graph on the ***Lane Closures 24 Hour Counts*** (see ***Figure 241.7.1***).

(4) Draw a line across the graph representing the percentage for both open road and signalized intersections (see ***Figure 241.7.1***).

(5) Plot the hourly percentages (hourly volume divided by total volume) on the graph. Any hourly percentage extending above the restricted capacity percentage lines for open road or signalized intersections indicates the potential for excessive delays.

(6) Lane closures should be prohibited during the time periods shown to have a potential for excessive delays.

241.5 Lane Closure Worksheet

DATE: _____

FINANCIAL PROJECT ID:_____ FEDERAL AID PROJECT NO.:_____

COUNTY:_____ DESIGNER:_____

NO. EXISTING LANES:_____ LOCATION: _____

SCOPE OF WORK: _____

Calculate the peak hour traffic volume (V)

V=ATC (1) X P/D (2) X D (3) X PSCF (4) X RTF (5) = (7)

Capacity (C) of an Existing 2-Lane – Converted to 2-Way, 1-Lane = 1400 VPH
Capacity (C) of an Existing 4-Lane – Converted to 1-Way, 1-Lane = 1800 VPH
Capacity (C) of an Existing 6-Lane – Converted to 1-Way, 2-Lane = 3600 VPH
Capacity (C) of an Existing 8-Lane – Converted to 1-Way, 3-Lane = 5400 VPH

Factors restricting Capacity:

TLW (12) LC (13) WZL (11) G/C (6)

Calculate the Restricted Capacity (RC) at the Lane Closure Site by multiplying the appropriate 2L, 4L, 6L, or 8L Capacity (C) from the Table above by the Obstruction Factor (OF) and the Work Zone Factor (WZF). If the Lane Closure is through or within 600 ft. of a signalized intersection, multiply the RC by the G/C Ratio.

RC (Open Road) = C (8) X OF (10) X WZF (11) = (9)

RC (Signalized) = RC (Open Road) (9) X G/C (6) = (9)

If V ≤ RC, there is no restriction on Lane Closure
If V > RC, calculate the hourly percentage of ADT at which Lane Closure will be permitted

$$\text{Open Road \%} = \frac{\text{RC (Open Road) (9)}}{\text{(ATC (1) X D (3) X PSCF (4) X RTF (5))}} = \_\_\_\_\_\%$$

Signalized % = Open Road % _____ X G/C (6) = _____ %

Plot 24 hour traffic to determine when Lane Closure permitted. (See ***Figure 241.7.1***)

NOTE: For Existing 2-Lane Roadways, D = 1.00.

Work Zone Factor (WZF) applies only to 2-Lane Roadways.

For RTF < 1.00, briefly describe alternate route _____
_____
_____

241.6 Lane Closure Input Data

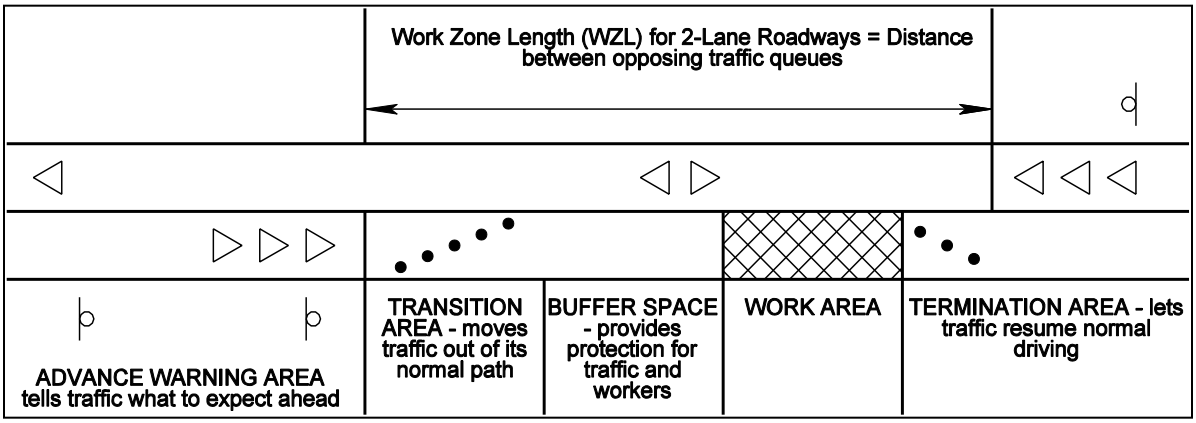
Table 241.6.1 Obstruction Factors (OF)

Lateral Clearance (LC) (feet)	Travel Lane Width (TLW) (feet)			
	12	11	10	9
6	1.00	0.96	0.90	0.80
4	0.98	0.94	0.87	0.77
2	0.94	0.90	0.83	0.72
0.0	0.86	0.82	0.75	0.65

Table 241.6.2 Work Zone Factors (WZF)

WZL (ft.)	WZF	WZL (ft.)	WZF	WZL (ft.)	WZF
200	0.99	2200	0.87	4200	0.78
400	0.97	2400	0.86	4400	0.77
600	0.96	2600	0.85	4600	0.77
800	0.95	2800	0.84	4800	0.76
1000	0.93	3000	0.83	5000	0.75
1200	0.92	3200	0.82	5200	0.75
1400	0.91	3400	0.81	5400	0.74
1600	0.90	3600	0.80	5600	0.73
1800	0.89	3800	0.80	5800	0.73
2000	0.88	4000	0.79	6000	0.72

Figure 241.6.1 Work Zone Length (WZL)



241.7 24-Hour Counts

Figure 241.7.1 24-HR Counts – Example

LANE CLOSURES

24 HOUR COUNTS

TIME	AM HOURLY VOLUME	ATC %	PM HOURLY VOLUME	ATC %
12 - 1	320	1.1	1920	6.4
1 - 2	180	0.6	1660	5.5
2 - 3	60	0.2	1620	5.4
3 - 4	50	0.2	2160	7.2
4 - 5	60	0.2	2380	7.9
5 - 6	260	0.9	2480	8.3
6 - 7	1050	3.5	1860	6.2
7 - 8	2270	7.6	1360	4.5
8 - 9	1820	6.1	1060	3.5
9 - 10	1740	5.8	850	2.8
10 - 11	1650	5.5	730	2.4
11 - 12	1920	6.4	540	1.8
		TOTAL	30,000	100

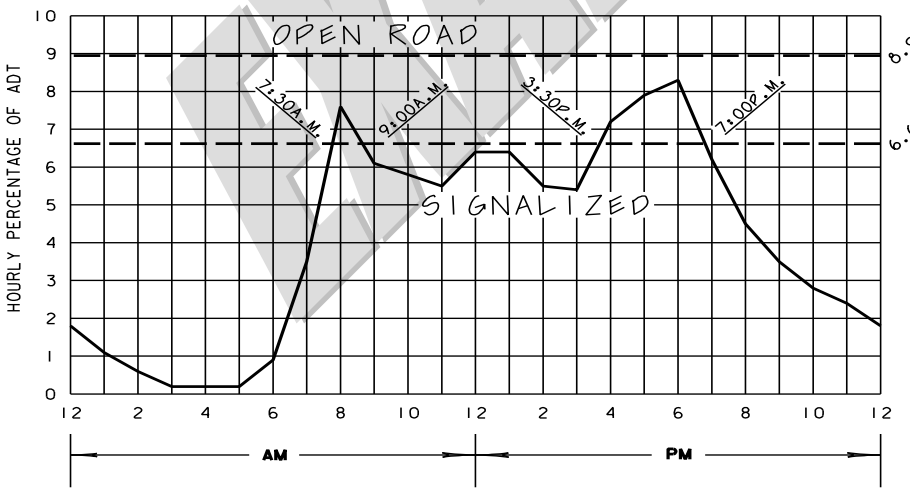
DATE
APR 19, 1998

DESIGNER
GIDDENS

FINANCIAL PROJECT ID
123456-7-89-10

LOCATION
BUCK LAKE RD.

HOURLY VARIATION OF DAILY TRAFFIC



-CONCLUSION-

ROUND TO THE NEAREST 1/2 HOUR CONSERVATIVELY

OPEN ROAD LANE CLOSURE
NO RESTRICTION

SIGNALIZED LANE CLOSURE
9:00A.M. - 3:30P.M.
7:00P.M. - 7:30A.M.

242 Traffic Pacing Design

242.1 General

See ***FDM 240.2.1.7*** for traffic pacing requirements and criteria.

242.2 Traffic Pacing Excel Program

An Excel file is available to assist in the preparation of the Traffic Pacing Report. The program can be found at the Department's temporary traffic control resources web page: ***TTC Resource Download Library***. The Excel worksheet is based on the methods presented in this chapter; Districts may require alternate methods.

The Excel file also illustrates an example of a bridge beam replacement.

242.3 Traffic Pacing Symbols and Definitions

The following symbols and definitions provide detail and guidance on the variables to be entered into the Input Data Sheets.

AADT Annual Average Daily Traffic. In lieu of actual traffic counts, use AADT provided by the Office of Planning. Adjust the AADT to peak season hourly traffic by applying the model correction factor and the hourly distribution factors.

ATC Actual Traffic Counts. Traffic counts can be obtained from the Office of Planning or collected on the project site. The designer needs hourly traffic volumes for a 24-hour period.

C Capacity. The capacity of the roadway under free flow conditions in passenger cars per hour per lane

C = 2,400 pc/h/ln for 70 mph regulatory speed

C = 2,300 pc/h/ln for 65 mph regulatory speed

C = 2,250 pc/h/ln for 60 mph regulatory speed

C = 2,220 pc/h/ln for 55 mph regulatory speed

C = 2,150 pc/h/ln for 50 mph regulatory speed

FHV Heavy-vehicle adjustment factor. This factor is used to convert hourly traffic to equivalent passenger cars. Heavy vehicles include trucks, busses and recreational vehicles.

HDF Hourly Distribution Factors. Multiply the AADT by the HTD to obtain the traffic volume for a particular hour. The Office of Planning publishes hourly distribution factors for regions of the state.

HTD Hourly Traffic Demand in vehicles / hour. Hourly traffic volumes will be required for each hour in the analysis period. Hourly traffic volumes may be obtained from the Project Traffic Report, the Office of Planning or from field data collection. Use the most recent values available.

MOCF Model Correction Factor. The MOCF converts AADT to peak season traffic.

N Number of Lanes

Pc/h/ln Passenger cars per hour per lane. Pc/h/ln represents the traffic volume or capacity of one lane adjusted for heavy vehicles.

PSCF Peak Season Conversion Factor. The Office of Planning publishes tables with the PSCF for each county in Florida. Each county table has a PSCF for the week that the traffic counts were collected. The factor converts the ATC to Peak Season Traffic representing the highest daily traffic for the year.

P_t Percent Trucks (%).

242.4 Traffic Pacing Calculations Example

STEP 1: Calculate the hourly percentage of peak season traffic for each hour of the day (in pcphpl) and plot the 24-hour traffic percentages.

A. Calculate the Heavy Vehicle Adjustment Factor,

$$F_{HV} = 1 + \left(\frac{P_t}{100}\right)0.5 = 1 + \left(\frac{6.71}{100}\right)0.5 = 1.034$$

B. Using actual traffic counts calculate the hourly traffic demand (*Hour 1 shown*)

$$HTD_i = \frac{(ATC_i)(PSCF)(F_{HV})}{N}$$

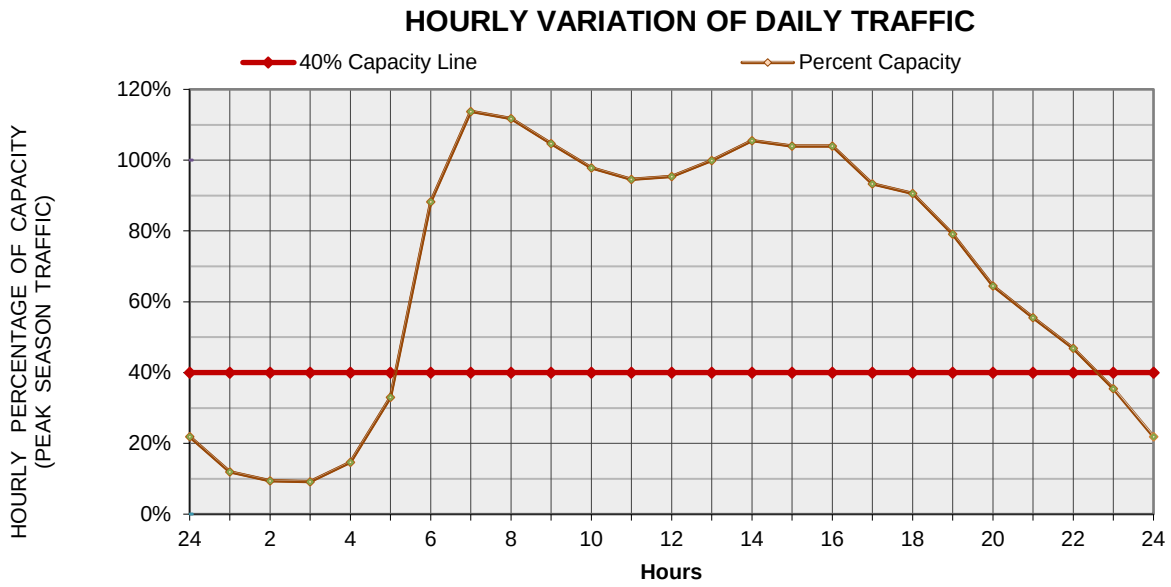
$$HTD_1 = \frac{(1406)(1.04)(1.034)}{3} = 504\ pcphpl$$

C. Calculate the percent capacity, $\%C = \frac{HTD_1}{C} \times 100$ where:

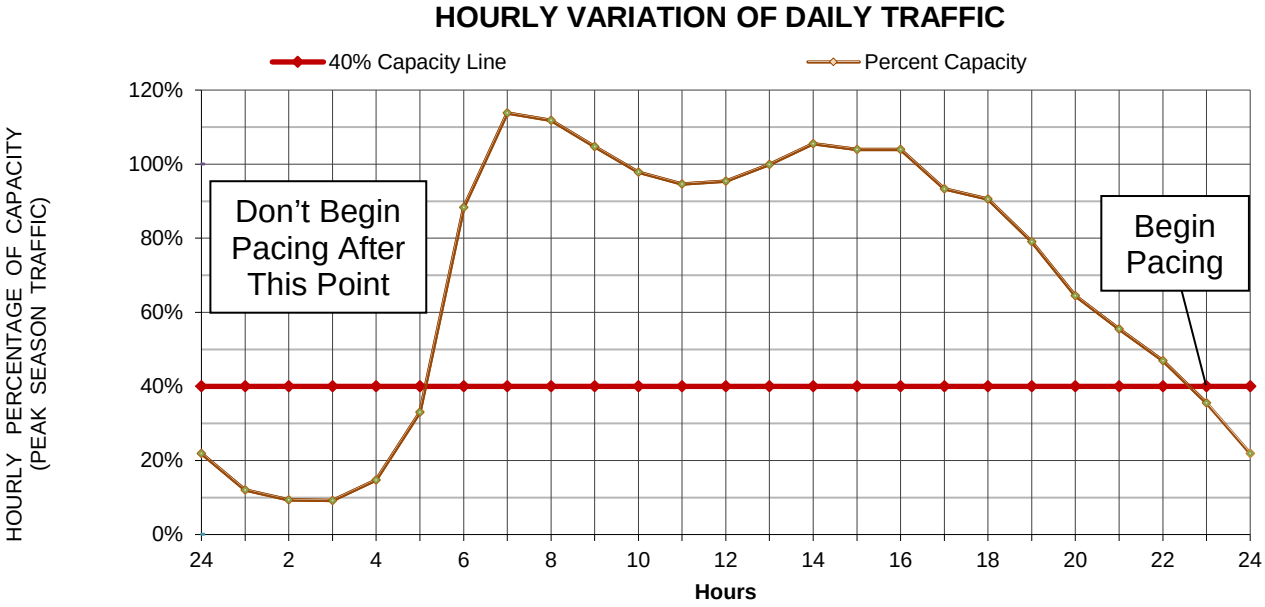
C = 2,300 pc/h/ln for 65 mph regulatory speed (*Hour 1 shown*)

$$\%C = \frac{HTD_1}{C} \times 100 = \frac{504}{2300} \times 100 = 21.9\%$$

Hour	AM Hourly Traffic Demand	Percent Capacity	Hour	PM Hourly Traffic Demand	Percent Capacity
24 - 1	504	21.90%	12-13	2193	95.40%
1 - 2	277	12.00%	13-14	2290	99.90%
2 - 3	215	9.40%	14-15	2427	105.50%
3 - 4	212	9.20%	15-16	2393	104.00%
4 - 5	338	14.70%	16-17	2368	104.00%
5 - 6	758	33.00%	17-18	2147	93.30%
6 - 7	2031	88.30%	18-19	2083	90.60%
7 - 8	2617	113.80%	19-20	1820	79.10%
8 - 9	2571	111.80%	20-21	1484	64.50%
9 -10	2408	104.70%	21-22	1277	55.50%
10-11	2249	97.80%	22-23	1078	46.90%
11-12	2174	94.60%	23-24	816	35.50%



STEP 2: Identify the traffic pacing restrictions. Leave a buffer period of one hour between the end of traffic pacing operations and the beginning of 40% capacity.



243 Portable Changeable Message Signs

243.1 General

See ***FDM 240*** for additional information concerning the use of portable changeable message signs (PCMS).

A PCMS is required for nighttime work that takes place within 4 feet of traveled way, and considered for the following conditions:

(1) Road closures

(2) Ramp closures

(3) Delays created by:

- (a) Congestion
- (b) Crashes
- (c) Lane closures
- (d) Two-way traffic on divided highway
- (e) Multiple lane closures
- (f) Unexpected shifts in alignment

243.2 PCMS Placement

The message displayed must be visible and unobstructed to a motorist in accordance with ***Standard Specification 102***.The message displayed must be installed at the following minimum distances:

(1) 900 feet on approach to construction work areas to allow for two message cycles.

(2) 500 to 800 feet in advance of potential traffic problems

(3) 0.5 to 2 miles in advance of complex traffic control schemes that require new or unusual traffic patterns.

243.3 PCMS Messages

Messages must be simple, with a minimum number of words and lines and must include no more than two displays of no more than three lines each with 8 characters per line. Provide the location and messages to be displayed in the Temporary Traffic Control (TTC) plan.

Programmed messages must provide appropriate information for the conditions likely to be encountered. Place the programmed messages in the TTC plan. Consider the following items in the development of a message:

(1) Message elements
   (a) Problem statement (where?)
   (b) Effect statement (what?)
   (c) Attention statement (who?)
   (d) Action statement (do?)

(2) Message format
   (a) Will vary depending on content
   (b) "Where" or "what" will generally lead
   (c) "Who" and "do" follow in that order
   (d) "Who" often understood from "where"

(3) Display format
   (a) Discrete, with entire message displayed at once is most desirable
   (b) Sequential is OK, 2 parts maximum
   (c) Run-on moving displays prohibited
   (d) One abbreviation per panel display desirable, two abbreviations are the maximum. Route designation is considered as one abbreviation and one word. Guidelines for abbreviations are provided on the following pages. Refer to the ***Library of Approved Safety Messages for DMS***.

243.3.1 PCMS Worksheet

See ***Figure 243.3.1*** for an illustration on the development of a PCMS Worksheet.

See ***Form 243-A*** (located in ***FDM 103***) and ***FDM 921*** for instruction on showing the worksheet information in the plans set.

Figure 243.3.1 PCMS Worksheet

Financial Project No.: 123456-7-89-10

Location of board: Westbound Buck Lake Road – Station 100+00

Used: from 01 - 01 - 01 at 6 : 00 (am)/pm

to 02 - 02 - 02 at 6 : 00 am (pm)

Message programmed by: W. Giddens

MESSAGE 1

U	S	E					
C	A	U	T	I	O	N	

MESSAGE 2

T	R	U	C	K	S		
E	N	T	E	R	I	N	G
R	O	A	D	W	A	Y	

Timing:

Message 1 will run 10 . 00 seconds.

Message 2 will run 12 . 50 seconds.

STANDARD ABBREVIATIONS FOR USE ON PCMS

Standard abbreviations easily understood are:

WORD	ABBREV.	WORD	ABBREV.
Boulevard	BLVD	Normal	NORM
Center	CNTR	Parking	PKING
Crossing	XING	Pedestrian	PED
Crosswalk	XWALK	Road	RD
Emergency	EMER	Service	SERV
Entrance, Enter	ENT	Shoulder	SHLDR
Expressway	EXPWY	Slippery	SLIP
Freeway	FRWY, FWY	Speed	SPD
Highway	HWY	Traffic	TRAF
Information	INFO	Travelers	TRVLRS
Left	LFT	Warning	WARN
Maintenance	MAINT		

Other abbreviations are easily understood whenever they appear in conjunction with a particular word commonly associated with it. These words and abbreviations are as follows:

WORD	ABBREV.	PROMPT
Access	ACCS	Road
Ahead	AHD	Fog*
Blocked	BLKD	Lane*
Bridge	BRDG	[Name]*
Chemical	CHEM	Spill
Construction	CONST	Ahead
Exit	EX, EXT	Next*
Express	EXP	Lane
Hazardous	HAZ	Driving
Interstate	I	[Number]
Major	MAJ	Accident
Mile	MI	[Number]*
Minor	MNR	Accident
Minute(s)	MIN	[Number]*
Oversized	OVRSZ	Load
Prepare	PREP	To Stop
Pavement	PVMT	Wet*
Quality	QLTY	Air*
Route	RT	Best*
Turnpike	TRNPK	[Name]*
Vehicle	VEH	Stalled*
Cardinal Directions	N, E, S, W	[Number]

Upper, Lower	UPR, LWR	Level

* = Prompt word given first

The following abbreviations are understood with a prompt word by about 75% of the drivers. These abbreviations may require some public education prior to usage.

WORD	ABBREV.	PROMPT
Condition	COND	Traffic*
Congested	CONG	Traffic
Downtown	DWNTN	Traffic
Frontage	FRNTG	Road
Local	LOC	Traffic
Northbound	N-BND	Traffic
Roadwork	RDWK	Ahead [Distance]
Temporary	TEMP	Route
Township	TWNNSHP	Limits

* = Prompt word given first

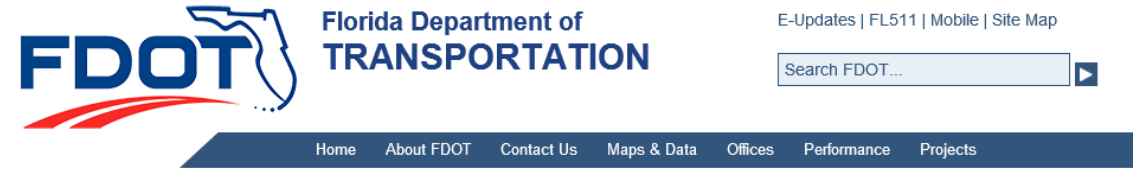
Certain abbreviations are prone to inviting confusion because another word is abbreviated or could be abbreviated in the same way. Do not use these abbreviations:

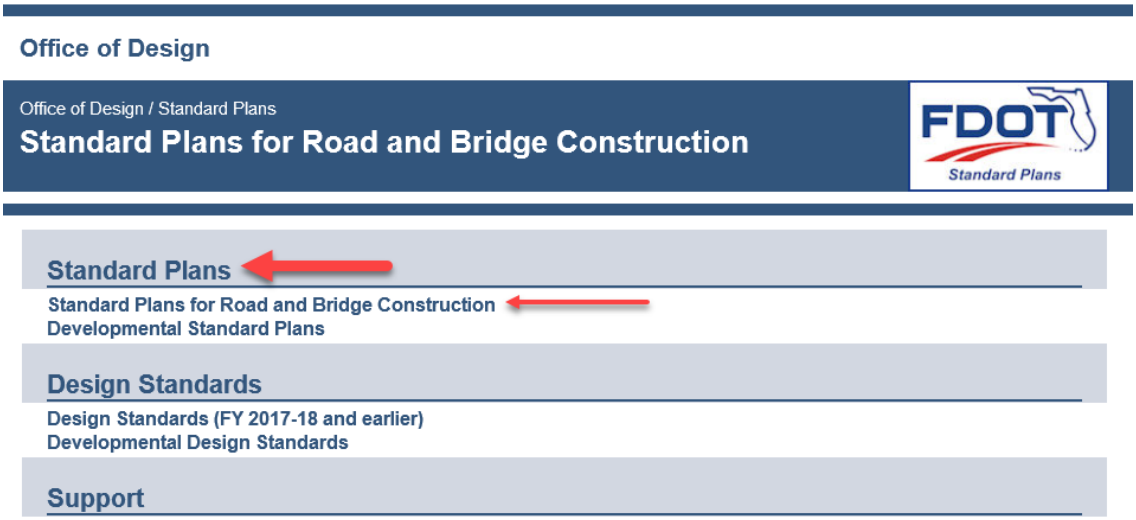
ABBREV.	INTENDED WORD	WORD ERRONEOUSLY GIVEN
WRNG	Warning	Wrong
ACC	Accident	Access (Road)
DLY	Delay	Daily
LT	Light (Traffic)	Left
STAD	Stadium	Standard
L	Left	Lane (Merge)
PARK	Parking	Park
RED	Reduce	Red
POLL	Pollution (Index)	Poll
FDR	Feeder	Federal
LOC	Local	Location
TEMP	Temporary	Temperature
CLRS	Clears	Color

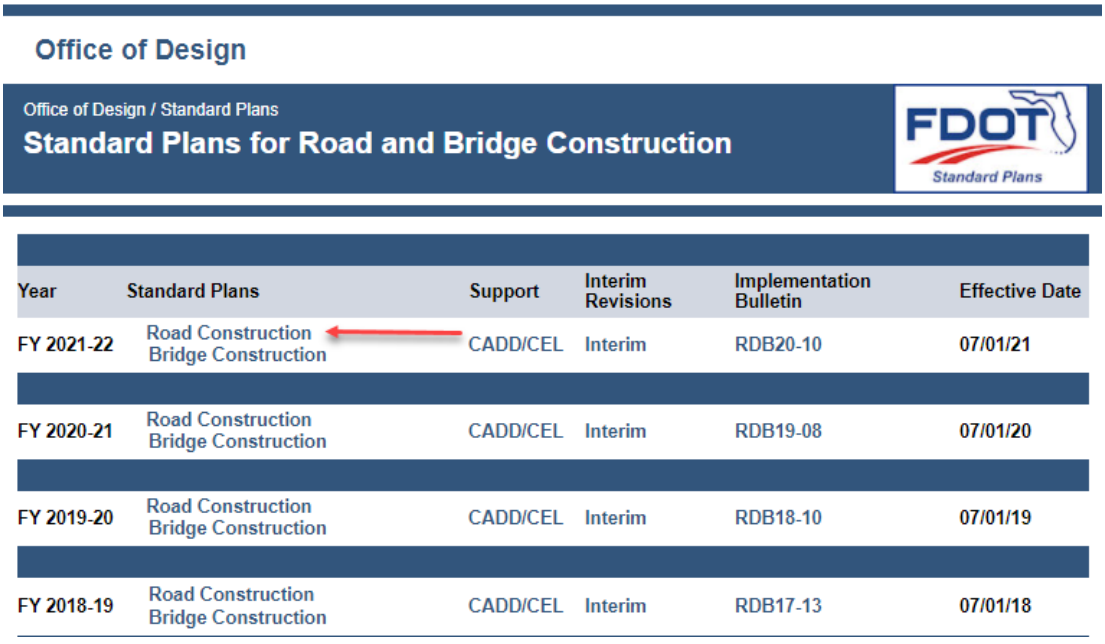
Supplemental Resources

FDOT Standard Plans

(http://www.fdot.gov/design/StandardPlans/)





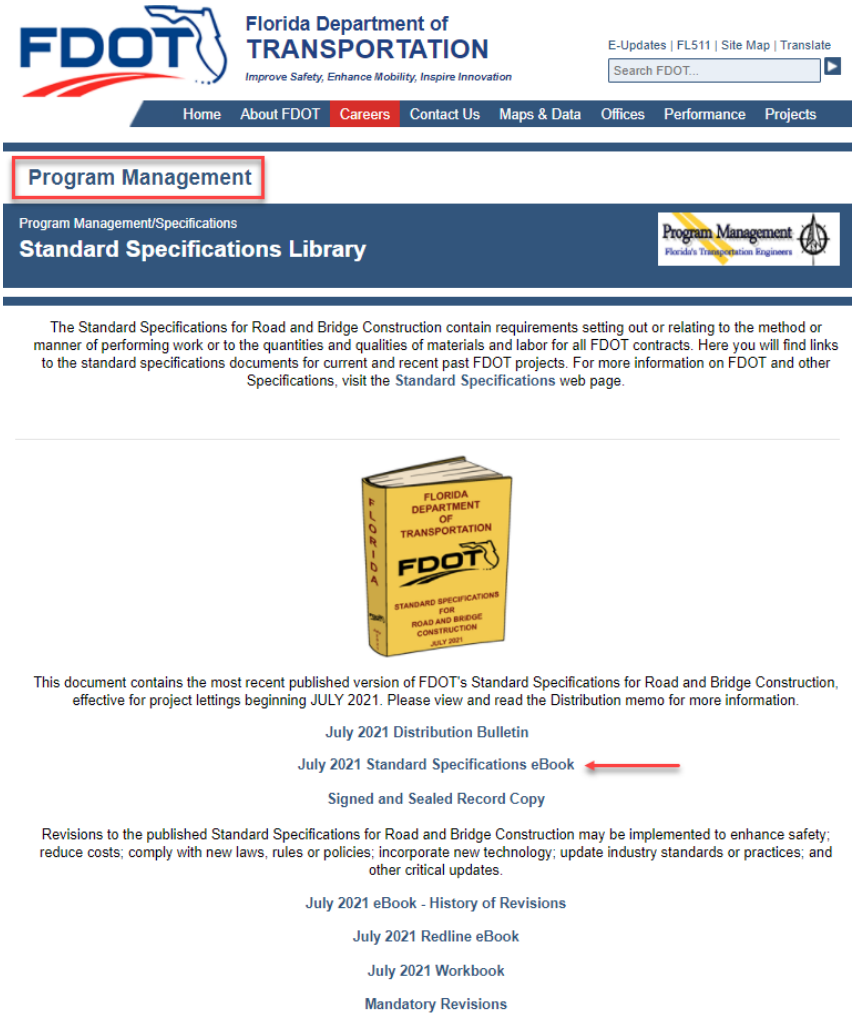


General Construction Operations-Roadway

		Maintenance of Traffic			
102-100		Temporary Barrier	415	SPI	XLS
102-110		Type K Temporary Concrete Barrier System	414		
102-120		Low Profile Barrier	412		
102-600	Errata	General Information for Traffic Control Through Work Zones *Quick Reference Sheet: 102 Series Tables*	600		
102-601		Two-Lane and Multilane Roadway, Work Beyond the Shoulder	601		
102-602		Two-Lane and Multilane, Work on Shoulder	602		
102-603		Two-Lane, Two-Way, Work Within the Travel Way	603		
102-604		Two-Lane, Two-Way, Intersection Work	604		
102-606		Two-Lane Roadway, Lane Closure Using Temporary Traffic Signals	606	SPI	
102-607	Errata	Mobile Operations	607		
102-608		Two-Lane, Two-Way, Temporary Diversion Connection	608		
102-613	Errata	Multilane Roadway, Lane Closures	613		
102-615		Multilane Roadway, Intersection Work	615		
102-620		Multilane Roadway, Temporary Diversion	620		
102-625		Temporary Road Closure	625		
102-628		Two-Way Left Turn Lanes	628		
102-655		Traffic Pacing	655	SPI	
102-660		Sidewalk Closure	660	SPI	
102-661		Bicycle Lane Closures	**NEW**		
102-665		Limited Access Temporary Opening	665	SPI	
102-680		Haul Road Crossing	**NEW**	SPI	

Standard Specifications

(http://www.fdot.gov/programmanagement/Implemented/SpecBooks/default.shtm)



Basis of Estimates

(http://www.fdot.gov/programmanagement/Estimates/BasisofEstimates/BOEManual/BOEOnline.shtm)

Approved Products List (APL)

(https://fdotwp1.dot.state.fl.us/ApprovedProductList/Specifications)

Bicycle & Pedestrian Temporary Traffic Control (TTC)

Expectations and Concepts

If the Bike Facility is a Paved shoulder, then it is kept free of stored equipment, vehicles and other obstructions.

Sidewalk Closures use pedestrian Longitudinal Channelizing Devices (LCDs) across full width of closed sidewalk. Include Sidewalk Closed sign in accordance with **Index 102-660**.

A Temporary Pedestrian Walkway is provided if pedestrian way is closed for more than 60 minutes. Is firm, stable, slip resistant. No obstructions or hazards. Minimum 5' width.

Walkway Delineation Longitudinal Channelizing Devices (LCDs) are interlocked, joints are free of sharp edges and have a maximum off-set of ½ inch on any plane. LCDs are used where a drop off greater than 10 inches is within 2 feet of pedestrian way, or where active work zone is within 2 feet of pedestrian way. LCDs are used along both sides of a temporary pedestrian way.

Crosswalks within a work zone must be installed at all signalized intersections, have a functioning pedestrian signal, align with adjusted pedestrian path. Remove existing crosswalk markings that conflict with the adjusted pedestrian path.

Detectable Warnings must be installed on both new and temporary curb ramps, before opening to pedestrian traffic, place across full width of the ramp or landing at a depth of 2-5 feet, place in accordance with **Indexes 102-660 and 522-002**.

Portable Changeable Message Signs are used to notify motorists and non-motorists of additional crossings, more non-motorists on the road, and facility closings.

ADA accessibility must be the same as the existing facility or greater.

Preserve safety features, connectivity of the facilities to and through the project, and directness of routes.

Provide like for like bicycle and pedestrian facilities. e.g. a permanent shared use path has a temporary shared use path.

Phase work so the facility is only closed when necessary.

Separate pedestrians and bicyclists from work area (vehicles, equipment, and operations).

Keep detours and diversions short. Detours should not create more than a 30% increase in the length of the non-motorized facility, or not longer than 0.5 miles for bicyclists.

The order of preference for routing:

1. **maintain facility on the same side of the road**
2. **divert to the opposite side of the road**
3. **detour to another road.**

Return to original road and original side of road as soon as possible.

TTC Definitions Quick Reference

- **Travel Way:** The portion of the roadway for the movement of vehicles.
- **Driver:** Any person in physical control of a vehicle on a travel way or steering a vehicle beingtowed by another vehicle.
- **Road User:** Individuals who use roadway facilities. They may include drivers, pedestrians,bicyclists, and transit users.
- **Roadwork:** All operations by state, counties, contractors, municipalities, utilities, and otherauthorized parties conducted in or adjacent to the travel way.
- **Roadside:** Where work activity is taking place adjacent to traveled way.
- **Two-Lane Two-Way:** Two lanes of moving motor vehicle traffic going in opposite directions.
- **Multilane:** Two or more lanes of moving motor vehicle traffic in one direction.
- **Moving:** Construction, maintenance, or utility activity that moves in continuous fashion alongthe road without stopping, usually at low speeds.
- **Mobile:** Work that moves intermittently or continuously.
- **Short Duration:** Daytime work that occupies location up to one hour.
- **Clear Zone:** Total roadside border area, starting at the edge of travel way, available for an errantdriver to stop or regain control of a vehicle.
- **Offset Zone:**
  - ✓ 15’ or more from edge of travel way
  - ✓ Behind existing barrier
  - ✓ More than 2’ behind the curb
- **Above Ground Hazard:** Anything (except Temporary Traffic Control devices) within the travel way or clear zone, is more than 4” high, firm and unyielding.
- **Drop Off:** A drop in elevation, parallel to the adjacent travel lanes, more than 3” with slopes steeper than 1:4.
- **Crashworthy:** Roadside appurtenance that has been successfully crash tested.
- **Lane Constriction:** One or more lanes narrowed but number of lanes remains the same.
- **Lane Closure:** One or more lanes of traveled way closed to traffic with at least one lane leftopen.
- **Shoulder Closure:** Activity that closes roadway shoulder but does not reduce number of lanes.
- **Intermittent Closure:** A work zone where traffic in one or both directions is stopped for shortperiod to allow work to proceed.
- **Center Skip Line Stripes:** 40 feet from end/start to end/start (10-foot line segment plus 30-foot gap).
- **Reflective Pavement Markers (RPMs):** Spaced 40 feet apart, reflective plastic roadway markersusually found on/near center roadway line.
- **Tangent:** A line of devices placed parallel to the work zone.

TABLE 1
CHANNELIZING DEVICE SPACING

Work Zone Speed (mph)	Maximum Spacing (feet)			
	Cones or Temporary Tubular Markers		Type I Barricades, Type II Barricades, Vertical Panels, or Drums	
	Taper	Tangent	Taper	Tangent
≤ 45	25	50	25	50
≥ 50	25	50	50	100

TABLE 2
TAPER LENGTH

Work Zone Speed (mph)	Minimum Length (Feet)
≤ 40	$L = (WS^2)/60$
≥ 45	$L = WS$

Example "L" Values

S (mph)	W (Width of Offset in Feet)														
	4			5			8			10			12		
	L	L/2	L/3	L	L/2	L/3	L	L/2	L/3	L	L/2	L/3	L	L/2	L/3
25	42	21	14	52	26	17	83	42	28	104	52	35	125	63	42
30	60	30	20	75	38	25	120	60	40	150	75	50	180	90	60
35	82	41	27	102	51	34	163	82	54	204	102	68	245	123	82
40	107	53	36	133	67	44	213	107	71	267	133	89	320	160	107
45	180	90	60	225	113	75	360	180	120	450	225	150	540	270	180
50	200	100	67	250	125	83	400	200	133	500	250	167	600	300	200
55	220	110	73	275	138	92	440	220	147	550	275	183	660	330	220
60	240	120	80	300	150	100	480	240	160	600	300	200	720	360	240
65	260	130	87	325	163	108	520	260	173	650	325	217	780	390	260
70	280	140	93	350	175	117	560	280	187	700	350	233	840	420	280

NOTE: Unless otherwise shown: Use L for merging tapers
Use L/2 for shifting tapers
Use L/3 for shoulder tapers

TABLE 3
WORK ZONE SIGN SPACING "X"

Road Type	Minimum Spacing (feet)
Arterials and Collectors with Work Zone Speed ≤ 40 mph	200
Arterials and Collectors with Work Zone Speed ≥ 45 mph	500
Limited Access Roadways (See Note)	1,500

NOTE:
For Limited access roadways with work zone speed ≤ 55 mph, the minimum spacing may be reduced in accordance with the MUTCD and as approved by the Engineer.

TABLE 4
BUFFER LENGTH "B"

Work Zone Speed (mph)	Minimum Length (feet)
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730

NOTE:
When Buffer Length "B" cannot be attained due to geometric constraints, use the greatest length possible, but not less than 155 feet.

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TABLE 5
CLEAR ZONE WIDTHS FOR WORK ZONES

Work Zone Speed (mph)	Travel Lanes & Multilane Ramps (feet)	Auxiliary Lanes & Single Lane Ramps (feet)
60–70	30	18
55	24	14
45–50	18	10
30–40	14	10
ALL SPEEDS CURB & GUTTER	4' BEHIND FACE OF CURB	4' BEHIND FACE OF CURB

NOTE:
For temporary conditions where existing curb has been removed but not reconstructed, curb and gutter values may be used.

TABLE 6
MINIMUM RADII FOR NORMAL CROWN

Work Zone Posted Speed (mph)	Minimum Radius (feet)
70	4090
65	3130
60	2400
55	1840
50	1390
45	1080
40	820
35	610
30	430

Superelevate When Smaller Radii is Used

TABLE 7
POST AND FOUNDATION TABLE FOR WORK ZONE SIGNS

SIGN SHAPE	SIGN SIZE (inches)	NUMBER OF STEEL U CHANNEL POSTS
Octagon	30x30	1
Triangle	36x36x36	1
	48x48x48	1
	60x60x60	2
Rectangle (W x H)	24x18	1
	24x30	1
	30x24	1
	36x18	1
	36x24	1
	48x18	1
	48x24	1
	36x48	2
	48x30	2
	48x36	2
	54x36	2
	48x60	3
	72x48	3
Square	30x30	1
	36x36	2
	48x48	2
Diamond	48x48	2
Circle	360	2

Notes For Table:

1. Use 3 lb/ft posts for Clear Height up to 10' and 4 lb/ft posts for Clear Height up to 12'.
2. Minimum foundation depth is 4.0' for 3 lb/ft posts and 4.5' for 4 lb/ft posts.
3. For both 3 lb/ft and 4 lb/ft base or sign posts installed in rock, a minimum cumulative depth of 2' of rock layer is required.
4. The soil plate as shown on the APL vendor drawing is not required for base posts or sign posts installed in existing rock (as defined in Note 3), asphalt roadway, shoulder pavement or soil under sidewalk.
5. For diamond warning signs with supplement plaque (up to 5 ft^2 in area), use 4 lb/ft posts for up to 10 ft Clear Height (measure to the bottom of diamond warning sign).

TABLE 8
DROP-OFF PROTECTION REQUIREMENTS

Condition	R (ft)	D (in.)	Device Required
1	0–12	> 3	Temporary Barrier
2	> 12–CZ	> 3 to ≤ 5	Channelizing Device
3	0–CZ	> 5	Temporary Barrier
4	Removal of Bridge or Retaining Wall Barrier		Temporary Barrier
5	Removal of portions of Bridge Deck		Temporary Barrier

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