DESIGN RESOLUTIONS

Design Steps:

- PM3's, along with ADE-Design & Plans Engineer reviewed the IIC Council presentation to understand the concerns and areas for improvement

- PM3's met with all of the design PM's to brainstorm potential process improvements to reduce the occurrences of these incidents

- PM's were assigned to two person teams to develop those improvement ideas

- PM3's & Plans Engineer reviewed and commented on the improvements that were developed

- QA Lead & Plans Engineer presenting to the IIC Council to solicit feedback

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DRAINAGE VERIFICATION

Issues: Existing conditions vary from those depicted on the plans

Impacts: Additional costs along with delay of associated work

- Exposure to costs associated with contractor demob/ remob costs and/or equipment standby costs
- If contractor needs to shutdown and wait for redesign, negative public perception of 'no work going on' for extended period
- Particularly problematic when a project has a compressed schedule/ public commitments for completion (school, environmental, EMS, special events, etc.) ~ may require payment of acceleration costs
- Wages of the IIC, ACE/ACM, ADE, County Maintenance Manager and Work Order Specialist for the creation and review of additional Work Orders and Cost Funding Changes.

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DRAINAGE VERIFICATION

Design Solutions:

Guidance applies to all projects. This guidance was developed in close coordination with the District Maintenance and Construction Units.

- Field verify all existing drainage features. Verify existing Maintenance IQ pipe information.
  - Field verify all drainage within project limits, including facilities owned by others, such as a municipality. (I.E. outside of the curb in a curbed section) to confirm that there aren't any existing issues. This includes Pavement Preservation Projects.
- If survey is unable to get shots of inverts, survey team is to coordinate with maintenance for assistance with traffic control and/or opening grates and manholes.
- If a survey is not available, the Design Team is to lift inlet grates and manhole lids to determine/verify inverts and directions of the pipe. Can utilize county maintenance forces for the following.
  - Traffic control for field views.
  - Assistance with opening grates and manholes.
  - Cleaning existing drainage to get a better look.
  - Test holes for drainage facilities. Ensure a PA One Call is completed prior to this work.
- Please note that significant lead time may be needed so that maintenance can fit this work into their regular work schedule. Coordinate as early as possible.
- This effort is to be completed by the SUE (Subsurface Utility Engineering) firm if an engineering agreement is in place.

DRAINAGE VERIFICATION

Design Solutions:

- When tapping into existing drainage facilities get the existing facilities videoed after preliminary drainage design is complete.
    - Coordination with Central Office to get a drainage facility videoed will be performed by the PM (Project Manager) for both In-house and Liaison Projects.
    - If the location of the existing facility is still unclear a test hole may be needed.
- Need to evaluate Parallel Pipe for cleaning or replacement
    - In general, parallel pipe systems are owned by the Municipality, especially in urban areas. Ownership of parallel systems can be verified by maintenance if needed.
    - If drainage is within our ROW (Right-of-Way) but ownership and maintenance is not PennDOT:
        - Determine if repair or replacement is needed.
        - Develop a scope of work and cost estimate.
        - Provide scope of work and cost estimate to Portfolio Manager to determine if it will be included in the project.
        - Attempt to make determination early as a legal agreement with the owner may be required.
- Need to evaluate condition of existing inlets, including size and shape to ensure they are a standard size if inlet adjustments are required.
    - Construction ACE (Assistant Construction Engineer) can make determination if designer is unsure what item number the existing condition warrants

DRAINAGE VERIFICATION

Design Solutions:

- Consider including "as-directed" quantity of inlet tops or adjustments on projects with a lot of existing drainage. Construction ACE can assist with deciding how much additional quantity to include.
- Ensure using proper inlet adjustment item at each location.

- M vs C inlet tops
  - Ensure existing curb matches the standard height of a type "C" top.
    When it does not match:
    - If in a curbed section with no sidewalk behind it, utilize a standard "C" top and include concrete to transition from existing curb height to "C" top.
    - If a curbed section with sidewalk, cut existing curb install an "M" top with the grate on the gutterline place a cast in place curb on top. Include detail on plan. Link to Standard Detail to be added.
- Utilize RC-46M to verify pipes will fit with inlet boxes specified
  - Verify for size and skew
  - When in doubt about a complicated inlet box, design build is an option that can be used on a case-by-case basis.
- Do not draw proposed pipe on a radius, all pipes must be drawn and constructed in straight lines.
- Perform a drainage field view prior to safety review utilizing the attached **Drainage Field View worksheet.**

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DRAINAGE VERIFICATION

Design Solutions:

Drainage Field View Checklist

Date of Field View:
Completed By:

Drainage Fieldview Checklist

Pipe Run:	Segment/Offset	or	Station
Beginning			
End			
Pipe Type:		Pipe Size:	
Pipe Length:			
Pipe Condition:		Pipe Cleaning:	
Pipe Cleaning:			
US Condition:		Inlet Size:	Curb height:
US Erosion Protection:			
US Location:			
US Ditch Condition:			
DS Condition:		Inlet Size:	Curb height:
DS Erosion Protection:			
DS Location:			
DS Ditch Condition:			
Utilities:			
General Remarks:			

Pipe Conditions:	Conditions:	Erosion Protection:	Location:	Photos:
Clean, good condition	D-E Endwall	None	Edge of Roadway	1. Upstream
Invert rotted	E-S Endwall	Eroded	Shoulder	2. US headwall
Fully Clogged	D Endwall	Rock	Outside of Shoulder	3. US access
Partially Clogged	D-W Endwall	Geotextile	Bottom of slope	4. Downstream
	Inlet	Concrete base		5. DS headwall
	End Section			6. DS access
	Open Pipe			7. Other

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DRAINAGE VERIFICATION

Additional Coordination with Construction:

GUIDANCE FOR DETERMINING THE NEED

FOR GRADE ADJUSTMENTS (606) AND REBUILT STRUCTURES (607)

When calling for new inlet tops and the finished grade elevation of the new inlet top will be ***higher or lower*** than the finished grade elevation of the existing inlet top, the appropriate 606 or 607 Item needs included.

When calling for new inlet tops and the finished grade elevation of the new inlet top will remain ***unchanged*** from the finished grade elevation of the existing inlet top, the following is intended to provide guidance for when to include Item 606 or 607.

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DRAINAGE VERIFICATION

Additional Coordination with Construction:

- When calling for a new **Type M** inlet top:
  - If the available depth between the top of the existing inlet box* and the finished grade is 13” or less, then no additional items are needed
  - If the available depth between the top of the existing inlet box* and the finished grade is greater than 13”, then the appropriate 606 or 607 item needs included
- When calling for a new **Type S** inlet top:
  - If the available depth between the top of the existing inlet box* and the finished grade is 14” or less, then no additional items are needed
  - If the available depth between the top of the existing inlet box* and the finished grade is greater than 14”, then the appropriate 606 or 607 item needs included
- When calling for a new **Type C** inlet top:
  - If the available depth between the top of the existing inlet box* and the finished grade is 14” or less, then no additional items are needed
  - If the available depth between the top of the existing inlet box* and the finished grade is greater than 14”, then the appropriate 606 or 607 item needs included
  - Also, Include a minimum of 8 LF (4 LF each side) of Item 630 (Plain Cement Concrete Curb) or Item 640 (Plain Cement Concrete Gutter)

DRAINAGE VERIFICATION

Additional Coordination with Construction:

Regardless of the type of inlet top, verify that the existing inlet where the top is to be replaced meets the length and width dimensions of an inlet per RC-45M. If it does not, then Item 607 needs included regardless of the available depth between the top of the existing inlet box and the finished grade. If the dimensions of the existing inlet are drastically different than the length and width dimensions of an inlet per RC-45M, then Item 605 should be used to replace the inlet.

In general, the Designer should inspect the visible portions of the existing inlet box for deterioration and stability and call for replacement of the inlet box if needed. For inlets that are questionable or if the designer is uncertain whether an inlet box should be replaced, feel free to contact the respective ACE and they can assist in making the determination.

*NOTE: The top of the existing inlet box is the original poured top elevation of the concrete box. Bricks, grade adjustment rings, grout pads, etc. **are not** part of the original inlet box. The measurement is to be taken at the front side of the inlet.

UTILITY VERIFICATION

Design Solutions:

- Ensure utilities on the plan are included on the cross-sections to develop the utilities conflict list (better to show and call out approximate utility depths than not at all; this will draw attention vs the possibility of getting missed. If depths are approximate, please label as approximate on the plan).
- Make effort to communicate new design concepts (i.e. over excavation, crane patterns, etc.) to help ensure parties understand design and limitations.
- The design team, with assistance from the Utilities Unit, as needed, will field verify existing utilities.
- SUE firm responsible for reaching out to existing utilities to verify locations; (District Utility Administrator to provide cursory level review to verify that SUE firm and utility companies are in coordination). See the following summary:
  - Test hole locations: Designer proposes where needed and the District Utility Administrator reviews and concurs with the locations.
  - SUE Report/plan review and acceptance: The SUE firm signs/seals the report/plan and accepts responsibility.
  - PM's responsibilities: Ensure utilities are shown on plan/cross-sections correctly based on SUE Report. It is recommended to coordinate with District Utilities Administrator to verify that utilities are shown correctly.

UTILITY VERIFICATION

Design Solutions (continued):

- Ensure SUE deliverable includes the entire project area, including any limit extensions and any project area expansions.

- Show approximate locations (field measured) of utility poles on guide rail straight line plans within 100' of proposed guide rail on pavement preservation projects. Ensure utility pole locations are being included and accounted for as part of the guide rail design.

- SUE form is completed within URMS by the PM and District Utility Administrator. PennDOT Publication 16, Design Manual Part 5, Utility Relocation has additional information on SUE. This includes the SUE process, SUE quality levels and deliverable requirements discussed in this memo.

- For Consultant Design Projects, ensure that the most up-to-date department details for SUE are being used. See Consultant Design PM3 for the latest details.
- For projects with highway lighting within the limits, the underground electric and fiber optic facilities for the lighting should be located and restored with the project. Please use the following items to locate and restore the lighting facilities.

  (Examples can be found in ECMS 105116)
  - 9000-0005 UTILITY TEST HOLE
  - 9000-0250 RESTORE UNDERGROUND ELECTRICAL AND FIBER OPTIC FACILITIES

QUANTITY OMISSIONS - INACCURACIES

Design Solutions:

Increased focus on items/quantities

- QA Manager will track WO's in ECMS to determine common items that are either missed or quantities need adjusted and then make the QA/QC reviewer aware to watch those items more closely.

- Each year the PM3's and Plans Development Engineer will choose (at a minimum) two projects to have an in-depth pre-construction review completed by either a consultant reviewer or a D9 Construction staff member that is not associated with the project's design or construction.

- This information will not only improve the quality of those two projects, but relevant issues will be presented to staff at designer day for consideration on future projects.

- The Construction Staff reviewing the submission documents submitted for the Constructability/Maintainability CPM meeting will provide a high-level cursory review of items/quantities. Current Constructability/Maintainability form used for these meetings will be updated to contain a line for the staff member performing this review to sign off on.

QUANTITY OMISSIONS - INACCURACIES

Design Solutions:

Winter Assignment Construction Inspectors Quantity Takeoffs

- Plans at or close to PS&E or higher priority/larger scale projects, can be assigned to Inspectors on winter assignment
- Using only information in plans and tabs, inspectors perform quantity takeoffs as a check

Tree Trimming and Tree Removal

- Tree trimming and tree removal items and their quantity calculations should be determined in accordance with the most recent Tree Trimming/Removal policy

Shoulder Backup Quantities

- Designer to make an engineering judgment on an average depth needed (to include the existing drop-off and any additional pavement depth being added with the contract) and then add 10% to account for any overrun.

TREE REMOVALS

Design Solutions: Special Provision/Tree Table/Authorization to Enter

ITEM 4810-0052 SELECTIVE TREE REMOVAL, INCLUDING ROOT SYSTEM REMOVAL WITH SEEDING AND MULCH

In accordance with Section 810 and as follows:

810.1 DESCRIPTION – Revise to read:

This work is the removal of selected trees, removal of stumps, root system and debris, backfilling, and placing seeding and mulching of disturbed areas.

810.3(a) Tree and Shrub Removal. Add the following:

Grind or remove stumps and root system to a minimum of 12 inches below grade or slope surfaces, as directed.

Backfill with acceptable material and cover with topsoil in accordance with Section 802.3(b).

Seed using Formula B in accordance with Section 804. Mulch using Straw in accordance with Section 805.

810.3(e) Clean-up. Add the following:

Do not dispose of wood chips within project limits.

810.4(b) Selective Tree Removal. Add the following.

Payment includes removal and disposal of existing tree, stump, and root system, backfill and topsoil, and seeding and mulching of disturbed areas.

- For projects in urban areas with significant utility, sidewalk, etc. conflicts. Consider using grind only.

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TREE REMOVALS

Design Solutions: Special Provision/Tree Table/Authorization to Enter

TREES (FOR INFORMATION ONLY)

LABEL	PARCEL#/ LEGAL ROW	STATION	OFFSET (FT)	SIDE	SIZE (IN)	TYPE	TO REMAIN	CONSTRUCTION PAY ITEM
A	1	014+30	26	RT	24	TWIN OAK	YES	N/A
B	1	013+04	31	LT	8	TWIN DEAD TREE	NO	4810-0052 SELECTIVE TREE REMOVAL, INCLUDING ROOT SYSTEM REMOVAL WITH SEEDING AND MULCH
C	1	013+35	49	LT	18	WALNUT	NO	0810-0052 SELECTIVE TREE REMOVAL
D	1	013+59	63	LT	12	OAK	NO	0201-0001 CLEARING AND GRUBBING
E	Legal ROW	013+90	65	LT	12	DEAD TREE	NO	0201-0001 CLEARING AND GRUBBING
F	Legal ROW	013+90	72	LT	30	SYCAMORE	NO	0201-0001 CLEARING AND GRUBBING
G	2	014+04	49	LT	30	DEAD TREE	NO	0810-0052 SELECTIVE TREE REMOVAL
H	3	014+22	52	LT	12	MAPLE	YES	N/A
I	3	014+38	26	LT	12	WALNUT	YES	N/A
J	3	014+39	39	LT	8	MAPLE	YES	N/A
K	3	014+31	64	LT	12	DEAD TREE	NO	0201-0001 CLEARING AND GRUBBING

Note: Any additional tree removals not tabbed within the limits of grading (including ditches and channels) will be considered incidental to Clearing and Grubbing.

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E&S PLAN INCONSISTENCIES

Issues: Notes and details in conflict on approved E&S Plans

Impacts: Additional costs along with delay of associated work

- Exposure to costs associated with E&S contractor demob/remob costs and/or equipment standby costs if BMPs conflict with work

Design Solution: On projects with multiple phases, the E&S Plan notes shall reflect the phasing and the following note will be used:

ALL EROSION CONTROL BMP'S ARE TO BE INSTALLED IN ACCORDANCE WITH PROJECT PHASING AND WORK SEQUENCE

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GENERAL REMINDERS

- In any case where the design staff is making plan revisions and/or adding work, the FINAL revised plans should always be accompanied by a list of additional (or deleted) items and quantities.

- Remember to account for Temporary Pavement Markings when developing quantities

- Remember to include the removal of Bridge Restriction signs by the contractor when no longer required.

- When using Portable Temporary Signals ~ Consider if they will need moved during the phasing. Include a reset item when needed. The Prime Contractor often is not able to move them and it will require the Sub-Contractor to return to the site and they will want a re-mobilization fee.

GENERAL REMINDERS

- TC-8604: Updated in August 2021 to comply with MUTCD
  - Yellow post/sheeting is no longer being used on the right side of the road to mark obstructions and/or end of guiderail. Yellow will continue to be used on the left side of one-way roads to match the edge line. Maintenance markers (red post/sheeting to match near edge line color) are more to alert our operators of obstructions when plowing and will now be used to mark the end of guiderail, etc. Maintenance markers must be installed at least 3-ft away from an impact attenuator.

- When you are drawing details, be sure to draw the original to scale and then scale down to avoid conflicts that would be evident (example: utilities/pipes/elevations)

- If your project does not include a Signing & Pavement Marking Plan and the markings are to be placed the same as existing, include the Type C Surveying Item and include the following in the GENERAL NOTES:

  CONTRAACTOR TO SURVEY ALL PAVEMENT MARKINGS BEFORE MILLING OR PAVING.

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