THE PORT AUTHORITY OF NY & NJ
Engineering Department

Traffic Design Guidelines

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DOCUMENT CONTROL

Document History			
Version	**Issue Date**	**Author**	**Details of Changes**
Version 2018 v1.1	1/15/2019	Z. Whiteman	Updated document reference links

1.0 TRAFFIC DISCIPLINE

1.1 OVERVIEW

These guidelines are provided as an overview of the Port Authority's design standards. Design details and associated documents outlined in these documents will be provided to the designer as required.

The Guidelines shall not replace professional design analyses, nor the Guidelines are intended to limit innovative design where equal performance in value, safety, and maintenance economy can be demonstrated. The design team shall be responsible for producing designs that comply with the Guidelines in addition to all applicable codes, ordinances, statutes, rules, regulations, and laws. Any conflict between the Guidelines and an applicable code, ordinance, statute, rule, regulation, and/or law shall be addressed with the respective functional chief. The use and inclusion of the Guidelines, specifications, or example drawing details as part of the Contract Documents does not alleviate the design professional from their responsibilities or legal liability for any Contract Documents they create. It is also recognized that the Guidelines are not universally applicable to every project. There may be instances where a guideline may not be appropriate. If the design professional believes that a deviation from the Guidelines is warranted, such a deviation shall be submitted in writing for approval to the respective functional chief. The Traffic Engineering Discipline is part of the Engineering/Architecture Design Division (EADD) of the Engineering Department. As expanded upon below, the Traffic Engineering Discipline is organized into six functional groups: Traffic Planning and Priority Programs, Traffic Design, Traffic Operations, Traffic Safety, Transportation Technologies, and the Agency Operations Center. Roadway Access Management is a technical tool that is included within the first four of these functional groups.

1.1.1 TRAFFIC PLANNING AND PRIORITY PROGRAMS

Perform transportation planning services and the functional planning of new infrastructure investments and improvements to existing vehicular and pedestrian facilities by performing surveys and developing and maintaining state-of-the-art traffic forecasting, simulation, and trip assignment computer models. Additionally, provide transportation planning and engineering services to major Redevelopment Programs and develop Transportation Management Plans to support construction.

1.1.2 TRAFFIC DESIGN

Perform traffic engineering design services to support the Engineering Department's commitment to capital and operating major works programs by serving as a Lead Engineer/Architect or in a support (Task Leader) capacity to other engineering disciplines.

Tasks include:

- ❒ Contract preparation.
- ❒ Stage IV construction coordination.
- ❒ Shop drawing reviews.
- ❒ Field support in auditing and implementing Maintenance of Traffic plans during construction.
- ❒ Traffic Signal turn-on and Final inspection checklist in coordination with the Construction Management Division (CMD) and Electrical Facility.
- ❒ TAA reviews.
- ❒ Transportation Management Plan (TMP) development.

1.1.3 TRAFFIC OPERATIONS

Perform day-to-day traffic engineering services to provide a safe and reliable transportation system through the practice of Service Engineering. Work with facility staff to resolve traffic flow, control, capacity, levels of service, access, egress, and parking issues. Determine the design, type, size, and location of all traffic signs, signals, pavement markings, roadside appurtenances, and similar devices.

1.1.4 TRAFFIC SAFETY

Perform traffic engineering services through a Traffic Safety Improvement Program to plan, implement, and evaluate traffic safety improvements to minimize the frequency, severity, and risk of vehicle crashes. Ensure due diligence on the part of the Port Authority of New York & New Jersey to provide a safe environment for vehicles and pedestrians.

1.1.5 TRANSPORTATION TECHNOLOGIES

Manage the agency's ITS program in accordance with the implementation roadmap to help deliver the ITS Strategic Plan mission through the use of transportation technologies. Perform ITS planning, design, and construction and operational support services to improve operational efficiency and help optimize the use of available transportation system network capacity.

1.1.6 AGENCY OPERATIONS CENTER

The PA-Agency Operations Center (PA-AOC) is an Agency-wide transportation management center, operational 24/7. The AOC provides a single point of contact for real-time transportation information within the PA allowing the agency to speak as one voice with the State/City of New York and the State of New Jersey transportation management centers, as well as TRANSCOM. The PA-AOC enhances coordination with regional transportation partners to promote more efficient regional transportation systems management. Additionally, the PA-AOC has made partnering with third party technology companies a strategic priority. Collaboration with companies such as Google, Apple and Waze has increased capabilities in real-time transportation management, allowing the PA to reach a much larger number of customers.

2.0 TECHNICAL AND CODE STANDARDS/REGULATIONS

- ❒ Federal Highway Administration: Manual on Uniform Traffic Control Devices (MUTCD), latest edition
- ❒ American Association of State Highway and Transportation Officials (AASHTO): A Policy on Geometric Design of Highways and Streets – "AASHTO Green Book," latest edition
- ❒ Roadside Design Guide, 4th Edition, AASHTO, 2011
- ❒ Standard Highway Signs, FHWA, 2004
- ❒ Highway Capacity Manual (HCM), Transportation Research Board (TRB), 2010
- ❒ Public Right of Way Accessibility Guidelines (PROWAG), 2013
- ❒ Guide for the Planning, Design, and Operation of Pedestrian Facilities, AASHTO, 2004
- ❒ Americans with Disabilities Act Standards for Accessible Design
- ❒ Guide for the Development of Bicycle Facilities, AASHTO, 4th Edition, 2012
- ❒ Pedestrian Planning and Design, John Fruin, Ph.D., 1971
- ❒ NYC CEQR Technical Manual, NYC Mayor's Office of Environmental Coordination, 2014
- ❒ Station Planning and Design Guidelines, MTA New York City Transit, 2006
- ❒ Transit Capacity and Quality of Service Manual, 3rd Edition, Transportation Research Board (TRB), 2013
- ❒ CADD Standard Manual (PA)
- ❒ Tenant Construction Review Manual (PA)
- ❒ Sustainable Design Guidelines (PA)
- ❒ Traffic Signal Design and Drawing Preparation Guidelines (PA)
- ❒ Airport Roadway Sign Design Manual (PA)
- ❒ Roadside and Median Barrier Design Guide (PA)
- ❒ ITS Design Guidelines (PA)
- ❒ Roadway Access Management Guidelines (PA)
- ❒ Transportation Management Plan (TMP) Guidelines (PA)
- ❒ Routine Lane Closure Guidelines (PA)
- ❒ Pavement Marking Design Guidelines (PA)

3.0 DESIGN CRITERIA AND SPECIAL REQUIREMENTS

3.1 PLANNING

3.1.1 TRAFFIC ANALYSIS

The design team should familiarize themselves with the material in the Port Authority Roadway Access Management Guidelines (1) prior to functional plan development. Of particular importance is chapter 2, "The Role of Roadway Access Management in Port Authority Business Practices."

3.1.1.1 FUNCTIONAL PLAN DEVELOPMENT

Generally produced in Stages I and II:

1. Determine design year (usually 20 years into future).
2. Determine design hourly volume (DHV).
3. On existing roads, obtain current traffic volume and apply growth factors that consider:
   - ❑ Local traffic
   - ❑ PA facility traffic
   - ❑ New facilities
   - ❑ Local planned developments
   - ❑ PA planned developments
4. For new facilities or roadways, determine trip generation volumes and assign them to the roadway network.
5. Select level of service for design (usually C or D).
6. Compare DHV to existing capacity (for not only the ultimate configuration but also for intermediate construction stages) at:
   - ❑ Tangent sections
   - ❑ Weaving areas
   - ❑ Ramps
   - ❑ Intersections
     - Signalized
     - Unsignalized
7. Develop conceptual plan to overcome capacity shortfall or operational deficiencies by:
   - ❑ Improving traffic management systems (improve existing conditions)
     - Rerouting traffic
     - Improved signing and striping
     - Traffic/parking restrictions
   - ❑ Widening
   - ❑ Signalization
     - Revise existing

- New

❑ Roadway Access Management

8. Prepare functional plan in sufficient detail to show:
   - ❑ Existing major elements (curbs, barriers, signals, etc.) to remain, to be relocated, and to be revised
   - ❑ New design elements
   - ❑ Existing elements to be relocated
   - ❑ Pavement marking to clearly show number of traffic lanes
   - ❑ Roadway layout throughout the area of concern and where it meets existing
9. Finalize functional plan to include:
   - ❑ Traffic volumes (DHV)
   - ❑ Roadway and lane widths
   - ❑ Traffic signals
   - ❑ Traffic signs (regulatory, warning, directional)
   - ❑ North arrow

In general, before proceeding into the next phase of design development, secure Line Department/ Facility concurrence with functional plan.

3.2 DESIGN

3.2.1 CONSTRUCTION STAGING AND HOURS OF WORK

Construction should be staged to minimize traffic impacts while maintaining sufficient capacity to meet demand.

If possible, the existing number of lanes should be maintained. Where the number of lanes cannot be maintained, consideration should be given to off-peak or nighttime construction. Traffic Engineering assists the Facility and Line Department in determining the hours of work. Some routine lane closures may be performed during daytime hours, but other closures may only be performed during nighttime hours, which vary by facility. Traffic Engineering performs the traffic analyses to determine the hours of work that minimize delays and queueing.

3.2.2 MAINTENANCE OF TRAFFIC (MOT)

All construction and maintenance operations work within roadways shall be performed with approved MOT drawings. Every construction stage and substage where the traffic pattern changes requires a unique MOT scheme. Closures within parking areas also require MOT. All drawings must:

- Warn road users (motorists, pedestrians, and bicyclists) of work zones.
- Advise road users of the proper travel path through the work zone.
- Delineate areas where traffic should not operate.
- Separate and provide reasonable protection for both road users and workers.

3.2.2.1 WORK ZONE TRAFFIC CONTROL LAYOUTS

A work zone is an area where road user conditions are changed by the use of temporary traffic control devices, flaggers, or other authorized personnel due to construction activity. Standards and guidelines for the maintenance and protection of traffic in work zones are found in Part 6 of the Manual on Uniform Traffic

Control Devices (MUTCD), the Port Authority Lane Closure Guidelines, Port Authority O&M Standards, and the Port Authority Standard Details.

The Lane Closure Guidelines should be utilized whenever possible. These shall be modified to meet site conditions as required. If the Routine Lane Closures do not apply, new drawings must be created. A link to the Routine Lane Closures (2) by facility are found below:

- Lane Closure Guidelines – Lincoln Tunnel (2)
- Lane Closure Guidelines – Holland Tunnel (3)
- Lane Closure Guidelines – George Washington Bridge (4)
- Lane Closure Guidelines – Outerbridge Crossing (5)
- Lane Closure Guidelines – Port Authority Bus Terminal (6)
- Lane Closure Guidelines – Newark Airport (7)
- Lane Closure Guidelines – JFK Airport (8)

O&M Standards should be utilized for routine maintenance and operations work only. However, the O&M standards may not be applicable for complex roadway configurations, where specific MOT drawings need to be developed.

3.2.2.2 DETOURS

Road closures should be avoided, but where necessary, detours should follow alternate routes close to, and generally parallel to the roadway being closed. The detour routes must have sufficient capacity and roadway width to carry the diverted traffic.

3.2.2.3 INTERSECTIONS

When a lane closure is required on the far side of an intersection consideration should be given to closing the impacted lane in advance of the intersection. Proper taper lengths are required for the lane closure in advance of the intersection.

3.2.2.4 RAMPS

Where work zones reduce the available acceleration lane distance, consideration should be given to closing the right lane in advance of the on-ramp to create a dedicated ramp entry lane using the closed right lane, where practical.

If advanced lane closures cannot be provided and adequate acceleration length to support a merge is not available, temporary traffic control of on-ramp traffic may, depending on mainline and ramp traffic volumes, consist of STOP (R1-1) or YIELD (R1-2) signs. Every attempt should be made to provide adequate acceleration length. The use of STOP or YIELD control contributes to a speed differential between mainline and entering traffic and should only be used where adequate acceleration length is not available or closing the ramp and detouring traffic is not practical.

In all cases, provide advance warning of the STOP or YIELD condition by using STOP AHEAD or YIELD AHEAD signs and VMS if appropriate. If space is available, install STOP and YIELD signs on both sides of the ramp.

3.2.2.5 PEDESTRIAN AND BICYCLE TRAFFIC

Pedestrian and/or bicycle traffic must be maintained through, or around work zones where pedestrians and/or bicyclists are not prohibited.

Pedestrian detour routes should be well marked, continuous, and easy to traverse. They must be maintained free of obstructions and hazards. The detour route shall maintain the same accessibility as existing.

3.2.2.6 WORK ZONE TRAFFIC CONTROL

Guidelines for the design, use, installation, and operation of traffic control devices in work zones are established by the MUTCD (PART 6, Temporary Traffic Control). The latest edition of the MUTCD is available online at www.mutcd.fhwa.dot.gov[9]. Temporary traffic control devices include but are not limited to:

- Construction Signs
- Channelizing Devices
- Flashing Arrow Sign Units
- Portable Variable Message Signs
- Hand Signaling Devices
- Temporary Concrete Barrier
- Temporary Impact Attenuators
- Back-up Trucks
- Temporary Pavement Markings
- Temporary Traffic Signals

3.2.2.7 CONSTRUCTION SIGNS

Guidelines for the design, use, and installation of construction signs are established by the MUTCD. In addition, the following should be considered:

- Choose standard MUTCD signs that are appropriate and that accurately describe the roadway conditions.
- Choose the standard message signs according to what action the driver needs to take. Minimize the use of special messages.
- Use larger signs when greater visibility is desired. For example, high speeds or large volumes.
- Consider using smaller signs in narrow medians if larger signs will overhang the adjacent travel lane.

3.2.2.8 CONSTRUCTION SIGN PLACEMENT

A. Warning signs must be located to provide adequate visibility distance to drivers. They must not be blocked by foliage, roadway features, or other signs and traffic control devices nor interfere with other signs.

B. Actual distance from a warning sign to the condition should be close to the stated distance on the sign and in accordance with the MUTCD. However, positioning of the sign to enhance visibility and avoid conflicts with other traffic control devices and roadway features is more important than precise agreement with the stated distance.

3.2.2.9 CONSTRUCTION SIGN MOUNTING

A. The majority of construction signs are placed on X-Base sign supports and are offset 2 feet minimum from any travel lane. However, some signs are placed on Type III Breakaway Barricades, which include:

- Arrow signs within tapers
- ROAD/RAMP CLOSED signs at the closure point
- Pedestrian detour/closure signs to physically block pedestrian paths

3.2.2.10 CHANNELIZING DEVICES

Channelizing devices guide motorists through the work zone. Channelizing devices are used to provide a physical separation between the travel lanes and the work area. Channelizing devices also provide for lane merges, lane shifts, diversions, detours, and narrowing of lanes. The predominantly used channelizing devices are drums and breakaway barricades but can include cones and tubular markers.

The type of channelizing devices used should be consistent throughout the work zone. In addition, the following should be considered:

- At locations where lane or shoulder closures are protected by temporary concrete barrier, a taper of channelizing devices is placed upstream of the end of the barrier where the closure begins.
- When used to close travel lanes where workers are exposed to traffic, the spacing of channelizing devices in tangent sections and tapers should be 20 feet.
- Where engineering judgement indicates a special need for closer device spacing, such as in tightly curved sections of the roadway, channelizing devices can be spaced 10 feet apart.
- Where driveways or intersecting streets or crossovers are located within the work zone, channelizing devices should be placed to adequately define their turning radii. A 5-foot spacing between channelizing devices should be adequate for most circumstances.
- Drums are to be used for all lane-closures except where work space is limited, and adequate lane widths cannot be provided through the use of drums but may be able to be provided by substituting cones.
- Type III barricades are used at all locations where a highway, bridge, ramp, or other segment of the roadway is closed to traffic, by placing them across the area that is closed.
- Place a minimum of 2 (preferably 3) Type III breakaway barricades with appropriate large arrow signs within the merging taper.

3.2.2.11 FLASHING ARROW SIGN UNITS

Flashing Arrow Sign Units (FASU) can be trailer-mounted or mounted on a back-up truck. The FASU can be set to display a Left Arrow, Right Arrow, Left and Right Arrow, and Caution pattern as stated below:

- Use a FASU for all lane closures, typically placed at the end of the taper with the appropriate arrow display.
- For shoulder closures and lane shifts the FASU displays a caution pattern, unless it is determined that an arrow display is more appropriate based on engineering judgement.
- Use a FASU for lane splits with a 2-sided arrow where both lanes provide equivalent destinations and purpose.

3.2.2.12 PORTABLE VARIABLE MESSAGE SIGNS

Portable variable message signs (PVMS) are to be used as supplemental, temporary work zone warning devices and for lane and roadway closures. PVMS may supplement signing in a work zone but cannot be used to replace regulatory or warning signs. They may also be used in lieu of or to supplement guide signs to display variable information, real-time traffic information, and for increased emphasis.

3.2.2.13 HAND SIGNALING DEVICES

Flaggers are used to stop traffic intermittently at work sites and to assign right of way, or to slow traffic as it passes the activity area to help protect the work crew. A flagger sign (W8-22) should be used to warn drivers that they are approaching a flagger station. Sight distance needs to be maximized for flagger locations, but as a minimum, approaching traffic must have sufficient distance to stop at the intended stopping point.

For projects in New York flagger services are the responsibility of the contractor. For projects in New Jersey flagger services are provided by the Authority (PAPD). When flagging services are required at a signalized intersection these services must be provided by the Authority (PAPD).

3.2.2.14 TEMPORARY TRAFFIC BARRIER

The use of traffic barriers (vehicle strong barriers) such as temporary concrete barrier or water-filled barrier should be used in the following conditions:

- When a drop-off of 6" or greater is present within 5 feet of the travel lane
- When the lane closure will be in place for an extended period of time.

Where temporary concrete barrier is used to close lanes or shoulders, the closure must first be formed using channelizing devices with the appropriate taper length. Recommended minimum flare rates for concrete barrier are shown in the AASHTO Roadside Design Guide. If possible, the approach ends should be started behind an existing barrier beyond its deflection distance. If approach ends cannot be carried beyond the clear zone, the ends must be suitably treated by impact attenuators or sand barrel arrays. A minimum length of 80 feet should be used for concrete barrier and 200 feet for water filled barrier (or per manufacturer's instructions, if greater).

3.2.2.15 TEMPORARY IMPACT ATTENUATORS

Temporary impact attenuators shield concrete barrier end sections and other rigid objects located within the clear zone in construction zones. For design guidance refer to the AASHTO Roadside Design Guide.

3.2.2.16 BACK-UP TRUCKS

When the use of vehicle strong barrier is not feasible, a back-up truck should be used. A back-up truck is a vehicle equipped with a truck-mounted impact attenuator located a short distance upstream from a slowly moving lane or shoulder closure area or is parked a short distance upstream from a stationary lane or shoulder work area. Back up trucks must be used to protect motorists and workers in stationary work areas adjacent to the highway, except when the work area is protected by vehicle strong barriers.

Back up trucks should be located in each of the lane(s) and/or shoulder in which the work area is located. They should be positioned a sufficient distance (a minimum of 30 feet for speeds 45 mph and under) upstream of the workers and/or equipment being protected to allow for the distance they will roll ahead upon impact, but not so far that an errant vehicle can travel around the back-up truck and strike the workers/equipment.

3.2.2.17 TEMPORARY PAVEMENT MARKINGS

Temporary pavement markings are used to delineate a temporary traffic pattern or when it is necessary to open a roadway that is under construction and the contractor is unable to install final pavement markings. Temporary pavement markings must comply with the MUTCD.

3.2.2.18 TEMPORARY TRAFFIC SIGNALS

A temporary traffic signal installation is defined as a fully functional traffic control device comprised in part or wholly of temporary traffic signal components. All temporary traffic signal installations must be designed in accordance with the MUTCD. Temporary traffic signals should be used in the following situations:

- When any portion of a permanent traffic signal is disrupted by construction activities
- When temporary traffic patterns need to be accommodated at a traffic signal location
- To control traffic and optimize capacity during all stages of a construction project

3.2.3 TRANSPORTATION MANAGEMENT PLANS

All projects that reduce the number of travel lanes or throughput capacity or require a traffic diversion/detour must include a Transportation Management Plan in accordance with the Transportation Management Plan Guidelines. [10]

3.2.4 PERMANENT CONSTRUCTION

3.2.4.1 SIGNING

All roadway signs shall be in accordance with the latest version of the MUTCD. Guide signing on airport roadway facilities shall be in accordance with the PA Airport Roadway Sign Design Manual [11] Lighting of Overhead Sign Panels shall be in accordance with the following guide:

Facility	Overhead Sign Lighting Criteria	Additional Notes
Airports, Bus Terminals, and Port Facilities	All signs shall require lighting unless otherwise noted or directed by the Chief Traffic Engineer.	Recommendations for permanent sign panel installations: 1. All signs shall be fabricated using Type XI sheeting. 2. All signs which have a VMS incorporated within, or positioned above or below, shall not have lighting.
Tunnels and Bridges	The need for lighting shall be evaluated in accordance with current AASHTO Roadway Lighting Guide Criteria.	

All low clearance signing shall be in accordance with Low Clearance Signing Guidelines. [12]

3.2.4.2 PAVEMENT MARKINGS

All pavement markings shall be in accordance with the Pavement Marking Design Guidelines (PA) [13]

3.2.4.3 GUIDERAIL

All guiderail design shall be in accordance with the Roadside and Median Barrier Design Guide (PA) [14]

3.2.4.4 BARRIERS

Traffic barrier design shall be in accordance with the Roadside and Median Barrier Design Guide (PA) [15]

3.2.4.5 DELINEATION DEVICES AND MARKERS

3.2.4.5.1 Delineator Spacing Guidelines

Delineators mounted on roadside or median barrier shall be spaced to allow the maximum benefit to the driver under all types of weather conditions. The following guide is recommended:

Side Mounted				
Straight Road	Left Curves	Right Curves	Verticals	Limited Visibility
75-100 Ft	40-50 Ft	75-100 Ft	40-50 Ft	40-50 Ft
Top Mounted				
Straight Road	Left Curves	Right Curves	Verticals	Limited Visibility
75-100 Ft	40-50 Ft	75-100 Ft	60-80 Ft	40-50 Ft

3.2.4.6 ITS

All ITS design shall be in accordance with the ITS Design Guidelines (PA) [16]

3.2.4.7 DYNAMIC MESSAGE SIGNS

All dynamic message signs shall be in accordance with the ITS Design Guidelines (PA)

3.2.4.8 TRAFFIC SIGNALS

All traffic signal design shall be in accordance with the Traffic Signal Design Guidelines (PA) [17]

3.2.4.9 PEDESTRIAN AND BICYCLE ACCOMMODATIONS

All pedestrian and bicycle facilities design shall be in accordance with *the Guide for the Planning, Design, and Operation of Pedestrian Facilities, AASHTO,* and *Guide for the Development of Bicycle Facilities, AASHTO*

Pedestrian accommodations at signalized intersections shall be in accordance with the Traffic Signal Design Guidelines (PA).

3.2.4.10 ROADWAY ACCESS MANAGEMENT

All site design shall be in accordance with the Port Authority Roadway Access Management Guidelines

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- ❑ TD 050.04 Symbol and Arrow Markings for Bicycle Lane

- ❑ TD 050.05 Arrow Markings
- ❑ TD 050.06 Word Markings (1 of 2)
- ❑ TD 050.07 Word Markings (2 of 2)
- ❑ TD 050.08 Route Shields and Word Markings
- ❑ TD 050.09 Lane and Ramp Pavement Markings
- ❑ TD 050.10 Parking Lot Markings
- ❑ TD 050.11 Accessible Parking for People with Disabilities
- ❑ TD 050.12 Intersection Markings
- ❑ TD 050.13 Miscellaneous Markings
- ❑ TD 050.14 Airside Markings and Sign Placement

4.1.6 TD060 – Delineation Devices and Markers (23)

- ❑ TD 060.01 Delineator Details and Mounting (1 of 2)
- ❑ TD 060.02 Delineator Details and Mounting (2 of 2)
- ❑ TD 060.03 Reflectorized Pavement Markers, Legend and Placement Detail (1 of 2)
- ❑ TD 060.04 Reflectorized Pavement Markers, Legend and Placement Detail (2 of 2)

4.1.7 TD070 – Permanent Impact Attenuators (24)

- ❑ TD 070.01 Quadguard Impact Attenuators with Tension Strut Backup
- ❑ TD 070.02 Quadguard Impact Attenuators with Concrete Backup
- ❑ TD 070.03 REACT 350
- ❑ TD 070.04 TRACC
- ❑ TD 070.05 CAT-350
- ❑ TD 070.06 Inertial Sand Filled Barrel Arrays
- ❑ TD 070.07 Nose Cover Marker for Attenuator End Treatment

4.1.8 TD100 – Maintenance of Traffic Devices

4.1.8.1 Channelizing Devices TD100 (25)

- ❑ TD 100.01 Traffic Cones, Plastic Drums and Barricades Types I, II, & III
- ❑ TD 100.02 Curb System and Delineator Guide Post Details

4.1.8.2 Temporary Barrier TD110 (26)

- ❑ TD 110.01 Precast Concrete Construction Barrier Type I
- ❑ TD 110.02 Precast Concrete Construction Barrier Type 4 (Alternates A & B)
- ❑ TD 110.03 Precast Concrete Construction Barrier Type 4 Joint Connection and Reinforcement Details
- ❑ TD 110.04 Precast Concrete Construction Barrier Tapered End Section

- ❑ TD 110.05 Precast Concrete Construction Barrier with Chain Link Fence, Sign Mount and Glare Screen Details
- ❑ TD 110.06 Temporary Concrete Construction Barrier Standard Detail
- ❑ TD 110.07 Water Filled Traffic Barrier
- ❑ TD 110.08 Timber Barricades Type I and II

4.1.8.3 TEMPORARY IMPACT ATTENUATORS TD120 (27)

- ❑ TD 120.02 Quad guard CZ, TRACC and NEAT Crash Cushions
- ❑ TD 120.03 ADIEM II Crash Cushion

4.1.8.4 TYPICAL LANE CLOSURE AND REDUCTION DETAILS AND NOTES TD140 (28)

- ❑ TD 140.01 Typical Lanes Closures and Reduction
- ❑ TD 140.02 Crosswalk Closing and Access Details
- ❑ TD 140.03 Traffic Control Device Placement, Ramping and Work Area Details

4.1.8.5 MISCELLANEOUS DEVICES TD150 (29)

- ❑ TD 150.01 Stop/Slow Paddle
- ❑ TD 150.02 FASU
- ❑ TD 150.03 Portable Sign Support Details
- ❑ TD 150.04 Video Detection System Details
- ❑ TD 150.06 Temporary Roadway Plates

4.1.9 TD200 – PERMANENT BARRIERS (30)

- ❑ TD 200.01 Type A Concrete Barrier Curb, Dowelled
- ❑ TD 200.02 Variable Width Median Barrier
- ❑ TD 200.03 On Bridge Concrete Barrier Curb
- ❑ TD 200.04 Median Concrete Barrier Curb
- ❑ TD 200.05 Concrete Barrier Precast
- ❑ TD 200.06 Concrete Barrier Cast-in-Place
- ❑ TD 200.07 Concrete Barrier Machine Formed
- ❑ TD 200.08 Concrete Barrier Single Slope
- ❑ TD 200.09 Concrete Barrier Half Section Single Slope
- ❑ TD 200.10 Single-Slope Concrete Barrier Terminal Section-Ramped Terminal
- ❑ TD 200.11 Barrier Transition Details
- ❑ TD 200.12 Transition Between Wide and Normal Width Single Slope Concrete Median Barrier
- ❑ TD 200.13 Transition of Concrete Barrier Between Standard (NJ) and Single Slope Concrete Shapes
- ❑ TD 200.14 Concrete Barrier with Light Post Detail

4.1.10 TD300 – GUIDERAIL AND END TREATMENTS (31)

- ❑ TD 300.01 W-Beam Guide Rail
- ❑ TD 300.02 Dual Faced W-Beam Guide Rail
- ❑ TD 300.03 Thrie-Beam Guide Rail
- ❑ TD 300.04 Modified Thrie-Beam Guide Rail
- ❑ TD 300.05 Guide Rail Attachments General Notes and Rub Rail Detail
- ❑ TD 300.06 W-BEAM BARRICADE TYPE A AND TYPE B
- ❑ TD 300.07 Guiderail Post Installation Detail
- ❑ TD 300.08 W-Beam Guide Rail Installation Layout Detail
- ❑ TD 300.09 W-Beam Median Guide Rail Installation Layout Detail
- ❑ TD 300.10 W-Beam Guide Rail Anchorages
- ❑ TD 300.11 Thrie-Beam & W-Beam Guide Rail Terminal Connection & End Section
- ❑ TD 300.12 Box Beam Median Barrier Details
- ❑ TD 300.13 Box Beam Tangent Section and Treatment for Buried End Detail
- ❑ TD 300.14 Box Beam Type I End Assembly
- ❑ TD 300.15 Box Beam Type II End Assembly
- ❑ TD 300.16 Box Beam End Assembly Type III Grading and Layout Details
- ❑ TD 300.17 Box Beam Guide Rail Transition to W-Beam Guide Rail
- ❑ TD 300.18 Box Beam Connections (On-End & Off-End) To Concrete Barrier and Anchor Bolt Detail
- ❑ TD 300.19 Box Beam Transition to Parapet or Barrier Connection
- ❑ TD 300.20 Box Beam Transition to Pylon and to Railing Transition Wall
- ❑ TD 300.21 Box Beam Transition to Variable Width Concrete Barrier
- ❑ TD 300.22 Flared Guide Rail Terminal and Tangent Terminal
- ❑ TD 300.23 Parallel Type Gating End Terminals (ET PLUS)
- ❑ TD 300.24 Transition Between W-Beam Guide Rail and Half Section Concrete Barrier (Sheet 1-2)
- ❑ TD 300.25 Transition Between W-Beam and Half Section Concrete Barrier (Sheet 2-2)
- ❑ TD 300.26 Transition Between Dual Faced W-Beam Guide Rail & Concrete Median Barrier (Sheet 1 of 2)
- ❑ TD 300.27 Transition Between Dual Faced W-Beam Guide Rail and Concrete Median Barrier (Sheet 2 of 2)
- ❑ TD 300.28 Transition Between Dual Faced W-Beam Guide Rail and Single Slope Concrete Median Barrier
- ❑ TD 300.29 Transition Between Dual Faced W-Beam Guide Rail and Concrete Median Barrier
- ❑ TD 300.30 Guide Rail Attachment to Sidewalk, Footing and Parapet
- ❑ TD 300.31 W-Beam Guide Rail Attachment to Jersey Shape Parapet (No Roadway Curbing on Approach)

- ❑ TD 300.32 W-Beam Guide Rail Attachment to Jersey Shape Parapet (With Roadway Curbing on Approach)
- ❑ TD 300.33 W-Beam Guide Rail Attachment (Sidewalk with Parapet)
- ❑ TD 300.34 W-Beam Guide Rail Attachment (Sidewalk with Steel Railing)
- ❑ TD 300.35 Transition Between Box Beam Guide Rail and Single Slope Half Section Concrete Barrier (Sheet 1 of 3)
- ❑ TD 300.36 Transition Between Box Beam Guide Rail and Single Slope Half Section Concrete Barrier (Sheet 2 of 3)
- ❑ TD 300.37 Transition Between Box Beam Guide Rail and Single Slope Half Section Concrete Barrier (Sheet 3 of 3)
- ❑ TD 300.38 Transition Between Box Beam Median Barrier and Single Slope Concrete Median Barrier (Sheet 1 of 3)
- ❑ TD 300.39 Transition Between Box Beam Median Barrier and Single Slope Concrete Median Barrier (Sheet 2 of 3)
- ❑ TD 300.40 Transition Between Box Beam Median Barrier and Single Slope Concrete Median Barrier (Sheet 3 of 3)
- ❑ TD 300.41 Non-Vegetative Surface Details

4.1.11 TD410 – TRAFFIC CALMING DEVICES (32)

- ❑ TD 410.01 Speed Hump
- ❑ TD 410.02 Rumble Strips and Toll Plaza Approach Rumble Strips
- ❑ TD 410.03 Shoulder Grooving for Rumble Strips

4.1.12 TD 500 – INTELLIGENT TRANSPORTATION SYSTEMS (33)

- ❑ TD 500.01 ITS General Notes, Legend, Abbreviations, and List of Manufacturers
- ❑ TD 500.02 Gantry DMS Details - 1
- ❑ TD 500.03 Gantry DMS Details – 2
- ❑ TD 500.04 Gantry Hybrid Drum Sign Details - 1
- ❑ TD 500.05 Gantry Hybrid Drum Sign Details - 2
- ❑ TD 500.06 DMS/Hybrid Sign Equipment Platform
- ❑ TD 500.07 Cantilever DMS Details
- ❑ TD 500.08 Butterfly DMS Details
- ❑ TD 500.09 Cantilever/Butterfly DMS Equipment Pad Details
- ❑ TD 500.10 DMS Power Distribution Diagrams
- ❑ TD 500.11 DMS Communications Diagram
- ❑ TD 500.12 Hybrid Drum Sign Power Distribution Diagrams
- ❑ TD 500.13 Hybrid Drum Sign Communications Diagram
- ❑ TD 500.14 Systems Control Cabinet Details
- ❑ TD 500.15 Power/Communications Cable and Conduit Schedules

- TD 500.16 DMS Configurations - 1
- TD 500.17 DMS Configurations - 2
- TD 500.18 DMS Configurations - 3
- TD 500.19 Variable Speed Limit Sign Details
- TD 500.20 Lane – Use Control Signal Details - 1
- TD 500.21 Lane – Use Control Signal Details - 2
- TD 500.22 Magnetometer Vehicle Detection subsystem - 1
- TD 500.23 Magnetometer Vehicle Detection subsystem - 2
- TD 500.24 Travel Time Subsystem Details - 1
- TD 500.25 Travel Time Subsystem Details - 2
- TD 500.26 Travel Time Subsystem Details - 3
- TD 500.27 Travel Time Subsystem Details - 4
- TD 500.28 Travel Time Subsystem Details - 5
- TD 500.29 Microwave Radar Vehicle Detector Subsystem
- TD 500.30 Weigh-In-Motion Details – 1 (Piezoelectric Sensor)
- TD 500.31 Weigh-In-Motion Details – 2 (Single Load Cell Sensor)
- TD 500.32 Road Weather Information Subsystem Details - 1
- TD 500.33 Road Weather Information Subsystem Details - 2
- TD 500.34 Road Weather Information Subsystem Details - 3
- TD 500.35 Highway Advisory Radio Details -1 (Sign Details)
- TD 500.36 Highway Advisory Radio Details – 2 (Transmitter Details)
- TD 500.37 Over Height Detection Details - 1
- TD 500.38 Over Height Detection Details - 2
- TD 500.39 CCTV Surveillance System Details (Pole Mount)
- TD 500.40 CCTV Surveillance System Details (Structure/Gantry Mount)
- TD 500.41 CCTV Surveillance System Details (Pole Mount w/Lowering Device -1)
- TD 500.42 CCTV Surveillance System Details (Pole Mount w/Lowering Device -2)
- TD 500.43 Manhole Details
- TD 500.44 Conduit Mounting Details

4.2 DIVISION 1 MOT SPECIFICATION (34)

Maintenance of Traffic and Work Area Protection Under "General Provisions" (Division 1) of the Specifications shall be included in all contracts requiring Maintenance of Traffic work. When utilized, the Division 1 MOT Specification shall be edited to conform to project requirements. For work order contracts, the unedited Division 1 MOT Specification should be included in the parent work order contract and referenced in subsequent work orders.

4.3 STANDARD SPECIFICATIONS [35]

The List of Specifications is as follows:

321723 THERMOPLASTIC REFLECTORIZED PAVEMENT MARKINGS (A 11/17/11)

321728 PREFORMED REMOVABLE RETROREFLECTIVE PAVEMENT MARKING TAPE (A)

321725 TRAFFIC PAINT PAVEMENT MARKINGS (N 10/18/95)

347113 BOX BEAM GUIDE RAIL (N 05/01/01)

347114 W-BEAM AND THRIE BEAM GUIDE RAIL (N 05/01/01)

347115 TEMPORARY TRAFFIC BARRIERS (A 05/01/01)

347117 TEMPORARY CONCRETE BARRIERS (P 08/07/96)

347118 TEMPORARY TIMBER CURB (N 05/01/01)

347121 TEMPORARY WATER FILLED BARRIER (N 05/01/01)

344113 TEMPORARY TRAFFIC SIGNAL EQUIPMENT (A 01/03/07)

347130 PLYWOOD SIGN PANELS AND WOOD SIGN POSTS (N 09/16/13)

101423 ALUMINUM SIGN PANELS (N 09/16/13)

260525 TRAFFIC SIGNAL CABLES (A 01/30/07)

265522 VEHICULAR TRAFFIC SIGNAL HEADS AND MOUNTING HARDWARE (A 01/30/07)

260547 TRAFFIC SIGNAL POLES, MAST ARMS, SPAN WIRE AND POLE FOUNDATIONS (A 01/30/07)

344117 PEDESTRIAN TRAFFIC SIGNALS (A 2/10/04)

344118 TRAFFIC SIGNAL CONTROLLER (P 5/1/01)

262999 INDUCTIVE DETECTION CABLE AND DETECTOR SENSOR UNIT (A 01/30/07)

344155 PREFORMED VEHICLE DETECTION LOOP (N 1/26/96)

347155 VEHICLE DETECTION LOOP (N 1/26/96)

261030 FIBEROPTIC CHANGEABLE MESSAGE SIGNS AND LANE CONTROL SIGNALS (N 4/22/96)

4.4 C-SPECIFICATIONS (36)

321724 WET REFLECTIVE THERMOPLASTIC REFLECTORIZED PAVEMENT MARKINGS (C 08/11/16)

321729 PREFORMED RETRO-REFLECTIVE PAVEMENT MARKINGS (HIGH PERFORMANCE WET REFLECTIVE TAPE) (C 08/09/16)

02585 PREFORMED THERMOPLASTIC PAVEMENT MARKINGS (C 04/28/15)

321725 TRAFFIC PAINT PAVEMENT MARKING (C 03/22/16)

344113 TEMPORARY TRAFFIC SIGNAL EQUIPMENT (C 03/04/16)

260525 TRAFFIC SIGNAL CABLES (C 03/04/16)

344117 PEDESTRIAN TRAFFIC SIGNALS, PUSHBUTTONS AND MOUNTING HARDWARE (C 03/04/16)

265522 VEHICULAR TRAFFIC SIGNAL HEADS AND MOUNTING HARDWARE (C 03/04/16)

260547 TRAFFIC SIGNAL POLES, MAST ARMS, SPAN WIRE AND POLE FOUNDATIONS (C 03/04/16)

344118 TRAFFIC SIGNAL CONTROLLER (C 03/04/16)

261080 UNITERRUPTED POWER SOURCE (C 03/04/16)

262999 INDUCTIVE DETECTION CABLE AND DETECTOR SENSOR UNIT (C 03/04/16)

344160 VIDEO DETECTION SUBSYSTEM (C 03/04/16)

261040 INTELLIGENT TRANSPORTATION SYSTEM (C 07/16/14)

261032 DYNAMIC MESSAGE SIGN (DMS) SUBSYSTEM (C 07/16/14)

16577 LANE-USE CONTROL SIGNAL SUBSYSTEM (N 07/16/14)

261042 MAGNETOMETER VEHICLE DETECTION SUB SYSTEM (C 02/12/18)

261044 ROAD WEATHER INFORMATION SUB SYSTEM (C 07/16/14)

16795 TRAVEL TIME SUB SYSTEM (C 07/26/13)

16796 MICROWAVE RADAR VEHICLE DETECTOR SUBSYSTEM (C 07/16/14)

261050 WEIGH-IN-MOTION (WIM) SUBSYSTEM (C 07/16/14)

16799 OVERHEIGHT VEHICLE DETECTION SUBSYSTEM (C 07/16/14)

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