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

Advanced Maintenance of Traffic

Participant Workbook



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Advanced Maintenance of Traffic

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 Vork Zone Fatalities

 Year
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 2010
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 2011
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 2012
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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

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Pay items for work zone devices

Training for everyone responsible for the design, implementation, or inspection of traffic control

Annual process reviews

FDOT

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 Categories | | |
|--------------------------------------|--|--|
| Flagger (Basic) | | |
| Intermediate | | |
| Advanced | | |
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FDOT

- Advanced Training • 20 Hours long
- Classroom instruction and workshopsIn-depth review of Standard Plans
- Design exercises and problem solving
 A MOT in TECH
- of MOT in TTCP • 60 Question qualification test

REQUIRED FOR:

- The Professional Engineer responsible for the development of the Temporary Traffic Control Plan.
- The Worksite Traffic Supervisor in accordance with FDOT Standard Specifications, Section 102.
- Personnel responsible for supervising the placement or field maintenance of temporary traffic control devices, including temporary barriers.
- Personnel responsible for inspection of the placement or operational function of temporary traffic control devices, including temporary barriers.

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FDOT **Principles of Traffic Control Selection of Devices FDOT Device Uniformity** Design of Device Placement Maintenance of Device of Device Specifications Contract Plans • Spec 102 • ATSSA • Approved Products List (APL) • Standard Plans MUTCD Guidelines Florida Department of Transportation











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



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Direction Indicator Barricade May be used in tapers & transitions If used, shall be in a series

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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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FDOT Type K Barrier – Freestanding (Bridge) Index 102-110, Sheet 3 TRAFFIC SIDE Barrier Unit Edge of Aboveground Hazard Setback Distance (See Index 102-100) Keeper Pin, 6" Min. Length Drop-Off Or Hazard (Hin.) (Max.) Asphalt Overlay (If Present) Ŧ ~ Bridge Deck Or Approach Slab 岩 Ø Hole (Bridge Deck Shown, Approach Slab Similar) FDOT Florida Department of Transportation







FDOT Type K Barrier – Freestanding (Median) Index 102-110, Sheet 3 rier Unit TRAFFIC ON BOTH SIDES Setback Distance (See Index 102-100) Setback Distance (See Index 102–100) Edge Of -Travel Way Edge Of Travel Way 11111111 Asphalt Overlay (If Present) Keeper Pin, 6" Min. Length γ Bridge Deck Or Approach Slab This application applies to bridge decks, approach slabs, asphalt pads, flexible or rigid pavement FDOT Florida Department of Transportation

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| 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 I Object Marker | | |
| Deflection Distance & Offset | Deflection Distance – 9 inch min Approach End Offset – 6 foot min | | |
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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.

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FDOT

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.

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NCHRP 350

- Purchased before January 1, 2020
- May be used on projects until January 1, 2030



 Purchased or Manufactured after January 1, 2020

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| | TABLE 5 ROADWAY FUNCTIONAL CLASSIFICATION AND ROLE IN THE TRANSPORTATION SYSTEM | | Alternative B Activity: | |
|---|--|---|--|--|
| | Roadway Classification | Role in the Transportation System | , accinative by certify: | |
| | Principal Arterial | Serves a large percentage of travel between cities and other activity centers, especially when minimizing travel time and distance is important. | | |
| Traffic | Minor Arterial | Provides service for trips of moderate length, serves geographic areas that are smaller than their higher arterial counterparts, and offers connectivity to the higher arterial system. | vices | |
| | Collector | Collects traffic from local streets and connects them with arterials; more access to adjacent properties compared to arterials. | 11000 | |
| | Local | Any road not defined as an arterial or a collector; primarily provides access to land with little or no through movement. | | |
| | * Context Classification is not applied to limited-access facilities. | | | |
| Let's loo | Context classification is not applied to limited-access facilities. For non-limited-access roadways, the FDM provides design criteria and standards based on both context classification and functional classification. | | devices. | |
| A: Specifications 102-Maintenance of Traffic | B: FDOT Context Classification Guide | | <u>C: FDOT Evaluation</u> Guide – Temporary Concrete Barrier | |
| Florida Department of Transportation | | | | |




















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Transition Area

Direct motorist from one lane to another in a smooth and gradual transition with channelizing device

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



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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.

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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.

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Method to:

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

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| MOT Pay Items | | | | |
|--------------------------------------|--|--|--|--|
| 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 | | | |
| 102-61 | Business Signs, EA | | | |
| 102- 71- AB | Barrier Wall (Temporary), LF | | | |
| | | | | |
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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 | | | |
| | | | | |
| Florido Deportment of Transportation | | | | |



























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| Rules of Conduct | | | | | |
|--------------------------------------|--|---|--|--|--|
| | Be alert to needs of emergency vehicles and crews | lf 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 | | | |
| Florida Department of Transportation | | | | | |



















































| Referenced Webpage Links | | | | |
|--|---------------|--|--|--|
| Maintenance of Traffic Related Webpage Links | | | | |
| Description | Web page link | | | |
| MUTCD | | | | |
| Florida Department of Transportation | | | | |
| Standard Plans | | | | |
| MOT Training Course Providers | | | | |
| FDOT Design Manual | | | | |
| Specification Book | | | | |
| APL (Approved Products List) | | | | |
| Survey Safety Handbook | | | | |
| Maintenance of Traffic Training Procedure | | | | |
| MOT Administration Website | | | | |
| Florida Department of Transportation | | | | |

FORM INSTRUCTIONS

- Student ID is the first 9 numbers of a State Drivers License or Passport. No letters, dashes or spaces. Add zeros at the end to complete 9 numbers.
- 2 Your email address is mandatory. Email will be used for login instructions to obtain exam results, and receive expiration reminders.
- 3 Fill in bubbles completely.
- 4 If you erase, make sure it is erased completely.
- 5 Review your score sheet at the end of the exam and make sure you have not filled in 2 bubbles for the same guestion.





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 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:

| Bituminous Adhesive | Section 970 |
|--|-------------|
| Temporary Raised Pavement Markers | Section 990 |
| Paint | Section 971 |
| Removable Tape | Section 990 |
| Glass Spheres | Section 971 |
| Temporary Traffic Control Device Materials | Section 990 |
| Retroreflective and Nonreflective Sheeting | |
| for Temporary Traffic Control Devices | Section 994 |

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, maintain traffic control, and handle traffic-related situations. 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.

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 fourteen 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.

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: When an existing pedestrian or bicycle way is located within a traffic control work zone, accommodation must be maintained and provision for the disabled must be provided. Pedestrians are to 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 for Transportation Facilities. Maintain existing or detour bicycle facilities satisfactorily throughout the project limits. Advanced notification of sidewalk closures and marked detours shall be provided by appropriate signs. Only approved pedestrian longitudinal channelizing devices may be used to delineate temporary traffic control zone pedestrian walkway. Existing businesses in work areas are to be provided with adequate entrances for vehicular and pedestrian traffic during business hours.

102-4 Alternative Traffic Control Plan.

The Contractor may propose an alternative traffic control plan (TCP) to the plan

presented in the Contract Documents. The Contractor's Engineer of Record must sign and seal the alternative plan and submit to the Engineer. Prepare the TCP in conformance with and in the form outlined in the current version of the FDOT Design Manual. Indicate in the plan a TCP foreach phase of activities. Take responsibility for identifying and assessing any potential impacts to a utility that may be caused by the alternate TCP 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 TCP allowing for daytime lane closures for friction course paving. The alternative TCP must be a lane closure analysis based on actual traffic counts and prepared in accordance with the FDOT Design Manual.

Engineer's approval of the alternate TCP 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 Specifications, Design Plans (including TCPs) or other 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 TCP. Obtain the Engineer's written approval before beginning work using an alternate TCP. The Engineer's written approval is required for all modifications to the TCP. The Engineer will only allow changes to the TCP 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 Standards: FDOT Standard Plans are the minimum standards for the use in the development of all TCPs. The MUTCD, Part VI is the minimum national standard for traffic control for highway construction, maintenance, and utility operations. Follow the basic principles and minimum standards contained in these documents for the design, application, installation, maintenance, and removal of all traffic control devices, warning devices and barriers which are necessary to protect the public and workers from hazards within the project limits.

102-5.2 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.

102-5.3 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.

102-5.4 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.

102-5.5 Access for Residences and Businesses: Provide continuous access to all residences and all places of business.

102-5.6 Protection of the Work from Injury by Traffic: Where traffic would be injurious to a base, surface course, or structure constructed as a part of the work, maintain all traffic outside the limits of such areas until the potential for injury no longer exists.

102-5.7 Flagger: Provide flaggers to control traffic when traffic in both directions must use a single lane and in other situations as required. All flaggers must meet the personnel qualifications specified in Section 105.

102-5.8 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.

102-5.9 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.

102-5.10 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.

102-5.11 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.

102-5.12 Limited Access Temporary Openings: When required by the Contract Documents, construct 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 2000 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.

Where pedestrian facilities are detoured, blocked or closed during the work, provide safe alternate accessible routes through or around the work zone meeting the requirements of the ADA Standards for Transportation Facilities. When temporary walkway surfaces and ramps are required to be constructed, ensure surfaces are stable, firm, slip resistant, and kept free of any obstructions and hazards such as holes, debris, mud, construction equipment and stored materials. 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 Standard Plans, Index 102-607 is used on freeway facilities (interstates, toll roads, and expressways) at nighttime for work within the travel lane.

3. When Standard Plans, Index 102-655 Traffic Pacing is called for in the Plans or approved by the Engineer.

4. When pulling conductor/cable above an open traffic lane on limited access facilities, when called for in the Plans or approved by the Engineer.

5. When Standard Plans, Index 102-625 Temporary Road Closure 5 Minutes or Less 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. Immediately remove or cover, using any method of covering approved by the Engineer, any existing or temporary devices 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/contentdocs/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=166e0f

<u>16</u> <u>2.</u> 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: Furnish, install, maintain, remove and relocate signs in accordance with the Plans and Standard Plans, Index 102-600.

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

102-9.2.2 Portable Signs: Use only approved systems, which includes sign stands and attachment hardware (nuts, bolts, clamps, brackets, braces, etc.), meeting the vendor requirements specified on the APL drawings.

102-9.2.3 Barrier Mounted Signs: If post mounting criteria cannot be achieved in accordance with Standard Plans, Index 102-600 and a barrier or traffic railing exists, use temporary sign criteria provided in Standard Plans, Index 700-012 or Index 700-013. 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: Provide and place signs in accordance with the Plans and Standard Plans, Index 102 series. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

102-9.4 Project Information Signs: Provide and place signs in accordance with the Plans and Standard Plans, Index 102 series. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

102-9.5 Channelizing Devices: Furnish, install, maintain, remove and relocate channelizing devices in accordance with the Plans and Standard Plans.

102-9.5.1 Retroreflective Collars for Traffic Cones: Use collars for traffic cones listed on the APL that meet the requirements of Section 990. Use cone collars at night designed to properly fit the taper of the cone when installed. 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.

Collars must be capable of being removed for temporary use or attached permanently to the cone in accordance with the manufacturer's recommendations. Provide a white sheeting having a smooth outer surface and that has the property of a retroreflector over its entire surface.

102-9.5.2 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. For pedestrian LCDs requiring internal ballasting, an indicator that clearly identifies the proper ballast level will be required. For pedestrian LCDs requiring external ballasting, the ballasting methods must be detailed in the APL drawings including ballasting type and minimum weight.

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

102-9.6 Temporary Barrier: Furnish, install, maintain, remove and relocate temporary barrier in accordance with the Plans 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 1 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 Plans 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 at 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.

102-9.6.2.1 Temporary Barrier Meeting the Requirements of Standard Plans, Index 102-120 and 102-110: Ensure the marking requirements of the respective Index are met.

102-9.6.2.2: 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.

102-9.6.2.3 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.

102-9.6.2.4 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.

102-9.7 Barrier Delineators: Install barrier delineators on top of temporary barrier and vehicular LCDs meeting the requirements of Section 705.

102-9.8 Temporary Glare Screen: Use temporary glare screens listed on the APL that meet the requirements of Section 990. Furnish, install, maintain, remove and relocate glare screen systems in conjunction with temporary barrier at locations identified in the Plans.

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.

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

102-9.9 Temporary Crash Cushion (Redirective or Gating): Furnish, install, maintain and subsequently remove temporary crash cushions in accordance with the details and notes shown in the Plans, 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.

102-9.10 Temporary Guardrail: Furnish temporary guardrail in accordance with the Plans and Standard Plans. Meet the requirements of Section 536.

102-9.11 Arrow Board: Furnish arrow boards that meet the requirements of Section 990 as required by the Plans and Standard Plans to advise approaching traffic of lane closures or shoulder work. Ensure that the arrow board display panel is raised to a fully upright position and is fully visible to motorists. 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 must 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.

102-9.12 Portable Changeable Message Sign (PCMS): Use PCMSs or truck mounted changeable message signs that meet the requirements of Section 990 as required by the Plans and Standard Plans 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.

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.

102-9.13 Portable Regulatory Signs (PRS): Furnish PRSs that meet the requirements of Section 990 as required by the Plans and Standard Plans. 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.

102-9.14 Radar Speed Display Unit (RSDU): Furnish RSDUs that meet the requirements of Section 990 as required by the Plans and Standard Plans 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.

102-9.15 Temporary Signalization and Maintenance: Provide temporary signals and maintain 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 Plans,

2. Temporary portable traffic signals as shown in the Plans,

- 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.

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. For temporary signals used for lane closure operations on two-lane, two-way roadways meet the requirements in 102-9.21.

102-9.16 Temporary Traffic Detection and Maintenance: Provide temporary traffic detection and maintenance at existing, temporary, and new signalized intersections. Provide temporary traffic detection equipment listed on the APL. Restore any loss of detection within 12 hours. 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.

102-9.17 Truck Mounted Attenuators and Trailer Mounted Attenuators: Furnish, operate and maintain APL listed truck mounted and trailer mounted attenuators in accordance with the manufacturer's recommendations.

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

Attenuators will not be paid for separately. Include the cost of the truck with either a truck mounted attenuator or a trailer mounted attenuator in Maintenance of Traffic, lump sum. Payment includes all costs, including furnishing, operating maintaining and removal when no longer required, and all materials, labor, tools, equipment and incidentals required for attenuator maintenance.

102-9.18 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.

102-9.19 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.

102-9.20 Temporary Lane Separator: Furnish, install, maintain, remove and relocate temporary lane separator in accordance with the Plans and Standard Plans, Index 102-600. 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.

102-9.21 Temporary Signals for Lane Closures on Two-Lane, Two-Way Roadways: Furnish, install, maintain, remove, and relocate temporary signals for lane closure operations on two-lane, two-way roadways at the locations shown in the Plans. Temporary signals may be used, at the Contractor's option, as an alternate to flaggers for lane closure operations on twolane, two-way roadways in accordance with Standard Plans, Index 102-606. 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. **102-9.22 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 General: Use removable tape listed on the APL as shown in the Plans and meeting the requirements of 990-4.

102-10.3.2 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.

102-10.3.3 Retroreflectivity: Apply white and yellow pavement markings that will attain an initial retroreflectivity of not less than 300 mcd/lx·m² for white and contrast markings and not less than 250 mcd/lx·m² for yellow markings. Black portions of contrast tapes and black masking tapes must be non-reflective and have a reflectance of less than 5 mcd/lx m². At the end of the six month service life, the retro reflectance of white and yellow removable tape shall not be less than 150 mcd/lx·m².

102-10.3.4 Removability: Provide removable tape capable of being removed from bituminous concrete and portland cement concrete pavement intact or in substantially large strips, either manually or by a mechanical roll-up device, at temperatures above 40°F, 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. Provide only temporary RPMs listed on the APL. 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 Project Information Signs: No separate payment will be made for project information signs. Payment will be included under Maintenance of Traffic, lump sum.

102-11.8 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 Plans, 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, per each per day.

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.

102-11.9 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 102-11.12.

102-11.10 Barrier Delineators: No separate payment will be made for barrier delineators installed on top of temporary barrier and vehicular LCDs. Include the cost for barrier delineators in the cost of the barrier or vehicular LCD.

102-11.11 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.

102-11.12 Temporary Crash Cushions: No separate payment will be made for the concrete or asphalt pad.

102-11.12.1 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.

102-11.12.2 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.

102-11.13 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.

102-11.14 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.

102-11.15 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 fourteen working days before Contract Time begins as authorized by the Engineer.

102-11.16 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.

102-11.17 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.

102-11.18 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.

102-11.19 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 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.

102-11.20 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 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.

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. The number of strips used must meet the requirements of Standard Plans, Index 102-603. 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 Plans. 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 102-13. 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 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 Project Information Signs: Price and payment will be full compensation for all materials and labor for furnishing, installing, relocating, maintaining and removing signs.

102-13.8 Channelizing Devices: Prices and payment will be full compensation for furnishing, installing, relocating, maintaining and removing the channelizing devices.

102-13.9 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.

102-13.10 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.

102-13.11 Temporary Crash Cushion (Redirective or Gating): Price and payment will be full compensation for furnishing, installing, maintaining, and removing crash cushions and concrete or asphalt pads.

102-13.12 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.

102-13.13 Arrow Board: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing arrow boards.

102-13.14 Portable Changeable Message Sign: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing portable changeable message signs.

102-13.15 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.

102-13.16 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.

102-13.17 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.

102-13.18 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.

102-13.19 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. 102-115- | Type III Barricade - per each per day. |
| | |
| Item No. 102-120- | Temporary Signal for Lane Closures on Two-Lane, Two- |
| Item No. 102-120- | Temporary Signal for Lane Closures on Two-Lane, Two- Way Roadways – per each per day. |
| Item No. 102-120- Item No. 102-150- | Temporary Signal for Lane Closures on Two-Lane, Two- Way Roadways – per each per day. Portable Regulatory Sign - per each per day. |
| Item No. 102-120- Item No. 102-150- Item No. 102-150- | Temporary Signal for Lane Closures on Two-Lane, Two- Way Roadways – per each per day. Portable Regulatory Sign - per each per day. Radar Speed Display Unit - per each per day. |
| Item No. 102-120- Item No. 102-150- Item No. 102-150- Item No. 102-909- | Temporary Signal for Lane Closures on Two-Lane, Two- Way Roadways – per each per day. Portable Regulatory Sign - per each per day. Radar Speed Display Unit - per each per day. Temporary Raised Rumble Strips - per day. |
| Item No. 102-120- Item No. 102-150- Item No. 102-150- Item No. 102-909- Item No. 102-913- | Temporary Signal for Lane Closures on Two-Lane, Two- Way Roadways – per each per day. Portable Regulatory Sign - per each per day. Radar Speed Display Unit - per each per day. Temporary Raised Rumble Strips - per day. Removable Tape. |
| Item No. 102-120- Item No. 102-150- Item No. 102-150- Item No. 102-909- Item No. 102-913- Item No. 710- | Temporary Signal for Lane Closures on Two-Lane, Two- Way Roadways – per each per day. Portable Regulatory Sign - per each per day. Radar Speed Display Unit - per each per day. Temporary Raised Rumble Strips - per day. Removable Tape. Painted Pavement Markings. |
| Item No. 102-120- Item No. 102-150- Item No. 102-150- Item No. 102-909- Item No. 102-913- Item No. 710- Item No. 711- | Temporary Signal for Lane Closures on Two-Lane, Two- Way Roadways – per each per day. Portable Regulatory Sign - per each per day. Radar Speed Display Unit - per each per day. Temporary Raised Rumble Strips - per day. Removable Tape. Painted Pavement Markings. 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.

105-1.2 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, and fiber reinforced polymer 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, timber, prestressed and/or precast concrete products and drainage products 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 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: <u>https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section62V2.shtm.</u>

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.

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/Section111V1.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/Section115V2.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 D 3740 for earthwork, ASTM D 3666 for asphalt and ASTM C 1077 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 Earthwork Records System (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.

105-8.4 Earthwork Quality Control (QC) Personnel:

105-8.4.1 Earthwork Level I: 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 I qualification.

105-8.4.2 Earthwork Level II: 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 II 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 II 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 I Technician. As an exception, measurements of temperature may be performed by someone under the supervision of a CTQP Plant Level II 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 II Technician on the roadway at all times when placing asphalt mix for the Department, and perform all testing with a CTQP Asphalt Paving Level I 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 II 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 II 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: 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: a. Precast Concrete Structures Association (PCSA) Batch Plant Operator, b. NRMCA Certified Concrete Technologist Level 3, or c. NRMCA Plant Manager Certification. For dry cast concrete pipe and dry cast drainage structures, the Department will accept American Concrete Pipe Association (ACPA) 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/concreteprestressed.shtm.

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

Ensure the plant manager for QC 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. Certificate of completion of Section 450 Specification examination. Ensure that the QC inspector/technician has the following certifications:

1. ACI Concrete Field Testing Technician Grade I certification.

2. Certificate of completion of Section 450 Specification examination.

105-8.8.1 Additional Requirements for Quality Control (QC) Personnel of Prestressed Manufacturing Facilities:

105-8.8.1.1 Testing Personnel: Ensure that testing technicians meet the requirement of 105-8.7.3.

105-8.8.1.2 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:

with 105-8.9.2.1.3.

1. Precast Concrete Pipe Technician Level I, in accordance

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 II 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 I or II, on the work crew. The supervisor of the work crew, who must be a Level II 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 II 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 II 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 I or II, on the work crew. The supervisor of the work crew, who must be a Level II 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 II 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 II 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: <u>http://www.fdot.gov/traffic/</u>.

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 Faci | lity Manager for Quality Contr | rol | | | | |
| Structural Steel Mamber Type | Minimum Years of Experience Required | | | | | |
| Structural Steel Member Type | QC Inspector/Technician | Facility Manager for QC | | | | |
| Rolled beam bridges | 1 year | 3 years | | | | |
| 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) members3 years5 years | | | | | | |

TRAFFIC CONTROL MATERIALS

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 Approved Product List (APL): Sheeting for use on Temporary Traffic Control Devices 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.

990-2.1.1 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.

990-2.1.2 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.

990-2.1.3 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.

990-2.1.4 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 shall submit an application in accordance with Section 6 and include the following:

Section.

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

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 | | | | | | | |
|-------------|-----------------|-------------------------------|-----------------------------|--|--|--|--|
| Туре | Minimum Size | Minimum Number of Elements | Minimum Legibility Distance | | | | |
| В | 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 preprogrammed 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, weatherresistant 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:

2 inches; and,

1. The minimum vertical aspect of the arm and sheeting shall be

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 Skid Resistance: The surface of the stripes and markings shall provide a minimum skid resistance value of 35 BPN (British Pendulum Number) when tested according to ASTM E303. Bike lane symbols and pedestrian crosswalks shall provide a minimum skid resistance value of 55 BPN.

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 80°F 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 80°F. 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 50°F 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.

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.

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 ZoneSigns.

990-8.1 Post Mounted Sign Supports: 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. Use only non-corrosive metal, aluminum, or galvanized steel attachment hardware.

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 the 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:

| 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) | | | | |

990-9.1.1 Removable Striping Type:

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:

a. Installations Instructions

b. Photographs

c. Drawings (may be included in Installations 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

990-15 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:

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

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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, (<u>MUTCD</u>), Part VI
- (2) Policy on Geometric Design of Highways and Streets, AASHTO
- (3) Roadside Design Guide, AASHTO, Chapter 9
- (4) <u>Standard Plans</u>, **102 Series** and **711-002**
- (5) **FDOT Standard Specifications for Road and Bridge Construction** (<u>Standard</u> <u>Specifications</u>)
- (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

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 <u>Standard Plans</u>, **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 <u>Standard Plans</u>, **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 in accordance with the requirements of *FDM 240.2.2.12*. 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.

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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 C | ross Slop | es |
|---------------|---------|-------------|------------|--------|-----------|----|
| | | i luan i vi | 1 O I II U | 0.02 0 | 1033 0100 | |

| 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 |

240.2.1.5 Lane Widths

See <u>Standard Plans</u>, 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.

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.

When a closure of one or more lanes is necessary, provide an allowable lane closure duration of at least one eight-hour period per 24-hour work period. Approval by the State Roadway Design Engineer is required when at least one eight-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, approval by the District Secretary is required.

See *FDM 241* for illustrations of lane closure analysis worksheets.

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 <u>Standard Plans</u> 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.

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*.
- Provide sufficient detail for diversion geometry and temporary drainage in the TTCP. See the <u>FDOT Drainage Design Guide</u>, Temporary Drainage Chapter, for guidance, Show the radius of curvature and taper lengths. Cross sections which only show

geometric information may be included in the TTCP for complex diversions (e.g., a special detour within a superelevated section).

- 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 <u>Standard Plans</u>. 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.

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.

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 <u>Standard Specifications</u>, **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 321* for more information on phasing.
- (3) See <u>Standard Plans</u>, 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. If necessary to direct non-motorists onto the roadway then:
 - Separate motorized traffic from pedestrians.
 - a. Provide a temporary barrier per *FDM 215* where pedestrians are shifted adjacent to traffic lanes.
 - Consider closing one lane of motorized traffic to accommodate non-motorized traffic of bicycle or pedestrian facilities with high usership.
- 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 minimum width of 8 feet.
- When the existing bike facility is a bicycle lane, marked shoulder or rideable paved shoulder 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.
 - 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, then consider the use of temporary traffic signals or RRFBs. 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 traffic detection. Coordinate required modifications to existing traffic signal operations with the District Traffic Operations Engineer and show signal adjustments in the TTCP.

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 <u>Standard Plans</u>, 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.

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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.

240.2.2 Temporary Traffic Control Devices

The <u>MUTCD</u> 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 <u>Standard Plans</u>, **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.

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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 <u>MUTCD</u> 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 <u>Standard Plans</u>, **102 Series** and <u>Standard Plans</u>, **102 Series** and <u>Standard</u>

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 <u>Standard Plans</u>, **102 Series** and <u>Standard Specifications</u>, **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 <u>MUTCD</u> 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:

- (a) Design temporary signal supports for an 80 mph wind speed. See <u>Structures</u> <u>Manual</u>, Volume 3 for additional requirements.
- (b) See Lateral Offset Criteria in *FDM 215* for placement of temporary traffic signal supports.

The TTCP is to provide instruction for specific alterations (physical location, and preliminary phasing and timing) necessary for existing, temporary and portable signals. Include signal installation plans for each phase of construction in the TTCP. Include traffic control signal requirements or responsibilities in the Technical Special Provisions. Signal

displays and location must meet <u>MUTCD</u> requirements. If temporary signals are used where a pedestrian crossing is present, the pedestrian must be accommodated in the signal timing.

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 <u>Standard Plans</u>, 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 <u>Standard Specifications</u>, **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 for construction projects on multilane divided roadways with lane closures, and a posted speed of 55 mph or greater. Do not specify the use of a MAS when the work zone is shielded by a barrier.

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 <u>Standard Plans</u>, 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. The Department may determine that temporary highway lighting is warranted in the area of an interchange, or other project locations and conditions. When used, temporary highway lighting must comply with the following:

- (1) Meet minimum lateral offset criteria in *Table 215.2.2*.
- (2) Utilize structural supports that are crashworthy or shielded by a crashworthy barrier that was installed for other purposes.
- (3) 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 <u>Standard Plans</u>, **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.

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- (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 <u>Standard Plans</u>, 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. 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) Structural supports for temporary lighting may be attached to and located behind Type K Temporary Concrete Barrier that is bolted or staked down utilizing the details shown on the standard.
- (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.
- (4) 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.

| 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 |

 Table 240.2.2
 Typical Durations for Overhead Bridge Work

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 <u>Standard Plans</u>, 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 <u>Standard Plans</u>, 102 Series and the associated <u>Standard Plans</u> Instructions (SPI 102-200 for the 300 Series and 102-201 for the 700 Series) for more information.

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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 <u>Standard Plans</u>, **Index 546-001** and <u>Standard Specifications</u>, **Section 546** for additional requirements and information.

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*.
| 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 | | |

Table 240.3.1 Transportation Operations Strategies

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*.

²⁴⁰⁻ Transportation Management Plan

See the following for additional information on public involvement and CAP requirements:

- (1) **FDM 104**
- (2) <u>Public Involvement Handbook</u>
- (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 240.4.2.7* for requirements and criteria concerning lane closures.

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 time period a lane closure could occur without excessive travel delay.

Many roadways have directional peak hour traffic volumes, with inbound morning traffic, and outbound afternoon traffic. Doing a composite lane closure analysis would in many cases require night work or create very short allowable lane closure periods. If a separate lane closure analysis is calculated for inbound and outbound separately, night work may be avoided and longer lane closure periods may be allowed.

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: <u>TTC Resource</u> <u>Download Library</u>. 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*).

241-Lane Closure Analysis

| | | 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 <u>Transportation</u> <u>Statistics Office</u> has tables showing Peak Season Conversion Factors for every county in Florida. These tables are found in the <u>Florida Traffic</u> <u>Online</u> 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 | С | 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 <i>FDM 241.6</i> 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 |

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.

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241-Lane Closure Analysis

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D

3

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 <i>FDM 241.6</i>). |
|---------|---|
| 12) TLW | Travel Lane Width is used to determine the obstruction factor (see the Obstruction Factor Table in <i>FDM 241.6</i>). |
| (13) LC | Lateral Clearance is the distance from the edge of the travel lane to the |

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 neak l | 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

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.

If $V \le RC$, there is no restriction on Lane Closure If V > RC, calculate the hourly percentage of ADT at which Lane Closure will be permitted



241-Lane Closure Analysis

241.6 Lane Closure Input Data

| Lateral Clearance (LC) | Travel Lane Width (TLW) (feet) | | | |
|---------------------------|--------------------------------|------|------|------|
| (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 241.6.1 Obstruction Factors (OF)

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

241-Lane Closure Analysis

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: <u>TTC Resource Download Library</u>. 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

- **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

recreational vehicles.

- **Pc/h/In** Passenger cars per hour per lane. Pc/h/In 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.
- Pt Percent Trucks (%).

242.4 Traffic Pacing Calculations Example

- **<u>STEP 1</u>**: 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% |

242-Traffic Pacing Design



<u>STEP 2</u>: 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.



HOURLY VARIATION OF DAILY TRAFFIC

²⁴²⁻Traffic Pacing Design

243 Portable Changeable Message Signs

243.1 General

See *FDM 240.9.2.2* 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 <u>Standard Specification 102</u>. 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.

| Topic #625-000-002 | |
|--------------------|-----------------|
| FDOT Design Manual | January 1, 2021 |

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 321* for instruction on showing the worksheet information in the plans set.

^{243–}Portable Changeable Message Signs

| Figure 243.3.1 PCMS Worksheet | | | |
|---|--|--|--|
| Financial Project No.: <u>123456-7-89-10</u> | | | |
| Location of board: <u>Westbound Buck Lake Road – Station 100+00</u> | | | |
| Used: from <u>01 - 01 - 01 at 6</u> : <u>00</u> ampm | | | |
| to <u>02 - 02 - 02 at 6 : 00 ampm</u> | | | |
| Message programmed by: <u>W. Giddens</u> | | | |
| MESSAGE 1 | | | |
| | | | |
| | | | |
| | | | |
| 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 <u>10</u>.<u>00</u> seconds.

Message 2 will run <u>12</u>.<u>50</u> seconds.

243–Portable Changeable Message Signs

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. | <u>PROMPT</u> |
|---------------------|------------|---------------|
| 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 | 1 | [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] |
| | | |

243–Portable Changeable Message Signs

Level

Upper, Lower UPR, LWR

* = 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/)



Office of Design

Office of Design / Standard Plans

Standard Plans for Road and Bridge Construction Standard Plans Implementation Interim Year Standard Plans Effective Date Support Revisions Bulletin Road Construction FY 2021-22 CADD/CEL Interim RDB20-10 07/01/21 **Bridge Construction** Road Construction FY 2020-21 RDB19-08 07/01/20 CADD/CEL Interim **Bridge Construction** Road Construction FY 2019-20 CADD/CEL Interim RDB18-10 07/01/19 **Bridge Construction** Road Construction FY 2018-19 CADD/CEL Interim RDB17-13 07/01/18 **Bridge Construction**

FD

| Gener | al Constru | ction Operations-Roadway | | | |
|---------|------------|--|-----|-----|-----|
| | | Maintenance of Traffic | | | |
| 102-100 | | Temporary Barrier | 415 | | |
| 102-110 | | Type K Temporary Concrete Barrier System | 414 | SPI | XLS |
| 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 | 1 | |
| 102-603 | | Two-Lane, Two-Way, Work Within the Travel Way | 603 | 1 | |
| 102-604 | | Two-Lane, Two-Way, Intersection Work | 604 |] | |
| 102-606 | | Two-Lane Roadway, Lane Closure Using Temporary Traffic Signals | | SPI | |
| 102-607 | Errata | Mobile Operations | 607 | 1 | |
| 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 | SDI | |
| 102-661 | | Bicycle Lane Closures | NEW | 311 | |
| 102-665 | | Limited Access Temporary Opening | 665 | SPI | |
| 102-680 | | Haul Road Crossing | NEW | SPI | |

Standard Specifications

(http://www.fdot.gov/programmanagement/Implemented/SpecBooks/d

efault.shtm) Florida Department of TRANSPORTATION E-Updates | FL511 | Site Map | Translate ► Search FDOT About FDOT Careers Contact Us Maps & Data Offices Performance Projects **Program Management** Program Management/Specifications Program Ma Standard Specifications Library The Standard Specifications for Road and Bridge Construction contain requirements setting out or relating to the method or manner of performing work or to the quantities and qualities of materials and labor for all FDOT contracts. Here you will find links to the standard specifications documents for current and recent past FDOT projects. For more information on FDOT and other Specifications, visit the Standard Specifications web page This document contains the most recent published version of FDOT's Standard Specifications for Road and Bridge Construction, effective for project lettings beginning JULY 2021. Please view and read the Distribution memo for more information. July 2021 Distribution Bulletin July 2021 Standard Specifications eBook 🝝 Signed and Sealed Record Copy

Revisions to the published Standard Specifications for Road and Bridge Construction may be implemented to enhance safety; reduce costs; comply with new laws, rules or policies; incorporate new technology; update industry standards or practices; and other critical updates.

July 2021 eBook - History of Revisions

July 2021 Redline eBook

July 2021 Workbook

Mandatory Revisions

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.

Standard Plans Indexes: 102-600, 102-660, 102-661, and 522-002

FDDT Design Manual (FDM): 240.2.1.9

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 along the 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.

| СІ | TABLE 1 CHANNELIZING DEVICE SPACING | | | | | |
|------------------------|--|--|----------------|--|--|--|
| Work | | Maximur | n Spacing (fee | t) | | |
| Zone Speed (mph) | Cone Temp Tubular | Cones or Type I Bai Temporary Type II Ba bular Markers Vertical Panels | | arricades, Parricades, Pls, or Drums | | |
| | Taper | Tangent | Taper | Tangent | | |
| ≤ 45 | 25 | 50 | 25 | 50 | | |
| ≥ 50 | 25 | 50 | 50 | 100 | | |

| TABLE | 3 |
|--|--|
| WORK ZONE SIGN | I 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 w the minimum spacing may be reduce | work zone speed ≤ 55 mph, ed in accordance with the |

MUTCD and as approved by the Engineer.

| CLEAR ZON | TABLE 5 E 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.

FDOT

| TABLE TAPER LENG | 2 GTH "L" |
|---|-------------------------|
| FORMUL | 4 <i>5</i> |
| S ≤ 40 | $L = (WS^2)/60$ |
| S ≥ 45 | L = WS |
| Where: L = Taper Length in f W = Width of Offset i S = Work Zone Speed | eet n feet in mph |
| NOTE: See Table 9 for | example lues |

| TAB | LE 4 |
|---|---|
| BUFFER LI | ENGTH "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 Leng attained due to ged use the greatest but not less than | th "B" cannot be ometric constraints, length possible, 155 feet. |

| LE 6 RADII FOR CROWN |
|-----------------------------|
| Minimum Radius (feet) |
| 4090 |
| 3130 |
| 2400 |
| 1840 |
| 1390 |
| 1080 |
| 820 |
| 610 |
| 430 |
| |

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QUICK REFERENCE SHEET **102 SERIES TABLES**

| | | Т | ABLE 7 |
|------------|-----------------------|------------------------------------|---|
| PC | OST AND | FOUNDATION | TABLE FOR WORK ZONE SIGNS |
| SIGN SHAPE | SIGN SIZE (inches) | NUMBER OF STEEL U CHANNEL POSTS | Notes For Table: |
| Octagon | 30x30 | 1 | 1. Use 3 lb/ft posts for Clear Height up to 10' |
| | 36x36x36 | 1 | and 4 lb/ft posts for Clear Height up to 12'. |
| Triangle | 48x48x48 | 1 | · · · · · · · · · · · · · · · · · · · |
| | 60x60x60 | 2 | * Use 4 lb/ft U-channel sign post with a |
| | 24x18 | 1 | mounting height of 7' min. and 8' max. Attach |
| | 24x30 | 1 | sign panel using Z-bracket detail on Sheet 6. |
| | <u>30x24 1</u> | | |
| | 36x18 | 1 | 2. Minimum foundation depth is 4.0' for 3 lb/ft |
| | 36x24 | 1 | posts and 4.5' for 4 lb/ft posts. |
| Rectangle | 48x18 | 1 | 2 For hold 2 th (G) and A th (G) have an eight |
| (W × H) | 48x24 | 1 | 3. For both 3 lb/ft and 4 lb/ft base or sign |
| (W × 11) | 36x48 | 2 | dopth of 2' of rock layor is required |
| | 48x30 | 2 | depth of 2 of fock layer is required. |
| | 48x36 | 2 | 4 The soil plate as shown on the API vendor |
| | 54x36 | 2 | drawing is not required for base posts or |
| | 48x60 | 3 | sign posts installed in existing rock (as |
| | 72x48 | 3 | defined in Note 3), asphalt roadway, shoulder |
| | 120x60* | 4* | pavement or soil under sidewalk. |
| | 30x30 | 1 | |
| Square | 36x36 | 2 | 5. For diamond warning signs with supplement |
| | 48x48 | 2 | plaque (up to 5 ft² in area), use 4 lb/ft posts |
| Diamond | 48x48 | 2 | for up to 10 ft Clear Height (measure to the bottom of diamond warning sign). |
| Circle | 36Ø | 2 | |

| DR | OP-OFF PRO | TABLE 8 DTECTION RE | QUIREMENTS |
|-----------|----------------------|------------------------------|---------------------|
| Condition | X (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 Retaining | of Bridge or Wall Barrier | Temporary Barrier |
| 5 | Removal c Brid | f portions of ge Deck | Temporary Barrier |

| | | | | E. | T / X AMPL | ABLE 9 E "L" V | ALUES | | | | | |
|------------|-----|-----|-----|-----|---------------|-------------------|----------|-----|------|------|------|-----|
| | | | | | | V (fe | V et) | | | | | |
| S (mph) | | 5 | | | 8 | | | 10 | | | 12 | |
| | L | L/2 | L/3 | L | L/2 | L/3 | L | L/2 | L/3 | L | L/2 | L/3 |
| 25 | 52 | 26 | 17 | 83 | 42 | 28 | 104 | 52 | 35 | 125 | 63 | 42 |
| 30 | 75 | 38 | 25 | 120 | 60 | 40 | 150 | 75 | 50 | 180 | 90 | 60 |
| 35 | 102 | 51 | 34 | 163 | 82 | 54 | 204 | 102 | 68 | 245 | 123 | 82 |
| 40 | 133 | 67 | 44 | 213 | 107 | 71 | 267 | 133 | 89 | 320 | 160 | 107 |
| 45 | 225 | 113 | 75 | 360 | 180 | 120 | 450 | 225 | 150 | 540 | 270 | 180 |
| 50 | 250 | 125 | 83 | 400 | 200 | 133 | 500 | 250 | 167 | 600 | 300 | 200 |
| 55 | 275 | 138 | 92 | 440 | 220 | 147 | 550 | 275 | 183 | 660 | 330 | 220 |
| 60 | 300 | 150 | 100 | 480 | 240 | 160 | 600 | 300 | 200 | 720 | 360 | 240 |
| 65 | 325 | 163 | 108 | 520 | 260 | 173 | 650 | 325 | 217 | 780 | 390 | 260 |
| 70 | 350 | 175 | 117 | 560 | 280 | 187 | 700 | 350 | 233 | 840 | 420 | 280 |
| | | | FD | | F | Y 202 | 21-22 | | QUIC | K RE | FERE | NCE |

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