

### **1.3 PLAN SHEETS DELIVERY, PRINTING AND PLOTTING ORDER OF PREFERENCE**

In order to decrease the use of plotters for full-size plan sheets and reduce the consumption of paper, utilize the following order of precedence:

1. Distribute plan sets for either plan review or construction as an electronic file.
2. In circumstances that require a hard-copy set of plans, opt for half-size (11 in × 17 in) printed to laser prints in lieu of plotting a full-size (22 in × 34 in) or a Roll Plan (34 in width × 200 in maximum length).
3. Provide a full-size plot (22 in × 34 in) or a Roll Plan plot (34 in width × 200 in maximum length) only upon request to the District Project Manager.

**INTENTIONALLY BLANK**

**Resource Agencies** - A group of federal and state agencies or commissions which have various regulatory, jurisdictional, and/or administrative responsibilities in a variety of subject areas that are part of the Transportation Project Development Process. These agencies and commissions are involved in participating in project meetings, reviewing and evaluating Department studies, commenting on documents, and granting certain approvals.

**Right-of-Way** - Land, property, or interest therein acquired for and devoted to transportation purposes, including construction, maintenance, operations, and protection of a facility.

**Roadway Safety Assessment** - A tool that planners can initiate in coordination with PennDOT. An RSA is a formal safety performance examination of an existing or future road, bridge or intersection by an independent assessment team. The RSA team considers the safety of all road users, qualitatively estimates and reports on road safety issues and opportunities for safety improvement.

**Roadside Development** - Items for seeding, sodding, mulching, topsoiling, planting of ground covers, other planting, and items for erosion control.

**Roadway Construction Standards** - Publication 72M, containing PennDOT's design standard drawings for roadway construction.

**Roadway Deficiencies** - Problems with the existing roadway system, or lack of a roadway system, that causes safety concerns, motorist inconvenience, or traffic congestion.

**Roll Plan** - Contains the data and information for the project design's two-dimensional plan views and profile views on a minimum of two, full project length plans. This data and information have historically been prepared and presented for plan views and profile views on 22" x 34" sheets (ANSI D size).

**Rural Planning Organization (RPO)** - Seven multi-county, non-profit agencies in rural areas created by counties to support regional planning and economic development initiatives. RPOs represent 37 of the Commonwealth's 67 counties for transportation planning.

## S

**Safety Improvements** - Roadway maintenance activities and smaller construction projects that correct conditions occurring on or alongside an existing highway. Typically involves minor widening, resurfacing, regarding roadsides, hazard or obstacle elimination, guiderail installation, and miscellaneous maintenance.

**Safety Management System (SMS)** - A systematic process that has the goal of reducing the number and severity of traffic crashes by ensuring that all opportunities to improve highway safety are identified, considered, implemented as appropriate, and evaluated in all phases of highway planning, design, construction, maintenance, and operation and by providing information for selecting and implementing effective highway safety strategies and projects.

**Scope of Work** - A detailed, written listing of tasks prepared in advance of engineering and environmental work to explicitly define the contents of studies. A Scope of Work is typically provided to prospective consultant firms prior to the initiation of studies to aid them in preparing estimates of working hours, schedules, and costs required to prepare, complete, and deliver all portions of the work described.

**Scoping** - As defined by the Council on Environmental Quality (CEQ) Regulations, the process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

**Scoping Field View** - See **Field View**

**Scoping Form** - A prepared Department document with blanks for the insertion of details or information to define all essential items associated with the evaluation, study, and assessment of a project. The scoping form is used to record initial project data and to make preliminary judgments regarding impact subject areas, assessments of significance, proposed analysis, coordination, and documentation required.

# CHAPTER 1

## GENERAL PROCEDURES

### 1.0 INTRODUCTION

The objective of this Manual is to promote uniformity in the preparation of plans by establishing the general format and presenting the detailed information which is required for each type of plan sheet required in the maintenance and construction of highway facilities. The drafting standards contained herein apply to all Department plans including Right-of-Way, Structure, Roadway, Geotechnical, Traffic Signal, Highway Lighting, Highway Occupancy, etc. This information, in conjunction with a high, professional standard of drafting techniques, shall ensure, to the greatest extent possible, the uniform appearance and reproduction quality of data presented on right-of-way plan sheets, contract plan sheets, etc. The guidance provided shall also assist the designer in avoiding errors and omissions which consequently would require excessive alterations and corrections.

The accuracy and completeness of all the drawings indicated herein are prerequisites for the fair and equitable compensation of right-of-way and for enabling the Contractor to submit a sound, equitable bid for a project. The final plans, as presented to the Department, shall be concise, complete and contain all the design data necessary to acquire right-of-way or for a Contractor to construct the project to Department standards.

### 1.1 ~~PROCEDURES FOR MODIFICATIONS OR ADDITIONS TO THE DESIGN~~ UPDATING THIS MANUAL

~~Whenever a District Executive or a Bureau Director determines that modifications or additions are required to improve the current guidelines in Design Manual, Part 3, the following procedures shall be followed:~~

~~1. The recommended modifications or additions shall be transmitted to the Director, Bureau of Design and Delivery with the following information:~~

~~a. The title and page number of the existing practice, if applicable.~~

~~b. The recommended modifications or additions and the Chapter(s) and the appropriate page number(s) into which they should be incorporated.~~

~~c. The reasons for recommending the modifications or additions.~~

~~2. The Director, Bureau of Design and Delivery shall review the recommended modifications or additions and transmit copies to the various Bureau Directors and District Executives involved for their comments. FHWA comments shall also be solicited, when required.~~

~~3. All comments shall be submitted to the Director, Bureau of Design and Delivery and, upon review, appropriate action shall be taken.~~

~~4. If modifications or additions are required to the current criteria, they shall be made through standard procedures for incorporation into Publication 14M, Design Manual, Part 3, *Plans Presentation*.~~

To uphold PennDOT's mission to provide a sustainable transportation system and quality services that are embraced by our communities and add value to our customers, it is important that design processes and procedures include state-of-the-art best practices. As practitioners, PennDOT's employees are the best resources for providing these updates.

PennDOT encourages staff and consultants to submit comments and suggestions for changes to the manual to the following e-mail resource account: [RA-PDDigitalDelivery@pa.gov](mailto:RA-PDDigitalDelivery@pa.gov).

Highway Design and Technology Division Staff review comments and suggestions in a timely manner. Their review is also coordinated with other PennDOT sections, as appropriate.

## 1.4 STATIONING

Stationing for metric Construction Plans shall be based on the AASHTO recommended stationing where one station equals 1 km or 1000 m, and is typically written:

1+000.000

By example, station 1+326.130 indicates a point 326.130 m ahead of station 1+000.000. Stations shall be indicated and labeled every 100 m along the baseline with additional stationing indicated at every 20 m but not labeled. Equality, PT, PI, PC, PVT, PVI and PVC stationing shall be indicated and labeled. All stationing shall be computed to the nearest 0.001 m or 1 mm.

Stationing for English Construction Plans, where one station equals 100 ft, is typically written:

1+00.00

By example, station 1+56.25 indicates a point 56.25 feet ahead of station 1+00.00. Stations shall be indicated and labeled every 100 ft along the baseline. Equality, PT, PI, PC, PVT, PVI and PVC stationing shall be indicated and labeled. All stationing shall be computed to the nearest 0.01 ft.

## 1.5 REQUIREMENTS FOR FINAL ELECTRONIC DELIVERABLE OF FINAL RIGHT-OF-WAY AND CONSTRUCTION PLAN SHEETS

Upon completion of final Right-of-Way Plans, final Construction Plans, ~~s~~Supplemental ~~Construction~~ Plans and as-built Construction Plans, it shall be a requirement to prepare "PDF" (Portable Document File) files for each sheet, with one sheet per "PDF" file, as the final deliverable. This requirement shall be applicable to both Department and consultant prepared plans\*.

The final deliverable for all right-of-way plan sheets, construction plan sheets, supplemental plan sheets, and as-built plan sheets shall be prepared following normally acceptable drafting standards and meeting microfilming requirements. These "PDF" files shall contain all applicable signatures and seals. This requirement will provide the Department files that can efficiently be captured in the Electronic Document Management System (EDMS).

All files shall be documents with black line work on white background in "PDF" format (600 dots per inch (DPI)) with no layer or security settings when the files are being created directly from drafting software such as "Microstation". However, if the hard copy plan sheets are being scanned to produce the "PDF" files, the dots per inch setting shall be 200. "PDF" is a common format for exchanging raster graphics (bitmap) images between applications programs, including those used for scanner images.

The files shall represent the final right-of-way plan sheets, construction plan sheets (all roadway plans and supplemental plans) and the final as-built construction plan sheets. All Department prepared "PDF" files shall be created in a shared folder on the Department's computer network. All consultant prepared "PDF" files should be delivered ~~on CD-ROM~~to an electronic file storage site, as agreed upon with the District. Each document type shall be in a separate and appropriately named folder (i.e. River County>SR9999Sec023>Roadway Plan).~~Each plan sheet shall be a single "PDF" file.~~

For preparation of final Construction Plans, the layout of the Plan Sheets and the Profile Sheets shall consist of a minimum of two, full project length "Roll Plans". The Roll Plan size shall be a width of 34 in and a maximum length of 200 in. The Roll Plans shall replace both the Plan Sheets and Profile Sheets that have historically been prepared either as the standard ANSI D size, 34 in × 22 in or as an abbreviated format size, 11 in × 8.5 in. Preservation projects shall only include a Roll Plan for the Plan Sheet. Preparation of a "Roll Plan" is not required for the other sheets in the Construction Plans. See Appendix E for information and guidance regarding Roll Plan workflow guidelines.

For preparation of final Supplemental Plans, the use of Roll Plans is optional and shall be evaluated per project, especially for Supplemental Plans involving the Public Utility Commission (PUC) and environmental permitting.

Sheets for Final Right-of-Way Plans shall not be prepared as Roll Plans due to the requirements of local agencies.

The naming convention for ~~standard ANSI D size, 863.6 mm × 558.8 mm (34 in × 22 in)~~ plan sheets, that has been established for the Department's EDMS, is outlined in [Appendix A](#) and shall be followed.

All digital signatures and seals are required to use appropriate security software that provides an electronic authentication process attached to or logically associated with the document that meets the requirements as set forth by the Department of State in 49 Pa. Code §37.60.

\* Other plans such as the Post Construction Stormwater Management (PCSM) plans may have different requirements. See appropriate directives.

**INTENTIONALLY BLANK**

## 2.1 TITLE SHEET

The information presented in this section shall be shown on the Title Sheet, in the appropriate location, for all Construction Plans. The Title Sheet shall be plotted on the standard ANSI D size, 34 in × 22 in. An example of a typical Title Sheet is shown in [Chapter 15, Section 15.2, Plate B-I](#).

**A. Title Block Identification Data.** The following data shall constitute the Title Block on the Title Sheet:

1. Headings and Title of Plan.
2. State Route.
3. Section Number.
4. County or Counties.
5. Township, Borough or City.
6. "Limit of Work" Stations.
7. Construction Length.

**B. Identification Block.** The following information shall be provided in the Identification Block in the upper right-hand corner. Refer to [Chapter 15, Section 15.2, Plate B-I](#) for an example of an Identification Block for Construction Plans.

1. State Route.
2. Section Number.
3. Engineering District.
4. County or Counties.
5. Township, Borough or City.
6. Total Number of Sheets.
7. ECMS Number.

Only major routes shall appear in the Title Block and in the Identification Block on the Title Sheet.

**C. "And" Routes.** When the project consists of two or more major routes, the route numbers and the Stationing Limits of each are to be shown, with their individual construction length, and combined in the total construction length. The "And" route requires a separate section number.

**D. "Also" Routes.** When work on an intersecting or adjacent State Route is undertaken in conjunction with the mainline construction, that route shall be identified on the Title Sheet by the word "Also". This route shall be shown after the main route(s) listing and shall show Stationing Limits of work FROM STA \_\_\_\_\_ TO STA \_\_\_\_\_ without construction lengths.

The "Also" routes shall not be totaled with the main routes nor shall they appear in the Identification Block in the upper right-hand corner of the Title Sheet.

The "Also" routes shall appear on the Title Sheet only if their construction length is at least 500 ft in length and consists of full width construction, except for interchanges. If the work involved consists only of resurfacing and widening, it shall not be considered full width construction. The inclusion of an additional traffic lane shall be considered full width construction. Interchange route numbers shall be included as an "Also" route if the interchange is part of the route appearing in the Title Block (show interchange numbers only, do not show stations).

**E. "Limit of Work" Stations and Project Length.** Stationing Limits for construction shall include all work to be performed by the Contractor. For exceptions, refer to [Chapter 8](#) and [Chapter 9](#). To allow for working room and any minor construction changes, the Stationing Limit should be set between 50 ft and 100 ft beyond the last work called for on the plan. When the project is located in two or more counties, the Stationing Limits should be broken for each county. Stationing Limits should be from south to north or from west to east. See [Chapter 15, Section 15.1, Plates A-IV and A-VI](#) for example sketches indicating "Limit of Work" stations.

The length indicated on the Title Sheet represents the construction length (see [Section 2.3.D](#)). The length shall be expressed to the nearest 0.001 mi if the project has been surveyed.

**2.2 INDEX SHEET**

The Index Sheet shall be plotted on the standard ANSI D size, 34 in × 22 in. The following general information shall be shown on the Index Sheet for all Construction Plans:

1. Index Map.
2. Record of Existing Road Types.
3. Straight Line Diagram Data.
4. Location of Project on State Map.
5. Sheet Index.
6. Tabulation of Equalities Between Segment Node Points and the Survey Stations (if available).

**A. Index Map.** The Index Map shall be placed on the Index Sheet, to best advantage, using a scale no smaller than 1" = 500' and shall show the following data, where applicable:

1. Construction centerline and stations identified at maximum 500 ft intervals.
2. Edge of existing pavement.
3. State Routes and Township Roads (Show posted Traffic Route Numbers).
4. Local road names.
5. Railroads.
6. Edge of streams (Identify major streams).
7. Outline of proposed and existing bridges.
8. Political subdivisions.
9. "Limit of Work" stations on the mainline.

**Example:**

LIMIT OF WORK  
STA 675+00.00  
SEG 20 OFFSET 75  
SR 1033 SEC A04  
GREENWOOD TOWNSHIP  
PERRY COUNTY






10. Channel changes.
11. Temporary roadways.
12. "Stop Work" and "Start Work" stations on all "Also" routes, crossroads, temporary roadways, temporary connections, service roads, railroad-highway grade crossings, channel changes, reconditioning of abandoned State highways and mainlines where the first work starts and the last work stops.

**Example:**

STOP WORK  
STA 240+50.00  
SEG 15 OFFSET 50  
SR 1033 SEC A04  
(Section Number, if applicable,  
See [Section 2.1.B.](#))

- 13. Equality stations.
- 14. Property lines and owner's names. Property owner's names shall be spelled out exactly as shown on the Deed. Parcel Identification Numbers, corresponding to those assigned on the Plan Sheet shall appear in their proper location. When the scale is small and/or properties are too numerous, code properties with the Parcel Identification Number and tabulate the property owner's names elsewhere on this sheet. Also see [Section 2.6.A.13](#).
- 15. Sections of roadway to be abandoned or vacated shall be shown and identified.
- 16. Limits of project covered within each Plan Sheet with the plan sheet number identified in the Legend using the following appropriate symbols:

## LEGEND

	<b>PLAN</b>
	<b>PROFILE</b>
	<b>PLAN AND PROFILE</b>
	<b>PARCEL IDENTIFICATION NUMBER</b>
	<b>PARCEL IDENTIFICATION NUMBER-NO TAKE</b>

- 17. Distances to the nearest 0.1 mi to the nearest community at each end of project. Also give similar distances from "Stop Work" or "Start Work" stations for the State Route crossroads to the nearest community in each direction. If no towns are nearby, indicate distance (in miles) to Traffic Routes or State Routes.
- 18. North Arrow and Bar Scale.
- 19. Abandonment Notes (Same as on the Right-of-Way Plan).

If the project only requires one plan sheet ([Roll Plan, see Section 2.6.A](#)) and the above information can be shown, then an index map is not required.

**B. Record of Existing Types of Roadway Pavement (OPTIONAL).** List, in tabular form, a record of the existing types of roadway pavement adjacent to the proposed construction and throughout the limits of construction. Do not list "Also" routes. Include the following disclaimer statement below the listing:

NOTE: THE DEPTHS OF MATERIAL SHOWN ARE FOR DESIGN PURPOSES ONLY. ANY RISK OF UNANTICIPATED COSTS ASSOCIATED WITH DIFFERENCES BETWEEN THE LISTED DEPTHS AND THE ACTUAL DEPTHS SHALL BE ACCEPTED BY THE CONTRACTOR.

**Example:**

Limit of Work	
Adjacent to Seg 30	24' of 3.5" Bit Surf
	Crse ID-2 on 10"
	Cr Stone Base Crse



**E. Identification Block.** Complete the Identification Block in the upper right-hand corner. A sample Identification Block is shown below.

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
				OF
(CITY, BOROUGH OR TOWNSHIP)				
REVISION NUMBER	REVISIONS		DATE	BY

**FIGURE 2.4  
 SAMPLE OF IDENTIFICATION BLOCK**

**F. Tabulation of Segment Equalities.** A sample format for listing the equalities between segment node points and the survey stationing is shown below:

SR 0010

- Segment 10, Offset 141 = Station 153+49
- Segment 20 = Station 185+37
- Segment 30 = Station 210+93

If desired, the straight line diagram station equivalent may be included with this equality.

**2.3 TYPICAL SECTION SHEET**

The Typical Section Sheet shall be plotted on the standard ANSI D size, 34 in × 22 in. The following general information shall be shown on the Typical Section Sheet for all Construction Plans:

1. General Notes.\*
2. Identification Block.\*
3. Location Map.\*
4. Tabulation of Overall and Construction Lengths.\*
5. List of all Equalities.\*
6. Earthwork Summary Entire Project.\*
7. Listing of Public Utilities.\*
8. Tabulation of Project Coordinates.\*
9. Special Details.\*\*
10. Typical Sections.\*\*

\* To be shown on the first Typical Section Sheet.

\*\* Use additional sheets, as required.

**A. General Notes.** The following is a listing of sample and standard Notes which shall be used, where applicable:

1. Legal Right-of-Way record (width, date published and date recorded). Legal Right-of-Way for all routes referenced to in the plan should be clearly defined as follows:

**J. Typical Sections.** Typical Sections and Stationing Limits for each type of construction encountered on the project shall be shown and shall be in accordance with the Department's current Typical Roadway Cross Sections as shown in Publication 13M, Design Manual, Part 2, *Highway Design*, Chapter 1, unless otherwise approved. Typical Sections are required for the following:

1. Normal section.
2. Superelevated or transition sections. Any special treatment shall be clearly indicated. Show the high side in fill and the low side in cut or vice versa but do not superimpose one on the other.
3. Partial sections for special treatment such as curbs, sidewalks, bicycle facilities, trails, etc.
4. Side roads, crossroads, ramps, service roads, frontage roads, temporary roadways, fringe or off-street parking facilities, crossovers, etc.
5. Partial sections to show typical seeding requirements if not shown on the regular Typical Sections.

The minimum data required on each Typical Section shall include the following, where applicable:

1. Profile grade point.
2. Pavement width, type, depth and cross slope (indicate cross slope as a percentage).
3. Shoulder width, type, depth and cross slope (indicate cross slope as a percentage). When the shoulder is constructed the same as the roadway pavement structure, show the limits of the effective shoulder width and label as EFFECTIVE SHOULDER AREA in addition to the width.
4. Centerline or baseline locations.
5. Base course and subbase width, type and depth.
6. Median width, type and cross slope.
7. Embankment and cut slopes.
8. Location and type of underdrain or pavement base drain (the type of backfill need not be shown).
9. Indicate reference to Standard Drawing RC-10M for cut slope rounding used.
10. Special reinforcement and special tiebar or tiebolt longitudinal joints.
11. Topsoil limits.
12. Median barrier and guide rail.
13. Subgrade slopes (if not parallel to pavement).
14. Label all items in accordance with the Summary of Quantities Sheet.

## 2.4 SUMMARY OF QUANTITIES SHEET

The Summary of Quantities Sheets shall be plotted on the standard ANSI D size, 34 in × 22 in. An example format of the Summary of Quantities Sheet is shown in [Chapter 15, Section 15.2, Plate B-II](#).

All items with their respective quantities payable under the Construction Contract shall be tabulated on a Summary of Quantities Sheet and the Summary of Quantities Sheet made part of the Construction Plans. These sheets shall follow the Typical Section Sheets in the Construction Plan.

## 2.5 TABULATION OF QUANTITIES SHEETS

Tabulation of Quantities Sheets shall be plotted on the standard ANSI D size, 34 in × 22 in. Contract items shall be tabulated as shown in the examples of typical Tabulation of Quantities Sheets in [Chapter 15, Section 15.2](#). These sheets shall follow the Summary of Quantities Sheet in the Construction Plan. The blocks in all tabulations shall be of sufficient height to enter a final quantity above the plan quantity.

**A. Tabulation of Drainage Items.** The following should be included in the Tabulation of Drainage Items along with other related items:

1. All pipe culverts with "Design Numbers", if appropriate.
2. Inlet tops or frames, Inlet boxes and manholes.
3. Class 2 and Class 4 Excavation.
4. Endwalls (specify type).
5. Pipe end sections and slope pipe fittings.
6. Pipe bedding, if necessary.
7. Embankment (for information only).
8. Remarks Column.
9. Maximum/Minimum Fill Height (for information only).

For projects where the number of drainage items exceeds the number of spaces available on a single width Tabulation Sheet, an alternate method of tabulation may be provided, as shown in [Chapter 15, Section 15.2, Plate B-VI](#). This alternate method shall only be used when necessary to maintain a drainage tabulation one sheet wide.

**B. List of Individual Tabulations.** Individual tabulations normally should be made for the following items:

1. Guide Rail and Median Barrier (with related items).
2. Right-of-Way Fence (with related items).
3. Driveways (including base and wearing courses, subbase, etc.).
4. Pavement Base Drains, Subgrade Drains, Pipe Underdrain and Outlets.
5. Roadway Quantities (shoulder, base and wearing courses, etc.), tabulated on a route by route basis.
6. Miscellaneous Items.
7. Grading sections of 1000 ft by route and stations with totals.
8. Tabulation of miscellaneous earthwork for special embankment excavation quantities. Include quantities (by route and stations) such as pocket fills, benching, rock embankment, removal of unsuitable material, etc.
9. Tabulation of topsoil quantities by route and stations.
10. Landscape Planting Design (Roadside Development) items (Jute Matting, Sodding, Seeding, etc.), tabulated by route if more than one, and the stations. Use individual tabulations when a few items have many breaks in the stationing.
11. Erosion and Sediment Pollution Control items shall normally be combined with the Landscape Planting Design (Roadside Development) items; however, depending on the size and type of the projects, these may be separate or combined with the Drainage or Miscellaneous Items.

Where quantities for items such as pavement base drains, parallel ditches, sidewalks, pipe removal and items involved with driveway construction are small, they may be included in the Miscellaneous Tabulation. The listing of items shall be in a sequential order of their occurrence with respect to increasing stationing off a baseline, survey or construction centerline for each route.

**5. Guide Rail.** Guide Rail is stationed from end to end, excluding end treatments and anchors, on the construction centerline. The amount of Guide Rail from center to center of the outermost posts on each end of the structure to which it is attached is included in the structure quantities. The remaining quantity is a roadway item. The total length (roadway plus structure) shall be divisible by the length of the rail sections between the estimated stations.

Guide Rail beginning on the mainline and extending around an intersection to a side road may be stationed on both routes.

Where a concrete slab is required for installation of Guide Rail over an underground structure or utility line, the slab shall be identified in the tabulation of Guide Rail items by listing the need for the slab in the remarks column opposite the appropriate run of Guide Rail.

**6. Inlets.** Provide separate pay items for the Top Unit, Frames, and Inlet Box.

Provide separate pay items for the Inlet Boxes based on the type (size) and installation depth. Determine the type (size) of inlet box based on the maximum pipe size (outside diameter) and pipe opening required. Determine the height range based on the installation depth, where the height is determined by subtracting the bottom slab elevation from the finished grade elevation.

Only provide one inlet box type (size) per installation. The contractor/fabricator is responsible to determine if two box types (sizes) with a transition slab can be utilized based on the requirements of the Standard Drawings.

## 2.6 PLAN SHEETS AND PROFILE SHEETS

**A. List of Items for Plan Sheets.** The Plan Sheets shall show the following items:

1. Construction and Survey Centerline (Baseline).
2. Structure Data.
3. Profile.
4. Plan.
5. Survey Book Numbers.
6. "Limit of Work" stations, "Start Work" and "Stop Work" stations, etc.
7. Topography.
8. Curve Data.
9. Intersection Ties Between Baselines and Intersection Radii.
10. Proposed work.
11. Utilities.
12. Right-of-Way Lines and Easements.
13. Property Lines and Ownership (only if Right-of-Way Plans prepared).
14. Reference Circles, Bench Marks, Bearings and Equalities.
15. North Arrow.
16. Identification Block (Route and Section Number).
17. Appropriate professional engineer's seal.
18. Areas to be abandoned or vacated shall be labeled (see [Section 2.6.K](#) for Abandonment and Vacations).
19. Location of existing or proposed bicycle facilities.

Each Plan Sheet and Profile Sheet shall be plotted as a Roll Plan, with each sheet having a width of 34 in. a minimum length of 22 in. and a maximum length of 200 in. The smallest scale for a Roll Plan is 1" = 100'; the Roll Plan may be at a larger scale of 1" = 50' or 1" = 25', so long as the project fits within the 34 in width of the sheet(s) for the Roll Plan. The accuracy and completeness of the Plan Sheet(s) and Profile Sheet(s) are prerequisites for enabling the Contractor to submit a sound, equitable bid for construction and to preclude to the greatest extent misinterpretation ~~of the plans~~. The plans Plan Sheet(s) and Profile Sheet(s), as presented, should be concise, complete and contain all design data necessary for construction.

**B. Bar Scales.** Indicate the appropriate Bar Scales (see [Section 2.1.F](#)). Circumstances may dictate other Bar Scales in which case special permission should be secured from the Field Liaison Engineer, Bureau of Design and Delivery, before commencing plan preparations.

**C. Profile Reference Block.** ~~To insure a balanced tracing, first determine whether the plan and profile can be shown on the same sheet or whether a separate sheet shall be required for the profile. The space required for and the arrangement of reference circles, bench marks, Notes and other descriptive data shall be considered when laying out the tracing. Where space permits, it is preferable to show the plan and profile on the same sheet. In laying out the Plan Sheets, the maximum use of the sheet area should be achieved.~~

All equalities in stationing shall be shown on the ~~plan~~Plan Sheet(s) for both equations occurring on the survey centerline and on the construction centerline. Leader lines shall be used to carry the station equality away from the centerline to a location where space permits.

~~When the plan and profile are on separate sheets, they~~The Plan Sheet(s) and Profile Sheet(s) shall be adequately cross referenced and shall be enclosed in a rectangle at the bottom inside border of the sheet as shown below:

FOR PROFILE, SEE SHEET 11.
----------------------------

Match lines referenced to other sheets shall be used to reference portions of complex interchanges that cannot be included on a single plan sheet.

**D. Centerlines and Baselines.** The main roadway centerline / baseline identified by the State Route Number shall be shown horizontally across the sheet with stations increasing from left to right and indicated as follows:

1. Construction Centerline or Construction Baseline.
2. Survey Centerline or Survey Baseline.
3. Construction and Survey Centerline.

Where the construction centerline does not coincide with the survey centerline, the construction centerline shall be indicated with complete alignment data and ties to the survey centerline. If necessary, an enlarged detail of the geometry shall be shown.

When two baselines are used, they shall be adequately tied to each other and, if necessary, an enlarged detail of the geometry shall be shown.

Bearings shall be indicated for all centerline and baseline tangents including ramps. ~~Show at least one bearing for each tangent on each sheet.~~

~~The alignment on each sheet shall be located so that the centerline station on the plan falls approximately over the corresponding point on the profile.~~

~~The roadway shall be arranged so that the last plan and profile station on the preceding sheet shall also be indicated as the first plan and profile station on the following sheet. This overlap should be, whenever possible, a minimum of 25 ft. The use of match lines without an overlap shall be approved on an individual case basis by the Bureau of Design and Delivery Field Liaison Engineer.~~

~~Sheet breaks shall be arranged to avoid curves, important intersections, concentrated topography or other design features at the ends of the sheets when possible. Avoid showing cross pipes, structures, etc., partly on one sheet and the remainder on the following sheet. If this condition is unavoidable, overlap sufficiently so that the entire structure may be placed on the following sheet.~~

**E. Data for Structures.** Show the following information near the structure on the Plan Sheet (both existing and proposed):

1. Existing Structure.

- a. Station.
  - b. Type of Structure.
  - c. Span.
  - d. Clearance.
  - e. Clear Roadway Width.
2. Proposed Structure.
- a. Station.
  - b. Type of Structure.
  - c. Span - along construction centerline (Indicate c-c bearings, etc.).
  - d. Under clearance - actual minimum.
  - e. Skew - Lt or Rt.
  - f. Roadway width between curbs or clear roadway (Indicate sidewalk width and side, Lt or Rt, if applicable).
  - g. Structure S- \_\_\_\_\_ Recommended \_\_\_\_\_.

**F. Hydraulic Data.** For all waterway structures, when there is a drainage area of 0.5 mi<sup>2</sup> or more, the Construction and Structural Plans to be submitted for PS&E approvals shall show the following data on the Plan Sheet: (1) Drainage Area (in square miles), (2) the magnitude, frequency and water surface elevations for the design flood and the 100-year flood, if different from the design flood, (3) if available, the magnitude, water surface elevations and date of occurrence of the flood of record, if greater than the 100-year flood and (4) if required, the magnitude, frequency and water surface elevations for the overtopping flood.

**G. Profile ~~Sheet Information~~Requirements.** The Roll Plans for Profile Sheet(s) shall include a profile of the proposed vertical alignment for all pertinent routes. On the profile, the existing ground line, existing structures, existing stream beds, existing railroads and existing ground elevations shall be shown. Profile elevations of stream beds and water surfaces shall be indicated at 50 ft intervals and critical points for 500 ft upstream and downstream from the construction centerline. Streams to the left of centerline shall generally be shown back or to the left and streams to the right of centerline generally be shown ahead or to the right. All line work for existing profiles shall be shown as dashed lines except that the existing ground line along the construction centerline shall be a continuous, solid line.

The datum elevation on the profile shall be shown, labeled and selected with due regard for the extremes of elevation ~~which shall occur on each sheet so that the profile shall not crowd the plan if it is on the same sheet.~~ The datum elevation shall preferably be in multiples of 10 ft.

Elevations of the existing ground on the construction centerline shall be slant lettered to the left.

All equalities in stationing shall be shown below the datum line. These include both equations occurring on the survey centerline and those equating survey and construction centerlines.

Stationing:

1. Full stations shall be lettered horizontally or vertically below the datum line.
2. Plus stations shall be lettered vertically below the datum line.

The following items shall be shown on the profile:

1. Proposed Roadway
2. Percentage of Grade

3. Vertical Curve Data
4. Sight Distances
5. Pipes
6. Inlets and Manholes
7. Channel Grade Line
8. Structures
9. Datum Elevations
10. Limits of Work and Start/Stop Work Limits

The proposed centerline profile grade shall be shown vertically to the right and shall be indicated as follows: G-214.16. Profile grade elevations shall be shown at all full stations, plus 50 ft stations such as +50 and at the vertical and horizontal control points such as PVC's, PVI's, PC's, PT's, etc., and for every station having a cross section. At critical areas, it may be necessary to show additional elevations. When a profile grade elevation is to be shown at a station where no existing ground elevation has been taken, show the elevation in the normal position.

All graphic grade profiles shall be shown as a long, dashed line.

The Profile Sheet shall indicate PVC's and PVT's using a small, single circle on the profile grade line. PVI's shall be shown using two small, concentric circles at the intersection of the tangent grade lines.

The percent of grade (%) shall be shown for all grade lines on the proposed centerline profile and shall be shown in hundredths of a percent (0.01%). For special cases, where tight controls or when meeting existing pavements dictate, the percent of grade can be indicated in thousandths of a percent (0.001%). For ramps in interchange areas and in other areas, the proposed grade elevations shall be shown at full stations and at plus 50 ft stations such as +50. Additional proposed grade elevations shall be shown on both edges of the pavement, at plus 25 ft stations such as +25, +50, +75 and on entrance and exit gores until the ramp attains the point of constant width with normal superelevation.

Complete profiles are required and shall be shown for adjustments to intersecting roadways and streets (excluding driveways).

**H. Plan Sheet Requirements.** A standard North Arrow shall be placed ~~on every sheet~~ in a clear area near the top center or top right-hand side of the ~~sheet~~Plan Sheet(s).

~~All plan sheets~~The Plan Sheet(s) shall be numbered. The use of letters after the numbers, such as 12a, 12b, etc., on ~~associated~~Plan sSheet(s) is not permitted, except for ~~p~~Plan Sheet revisions.

Where an Aerial Easement is required, the horizontal limits shall be shown on the ~~p~~Plan Sheet(s) and shall be labeled as follows:

LIMIT OF AERIAL EASEMENT, STA \_\_\_\_\_

The ~~p~~Plan sSheet(s) shall indicate PC's, PT's, TS's, SC's, CS's and ST's using a small, single circle on the centerline. PI's, POT's, POC's and POST's shall be shown using two small, concentric circles on the centerline or on the tangent.

Terminal joints and pavement relief joints shall be shown on the Plan Sheet(s).

Show the Survey Book Number ~~in the lower right hand corner of on~~ the Plan sSheet(s) ~~between the border and the datum line~~.

The "Limits of Work" stations for the ~~p~~Plan and profileSheet(s) shall be shown. Start Work and Stop Work stations for the ~~p~~Plan and profileSheet(s) shall be shown for "Also" routes, crossroads, and roadways being rehabilitated for abandonment purposes, temporary crossovers outside the construction area, temporary roadways, temporary connections, service roads, railroad-highway grade crossings and on channel changes.

All existing topography and ground elevations shall be slant lettering; all proposed work shall be lettered vertically. Dithering techniques should be used as described in [Chapter 13, Section 13.2](#).

**I. Topography.** All existing topography shall be shown. Of particular importance are existing roads, streets, driveways, buildings, power and telephone lines, underground pipes and cables of all kinds (see [Section 2.6.T](#)), inlets and manholes, inlet and/or outlet ditches, retaining walls, curbs, sidewalks, curb ramps, fences, railroads, bridges and culverts. Streams, lakes, swamps and other physical features shall also be included.

The type of vegetation or ground cover, together with boundaries or limits of wooded areas, groves, etc., shall be indicated with the standard symbols. Indicate distances to the nearest 0.1 mi at each end of project as indicated in [Section 2.2.A, item 17](#).

Information on the location of leech beds, septic tanks, wells and accessories shall be obtained during the basic survey and shall be shown on the Topographic Plan within the survey area. It is not necessary to perform extensive investigations, such as excavation, to determine the exact locations of these underground facilities. An indication as to the approximate location shall be sufficient if it is made clear on the plans that the location is, in fact, approximate and is not critical to the design. The designer shall be guided by existing Board of Health regulations since the loss or disturbance of sewage disposal facilities often requires the demolition of the dwelling. County, city, borough and township limits shall be indicated and tied to the centerline by station and angle, where possible.

**J. Intersecting Roadways.** The centerlines of all intersecting roadways and streets shall be tied to the construction centerline by station and angle. If the construction centerline is a horizontal curve in the area of the crossroad, the tie shall be made a POC and a point on the subtangent.


Profiles of existing crossroads, driveways, field entrances, etc., shall be shown as dashed lines from the mainline profile at the intersecting stations with the mainline. Do not show elevations of the profile. Driveways to the left of the mainline centerline are generally shown back from the intersection point and driveways to the right are generally shown ahead of the intersection point. Indicate the profile as follows: DRIVE RT OR TWP RD 370 LT, etc.

Indicate the width and type of existing driveways as: 12' STONE DRIVEWAY. Do not dimension.

Indicate the width and length of driveway adjustments in the remarks column in the Tabulation of Quantities Sheet (the width being the same as the existing).

Indicate the radius of major driveway intersections. A 10 ft minimum radius is desirable.

Driveway replacements shall be carried across the shoulder to the pavement when they are of a higher type of construction material than the shoulder itself.

Where driveway adjustments, etc., extend beyond the Legal and/or Required Right-of-Way Line, indicate in tabulation remarks column with this symbol: 

This symbol is commonly referred to as the "knock-out block". Profile change of driveways shall be shown on cross sections.

Show the Legal Right-of-Way Lines for all intersecting roads if they exist. See [Figure 3.12 in Chapter 3, Section 3.5](#) for an example sketch.

When Paved Shoulders are used on the mainline, carry the shoulders from the mainline around the radius to the point of tangency (PT) on the side road and, from that point, use the type of shoulders along the intersecting roadway as required. Indicate on the plans the limits of the mainline shoulders and the beginning of the side road shoulders using a line across the shoulder with the notation STOP TYPE \_\_\_\_\_ PAVED SHLDR and an arrow to the line.

Indicate the radius of paving at intersections. It is not necessary to show the radius of the outside edge of shoulder if a constant width shoulder is carried around the intersection. If a constant width shoulder is not used, indicate paving and shoulder radii with lines leading from the radius point to the shoulder edge and the paving edge.



**2.9 ABBREVIATED PLANS**

The use of an abbreviated format Construction Plan is encouraged for rehabilitation-type projects. Plan Sheet(s) shall be plotted as a Roll Plan, with a width of 34 in and a maximum length of 200 in. These plans~~The remaining sheets in the abbreviated format Construction Plan~~ may be 11 in × 8.5 in or full-sized standard ANSI D size, 34 in × 22 in. The originals shall be of high-quality so that reproductions are legible. The 11 in × 8.5 in plans shall be included directly in the proposal.

Permanent records shall be maintained in the Central Office of all plans ~~whether they are full size or 11 in × 8.5 in plans regardless of sheet size. Normally, 11 in × 8.5 in plans can be used for projects such as resurfacing, widening, shoulder reconstruction, guide rail replacement, minor bridge repairs, etc.~~ The maximum number of sheets for an abbreviated plan shall be 50 sheets.

When utility relocation or adjustments are required, a minimum plan for use with the utility company shall be provided in accordance with Publication 10C, Design Manual, Part 1C, *Transportation Engineering Procedures*, Chapter 4, Section 4.6 and Publication 16, Design Manual, Part 5, *Utility Relocation*, Section 3.8.

The following format is to be utilized when abbreviated plans are used:

1. **Title Sheet.** The Title Sheet shall contain the following information (Refer to [Figure 2.16](#) for a sample of an 11 in × 8.5 in Construction Plan Title Sheet.):
  - a. State Route and Section.
  - b. County.
  - c. Township, Borough or City.
  - d. Stationing Limits.
  - e. ECMS Number.
  - f. Total Number of Sheets.
  - g. Design Designation.
  - h. Traffic Data.
  - i. Prepared by \_\_\_\_\_ (Assistant District Executive or Consultant)
  - j. Recommended by \_\_\_\_\_ (District Executive)
  - k. Recommended by \_\_\_\_\_ (Deputy Secretary)
  - l. Approved by \_\_\_\_\_ (Secretary of Transportation)
2. **Location Map.** The Location Map shall contain all standard information (Refer to [Section 2.3.C](#)).
3. **General Project Data.**
  - a. General Notes (Refer to [Section 2.3.A](#)).
  - b. List of Equalities.
  - c. List of Public Utilities.
  - d. List of Existing Types of Roadway Pavement.
  - e. Earthwork Summary.
4. **Required Typical Sections.**
5. **Special Details (Drawings).**
6. **Summary of Quantities Sheet.**
7. **Tabulation of Quantities Sheet.**

**8. Plan Sheets.** Plan ~~s~~Sheet(s) shall be of the ~~straight line~~Roll Plan format showing all items of construction included in the project. Plan ~~s~~Sheet(s) may be omitted for simple projects which include limited items such as resurfacing with shoulder reconstruction and are uniform throughout the project. For projects with multiple items such as drainage, pavement patching, guide rail, pavement widening and similar construction, ~~p~~Plan ~~s~~Sheet(s) should be provided so that the Contractor can fully comprehend the scope of work and submit an accurate bid to the Department.

~~The 11 in x 8.5 in plans~~Plan Sheet(s) shall be of a high-quality to allow legible reproductions and shall contain all the data necessary for a Contractor to construct the facility to Department Standards. Readability is important and the minimum lettering size shall conform to that required on standard plans. ~~To ensure that data is not lost in reproduction, all sheets~~Plan Sheet(s) shall have border lines approximately 0.5 in in from the top, bottom and sides of the page. ~~Each sheet~~Plan Sheet(s) shall have the page number and contract number located within the border lines. ~~The originals or acceptable first generation prints should be submitted to the Central Office to assure that satisfactory reproductions can be made for the proposal. All line work within a plan should be of approximately the same density to facilitate microfilming. The mixing of 11 in x 8.5 in plans and full size plans for one project is not permitted.~~

**9. Control of Work Location.** Normally, the work shall be controlled using the standard stationing method. However, some types of work, such as resurfacing, can be controlled using segments and offsets to identify work areas.

INTENTIONALLY BLANK

## 2.11 DESIGN-BUILD MODIFIED TURNKEY

A Design-Build Modified Turnkey project is one in which the Department establishes the preliminary engineering information and the Design-Build team completes the design and constructs the project based on information provided. The procedures and information on developing Design-Build projects are contained in Publication 10C, Design Manual, Part 1C, *Transportation Engineering Procedures* and Publication 448, *Innovative Bidding Toolkit*.

PennDOT will provide the contractor with contract drawings (30% Design Stage) which is the approved conceptual drawings developed by the Department for use in bidding and awarding Design-Build Modified Turnkey contracts.

These conceptual Drawings may include but are not limited to the following:

1. Title Sheet (An example of a typical Title Sheet is shown in [Chapter 15, Section 15.2, Plate B-IX](#))
2. Index Sheet
3. Typical Section Sheet
4. Summary of Quantities Sheets (Items as shown in Bid Proposal)
5. Plan Sheet(s) (Existing and Relocated Utilities, Right of Way location and cut/fill limits, Roadway Design and etc.)
6. Conceptual Traffic Control Plan
7. Conceptual TS&L (General Plan Sheet)
8. Conceptual General Notes (Bridge)
9. Structure Boring Plan (if available)
10. Conceptual Erosion and Sediment Pollution Control Plan
11. Conceptual Traffic Signal Plans
12. Foundation Design Parameters (as applicable)
13. H&H Report including Permits

The conceptual Construction Drawings must have a Professional Engineer's Seal Block in accordance with [Section 2.1.K](#) and [Figure 2.1](#).

The Contractor will be required to submit a Preliminary and Final Construction Plan with a Design Engineer's PE Seal in accordance with [Section 2.1.K](#) and [Figure 2.1](#).

The Preliminary Roadway Construction Plan or partially developed milestone plans (e.g. 60% to 90%) submitted by the Contractor for review and approval by the Department prior to plan completion will require the following minimum information:

1. Existing Topography
2. Horizontal & Vertical Alignment (detailed ~~plan sheets~~Plan Sheet(s) and Profile Sheet(s))
3. Survey References
4. Typical Sections
5. Proposed Guide Rail
6. Proposed Utility Relocation
7. Right of Way location & cut/fill limits

8. Proposed limits of Roadway Construction
9. Final TS&L (in accordance with Publication 15M, Design Manual, Part 4, *Structures*)
10. Structure Boring Plan and Foundation Design Parameters (as applicable)
11. Proposed Drainage Items and location
12. Erosion & Sediment Pollution Control Plan (approved by DEP or County Conservation District)
13. Cross Sections as required

Preliminary Traffic Control Plan with the following information:

1. Plans for each required stage
2. Proposed Signing & Pavement Markings
3. Traffic Control Details as required

Partial Construction Plans shall require sealed drawings and specifications prior to beginning construction of a specific phase.

Final Roadway Construction Plan deliverable shall be prepared in accordance with the procedures discussed in [Section 1.5](#) and are applicable to both Department and consultant prepared plans. The naming convention for standard ANSI D size, 34 in × 22 in plan sheets [and for Roll Plans](#), which has been established for the Department's Electronic Document Management System (EDMS), is outlined in [Appendix A](#) and shall be followed. Final Roadway Construction Plans provided by the Contractor will include but not limited to the following:

1. Title Sheet
2. Index Sheet
3. Typical Section Sheet
4. Summary of Quantities Sheets
5. Tabulation of Quantities Sheets
6. Plan Sheets
7. Profile Sheets
8. Final Structure Plans (in accordance with Publication 15M, Design Manual, Part 4, *Structures*)
9. Cross Sections as required
10. Permanent Pavement Markings and Signing

The above requirements will be in accordance with the appropriate Sections of this Manual and Publication 15M, Design Manual, Part 4, *Structures*. Although Design-Build projects are bid lump sum, it will be necessary to show a breakdown of quantities by station/location on the Tabulation of Quantities sheet for the Preliminary and Final Construction Plan. The format shall follow [Section 2.5](#) and [15.2](#). The Final Roadway Construction Plans may not be the same as the Final "As Built" Roadway Plans.

Design Plan Reviews shall be in accordance with Publication 10C, Design Manual, Part 1C, *Transportation Engineering Procedures*, Sections 4.13.B and 4.13.C. Structure Reviews shall be in accordance with Publication 15M, Design Manual, Part 4, *Structures*.

Final "As Built" Roadway Plans will include all Contract Drawings including Roadway Plans, Quantity Tabulations, Erosion and Sediment Pollution Control Plans, Traffic Control Plans and Structure Plans. The "As Built" drawings shall conform to the procedures as outlined in Publication 10C, Design Manual, Part 1C, *Transportation Engineering Procedures*, Chapter 5, Section 5.7 and shall be prepared per plan presentation procedures as stated in this Manual and Publication 15M, Design Manual, Part 4, *Structures*.

Final "As Built" Cross Sections should be taken at critical locations and at least 50 ft intervals on the Main Line and Side Roads. Cross Sections are to be template to reflect "As Built" details and prepared in accordance with [Section 2.7](#).

**APPENDIX E**  
**ROLL PLAN WORKFLOW GUIDELINES**

## Purpose

The purpose of this document is to provide direction for formatting and delivering an un-sheeted, 2D digital deliverable to the contractor in the Portable Document Format (PDF). This plan format does not include plan borders and is intended to present the entire project within one PDF file. There are provisions provided below that outline the process for accommodating longer projects that may require more than one file.

These guidelines cover the formatting of 2D models of typical plan and profile views for Construction Plans and Supplemental Plans into the Roll Plan format, as identified in Publication 14M, Design Manual Part 3 (DM-3), Section 1.5.

**Right-of-Way Plans will not be formatted as a Roll Plan due to the requirements of local agencies.**

For Supplemental Plans, the use of Roll Plans is optional and will be evaluated per project, especially for Supplemental Plans involving the Public Utility Commission (PUC) and environmental permitting.

These models will be populated with both existing and design elements as required by DM-3. The following section for DM-3 will apply:

- 2.6 Plan Sheets and Profile Sheets

## Process Flow

The workflow shown in Figure E.1: PennDOT Roll Plan Production Workflow is a high-level diagram of the plan production development and delivery process. This diagram is configured with the processes of the project in the top horizontal lane and the information exchanged by each process is shown in the lower lane. Each blue box, in the Process lane, indicates either one or many tasks to be performed during a phase. The lower lane shows the exchange of data or information between tasks. This diagram is meant to be read from left to right with the arrows indicating the flow of data.

The purpose of the diagram is to highlight the Common Data / Collaborative Environment where the project design documents, and construction deliverables reside. This environment provides access to all stakeholders throughout the design and construction stages. Maintaining an up-to-date design model in a centralized location provides all stakeholders the opportunity to review model progress without the need to interrupt design or construction productivity.

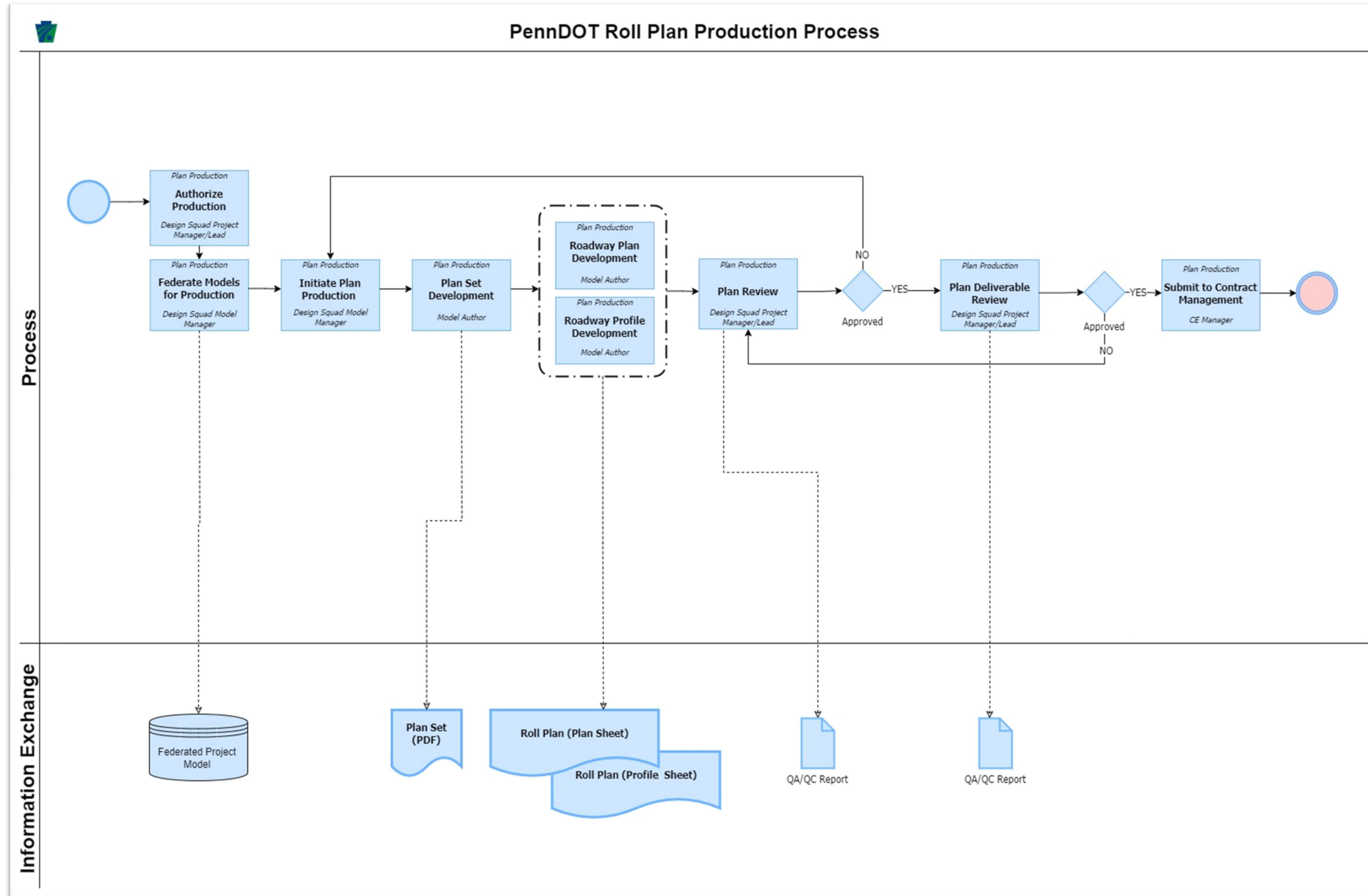


Figure E.1: PennDOT Roll Plan Production Workflow

## 2D Project Model Content and Layout

The project design, Roll Plan will contain the data and information that has been historically presented in the Construction Plan's plan and profile views as identified in Publication 14M (DM-3) Section 2.6 (Plan Sheets and Profile Sheets).

This data covers the following disciplines:

- Roadway
- Drainage
- Signing and Striping
- Traffic
- ESPC & PCSM
- Utilities
- Landscaping

The format of Public Utility Commission (PUC) plans will be evaluated per project. The reviewing agency will need to be consulted prior to development of the plans.

The layout will consist of a minimum of two, full project length, Roll Plans for the Construction Plan's plan sheets and profile sheets. These plan sheets and profile sheets have historically been prepared as 22" x 34" sheets (ANSI D size). Preservation projects will only include a 2D full project length Roll Plan for the plan view. All project design plans, regardless of formatting, will continue to be developed in accordance with DM-3.

The smallest scale for a roll plan is 1" = 100'. A roll plan may be prepared at a larger scale (e.g. 1" = 25'), so long as the project fits within the 34" width of the roll plan sheet(s). If a project has a main geometric alignment length greater than 19,000 ft at 1" = 100' scale or, has a geometric layout that does not allow for the entire length of the project to be logically placed within the space at 1" = 100' scale, then it can be separated into multiple files. PDF's are to be developed in this manner to provide a more manageable file size for mobile application. The use of complex patterning should be minimized to assist in the rendering on mobile devices. Links, as discussed in "PDF Customizations" and shown in Figure 3, should be used to allow easy access to model locations as needed. Annotation for the Roll Plan will be developed at a scale of 1" = 100'.

For all remaining sheets in the Construction Plan that do not require a plan or profile view, they will be developed and formatted for 22" x 34" sheets (ANSI D size) in accordance with DM-3. This includes the following:

- Title Sheet (Section 2.1)
- Index Sheet (Section 2.2) – Note: If a project has only one roll plan sheet, no Index Map will be needed.
- Typical Section Sheet (Section 2.3)
- Summary of Quantities Sheet (Section 2.4)
- Tabulation of Quantities Sheets (Section 2.5)
- Right-of-Way Plans (Chapter 3)



## PDF Customizations

To provide an easy to navigate environment within the Roll Plan for contractors and construction inspectors, an index of notable design features that link to locations within the PDF will be developed. The following locations are suggested as the minimum to be provided in the index:

- State Route Intersections
- Each 1000' station interval
- Major design features
- Others as determined by the Project Manager

Hyperlinks to the determined locations can either be developed within Open Roads Designer (ORD) through saved views or during post-production using either Adobe Acrobat or Bluebeam. If the post-production method is used, the links could be added to an index list located in a separate PDF document. The hyperlinks will take the user directly to the desired location in the plan or profile Roll Plan as shown in Figure E.2: Hyperlink Development.

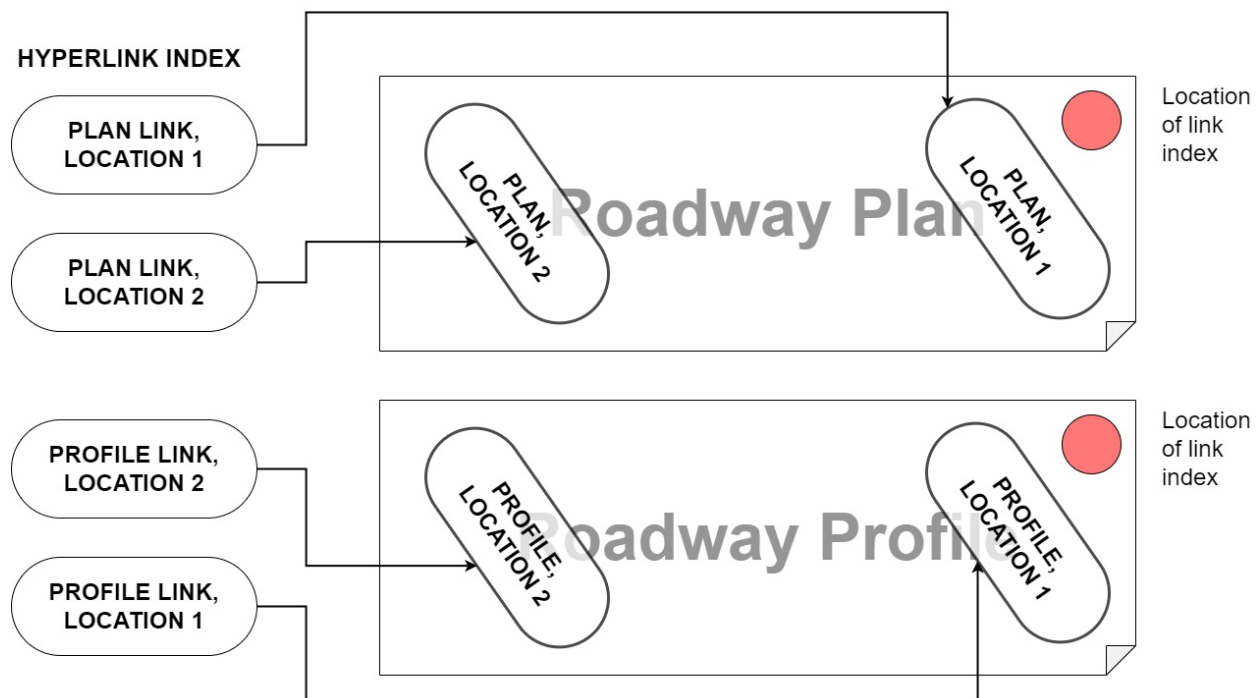


Figure E.2: Hyperlink Development

The following links provide instruction for the post-production method:

[Links in Adobe Acrobat \(Requires a licensed copy of Adobe\)](#)

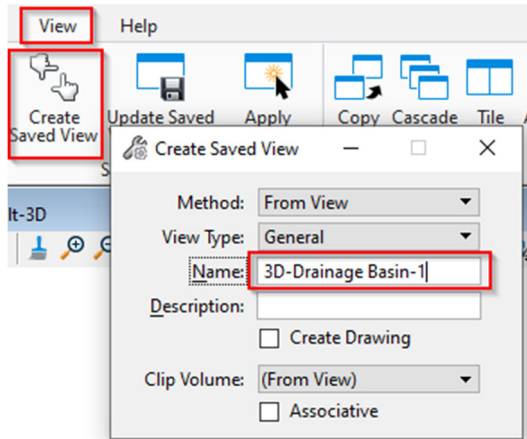
[Links in Bluebeam \(Requires a licensed copy of Bluebeam\)](#)

Links are usable in both Adobe and Bluebeam.

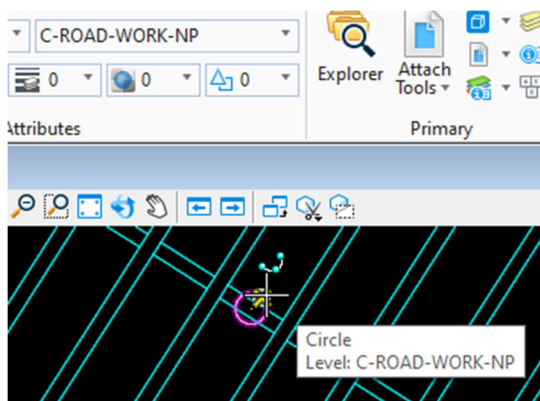
### Developing Saved Views in the Design Software:

OpenRoads Designer CONNECT Version 2021 R1 or higher:

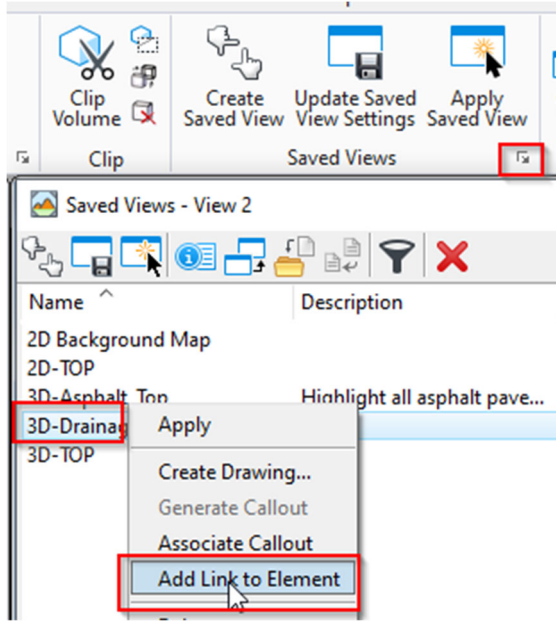
1. Saved views must be developed in the Federated (container) file in order for them to be used as links in the Adobe and Bluebeam products.
2. Adjust the program view that you want the user to zoom to.
3. Adjust layer visibility if needed.
4. Create the saved view and give it a logical name preceded with 2D- for 2D views and 3D- for 3D views.



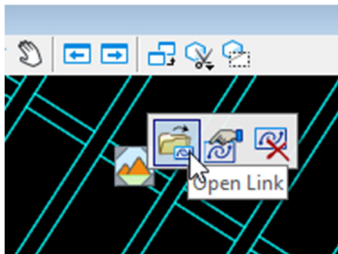
5. You are only able to add a link to a live object in the file. In order to place the link, you will need to create an object such as, a line, or circle where you want to place the link. If this is something you want to do, then select a “NP” layer such as C-ROAD-WORK-NP to place the small object on.



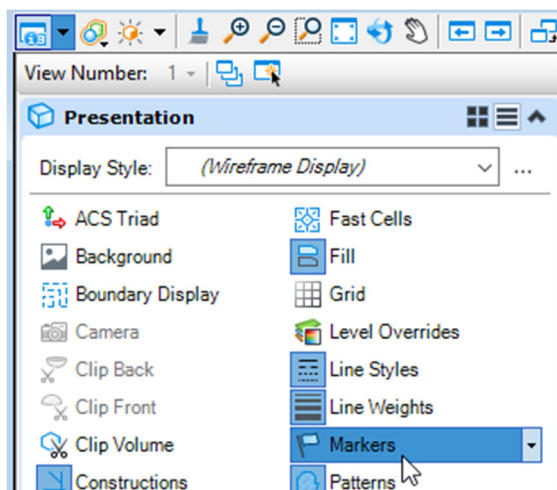
6. While still in the Federated (container) file, open the Saved Views dialog, select the view you want to get the link from, right click the view and select “Add Link to Element”. Go to the file element you want to attach the link to and select it. You will see a “link” marker at the location you selected.



7. Test the link by hovering over the link icon and selecting the “Open Link” option. This should take you to your desired location.



8. Link markers can be toggled off by selecting “Markers” in View Attributes.



## Plan and Profile Production Workflow:

The Roll Plan production workflow, shown in Figure E.3: Roll Plan Production Workflow, proceeds as follows:

- 2D model, developed per the current DM-3 and formatted as stated in this document.
- Annotations will be prepared in the Drawing Model that will be referenced, along with the Default Model to the Sheet Model (2D Project Model).
- The Sheet Model will be printed to a PDF file using the custom printing routine, RollPlan\_PDF, developed by PennDOT.
- A list of selected stations, major design features, intersecting roadways, and other design features will be prepared and used to create hyperlinks to saved views in the 2D Project Model.
- The 2D Project Model PDF will be checked prior to its delivery for bidding.

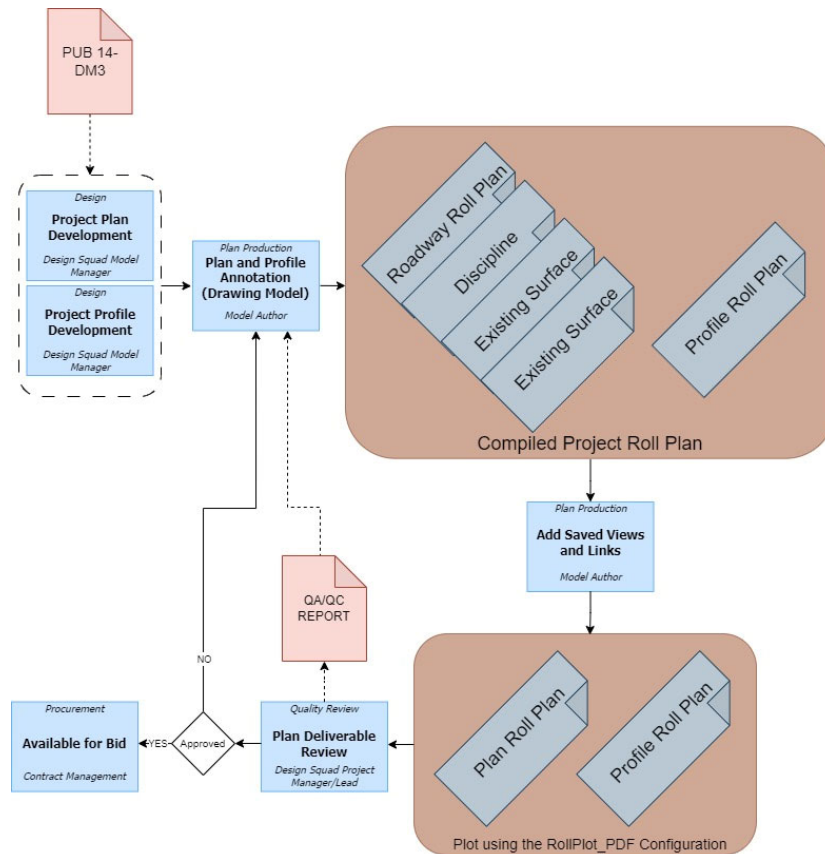


Figure E.3: Roll Plan Production Workflow

## Creating and Printing the Roll Plan

The PennDOT ORD workspace has been configured to produce and print the Roll Plan. The following outline provides a step-by-step process.

### Step 1: Place Named Boundary

Begin in the 2D plan (Default Model). Select the Drawing Production Workflow and then select “Place Named Boundary” from the “Drawing Production” ribbon.

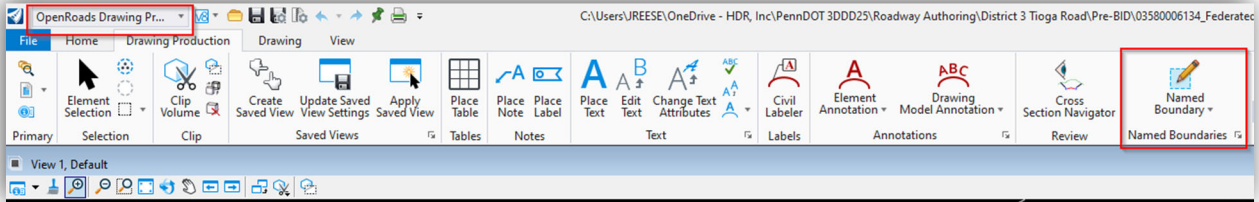


Figure E.4: Place Named Boundary

Click on the “Drawing Seed” drop-down list and select “Rolled Plan”. Contact the ORD Workspace administrator if the “Rolled Plan” is not seen in the drop down.

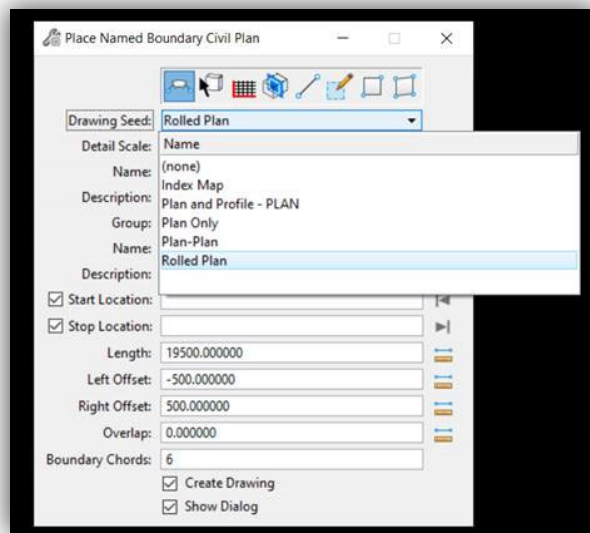


Figure E.5: Select Drawing Seed

Selecting the Rolled Plan Drawing Seed sets the detail scale to 1”=100’ and prompts the user to identify the path element, which is the controlling alignment. (see left bottom corner of ORD window for command prompts).

After identifying the alignment, set the location by either clicking the back or forward arrows to lock the start or stop location to the begin or end of the path or enter the begin and end stations. The Create Drawing box should be toggled on.

Left clicking twice places the Named Boundary in the view, and a third left click opens the Create Drawing Dialog box.



Figure E.6: Drawing Box

### Step 2: Create Drawing

The Create Drawing dialog box is based on the Rolled Plan Drawing Seed and should only require clicking OK to create this sheet. However, if it is desired to place the drawing models or sheet models in different DGNs, the boxes must be toggled next to Filename in the Drawing Model and Sheet Model sections to create or select desired files.

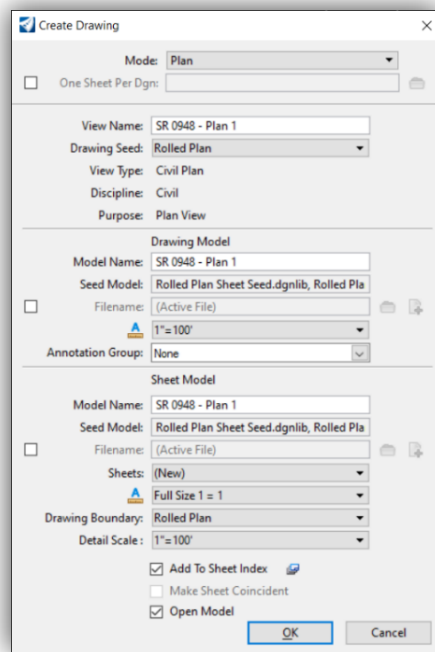


Figure E.7: Create Drawing Dialog

Clicking OK will produce the 34" x 200" sheet model. If the topography is not centered or requires adjustments, use the reference dialog box to move or adjust.

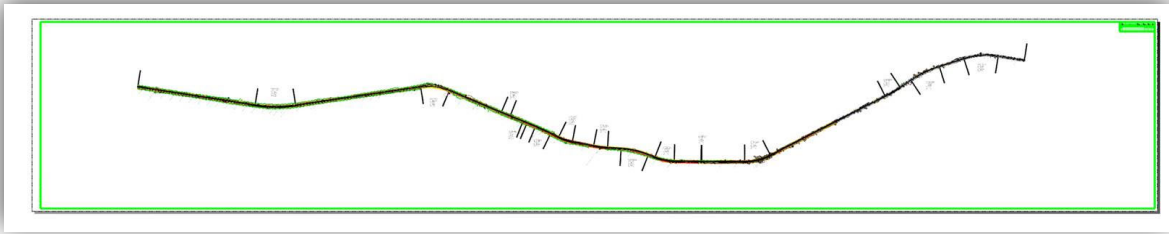


Figure E.8: PDF Sheet

### Step 3: Printing

Make sure all desired levels to be present in the Roll Plan are turned on in the Sheet Model before clicking Print. Only levels visible at the time of printing will appear in the Roll Plan. Select Print and the dialog box opens. Select the RollPlan\_PDF print driver and click Print to File. The RollPlan\_PDF driver, located in the PennDOT workspace, is configured to give the view access to turning levels on and off in both Adobe and Bluebeam.

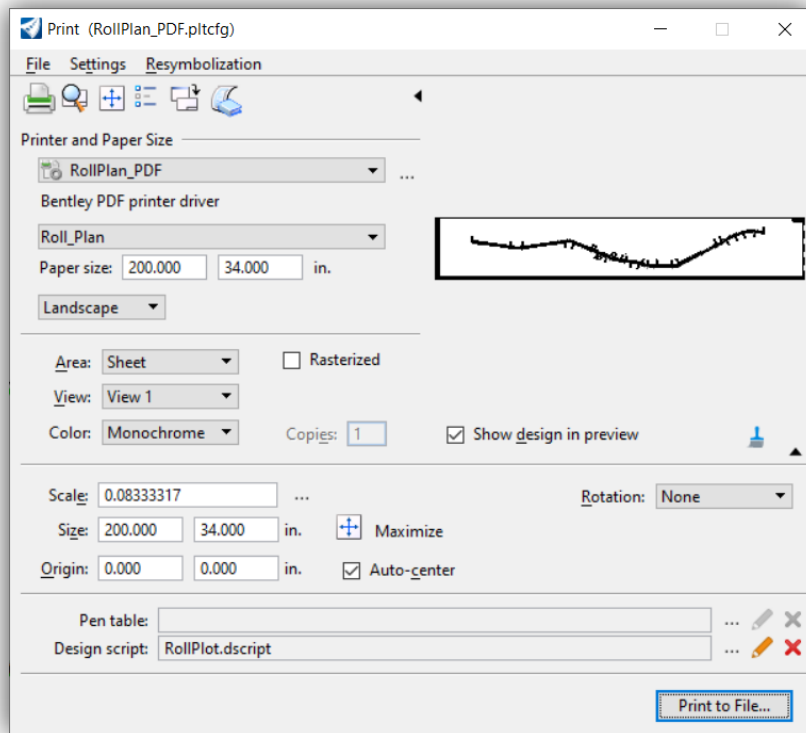


Figure E.9: Printing

Next use the No Wizard selection to create PDF in ProjectWise.



Figure E.10: Select Wizard

Select the desired folder location in ProjectWise, and assign a file name for the PDF document per standard plan sheet naming.

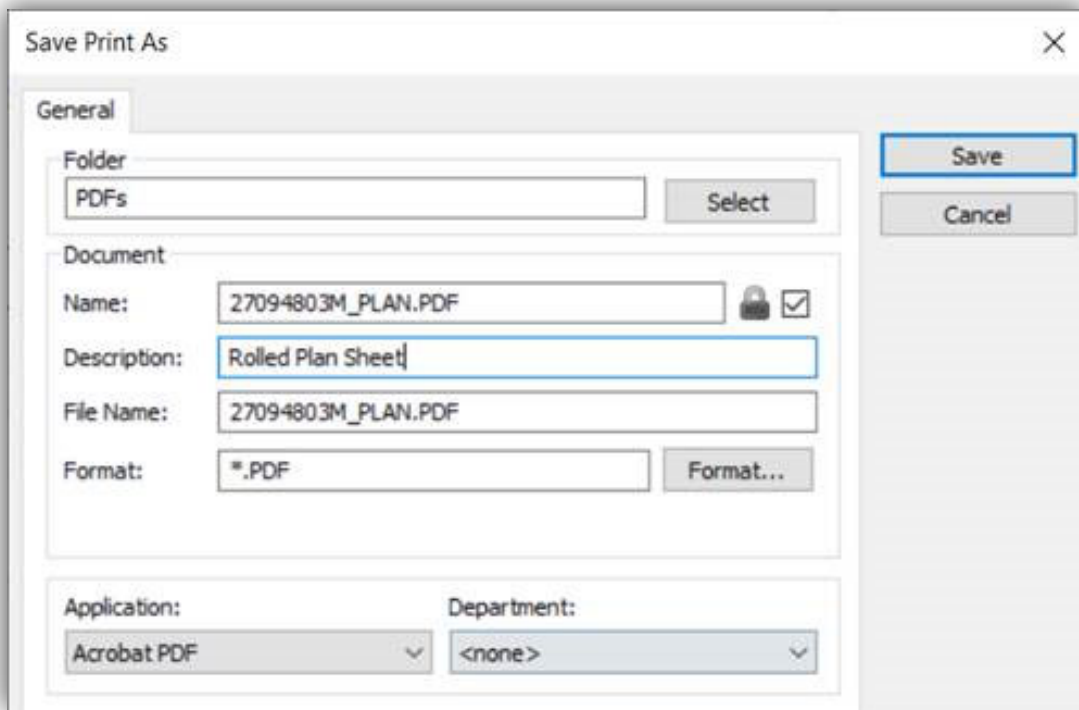


Figure E.11: Save PDF



The PDF has now been created, and levels will appear and can be turned on or off in Bluebeam REVU or Adobe PDF Reader.

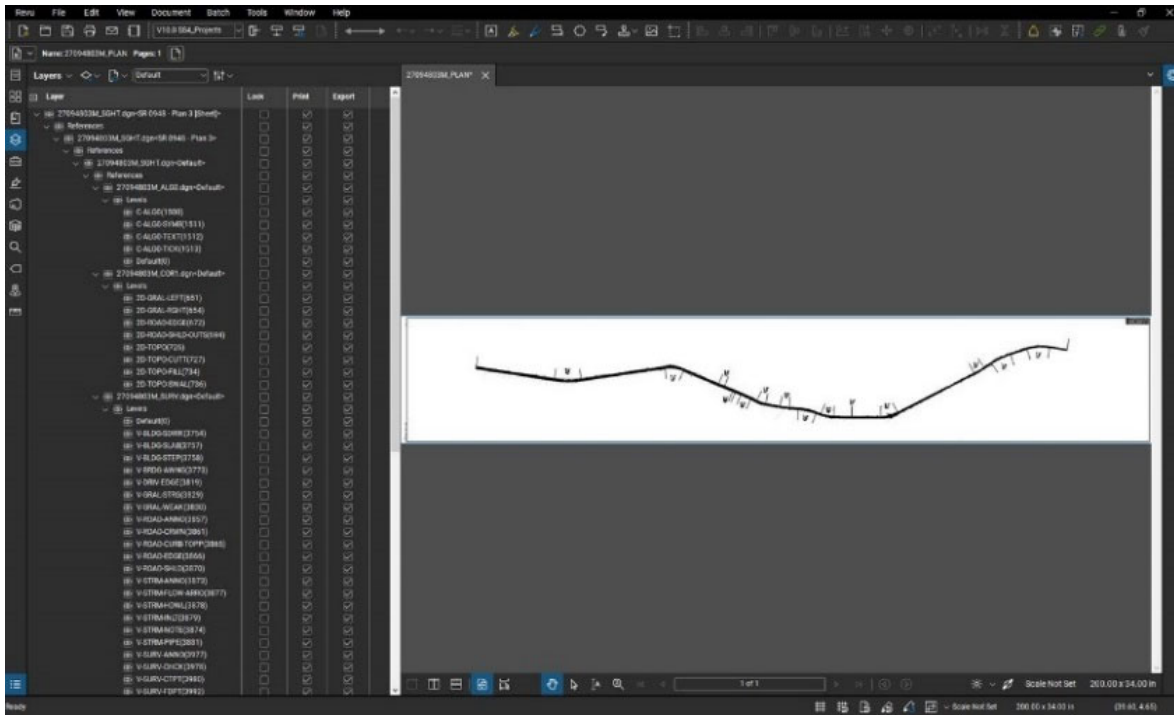


Figure E.12: PDF in Bluebeam Revu

## PennDOT's Construction Application

Construction teams will be using the Roll Plans (plan sheet and profile sheet) to locate, measure and comment on constructed elements. Cross sections of the roadway will be available in the 22" x 34" format (ANSI D size).

### Bidding

A pre-bid meeting may be held to notify potential bidders and answer questions about the use of the Roll Plan. Additional questions can be submitted through ECMS during the advertisement period.

Internal or Semi-Formal Facilitation Construction Partnering (Pay Items 0690-0001 or 0690-0002) should be added to the contracts for these pilot projects to facilitate collaboration and optimize successful outcomes.

## **Inspections**

Construction staff will be able to access the Roll Plans via the Mobile Construction Documents (MCDocs) application. Staff will continue to be able to use the MCDocs key features using iPads in the field. As the use of this plan format progresses, it will be important to document any challenges and lessons learned to improve future project user experience.

## **Third Parties**

Right-of-Way plans will be formatted in the 22" x 34" format (ANSI D size) due to the requirements of the local agencies. External parties such as PUC (railroad authorities), utility companies, FHWA PA Division Office, and any other regulatory sister agencies (e.g., DEP, Country Conservation Districts, etc.) should be consulted prior to preparing the review submittal. The design team is encouraged to reach out to external parties in advance of submissions to confirm Roll Plans will be acceptable.

## **Contractor's Participation**

The Roll Plan product will be issued in lieu of plan sheets and profile sheets in the 22" x 34" format (ANSI D size) as part of the Contract Drawings, as specified in Publication 408, Section 105.02(a).

During the Pre-Construction Meeting, the Department will provide a short demonstration on accessing and using the Roll Plan product. Subsequent meetings will be scheduled as part of the Construction Partnering requirements of the contract to request feedback on the user experience and effectiveness of the Roll Plan product. A minimum of two partnering meetings will be required, including the initial kickoff to answer any questions, and a closeout meeting to collect final feedback from the project team on this pilot project.

## **Roll Plan As-Built Plans**

"As-Built" drawings shall be prepared according to Publication 10, Design Manual Part 1 (DM-1) and Publication 10C, Design Manual Part 1C (DM-1C) with the following exceptions:

1. Instead of a full-size set of Construction Plans, the contractor shall use the Roll Plan products (plan and/or profile as applicable) as the basis for the edits.
2. Final "As-Built" drawings shall be completed electronically using a PDF editing software to note the changes on the original Roll Plan product and other PDF sheets, such as the Title Sheet.

If state funding is used for construction inspection, PennDOT must be involved with reviewing and/or preparing construction inspection agreements between the Local Project Sponsor and the consultant prior to advertisement.

For most local state funded projects, the Local Project Sponsor is required to adhere to PennDOT and the AASHTO design specifications. Consequently, the project is to be designed in a common sense manner, taking into account, where applicable, the various guidance documents referenced in this publication. A clear, understandable, biddable, and buildable plan is to be prepared. The District Office is to provide general guidance to the Local Project Sponsor on the content and quality of the PS&E package prior to its development, and review the package once it is completed to ensure that an acceptable bid package has been developed and that all of the proposed work is eligible for state funding. The PS&E package must be prepared in ECMS using PennDOT's format.

All PS&E packages for state funded local projects, with the exception of Simplified Non-Federal Bridge Agreement Process projects, must include the following elements:

- Final design plans, including tabulations and summaries of work items,
- Documentation of Safety Review approval,
- Bid specifications applicable to the particular project and any necessary attachments,
- Cost estimate (including lump sum justification and cost driver analysis forms; see Publication 352, *Estimating Manual*),
- Pre-Bid Construction Schedule (ASTA Powerproject format), must include 90 days from bid opening date to anticipated Notice to Proceed date,
- Subsurface Utility Engineering (SUE) forms, if applicable (see Publication 16, *Design Manual 5*) (See Chapter 6, *Utility and Railroad Coordination*),
- Environmental Clearance document, along with ECMTS, and a re-evaluation if necessary,
- Utility Clearance Certification (See Chapter 6, *Utility and Railroad Coordination*),
- Railroad Certification — with or without railroad involvement (See Chapter 6, *Utility and Railroad Coordination*),
- Right-of-Way Clearance (See Chapter 5, *Right-of-Way Phase*),
- All required permits (PA DEP Waterway Permit, USACE Permit, NPDES Permit),
- PUC order, if railroad is involved (See Chapter 6, *Utility and Railroad Coordination*),
- All executed Reimbursement Agreements (See Chapter 3, *Project Management Processes*),
- Executed Construction Inspection Agreement and Inspection Staffing Information as required (See Chapter 3, *Project Management Processes*),
- DB requirements (established by Central Office Bureau of Project Delivery),
- Work Breakdown Structure (WBS)/ID-21 Form for state construction funds,
- State Wage Rates,
- Public Works Employment Verification Requirements,
- Any other required approvals or unique items that should be called to the attention of the District Office, including, but not limited to, Proprietary Item Approval, Pavement Design Approval, Design Exception Approvals, and PennDOT Bulletin 15 approved materials,
- Pre-Bid Design Files: CADD ([InroadsORD](#) or MicroStation), Hydrology and Hydraulics (H&H), Environmental, Geotechnical, Permitting, Bridge and Utility Files (*District discretion*),
- All other state requirements.

All projects must have an **executed reimbursement agreement for the construction phase** and an **executed construction inspection agreement** in place prior to advertisement. Exceptions must be documented to ensure that the anticipated Notice to Proceed date can be met. Exceptions must also be

coordinated directly with the Bureau of Project Delivery, Chief of the Project Schedules, Specifications and Constructability Section.

The plans/Plan sheets are to be size 22-inch × 34-inch (1" = 25' scale or 1" = 50' scale with ADE-Design approval), except the Construction Plan may include a Roll Plan (34-inch width × 200-inch maximum length) for Plan Sheets and Profile Sheets. The minimum scale for the Roll Plan is 1" = 100'; there may be a larger scale of 1" = 50' or 1" = 25' so long as the project fits within the 34-inch width of the Roll Plan sheet(s). The specifying of proprietary items will not be permitted without the prior written approval of PennDOT Central Office. Publication 51, Chapter 19, *Standard & Proprietary Materials/Products/Processes Specifications*, includes information on submissions to request proprietary item approval. Proprietary item approval is required as part of the project PS&E package. Therefore, justification for proprietary item approval will be discussed with the District Project Manager and a letter will need to be submitted by the Local Project Sponsor to the District Project Manager requesting approval of the item well in advance of the PS&E. If the justification is determined to be sound, the letter will be forwarded to PennDOT Central Office for final approval. Every attempt should be made to not specify a proprietary item.

Publication 51, *PS&E Package Delivery Process Policies and Preparation Manual*, includes a PS&E submission certification list for standard PennDOT review process projects, which will be used to ensure that all of the applicable information is included in the PS&E package. A *PS&E Submission Certification List for Simplified Non-Federal Bridge Project Reimbursement Agreement Process* is included in this manual in Appendix P. The certification list items are applicable to projects where the bid opening will be administered by PennDOT on behalf of the Local Project Sponsor, using ECMS, as well as projects where the Local Project Sponsor has been authorized to conduct the bid opening locally. See Appendix G, *Projects Not Let or Administered in ECMS*, for the paper let process. As of 2013, PennDOT requires all local projects to be let in ECMS, except for unusual circumstances approved by the Bureau of Project Delivery, Project Schedules, Specifications and Constructability Section Chief.

The Local Project Sponsor will submit the PS&E package via ECMS to the District Project Manager at least nine (9) to fourteen (14) weeks prior to the bid opening date, depending on the project complexity, to allow adequate time for District Contract Management review, and PennDOT Central Office review if necessary. The Local Project Sponsor should coordinate with the District Project Manager to determine the PS&E package submission timeframe for each project. All projects must allow at least ninety (90) days from the bid opening date to the anticipated Notice to Proceed date. If less than ninety (90) days is needed, the Local Project Sponsor must obtain approval from the Central Office Bureau of Project Delivery, Highway Delivery Division to reduce the timeframe. The following information details responsibilities related to the PS&E package for ECMS lets:

- **District Contract Management:** Reviews PS&E package in ECMS. Approves the PS&E package and advertises the project in ECMS, as described in 4.1.B.13. *Advertisement*.
- **Central Office:** Conducts bid opening (4.1.B.14.e *Bid Opening*) and reviews the bids. If a bid justification is needed, the District Office, with input from the Local Project Sponsor, prepares the justification for review and approval by the Central Office Bureau of Project Delivery, Contract Management Section, Contract Awards.
- **Local Project Sponsor:** Concurs to award/reject the bid via ECMS.
- **Central Office:** Awards the contract in the name of the Local Project Sponsor and facilitates contract execution (or bid rejection).