Lessons Learned: Inspection Observations

JOHN CARUANO

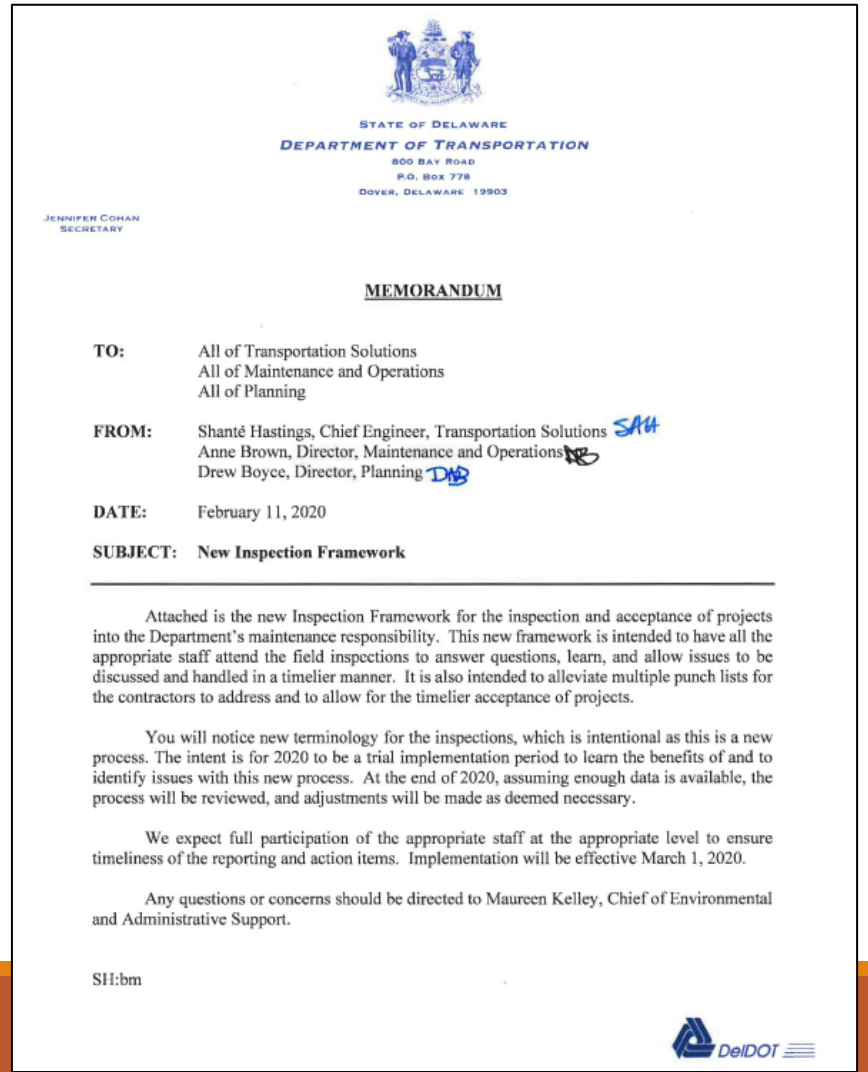
DELDOT SUPPORT ENGINEER

Inspection Observations

- Inspection Process Framework
  - Overview and Observations
  - Monthly Meetings
  - Evaluating Process and data
- Good Examples and Lessons to be Learned

Inspection Framework

- ~~Semi-Final and Final~~ Initial and Primary
- Appropriate Staff Attendance
- Alleviate Multiple Punch lists
- Timelier Acceptance of Projects
  - Established timelines



STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

JENNIFER COHAN
SECRETARY

MEMORANDUM

TO: All of Transportation Solutions
All of Maintenance and Operations
All of Planning

FROM: Shanté Hastings, Chief Engineer, Transportation Solutions SAH
Anne Brown, Director, Maintenance and Operations
Drew Boyce, Director, Planning DMB

DATE: February 11, 2020

SUBJECT: **New Inspection Framework**

Attached is the new Inspection Framework for the inspection and acceptance of projects into the Department's maintenance responsibility. This new framework is intended to have all the appropriate staff attend the field inspections to answer questions, learn, and allow issues to be discussed and handled in a timelier manner. It is also intended to alleviate multiple punch lists for the contractors to address and to allow for the timelier acceptance of projects.

You will notice new terminology for the inspections, which is intentional as this is a new process. The intent is for 2020 to be a trial implementation period to learn the benefits of and to identify issues with this new process. At the end of 2020, assuming enough data is available, the process will be reviewed, and adjustments will be made as deemed necessary.

We expect full participation of the appropriate staff at the appropriate level to ensure timeliness of the reporting and action items. Implementation will be effective March 1, 2020.

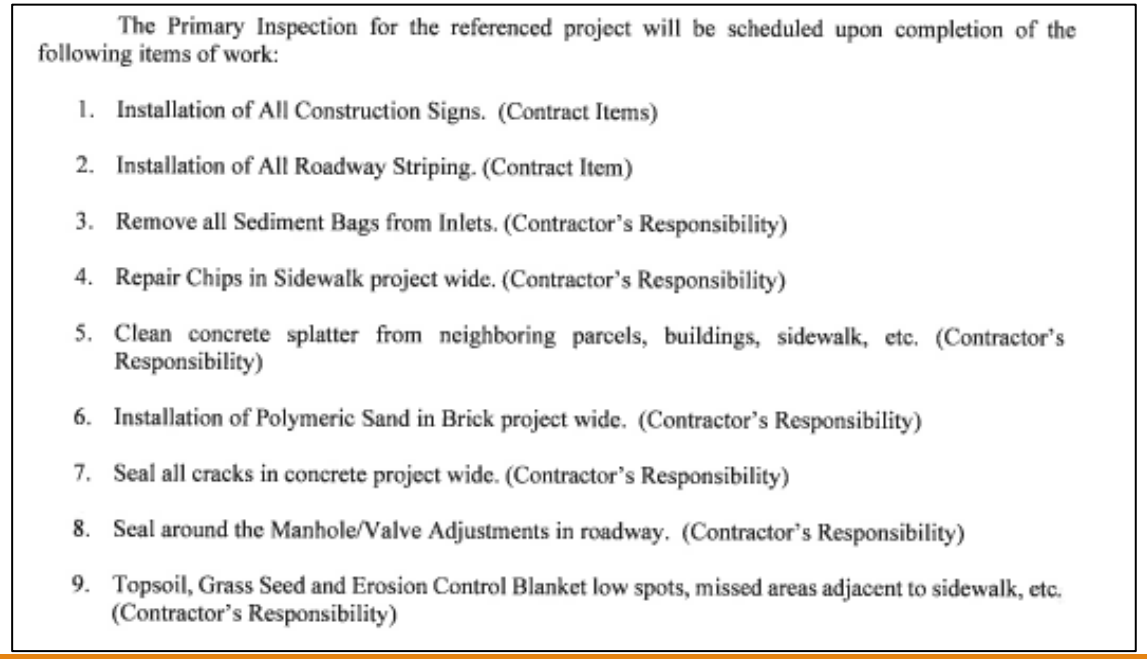
Any questions or concerns should be directed to Maureen Kelley, Chief of Environmental and Administrative Support.

SH:bm

DelDOT

Inspection Framework

- Initial Inspection
  - Completed by Administering Section
  - Prior to demobilization or at substantial completion
  - Initial Punch List
    - Include E&S, ADA, Safety, Bridge Management lists
    - List to Contractor within 7 days
    - Itemized for correction, location, financial responsibility



The Primary Inspection for the referenced project will be scheduled upon completion of the following items of work:

1. Installation of All Construction Signs. (Contract Items)
2. Installation of All Roadway Striping. (Contract Item)
3. Remove all Sediment Bags from Inlets. (Contractor's Responsibility)
4. Repair Chips in Sidewalk project wide. (Contractor's Responsibility)
5. Clean concrete splatter from neighboring parcels, buildings, sidewalk, etc. (Contractor's Responsibility)
6. Installation of Polymeric Sand in Brick project wide. (Contractor's Responsibility)
7. Seal all cracks in concrete project wide. (Contractor's Responsibility)
8. Seal around the Manhole/Valve Adjustments in roadway. (Contractor's Responsibility)
9. Topsoil, Grass Seed and Erosion Control Blanket low spots, missed areas adjacent to sidewalk, etc. (Contractor's Responsibility)

20. Install 5" solid white permanent pavement striping from STA 1+50, LT to STA 2+50, LT and from STA 102+50, LT to STA 103+15, LT in accordance with plan sheet 24. *(Contract item to be paid under existing contract items)*

21. Extend 5" solid white permanent pavement striping for bike lane to STA 106+80, LT in accordance with plan sheet 25. *(Contract item to be paid under existing contract items)*

22.

23. A temporary stop bar was observed at STA 6+75, RT on Pennsylvania Ave that was not covered in full by the permanent striping. It must be removed in order for the permanent pavement markings to accurately reflect the intended roadway guidance. Removal of pavement markings shall be in accordance Section 817.03.9. Use shot/abrasive grit blasting or water blasting equipment to remove pavement marking paint. After removal of striping on bituminous concrete, an approved flat black paint or asphalt sealer shall be used to cover any exposed aggregate or embedded paint. *(Incidental to previously paid contract item)*

24. An existing epoxy white line was observed at STA 104+15, RT on Southbound SR 1 that was not properly removed in full. It must be removed in order for the permanent pavement markings to accurately reflect the intended roadway guidance. Removal of pavement

25a. STA 103+25, LT, One Way/Divided Highway Sign
25b. STA 107+35, LT, Type 3 Object Marker Sign

26. All sign posts need the breakaway feature to be within 1" to 4" from the top of grade and shall be equipped with corner bolts in accordance with Standard Construction Detail T-15 (2013) sheet 1 of 1. The breakaway feature of the "North SR 1" sign at STA 106+20, LT was observed to not be adjusted to the correct height. Check and correct all sign posts within the Limits of Construction to ensure that all comply with the Standard Construction Details to allow for the proper operation of the assembly in the event of a vehicular impact. *(Incidental to previously paid contract item)*

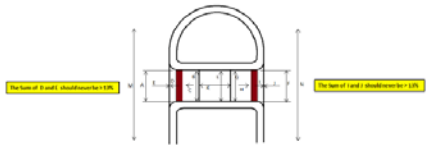
Inspection Framework

- Initial Inspection List Annotation

Completed on 8/31/2020 3. Address all items on E&S Inspection Report dated July 15, 2020 or most current report. To be sent under separate cover. This work must be completed prior to acceptance. *(Incidental to previously paid contract item)*

Completed on 8/31/2020 4. Address all items on BMP 1013 Initial Inspection Report dated July 9, 2020. To be sent under separate cover. *(Incidental to previously paid contract item)*

Completed on 8/26/2020 5. Address all items on ADA Compliance Review Report & Measurements dated July 20, 2020. To be sent under separate cover. *(Incidental to previously paid contract item)*



Curb Ramp, Type 5 (Retrofit & New)

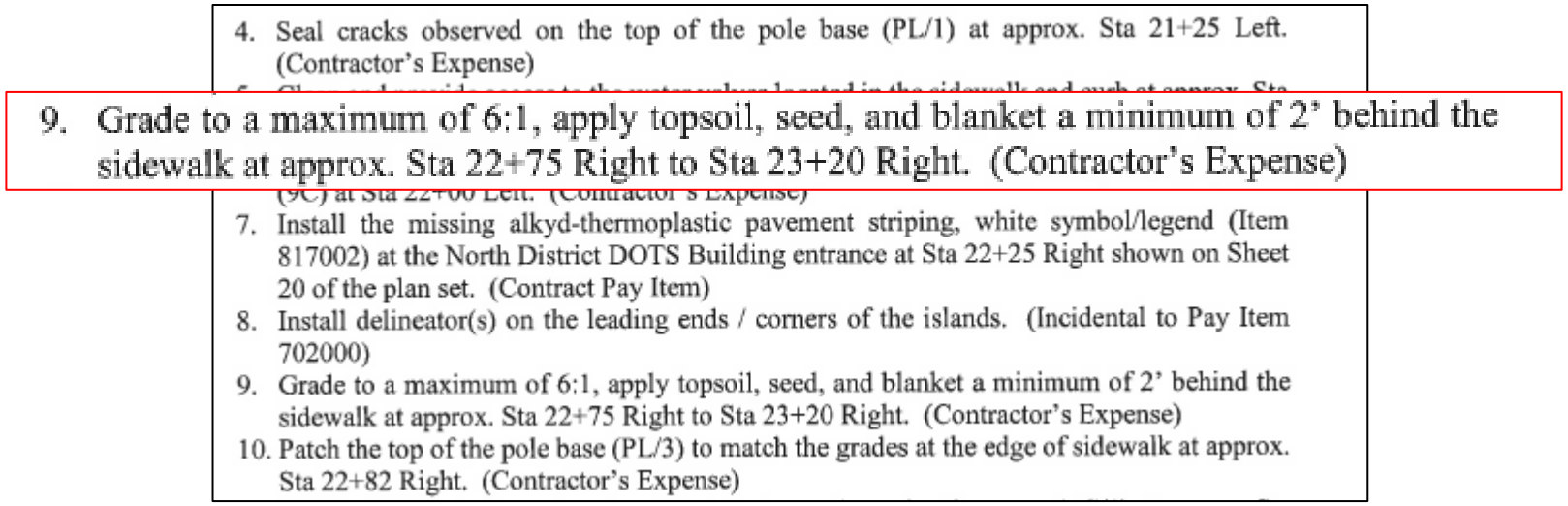
07/16/2020 13:13:40	Rt 1 ~~NB~~ SB at Sea colony	Corner	West	123	0.1	1.4	3.4	1.3	4.7	96	1	3.6	5.6	10.7	16.3	120	2.1	96	2	0.6	1.1	N/A	Good	96	0	Yes	1	No	N/A
Comments	STA 104+40, RT existing pork chop island			Counter Slope Non-Conforming (pavement/vertical difference in crosswalk). Vertical Difference Non-Conforming																							Completed on 8/19/2020. Hot-mix patched in front of concrete.	

pork chop island

Hot-mix patched in front of concrete.

Inspection Framework

- Primary Inspection
  - Administering Section with Engineering Support, M&O, Traffic, E&S, NPDES, Bridge, PM, Designer, etc.
  - Meeting on site to identify items to be on the list, and list reviewed at end of inspection
  - Administering Section generates list (7 days internal review, 14 days to contractor)



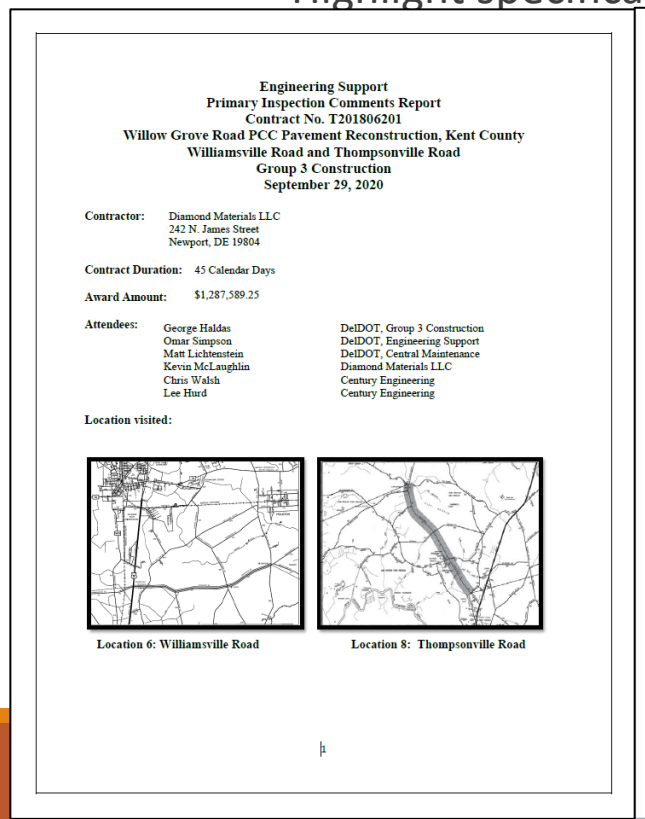
4. Seal cracks observed on the top of the pole base (PL/1) at approx. Sta 21+25 Left. (Contractor's Expense)

9. Grade to a maximum of 6:1, apply topsoil, seed, and blanket a minimum of 2' behind the sidewalk at approx. Sta 22+75 Right to Sta 23+20 Right. (Contractor's Expense)

7. Install the missing alkyd-thermoplastic pavement striping, white symbol/legend (Item 817002) at the North District DOTS Building entrance at Sta 22+25 Right shown on Sheet 20 of the plan set. (Contract Pay Item)
8. Install delineator(s) on the leading ends / corners of the islands. (Incidental to Pay Item 702000)
9. Grade to a maximum of 6:1, apply topsoil, seed, and blanket a minimum of 2' behind the sidewalk at approx. Sta 22+75 Right to Sta 23+20 Right. (Contractor's Expense)
10. Patch the top of the pole base (PL/3) to match the grades at the edge of sidewalk at approx. Sta 22+82 Right. (Contractor's Expense)

Inspection Framework

- Primary Inspection Report
  - Engineering Support generates for Departmental documentation, education, and best practice development
  - Highlight specifications and details pertaining to items



Engineering Support
Primary Inspection Comments Report
Contract No. T201806201
Willow Grove Road PCC Pavement Reconstruction, Kent County
Williamsville Road and Thompsonville Road
Group 3 Construction
September 29, 2020

Contractor: Diamond Materials LLC
242 N. James Street
Newport, DE 19804

Contract Duration: 45 Calendar Days

Award Amount: $1,287,589.25

Attendees:

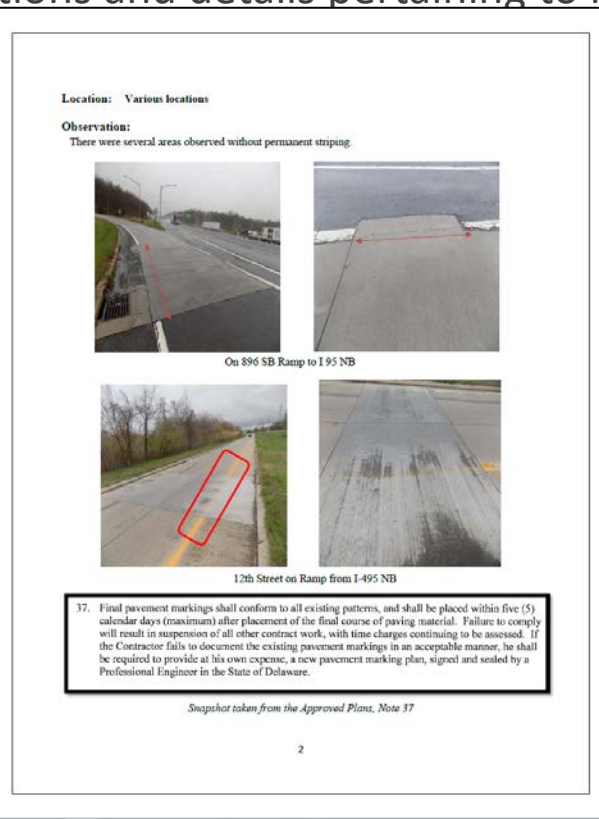
George Haldas	DelDOT, Group 3 Construction
Omar Simpson	DelDOT, Engineering Support
Matt Lichtenstein	DelDOT, Central Maintenance
Kevin McLaughlin	Diamond Materials LLC
Chris Walsh	Century Engineering
Lee Hurd	Century Engineering

Location visited:

Location 6: Williamsville Road

Location 8: Thompsonville Road

1



Location: Various locations

Observation:
There were several areas observed without permanent striping.

On 896 SB Ramp to I 95 NB

12th Street on Ramp from I-495 NB

37. Final pavement markings shall conform to all existing patterns, and shall be placed within five (5) calendar days (maximum) after placement of the final course of paving material. Failure to comply will result in suspension of all other contract work, with time charges continuing to be assessed. If the Contractor fails to document the existing pavement markings in an acceptable manner, he shall be required to provide at his own expense, a new pavement marking plan, signed and sealed by a Professional Engineer in the State of Delaware.

Snapshot taken from the Approved Plans, Note 37

2

Comments:
It is recommended that these areas are revisited, and the permanent striping is installed to adhere to the Contract Documents. This work must be corrected or resolved prior to acceptance.

Location: RT 7 NB under I-95

Observation:
There were multiple areas along the pavement edges in need of repair observed.

Comments:
It is recommended that these locations are revisited, and the necessary repairs are completed. If not addressed, this will lead to subgrade saturation which will lead to pavement deterioration. The Contractor must submit a method of repair to the Engineer for approval. This work must be corrected or resolved prior to acceptance.

Location: RT 7 NB under I-95

Observation:
There were multiple cracks observed on the PCC pavement surface.

3

Comments:
It is recommended that these spalls and lift holes are repaired as their current condition will only continue to deteriorate and provide an unsafe roadway surface for the traveling public. The Contractor must submit a method of repair to the Engineer for approval. This work must be corrected or resolved prior to acceptance.

General Comments:
There were no ADA facilities impacted and/or altered as part of this Contract.
The Administering will send a punch list to the Contractor outlining all remedial work that must be completed or resolved prior to acceptance.

Respectfully submitted by:
Omar Simpson
Projects Compliance Technician
DelDOT Engineering Support

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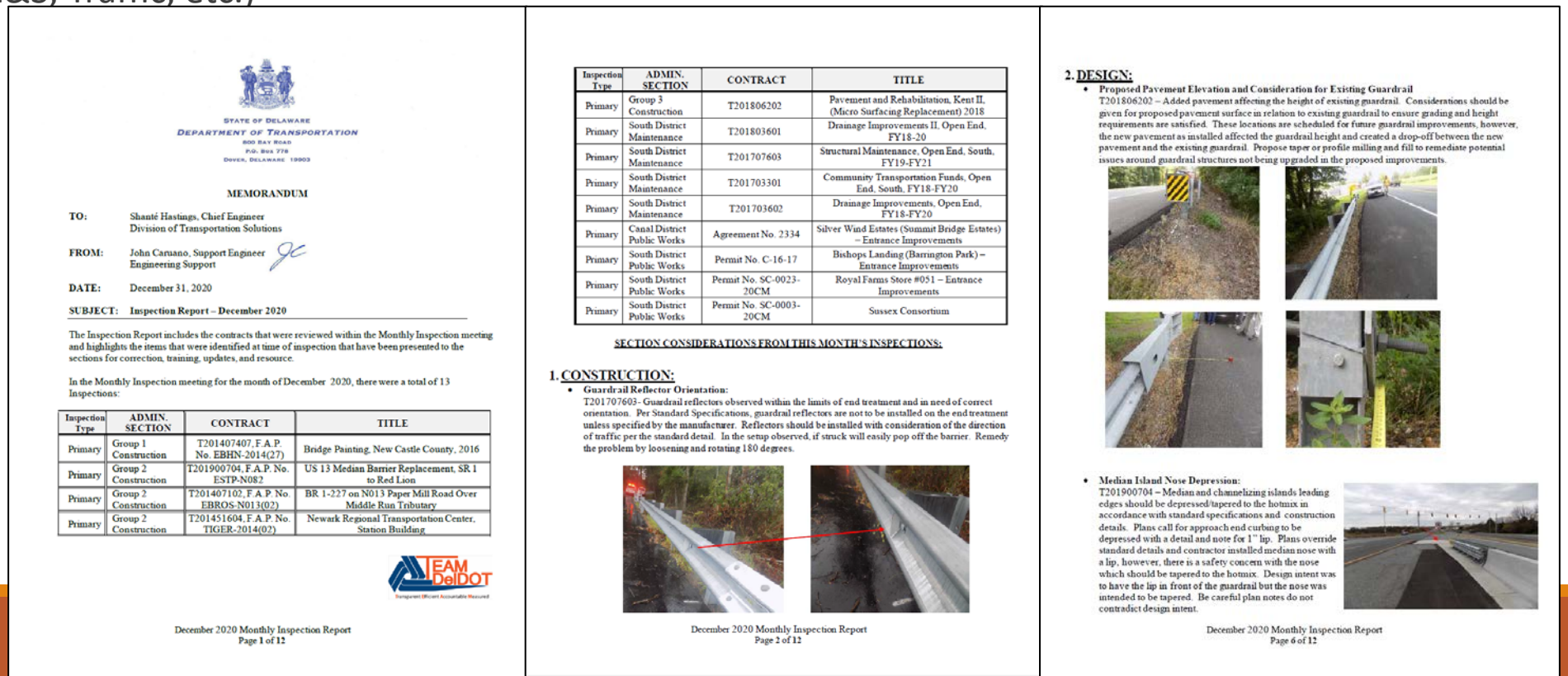
Inspection Framework

- Monthly Inspection Meetings
  - Highlight items for discussion from reports issued in the prior month
  - Monthly Inspection Report attempt to highlight items by category (Construction, Design, ADA, Bridge, E&S, Traffic, etc.)



STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

MEMORANDUM

TO: Shanté Hastings, Chief Engineer
Division of Transportation Solutions

FROM: John Caruano, Support Engineer
Engineering Support

DATE: December 31, 2020

SUBJECT: **Inspection Report – December 2020**

The Inspection Report includes the contracts that were reviewed within the Monthly Inspection meeting and highlights the items that were identified at time of inspection that have been presented to the sections for correction, training, updates, and resource.

In the Monthly Inspection meeting for the month of December 2020, there were a total of 13 Inspections:

Inspection Type	ADMIN. SECTION	CONTRACT	TITLE
Primary	Group 1 Construction	T201407407, F.A.P. No. EBHN-2014(27)	Bridge Painting, New Castle County, 2016
Primary	Group 2 Construction	T201900704, F.A.P. No. ESTP-N082	US 13 Median Barrier Replacement, SR 1 to Red Lion
Primary	Group 2 Construction	T201407102, F.A.P. No. EBROS-N013(02)	BR 1-227 on N013 Paper Mill Road Over Middle Run Tributary
Primary	Group 2 Construction	T201451604, F.A.P. No. TIGER-2014(02)	Newark Regional Transportation Center, Station Building

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Inspection Type	ADMIN. SECTION	CONTRACT	TITLE
Primary	Group 3 Construction	T201806202	Pavement and Rehabilitation, Kent II, (Micro Surfacing Replacement) 2018
Primary	South District Maintenance	T201803601	Drainage Improvements II, Open End, FY18-20
Primary	South District Maintenance	T201707603	Structural Maintenance, Open End, South, FY19-FY21
Primary	South District Maintenance	T201703301	Community Transportation Funds, Open End, South, FY18-FY20
Primary	South District Maintenance	T201703602	Drainage Improvements, Open End, FY18-FY20
Primary	Canal District Public Works	Agreement No. 2334	Silver Wind Estates (Summit Bridge Estates) – Entrance Improvements
Primary	South District Public Works	Permit No. C-16-17	Bishops Landing (Barrington Park) – Entrance Improvements
Primary	South District Public Works	Permit No. SC-0023-20CM	Royal Farms Store #051 – Entrance Improvements
Primary	South District Public Works	Permit No. SC-0003-20CM	Sussex Consortium

SECTION CONSIDERATIONS FROM THIS MONTH'S INSPECTIONS:

1. CONSTRUCTION:

- **Guardrail Reflector Orientation:**
  T201707603 - Guardrail reflectors observed within the limits of end treatment and in need of correct orientation. Per Standard Specifications, guardrail reflectors are not to be installed on the end treatment unless specified by the manufacturer. Reflectors should be installed with consideration of the direction of traffic per the standard detail. In the setup observed, if struck will easily pop off the barrier. Remedy the problem by loosening and rotating 180 degrees.

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2. DESIGN:

- **Proposed Pavement Elevation and Consideration for Existing Guardrail**
  T201806202 – Added pavement affecting the height of existing guardrail. Considerations should be given for proposed pavement surface in relation to existing guardrail to ensure grading and height requirements are satisfied. These locations are scheduled for future guardrail improvements, however, the new pavement as installed affected the guardrail height and created a drop-off between the new pavement and the existing guardrail. Propose taper or profile milling and fill to remediate potential issues around guardrail structures not being upgraded in the proposed improvements.

- **Median Island Nose Depression:**
  T201900704 – Median and channelizing islands leading edges should be depressed/tapered to the hotmix in accordance with standard specifications and construction details. Plans call for approach end curbing to be depressed with a detail and note for 1" lip. Plans override standard details and contractor installed median nose with a lip, however, there is a safety concern with the nose which should be tapered to the hotmix. Design intent was to have the lip in front of the guardrail but the nose was intended to be tapered. Be careful plan notes do not contradict design intent.

December 2020 Monthly Inspection Report
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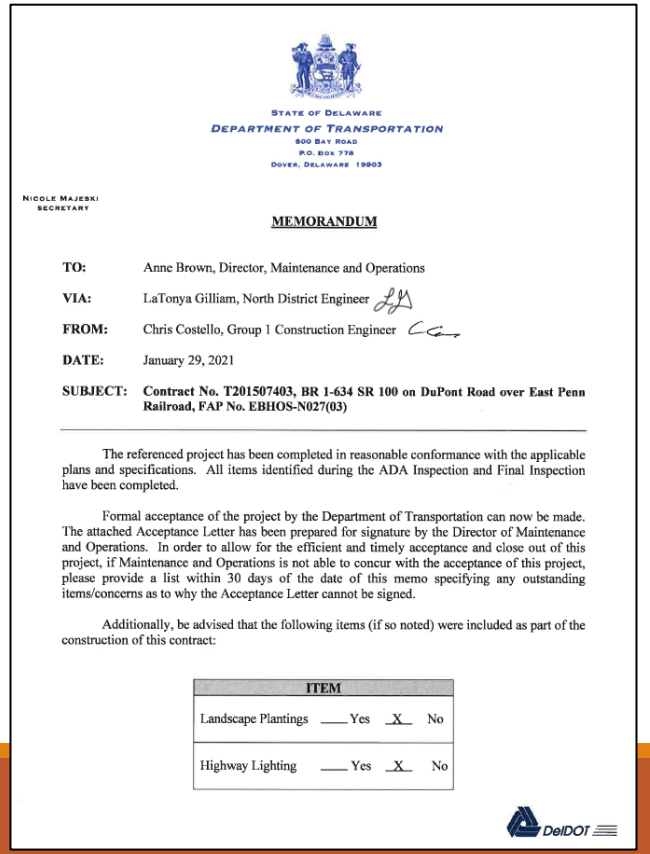
Inspection Framework

- Acceptance
  - The Administering Section notifies District Engineer and Maintenance Engineer that ALL Primary Punchlist items are addressed
  - Maintenance to verify all items are addressed within 30 calendar days
  - Maintenance to accept

4. Backfill around ET approximate Sta: 52+40. Cold patch any voids in maintenance strip between Sta: 44+75 Rt to 53+00 Rt. Dupont Road. Areas between Sta: 44+75 to 52+40 Rt Dupont Road. (Incidental to contract) North of 52+40 T&M. Completed 8/3/20
5. Trim tree above sidewalk Sta: 52+50 RT. Currently a branch is hanging below the required 8' clearance height. (Incidental to contract) Completed 8/10/20
6. Sawcut/caulk joints in curb within landing of curb ramp pedestrian connection Sta: 53+35 Rt. Dupont Road. Joint spacing of curb exceeded 10' at this location. (Incidental to contract) Completed 8/3/20
7. Permanent Signs breakaway sleeves not at proper elevation at the following locations: sign 3A Sta: 51+25 Lt and Stop Sign at intersection of Boulevard Road/Eastwood Road. (Incidental to contract) Completed 8/3/20
8. Fill in expansion dam vent holes at North and South Abutment. (Incidental to contract) Completed 8/4/20



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DOVER, DELAWARE 19903

NICOLE MAJESKI
SECRETARY

MEMORANDUM

TO: Anne Brown, Director, Maintenance and Operations

VIA: LaTonya Gilliam, North District Engineer

FROM: Chris Costello, Group 1 Construction Engineer

DATE: January 29, 2021

SUBJECT: **Contract No. T201507403, BR 1-634 SR 100 on DuPont Road over East Penn Railroad, FAP No. EBHOS-N027(03)**

The referenced project has been completed in reasonable conformance with the applicable plans and specifications. All items identified during the ADA Inspection and Final Inspection have been completed.

Formal acceptance of the project by the Department of Transportation can now be made. The attached Acceptance Letter has been prepared for signature by the Director of Maintenance and Operations. In order to allow for the efficient and timely acceptance and close out of this project, if Maintenance and Operations is not able to concur with the acceptance of this project, please provide a list within 30 days of the date of this memo specifying any outstanding items/concerns as to why the Acceptance Letter cannot be signed.

Additionally, be advised that the following items (if so noted) were included as part of the construction of this contract:

ITEM			
Landscape Plantings	___ Yes	_X_	No
Highway Lighting	___ Yes	_X_	No

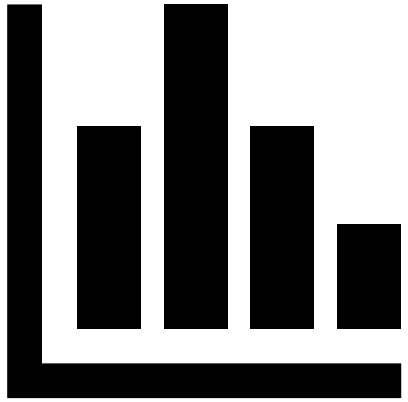
DelDOT

Inspection Framework Evaluation

- Next Steps
  - Evaluate data pertaining to timeframes
  - Obtain observational feedback from users
  - Collaborate and make any necessary changes
  - Update Specifications

Inspection Framework Evaluation

- Data Points to be investigated
  - # Primary Inspections (Total)
  - # Initial Inspections with M&O in Attendance
  - # days between initial and punch list to contractor
  - # Annotated punch lists submitted with Primary Request
  - # days between request and Primary Inspection
  - # days Draft Primary punch list for review to inspection team
  - # days Primary punch list to contractor
  - # days for contractor to resolve punch list items
  - # days between notice of primary punch list completion to signed acceptance letter



Initial Observational Feedback

- **What are the biggest challenges you see with the framework? (CONSTRUCTION RESPONSES)**
  - "Getting the walk through for initial inspection (Construction/Maintenance and Contractor) and ADA notes to be able to get the primary inspection done."
  - "Still rare that the initial occurs before substantial completion/demobilization, how can we catch everything on the initial list if not all the work is complete?"
  - "Timeframe for getting the initial list out (7 calendar days) is hard to meet because the initial lists are longer."
  - "Not getting everyone's items in advance of the Primary for those who can't make it."
  - "Terminology does not match Section 105.16 of the 2020 Standard Specifications, this framework should meet our contractual obligations."

Initial Observational Feedback

- **What are the biggest challenges you see with the framework? (MAINT., DCA, ENG SUPPORT)**
  - **“**The long wait times for the walks because of staffing or scheduling conflicts throughout the district….has gotten better.”
  - “Getting the inspections done timely and including all parties – preferably before the contractor demobes.”

Initial Observational Feedback

- **What works well under this framework? (CONSTRUCTION)**
  - **“**The documentation of this specific framework and timeframes helps to improve consistency and expectations of involved parties.”
  - “The acceptance process seems to be working a lot faster. I like annotating the list with a date the item was addressed. Also scheduling the Primary doesn’t seem to take as long as it use to. It used to be months before we could get a final inspection on date on the calendar. “

Initial Observational Feedback

- **What works well under this framework? (MAINTENANCE, DCA, ENG SUPPORT)**
  - "The ability to discuss different issues that come up in the field during the walk through inspections; item and situations that's not really on the approved plan set that was either overlooked through design or planning that was required or in some cases not."
  - "When the timing is early and all parties represented, it is much more efficient."
  - "It helps hold people accountable and keeps everyone on the same page. It's easier for others to follow-up and check things off in theory if people are being honest about what's completed on the lists."

Initial Observational Feedback

- **What parts of the framework need improvement? (CONSTRUCTION)**
- **"**There are still going to be things that all those sections find at the primary that we didn't find at the initial. I think more sections need to be made to attend the initial. Also most people never write back to the draft primary list. Maybe add language that they have 3 days to review the draft and after 3 days they lose their right to any further comments."
- "Addition of the Designer/EOR at the initial inspection. I performed several initial inspections this past year and it was evident that the presence of the Designer/EOR would have streamlined addressing identified issues. One example was when significant stream erosion was observed during the initial inspection which resulted in a separate field meeting with the EOR to discuss acceptable solutions. Ultimately, a plan revision had to be issued."
- "Because comments regarding deficiencies in E&S and Safety are expected during the initial inspection punch list, it might be beneficial to include E&S and Traffic as attending sections during the initial inspection."
- "Include the time the Contractor has to correct the initial punch list as outlined in Section 105.16.2.b."

Initial Observational Feedback

- **What parts of the framework need improvement? (MAINTENANCE, DCA, ENG SUPPORT)**
  - "Decrease timeframes (i.e. get official punch list from initial inspection back faster). Schedule primary as soon as possible."
  - "Make it mandatory for ADA inspection to occur before Initial Inspection while crews are still at jobsite."

Initial Observational Feedback

- **General comments on the framework? (CONSTRUCTION)**
- “I like the new framework. But I would request we go back to the naming convention of Semi-Final and Final it is more standard.”
- “Overall, I like the new process a lot. I’m thankful for it because it provides consistency among all of DelDOT.”

Initial Observational Feedback

- **General comments on the framework? (MAINTENANCE, DCA, ENG SUPPORT)**
- ”At Acceptance, Construction has been providing the date punch list work (ADA & Inspection) was completed but also providing pictures of the repairs. This has been a huge help to allow M&O to sign off right away because we don’t need to send one our inspectors out to review the punch list work. Just because there is a date of remedial work doesn’t mean it was actually done. We’ve found many inspectors just slap dates on repairs but the repairs have not been done once they come to our desk for acceptance.”
- “New system works.”
- “The one aspect I believe should be re-considered is the terminology. The Initial and Primary terminology is noted as intentional due to the new process. I don’t see this as new process rather than a detailed clarification of how we should be conducting inspections.”

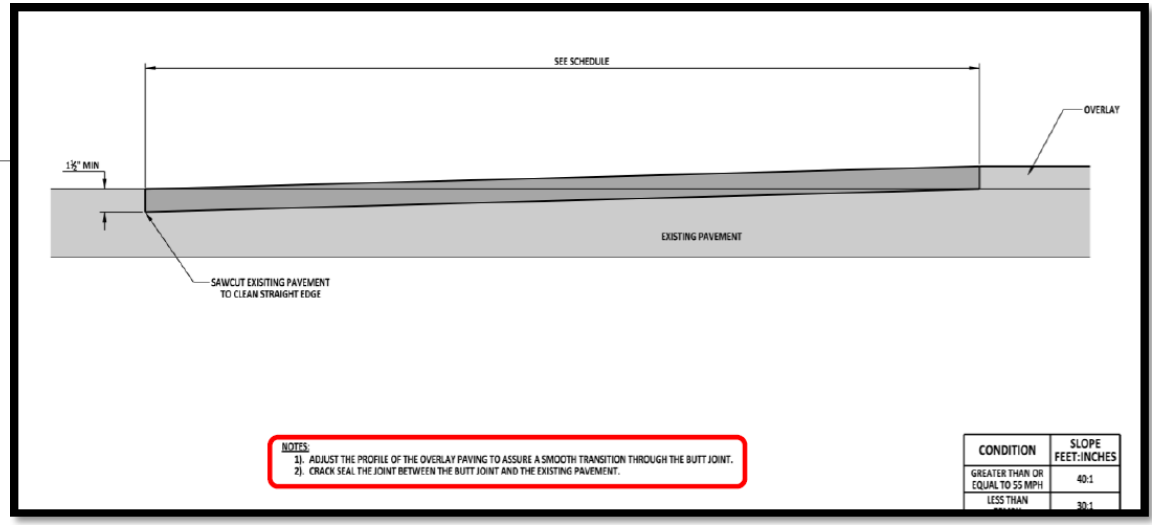
Primary Inspections

- Engineering Support generates Primary Inspection Report
  - Departmental documentation
  - Education
  - Best practice/process development
  - Detail/Specification evaluation
- Findings are based on the finished product
  - Ask questions to start a dialog.
  - We can only see what is on top.
  - Assist the Administering Section in making sure we get the product specified in contract documents

Pavement

Pavement

- Open Joints
  - Water intrusion
  - Butt Joints require sealing



Snapshot taken from Standard No. P-3 (2014), SHT. 1 of 1, of the Standard Details

Pavement

- Open Joints
  - Water intrusion
  - Sealing around patches for curbing, drainage inlets, manholes, utilities, etc.

Pavement

- 1/4” Pavement Tolerance

N. *Surface Tolerances.* Maximum deviation both longitudinal and transverse is 1/4 inch in 10 feet. Correct or remove areas exceeding these tolerances at no expense to the Department.

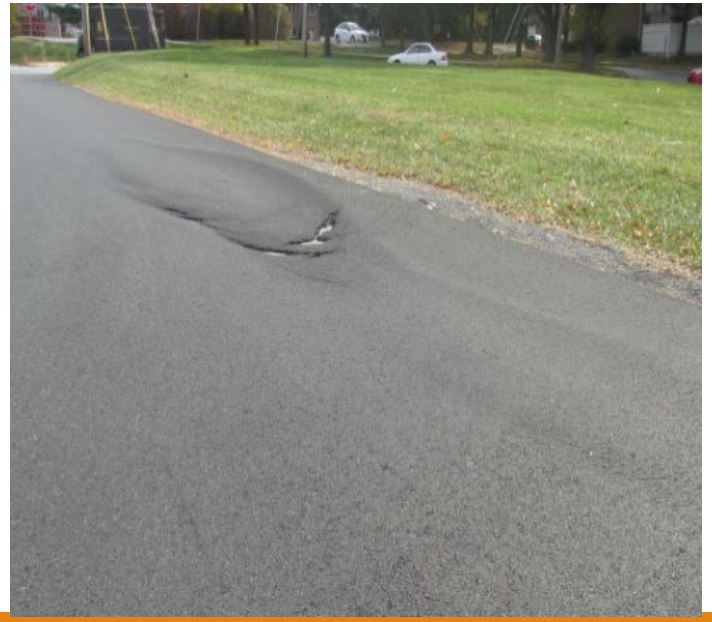
401.05 Basis of Payment.

Payment will be for the accepted quantity of bituminous pavement Materials at the Contract Unit Price per ton for furnishing, preparing, hauling, and placing all Materials, including tack coat and safety edge; for removing Material from around manholes, drainage inlets, valves, and similar features; for removing and replacing excess asphalt cement; and for all labor, Equipment, tools, and incidentals required to complete the Work.

Snapshot taken from 2016 Standard Specifications, Section 401.04 and 401.05

Pavement

- Pop outs
  - Fix to prevent water intrusion
  - Prevent premature deterioration
- Tackifier coverage



401.15 Basis of Payment. The quantity of hot-mix, hot-laid bituminous concrete will be paid for at the Contract unit price per ton (metric ton). Price and payment will constitute full compensation for furnishing, preparing, hauling, and placing all materials, including asphalt for tack coat; for removing hot-mix bituminous concrete from around manholes, drainage inlets, valves, and similar features; for removing and replacing excess asphalt cement, as determined by the Engineer; for applying a fog coat; and for all labor, equipment, tools, and incidentals required to complete the work, including the correction of defective work.

Snapshot taken from Section 401.15, of the Standard Specifications

Pavement

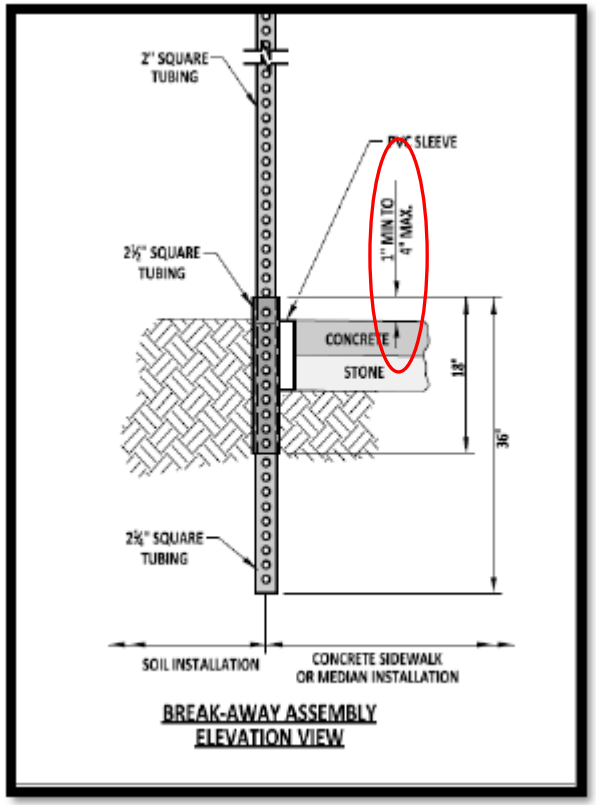
- Utility lids/manholes covered with material

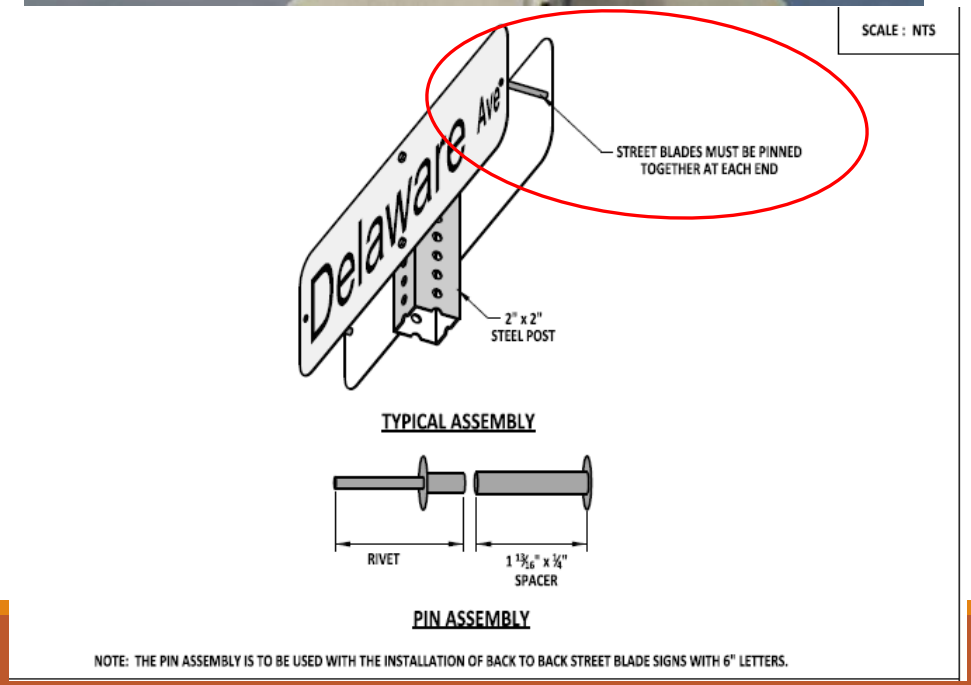
Pavement

- Rumble strips
  - Did they exist prior to project?
  - Design – scope existing conditions, verify no change at PSE
- Raised Pavement Markers (RPMs)
  - Included in contract bid items?
  - Lens colors/orientation

Signs

- Breakaway sleeves
- Breakaway height 1”-4”
- 90 degree bolt installation
- Pin double sign blades





Vegetative Stabilization/Grading

Vegetative Stabilization/Grading

- Backfill any settlement, rills, washouts, voids
- Adequate vegetation coverage

Vegetative Stabilization/Grading

- Blanket/mulch must be identified on the Approved Product List for use.
- Photodegradable products are not acceptable.

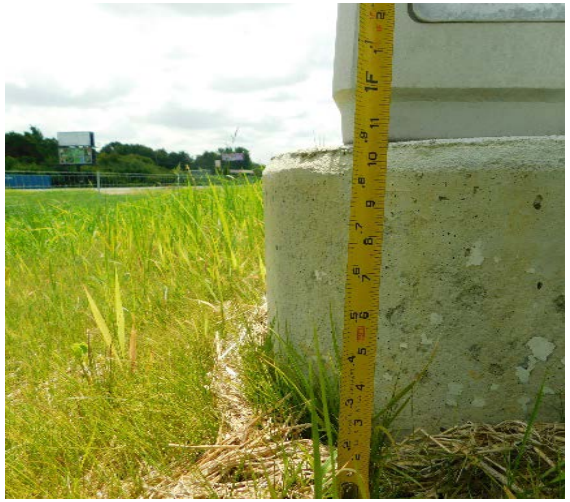
D. *Erosion Control and Mulching Products.*

1. *Rolled Erosion Control Products.* Select from the Approved Products List (https://www.deldot.gov/Business/prodlists/pdfs/soil/approved_product_list_rolled_erosion_control_products.pdf?01032018) for the location and type of blanket (ECB, TRM Type 1, or TRM Type 2) designated on the Plans. Photodegradable products are not acceptable.

Snapshot taken from the 2016 Standard Specifications, Section 908.02.D (Rev. 12/28/2018)

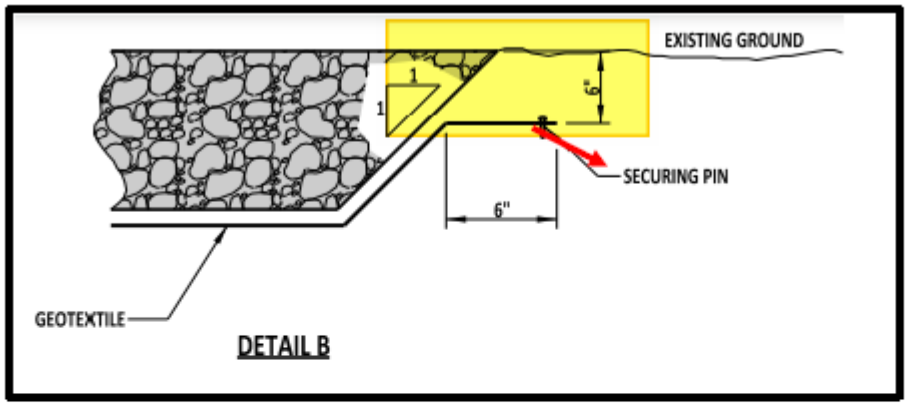
Vegetative Stabilization/Grading

- Structure height shall not exceed 4” above grade (lighting base, sign base, etc.)
- Utility Valves, junction wells, etc. to be flush with grade



Vegetative Stabilization/Grading

- Key in/secure geotextile (riprap)



Snapshot taken from the 2018 Standard Details, Standard No. E-20(2014)

708.03 Construction. Place the geotextile on a prepared suitable base area in a loose unstretched condition to minimize tearing and shifting. Join the adjacent edges of the fabric with a lock-type or chain-type stitch folded seam or overlap adjacent swaths of fabric a minimum of 12 inches, if permitted. The overlap direction shall be upstream over downstream and upslope over downslope. Anchor the fabric in place using securing pins or other acceptable methods. Cover the fabric as soon as possible so that it is not exposed for more than two weeks.

Snapshot taken from the 2018 Standard Specifications, Section 708.03

Vegetative Stabilization/Grading

- Remove any sediment/vegetation buildup that impedes flow

Pipes

- Recommended lift holes in structures be parged
- Recommended exposed rebar parged or epoxy
- Safety grates and locks

Drainage Inlets

- Pipes are to be mortared and flush with the wall

5. Ensure inlet and outlet pipes are the same size and type as the connecting pipes shown in the Contract Documents and that pipes extend through the walls and are flush with the inside of the wall. When the end of a reinforced concrete pipe is cut off, ensure that the end is cut clean and smoothly finished with mortar so that no bar reinforcement remains exposed. Fill any space between the pipe and the walls of the drainage inlet with non-shrink grout conforming to the requirements of Section 1047, with a minimum strength of 5000 pounds per square inch. Ensure that the greatest dimension of the opening in the drainage inlet for the pipe is no greater than the outside pipe diameter plus 4 inches.

Snapshot taken from Section 602.03 of the Standard Specification (2016)

Drainage Inlets

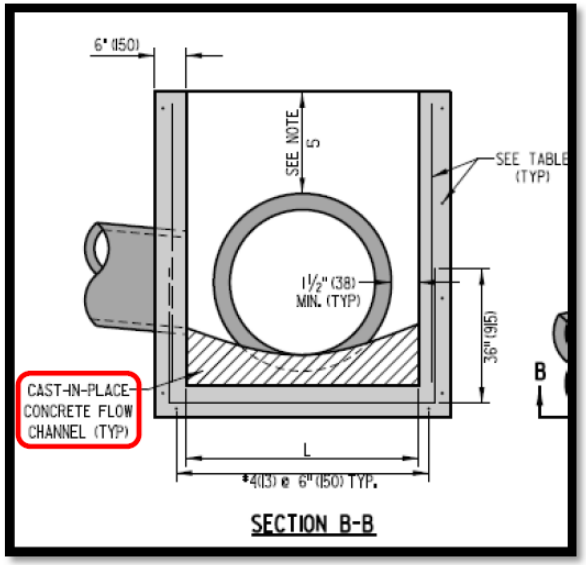
- Steps installed when required
  - First step located 24” max from grate top
  - Top slab or 4 feet in depth from top of grate to invert of lowest pipe

4. Install steps on the backwall for all drainage inlets and manholes, and junction boxes that utilize a removable top slab, as specified in the Contract Documents or are 4 feet or more in depth, measured from the top of grate or cover to the invert of the lowest pipe. Provide a minimum embedment of 3 inches in the wall and ensure that the steps protrude out 6 inches from the wall. Begin steps within 24 inches of the top of grate/lid and end steps no more than 12 inches above the lowest invert except where a pipe is in the backwall. Space steps vertically at 12 inch intervals.

Snapshot taken from Section 602.03 of the Standard Specification (2016)

Drainage Inlets

- Flow channel installation



NOTES:

0. INLET BOXES SHALL BE PRECAST OR CAST-IN-PLACE.
2). PIPES SHALL NOT BE INSTALLED THROUGH ANY CORNER OF THE INLET BOX.
3). RISER SECTIONS MAY BE USED FOR DEEP INLET BOXES.
4). PIPES MAY BE INSTALLED NEAR OR THROUGH JOINTS FOR RISER SECTIONS.
5). WHEN THE COVER ABOVE THE PIPE IS LESS THAN 4" (100) TO THE COVER SLAB OR TOP UNIT OPENING, THE PORTION OF BOX WALL ABOVE THE PIPE MAY BE REMOVED AS SHOWN IN THE OPTIONAL PIPE OPENING DETAIL. THE AREA ABOVE THE PIPE SHALL THEN BE FORMED AND FILLED WITH HIGH-STRENGTH, NON-SHRINK GROUT MIXED WITH COARSE AGGREGATE IN A 1:1 RATIO BY WEIGHT.
6). CONCRETE FLOW CHANNEL SHALL BE WARPED FOR POSITIVE DRAINAGE.
7). WHEN INLET BOX IS PRECAST, PIPE OPENING SHALL BE BETWEEN 3" (75) AND 4" (100) LARGER THAN OUTSIDE DIAMETER OF PIPE AND SHALL NOT ENCROACH ON ADJACENT WALL.
8). REINFORCEMENT FOR LAWN INLET BOXES SHALL BE 4" (102) X 4" (102), W4 X W4 (W26 X W26) WELDED WIRE.

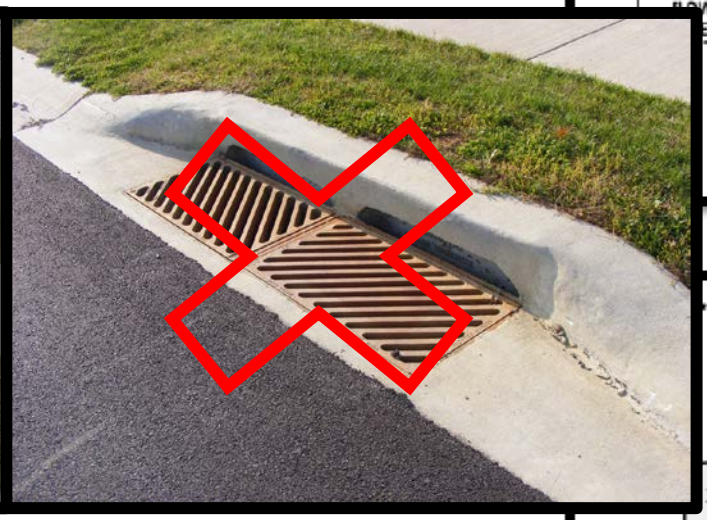
Snapshots taken from Standard No. D-4(2009) Sheet 1 of 1, of the Standard Construction Details

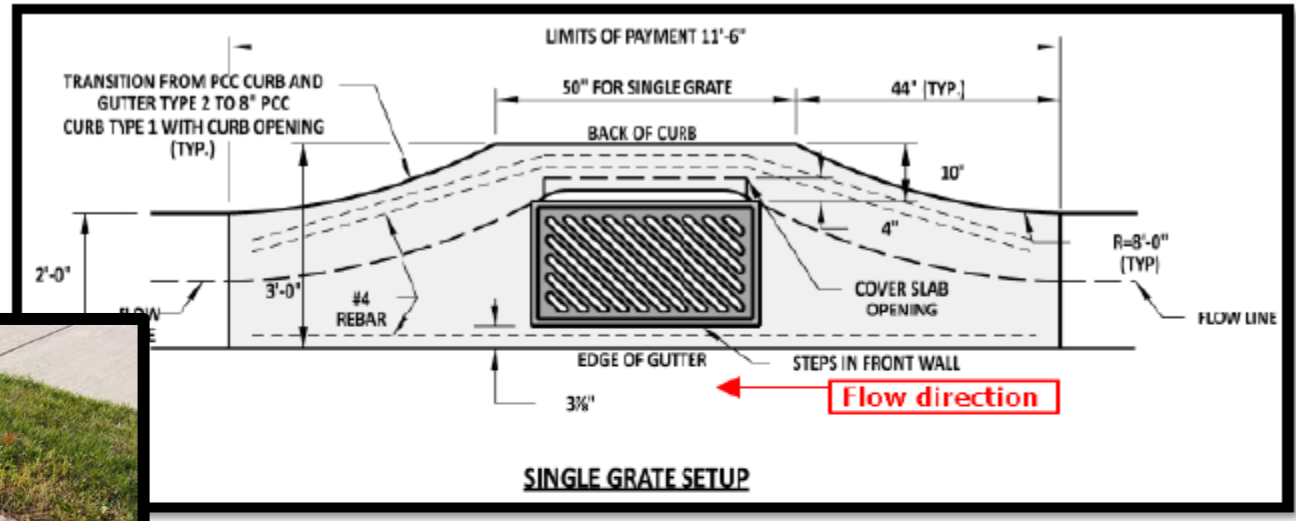
Drainage Inlets

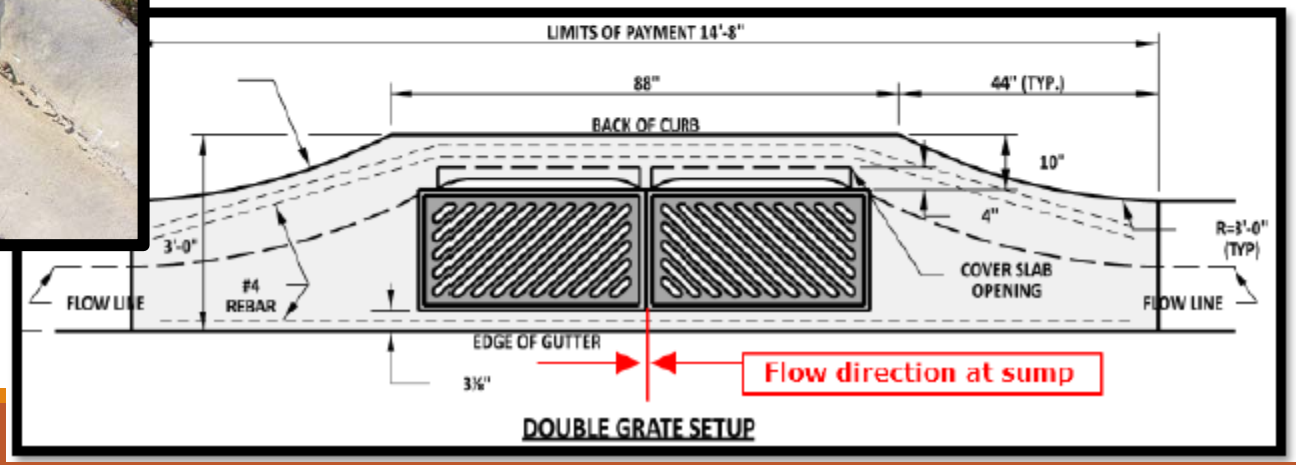
- Formwork/foam to be removed
- Parging for “honey combing”, around pipe entry, frame adjustments
- Grate types

Drainage Inlets

- Grate orientation







PCC Curb, Sidewalk, Islands

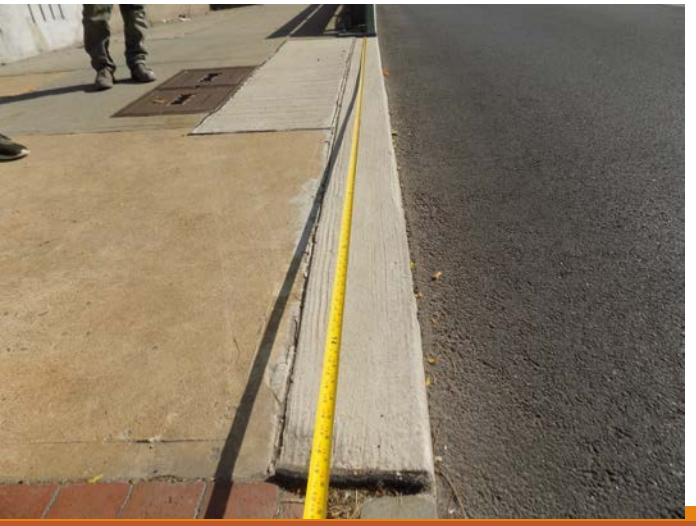
PCC Curbs

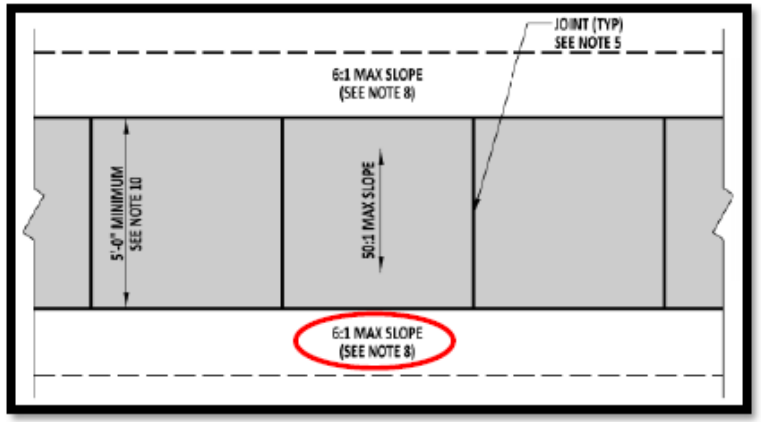
- Gutter Flow/Drainage (Design)
  - Gutter to better manage and direct flows
  - Verify outfall within project scoping, check for highpoints just beyond tie-in location
  - Does typical section (adjacent grading) prevent roadway from draining?
  - “Maintain/Ensure Positive Drainage” vs. “Match Existing Pavement or Curb Elevations”
  - Entrance or driveways may require additional consideration/information to maintain gutter flow/conveyance
  - Pedestrian connections and drainage structures

1. UNLESS OTHERWISE NOTED, POINT GEOMETRY ADJACENT TO CURB IS GIVEN TO THE EDGE OF PAVEMENT.
2. RADII ARE GIVEN TO THE EDGE OF PAVEMENT.
3. THE CONTRACTOR SHALL STAKE ALL GRADES TO ENSURE POSITIVE DRAINAGE AND ADA CONFORMANCE PRIOR TO CONSTRUCTION. ALL GRADES MUST BE APPROVED BY THE ENGINEER IN THE FIELD PRIOR TO CONSTRUCTION. ALL WORK REQUIRED FOR THE CALCULATING AND STAKING OF GRADES SHALL BE PAID FOR UNDER ITEM 763501 - CONSTRUCTION ENGINEERING.
4. PROPOSED CURBS OR PAVEMENT THAT TIE INTO EXISTING PAVEMENT OR CURB SHALL MATCH THE EXISTING PAVEMENT OR CURB ELEVATIONS. THE INTENT IS TO MEET EXISTING ROAD ELEVATIONS.

Sidewalk/Curb

- Cut joints where spacing exceeds maximum
- Provide 2’ @ 6:1 slope adjacent to Sidewalk/SUP
  - Consider specifying 6:1 slope on typical sections when R/W permits





Snapshot taken from Standard No. M-3 (2018), Sheet 1 of 1, of the Standard Details

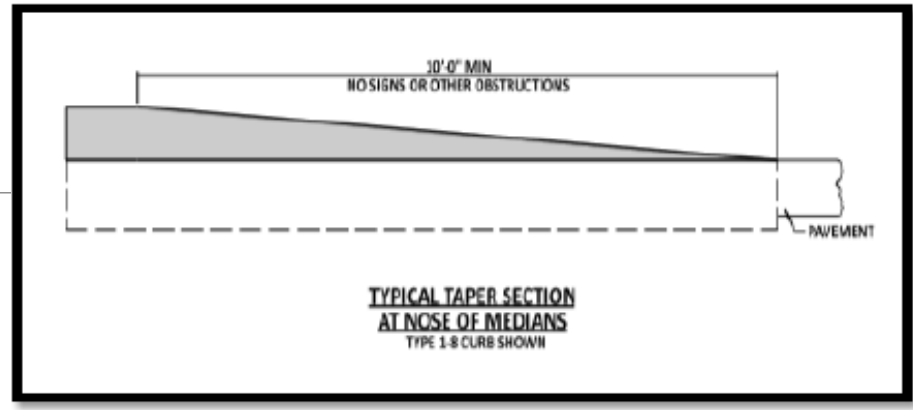
SIDEWALK

7). SEE DETAIL C-2, SHEETS 1, 2 OR 3 FOR PEDESTRIAN CONNECTION TREATMENTS WHEN THE SIDEWALK OR SHARED-USE PATH INTERSECTS WITH A TRAVELWAY.
8). A 6:1 MAX SLOPE IS REQUIRED FOR 2'-0" ON BOTH SIDES OF THE SIDEWALK.
9). TOPSOIL, SEED, & MULCH ANY DISTURBED AREA ADJACENT TO THE SIDEWALK UP TO A MAXIMUM OF 2'-0".
10). ON REHABILITATION PROJECTS, WHEN EXISTING OBSTRUCTIONS (FIRE HYDRANT, UTILITY POLE, ETC....) ARE LOCATED IN THE SIDEWALK, THE SIDEWALK PATH SHALL NOT BE LESS THAN 34" WIDE FOR NO MORE THEN 24".

Snapshot taken from Standard No. M-3 (2018), Sheet 1 of 1, of the Standard Details

PCC Islands

- Depress Median/Channelizing Island leading edges/noses
  - No signs within this 10’ taper
- Tubular Markers on channelizing islands



Bridge

- Bridge Painting

e. At the completion of the painting Work, stencil in 3 inches high letters and numbers the completion date (month and year) and the Bridge number. Use the same paint as the finish coat, except that the color must be black. Stencil this information on the outside of each fascia beam at the approaching traffic end of the Structure at a location designated by the Engineer.

Example:

BR 1-001

MAR 2013

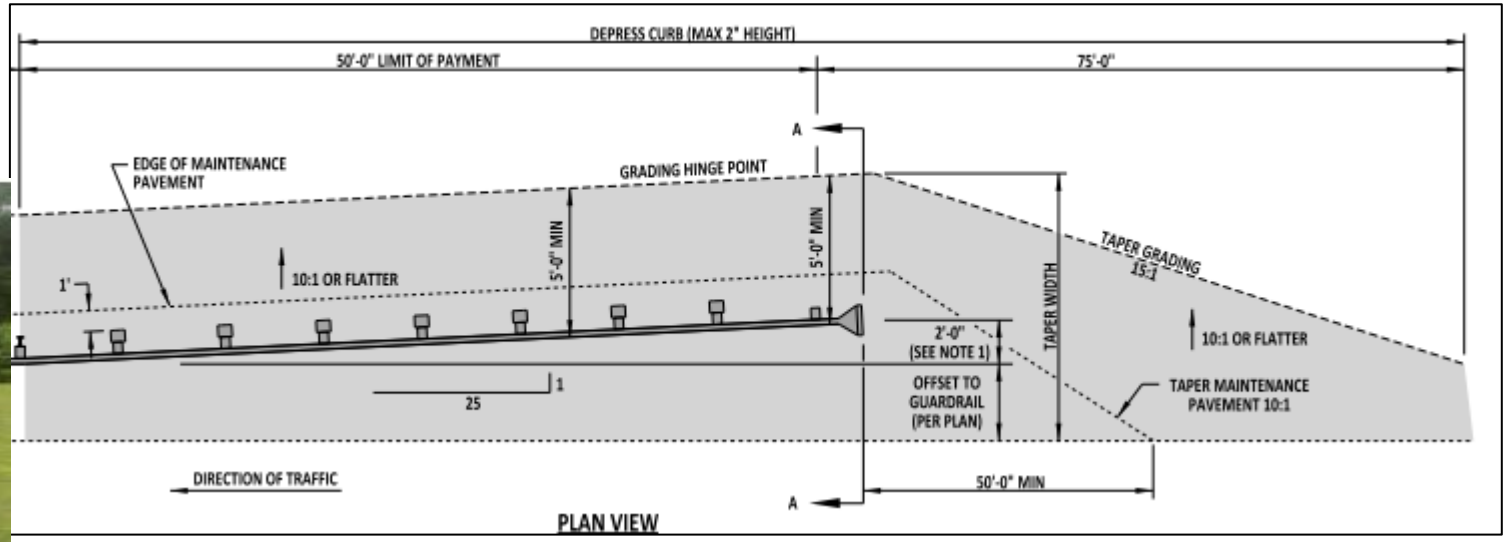
Snapshot taken from the 2016 Standard Specifications, Section 616.03.D8

Guardrail

- Tighten all hardware (bolts, swaged cable, offset blocks)
- Bearing plate orientation and secured

Guardrail

- End Treatment Grading
  - Ensure adequate R/W
  - How does this affect proposed drainage?
  - 10:1 slope per the detail



Guardrail

Delineator Panel

Delineator Panel Attachment

Installation of the front delineation plate will be determined by the location of the attenuator and state regulations. A delineation plate is shipped with a yellow powder coat background and no striping. It is attached with four bolts. Applying the striping to the plate is easier while it is removed from the attenuator. Examples of the delineation plate are as follows:

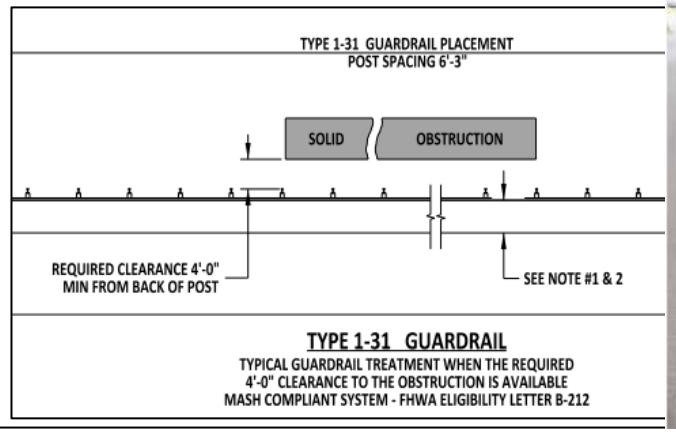
Right Shoulder

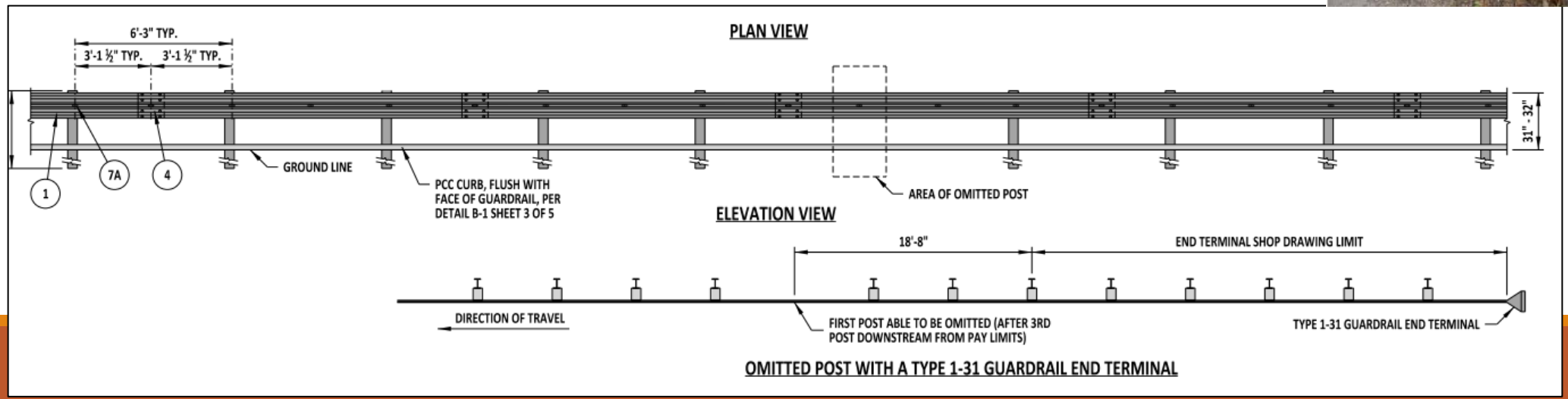
Chevron for Medians

Left Shoulder

Guardrail

- Offset/Clearance distance from back of post
- Curb Opening Considerations
  - Leave Outs
  - Guardrail with omitted post
  - Layout based on guardrail spacing (Type 1-31 = 6’3”)





Guardrail

- Pavement overlay and Guardrail Height

Pavement Markings

Pavement Marking Considerations

- Consider proposed improvement impacts on existing striping

Pavement Marking Removal

- Asphalt Sealer or black paint over striping removal

817.03.9 Removal of pavement marking paint or tape

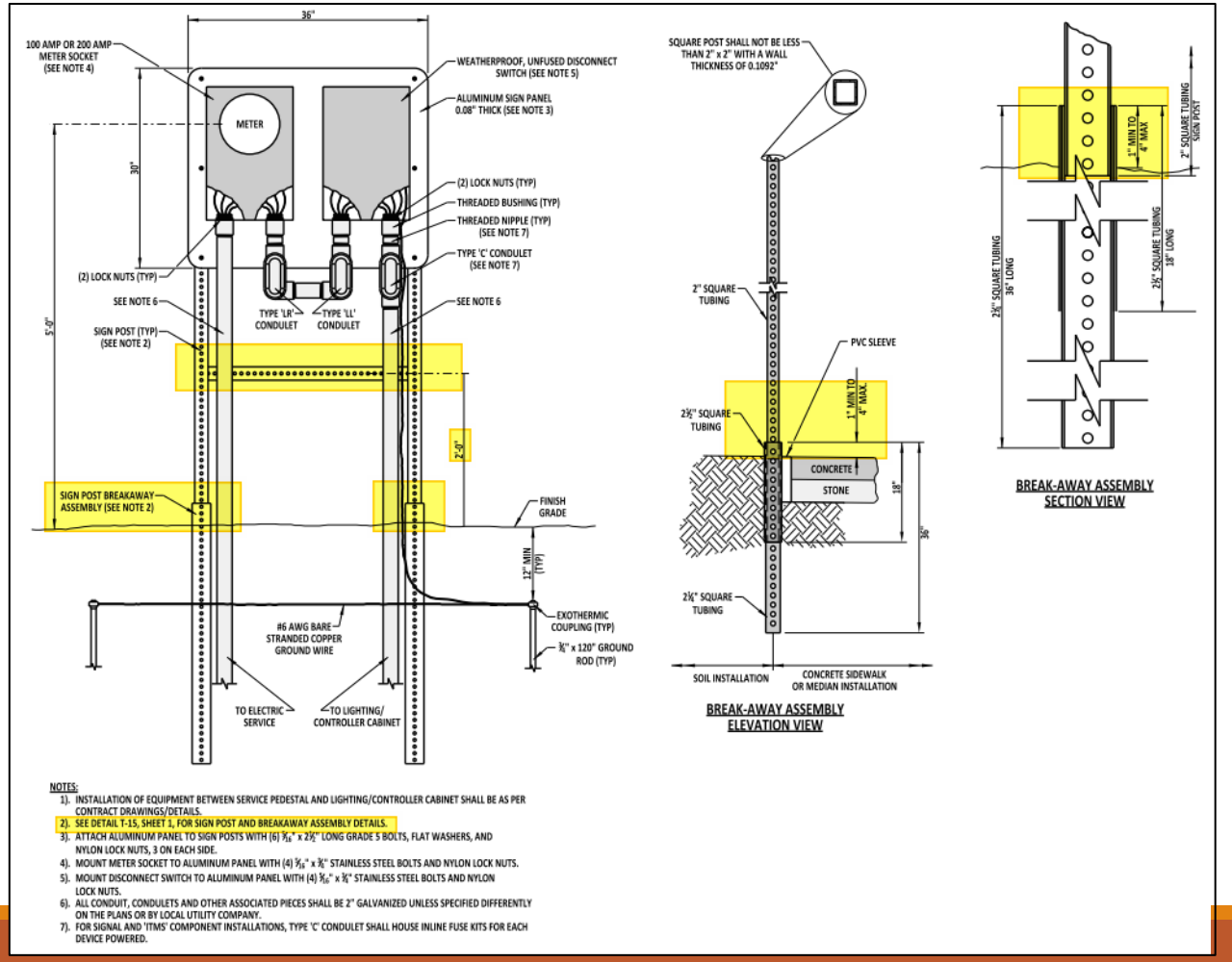
A. General pavement marking removal requirements:

1. Perform the removal operation in a manner that will not damage the pavement surface.
2. Collect and dispose of all shot/abrasive grit and pavement marking Materials removed from the pavement surface. Do not wash or sweep such Material to the roadside.
3. After removal of striping on bituminous concrete, use an approved flat black paint or asphalt sealer to cover any exposed aggregate or embedded paint.

B. Use shot/abrasive grit blasting or water blasting Equipment to remove pavement marking paint and epoxy resins.

Traffic Equipment

- Electric Service Pedestals



ADA/Pedestrian/Bicycle

- Vertical Differences

3.3.2 PAR Vertical Surface Discontinuities

Vertical surface discontinuities between adjacent surfaces shall be beveled where greater than ¼ inch. Vertical surface discontinuities between ¼ inch and ½ inch shall be beveled with a slope not steeper than 2H:1V (50.0%) as illustrated in Figure 3.3.2. Where a vertical difference of ½ inch or less is impracticable, the surface discontinuity shall be sloped no steeper than 12H:1V (8.3%). The transition between the depressed curb at a blended transition or ramp segment and gutter must meet the requirements of Section 3.8.7.8. Beveling shall be applied across the entire limits of the vertical surface discontinuity.

Snapshots taken from, Section 3.3.2. the 2018 Pedestrian Accessibility Standards (PAS)

ADA/Pedestrian/Bicycle

- Consideration for accessibility/turning space

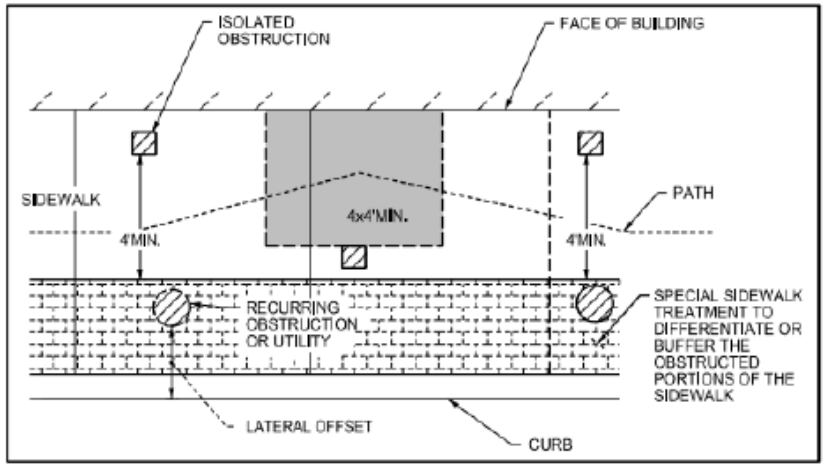
3.7.1.1 Multiple Obstructions and Pivot Points

Designers are expected to avoid the offset grouping of obstructions in the PAR. In instances where multiple obstructions are located in or adjacent to the PAR due to physical constraints, and where an obstruction in the PCP cannot be removed, the following PAR Minimum Standards for Pivot Points apply:

A. New and Reconstruction Projects - PAR layout at grouped obstructions and pivot points shall include a 5 feet x 5 feet accessible maneuvering area.

B. 3R and Maintenance Projects - PAR layout at grouped obstructions and pivot points shall include a 4 feet x 4 feet accessible maneuvering area (See Figure 3.7.1.1).

Figure 3.7.1.1 Grouped Obstructions and Pivot Point Clearance on 3R - Projects



Snapshot taken from 2018 PAS Manual Section 3.7.1.1.

ADA/Pedestrian/Bicycle

- Protrusions and Vertical Clearance
  - Vegetation
  - Guy Wires
  - Utilities
  - Signs

3.7.4 Protruding Objects

Objects mounted on fixed structures where the objects' leading edges protrude into the PCP above the cane detectable range and below the required Vertical Clearance (for example protruding edge occurs between 27 inches and 80 inches above the pedestrian facility's surface) shall meet the Minimum Standard of 4 inches maximum protrusion, measured from the face of the fixed structure into the PCP. (See protruding objects mounted on fixed structures in Figure 3.2, Figure 3.7.4, and Figure 3.8.6-a)

PAR Minimum Standards along a SUP require that no overhanging or protruding objects impact any portion of a shared use path at or below 96 inches. At the time of final inspection for SUP facilities, the Minimum Standard is 120 inches for overhanging vegetation such as tree limbs to allow for future growth.

Snapshot taken from Section 3.7.4, of the DelDOT PAS Manual (2018)

3.7.6 Post-Mounted Objects

Signs mounted on posts or pylons with leading edges that protrude at a height above the cane detectable range (more than 27 inches above the PCP surface and below the required vertical clearance) cannot protrude more than 4 inches out into the PCP per the DE MUTCD. The

Snapshot taken from Figure 3.7.6, of the DelDOT PAS Manual (2018)

ADA/Pedestrian/Bicycle

- DWS Placement
  - DWS shall extend the full width of curb ramp and fully depressed curb.

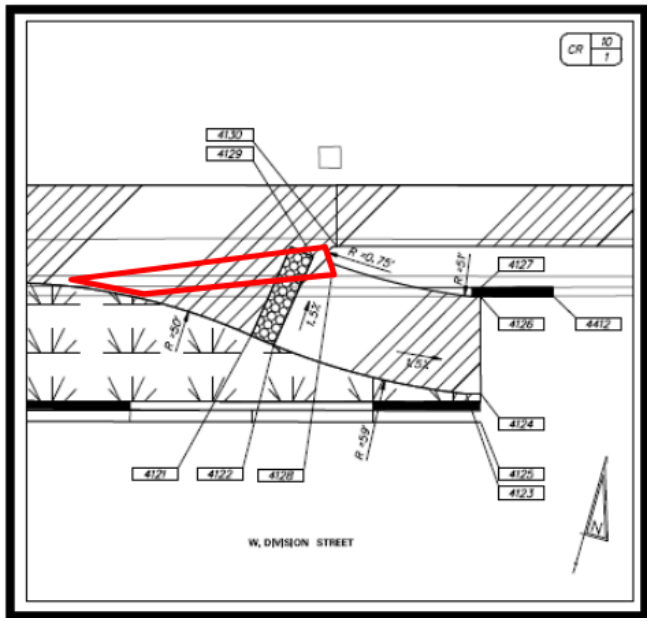
3.9.3 Placement of DWS at Curb Ramps

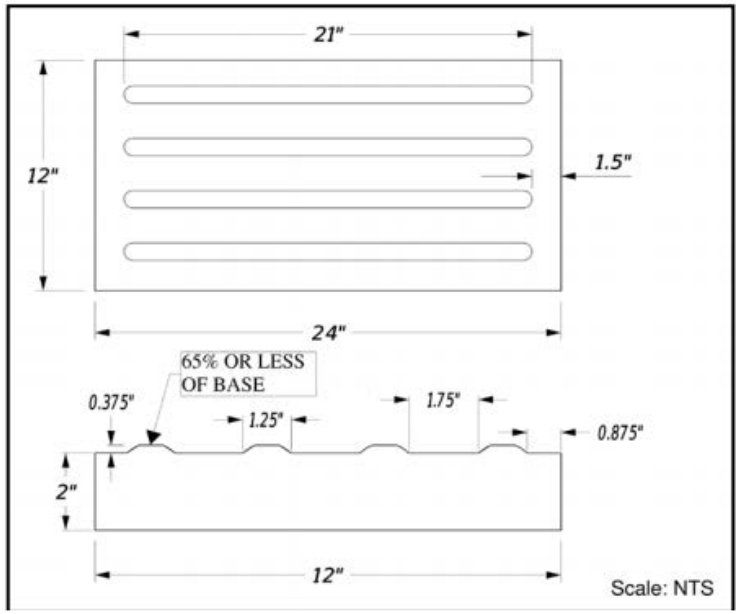
The DWS shall extend the full width of the curb ramp and fully depressed curb (excluding tapered curbs that form part of ramp side flares). The DWS shall extend at least 2 feet in length, measured in the direction of travel, from the back of the curb on the ramp surface. DWS are not permitted to be placed within the footprint of the depressed curb itself and must be installed behind the effective back of curb, including along tangent sections. DWS should be installed perpendicular to the path of pedestrian travel as described in Section 3.9.3.1, with DWS grid pattern oriented in-line or on alignment with the direction of pedestrian travel at street crossings, to provide smoother travel for wheelchair users and allow the wheels to "track" between the domes.

Snapshot taken from 2018 PAS, Section 3.9.3

ADA/Pedestrian/Bicycle

- DWS Placement
  - Consideration with parallel on-road bicycle facility/bike lane
  - Directional Tactile Surface indicator (DTSI) – DGM 1-28
    - Located on approach/exit of the bike ramp
    - Run parallel to the pedestrian route of travel to identify to the pedestrian the continued direction of travel





Thank you!

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