

Chapter 2 General Plan Information

Plans are the media through which the designer communicates the design to the contractors. The designer's mission is to be as clear and consistent as possible in communicating construction information on the plans. The designer is responsible for producing plan sheets that are accurate, neat, presentable, and reproduce legibly, which is critical to this mission. This chapter provides the designer with the policies and procedures to present design information on a set of roadway project plans. It also provides guidance on the electronic plan submittal process, the use of the Connect NCDOT SharePoint site, combined and clustered projects, public involvement mapping guidelines, location and design approval, and the roadway aesthetic review process.

2.1 Displaying Information and Data

Make the text and plan details legible from either the bottom or right edge of the plan sheet. The orientation of the text is as follows:

- horizontal line: read left to right
- vertical line: read bottom to top
- diagonals: read left to right

Tables 2-1 through 2-4 show the Department's labeling precision preferences. Discuss deviations with the NCDOT project manager and roadway team lead.

Table 2-1 Labeling Precision Preferences for Typical Sections

Feature	Units	Precision	Example
Stations	FT	Hundredth	10+00.00
Dimensioning	FT	Whole, Tenth	12', 0.5'
	IN	Whole	6"
		Tenth	2.5"
Superelevation	FT/FT	Hundredth, Thousandth	0.02, 0.025
Side slopes	H:V	Whole:1	2:1
Pavement schedule	IN	Whole, Fractional, Tenth	3.5"
	FT-IN	Whole	2'-6"

Table 2-2 Labeling Precision Preferences for Plans

Feature	Units	Precision	Example
Stations	FT	Hundredth	10+00.00
Partial stations			+00.00
Offsets			36.00'
Dimensioning	FT	Whole, Tenth	12', 0.5'
	FT-IN	Whole	2'-6"
	IN		6"
Superelevation	FT/FT	Hundredth, Thousandth	02, 025
Bearings	DMS	Tenth of Second	N 23° 23'31.3" E
Curve data:			
Central angle (Δ)	DMS	Tenth of Second	23° 23'31.3"
Degree of curve (D)			
Spiral angle (θ_s)			
Length of curve (L)	FT	Hundredth	123.45'
Tangent distance (T)			
Radius (R)			
Total length of spiral (Ls)			
Long tangent (LT)			
Short tangent (ST)			
Runoff (RO)			
Superelevation (SE)		FT/FT	Hundredth, Thousandth
Flares and tapers	L:W	Whole:1	50:1
Traffic diagrams (ADT)	100	Hundreds	400

Table 2-3 Labeling Precision Preferences for Profiles

Feature	Units	Precision	Example
Stations	FT	Hundredth	10+00.00
Dimensioning	FT	Whole, Tenth	12', 0.5'
	IN	Whole	6"
Elevations	FT	Hundredth	788.55'
Grades	FT/FT	Ten Thousandth	(+) 3.2657%
Length of vertical curve (VC)	FT	Ten Foot Intervals	460'
Rate of vertical curvature (K)	None	Whole	84

Table 2-4 Labeling Precision Preferences for Cross Sections

Feature	Units	Precision	Example
Stations	FT	Hundredth	10+00.00
Elevations			844.06
Dimensioning	FT	Whole, Tenth	12', 0.5'
	IN	Whole	6"
Superelevation	FT/FT	Hundredth, Thousandth	.02, .025
Side slopes	H:V	Whole:1	2:1

Apply the following rules for displaying information and data on roadway plan sheets:

1. Dimensioning requirements:
 - a. Show dimensions in feet and inches with an accompanying apostrophe (symbol for foot) and quotation mark (symbol for inch), e.g., 12', 0.5', 2'-6", 2½". Maintain consistency in the dimensioning throughout the roadway plans. Base the use of feet and decimals of a foot for dimensions versus the use of feet and inches on the bid item involved.
 - b. Show horizontal control points on plans, including survey centerline, intersections, and alignments in feet to two decimal places.
2. Stationing:
 - a. Base plan sheet stationing on 100 feet per station with full annotation at 500-foot stations (e.g., 15+00, 20+00).
 - b. Increase plan sheet stationing for mainline alignment from left to right (west to east) or from top to bottom (north to south).
3. Vertical curve data:
 - a. Label design speed only when the vertical curve does not meet the design speed for the project.
 - b. Show profile grade in percent to four decimal places with the prefix (+) or (-) to indicate slope direction. In keeping with standard computer-aided design and drafting (CADD) practice, ensure that the vertical point of intersection elevation is rounded to the nearest hundredth of a foot.
4. Side slopes (typical sections and cross sections):
 - a. Express slope ratios in horizontal to vertical (H:V) format (e.g., 2:1, 4:1).
 - b. Show side slope ratios to the nearest tenth (e.g., 1.5:1) when deemed appropriate by the roadway designer.
5. Flares and tapers:
 - a. Express flares in a nondimensional ratio. The longitudinal component shown first and then the lateral offset component (e.g., 50:1, 15:1).
 - b. Express tapers as a dimension in feet (whole number) where feasible.

6. Line work:
 - a. Make a good, clear delineation of all lines so the proposed work will stand out in contrast to existing features. Use NCDOT's workspaces to ensure consistency in design and printing.
 - b. Do not place lines, hatching, or patterning through text or figures.

2.1.1 Lettering on Plans

Do not crowd other information when placing text on plan sheets. Carefully choose locations for text labels that are as close as possible to the point of application. Place text in a manner such that it is not upside down. Ensure text is in all caps and legible when the plan set is oriented with the binding on the left side of the plan set. Make text orientation consistent throughout the plans.

Use abbreviations on plan and profile sheets only where there is not enough space to spell out the word. Spell out words or use a legend for abbreviations in instances where the meaning of the abbreviation may be in doubt. Make all plan text legible at any standard printing scale.

2.1.2 Scale on Plans

For roadway plan sheets, a horizontal scale of 1 inch = 50 feet (NCDOT standard base scale) is generally used. A horizontal scale of 1 inch = 20 feet, 1 inch = 30 feet, or 1 inch = 40 feet can be used where greater detail is required and where existing topo is congested. Utilize a horizontal scale of 1 inch = 100 feet for projects on new location, in areas of very little topo, and for interchange sheets. Discuss the scale of the sheets with the Project Manager at the scoping meeting to ensure that proper surveys are requested through the Photogrammetry Unit and Location and Surveys Unit.

For roadway profile sheets, a scale of 1 inch = 50 feet (horizontal) and 1 inch = 10 feet (vertical) is commonly used. The horizontal scale on the profile sheet typically matches the horizontal scale of the plan sheet.

For most projects, cross sections are plotted on a horizontal and vertical scale of 1 inch = 10 feet. On mountainous projects with extremely high cuts and fills 1 inch = 20 feet might be more practical.

Adjust text size based on the drawing annotation scale in accordance with the [NCDOT Roadway Text Standard and Guideline](#).

2.2 Standard Sheets for Plan Preparation

Utilize standard sheets available from CADD for plan preparation. Plan border sheets and other standard cells are contained in the NCDOT workspace. Adhere strictly to their use to maintain conformity in plans prepared Department-wide. When deviation from the use of standard sheets is necessary, discuss this deviation with the NCDOT Project Manager and state contract officer.

All individual PDF sheets must be scaled 34 inches wide x 22 inches high. Submit full size cross section sheets (34 inches x 22 inches) when there are 30 cross section sheets or less. Submit half size cross section sheets (17 inches wide x 11 inches high) when there are more than 30 cross section sheets.

2.3 Electronic Plan Submittal

NCDOT has implemented an all-electronic process for letting. Turn in all submissions for design-bid-build projects with electronic signatures on documentation directly generated from electronic sources. Electronic plans submitted internally by units within the Department, as well as electronic plans submitted by private engineering firms or local government agencies to NCDOT, shall conform to the following specifications. The roadway designer is responsible for ensuring the plans and provisions that they submit electronically are signed and sealed (if appropriate) and follow all formatting guidelines as outlined.

2.3.1 Formatting Standards

Because files are managed, stored, and sorted electronically, perform file formatting, naming, and assignment of properties in a precise and consistent manner. Secure explicit approval from the NCDOT Project Manager and NCDOT Roadway Design Lead for deviations from the standards described. Submit all electronic plans in portable document format (PDF). Adhere to the following criteria when creating a PDF plan:

- Remove content that should not be included in the final sealed plan document.
- Include a cell image of the North Carolina Professional Engineer seal before creating the PDF plan document. Refer to North Carolina Administrative Code (NCAC) [21 NCAC 56 .1102](#) for specific information regarding the design of the seal.
- Ensure PDFs are printable at the appropriate scale. Must be either 34 inches x 22 inches or 17 inches x 11 inches in order to plot to scale. An interchange plan sheet may require a custom scale.
- Ensure PDFs are text searchable with default CADD layers.
- Ensure PDFs are landscape oriented (rotation 0 degrees).
- Provide an individual PDF file for each plan sheet.
- Generate all PDFs directly from the creating application, not by scanning.
- Ensure settings specified in the Final Plans Best Practices are followed when creating PDF files.

2.3.2 Standard Filename Structure

File naming conventions are unique to each discipline. Include the sheet page number and Transportation Improvement Project (TIP) number along with some sort of description or classification to suggest the content of the file in the file name.

Refer to the [NCDOT Standard File Naming Conventions Guideline](#) for guidance for all NCDOT users and engineering consultant firms that produce roadway plans.

Use the naming standards and conventions for the various document sets to bundle plan sheets in the Final Plans library on the Preconstruction project team site on Connect NCDOT. Each discipline will have its own unique document set folder. Give file names a two-part numeric prefix when moving them to the Final Plans library. The first three digits are the same as the document set that contains the file (e.g., 100 roadway and 300 cross sections). The second three digits are the unique number for each sheet in proper sequence. The second 3-digit number is NOT the page number displayed on the sheet. Use increments of five (e.g., 001, 005,

010, etc.) for the second 3-digit number to allow additional sheets to be added if needed. Folder and file name numeric prefixes will control the let plan page order in the final plan set.

Refer to the quick reference for [NCDOT Final Plans and Special Provisions](#) for more detailed guidance (link is accessible only with a valid NCID account).

Download the plan file renaming tool from the [NCDOT CADD team site](#) to assist in sorting, sequencing, and formatting the numeric prefixes to the files.

2.3.3 Electronic Signatures

The Department has implemented procedures for Professional Engineers to digitally seal and sign plans. Submit all plans electronically in a PDF format with digital signatures. DocuSign was chosen by NCDOT to provide digital signatures, but providers can use any recognized eSignature tool to sign documents.

The North Carolina Board of Examiners for Engineers and Surveyors recognizes electronically generated seals as an acceptable form of the professional seal. Seal electronic plans in accordance with Title 21, Section .1100 Chapter 56 of the NCAC.

Refer to [21 NCAC 56 .1101](#), [21 NCAC 56 .1102](#) and [21 NCAC 56 .1103](#) for more specific information regarding NCAC rules.

- The seal may be a computer-generated seal or other facsimile that becomes a permanent addition to the plan sheet.
- The licensee's signature must be placed over, or near, the seal on the original document.
- The date of signing must be annotated on the original document.
- All sheets of engineering and surveying drawings must be sealed.

In addition to the information provided above, the following plan sheets typically require the indicated seals:

1. Title Sheet – Roadway Design Engineer and Hydraulics Engineer.
2. Sheet 1A – Roadway Design Engineer.
3. Typical Sections – Roadway Design Engineer and Pavement Design Engineer.
4. Roadway Detail Sheets – Roadway Design Engineer and Hydraulics Engineer (if applicable)
5. Details from other Disciplines – Will be sealed by the Discipline Engineer.
6. Plan and Profile Sheets – Roadway Design Engineer and Hydraulics Engineer.

2.4 Connect NCDOT (SharePoint)

[Connect NCDOT](#) is an extranet website designed to service NCDOT and its business partners. The site houses information geared towards engineering firms, contractors, and other businesses that collaborate with the Department. Project and team sites are reserved for internal and external collaboration which require specific permissions to access.

Refer to the [NCDOT Preconstruction](#) team sites for preconstruction information for NCDOT highway and bridge projects (link is accessible only with a valid NCID account).

Refer to [NCDOT Preconstruction Best Practices](#) for instructions and guidelines for using the preconstruction application for sharing and exchanging project design documents between NCDOT and Professional Engineering Firms (link is accessible only with a valid NCID account).

2.5 Combined and Clustered Projects

Typically, a project is advertised and let as an individual project, but in some cases two or more projects may be combined or clustered. There are various reasons to combine or cluster projects, which will be covered in detail in this section.

2.5.1 Combining State Highway Projects

A combined project involves combining two or more individual projects into a project with a single construction Work Breakdown Structure (WBS) element. A combined project is treated as one project. Only one contractor is awarded the contract for the combined project. There is no limit to the types of projects that can be combined for advertisement and letting purposes. For example, combined projects can include two or more TIP projects or a TIP project and a resurfacing project. Some of the benefits of combining projects include:

- There is only one prime contractor, which simplifies contract administration.
- There is no cooperation of contractor clause needed when adjacent projects are combined.
- The construction phasing is typically less complex due to only a single prime contractor being involved in the projects.

If the distribution of final right of way plans has occurred on a part or the entire combined project, follow the guidance below when combining projects into a project with a single WBS construction element.

1. Organize the combined set of plans as follows:
 - a. Combined title sheet (Sheet No. 1)
 - b. Sheet 1A for combined set (Sheet 1A)
 - c. Conventional symbols for combined set (Sheet 2)
 - d. Part I plan set (with no 1A or 1B sheets)
 - e. Part II plan set (with no 1A or 1B sheets)
2. Title sheets:
 - a. (Sheet 1) Create a combined title sheet for the combined plan set. The combined title sheet is identical to the standard TIP project title sheet and should reference the following:
 - i. Show the contract number and all TIP or WBS element numbers on the left edge of the sheet for each project that is being combined.
 - ii. Create a project layout to show all the projects that are to be combined. Identify the project limits for each individual project on the project layout by TIP numbers and stations. Label each TIP number as a part (Part I, Part II, Part III, etc.)
 - iii. Reference a combined length of roadway, combined length of structure, and total combined project length on the combined title sheet.

- iv. Include the following information in the project identification block in the top right corner of the combined title sheet:
 - 1) State Project Reference No. – List all TIP numbers. If there is no TIP number assigned to one or more of the projects, list the resurfacing project number or project identification number.
 - 2) State Project No. – List the P.E., right of way, utility, and construction WBS elements for all individual projects that are to be combined. There should be only one construction WBS element.
 - 3) F.A. Project No. – List the PE, right of way, utility, and construction F.A. numbers as applicable for each individual project.
 - 4) Description – In the rows for the description, list the PE, right of way, utility, or construction in parentheses for each associated WBS element.
- b. Create a title sheet for each individual project plan set. These individual project title sheets are identical to the standard TIP project title sheet with the following exceptions.
 - i. No contract number will be referenced on the individual project title sheets. The combined title sheet is the only sheet on which the contract number is shown.
 - ii. There is only one construction WBS element for a combined project. The construction WBS element referenced in the title block in the upper right-hand corner of the combined title sheet and all individual title sheets should be identical.
3. (Sheet 1A) Index of Sheets, General Notes, and List of Roadway Standard Drawings:
 - a. A combined project will have only one 1A sheet. This 1A sheet will contain the following:
 - i. An Index of Sheets referencing all plan sheets of the combined plan package.
 - ii. The General Notes for all projects in the combined plan package.
 - iii. The 2018 Roadway English Standard Drawings for all projects in the combined plan package.
 - iv. Typically, only one 1A sheet will be needed. Use multiple 1A sheets if needed to ensure text sizes meet minimum tolerances.
4. (Sheet 2) Conventional Plan Sheet Symbols:
 - a. A combined project will have only one Conventional Plan Sheet Symbols sheet.

Place the individual parts (TIP projects, resurfacing projects) behind the combined project sheets. With few exceptions, each individual project is assembled as if it was an independent project rather than part of a combined project. The exceptions, as noted above, are that the individual parts do NOT require the Index of Sheets, Sheet 1A, and Conventional Plan Sheet Symbols sheet.

Differentiate the individual projects by labeling them as Part I, Part II, and so forth. Combine all pay item quantities from the individual projects into a single estimate since there is only one construction WBS element for the combined projects. Since each individual project will contain summary of quantity sheets specific to that project, consolidate the summary of quantity information in order to determine quantities for the combined estimate. List the summary sheet

totals from other parts under the respective summary totals in the Part I plans. Add the totals and show a grand total.

Place plan submittals from other disciplines into Part I of the combined project, if necessary. For example, there may be only one set of transportation management plans (TMP) that covers all projects within the combined project package. In that case, place the TMP submittal package in the Part I plans.

Refer to the following links for an example of a combined project: [Part I](#) and [Part II](#).

2.5.2 Clustered State Highway Projects

A clustered project involves advertising and letting two or more projects together. Do not treat clustered projects as combined projects; each individual project is treated as its own project and never combined. One or multiple contractors could be awarded the contract for a clustered project. The primary benefit of clustering projects is to keep construction costs as low as possible. Contractors can bid on the clustered project as a whole and bid on the individual parts. If a contractor's bid for the clustered project is less than the lowest bid price for each of the individual projects, that contractor will typically be awarded the contract. If the sum of the lowest bids for each of the individual projects is less than the lowest total cost for the clustered project, the clustered project will be awarded to the contractors with the lowest individual bids.

Prepare a clustered earthwork balance sheet for the clustered project in addition to the individual earthwork balance sheets for the individual projects. This clustered earthwork balance sheet combines the earthwork from the individual projects into one earthwork balance sheet. Confirm that the construction phasing will allow suitable waste material from one project to be incorporated into the other clustered project when preparing the clustered earthwork balance sheet.

The earthwork summaries in each of the individual projects are not affected. The only requirement is to prepare a clustered earthwork balance sheet. For example, when two projects are clustered (Project A and Project B), three earthwork balance sheets need to be prepared: one for Project A, one for Project B, and one for the clustered project.

Refer to [Earthwork Balance Sheet](#) for an example of a clustered project earthwork balance sheet.

2.6 Public Involvement Mapping Guidelines

Public involvement is a critical component of the transportation decision making process. Public involvement allows citizens the opportunity to provide opinions, insights, and observations that can improve the design and potentially accelerate project delivery. The Roadway Design Unit and its consultant partners will coordinate with the Public Involvement Team to develop any public involvement mapping that is required during project development. Some of the outcomes of this coordination include:

- A description of the standard mapping products and when they should be used
- Best practices for the development of these products
- Checklists to assist those who are producing and reviewing corridor public hearing maps and designing public meeting/hearing maps

The Department has developed a [NCDOT Statewide Public Involvement Plan](#) to provide public involvement guidance to ensure quality, consistency, and compliance throughout all NCDOT public involvement efforts. The Department has also developed a [NCDOT Public Involvement Map Information Guide](#) to capture the mapping needs for a project. The Roadway Design Unit and our consultant partners are responsible for preparing Corridor Public Hearing Maps and Design Public Meeting/Hearing Maps.

2.6.1 Corridor Public Hearing Maps

Corridor public hearing maps are used to solicit feedback from the public on the corridors being studied, the alternatives being studied within the corridor, and the impacts associated with each. Therefore, all corridors should reflect a design that avoids and minimizes impacts to the extent practicable. The primary focus of the corridor public hearing map is not only the design details and how individual property owners are affected, but also how each studied highway corridor benefits and affects the region from a transportation perspective. Generally, a Corridor Public Hearing is held after the completion of the draft environmental document.

The Corridor Public Hearing Map consists of multiple corridor bands that include certain minimal design features as defined in the [NCDOT Public Involvement Map Information Guide](#).

Download and use the [NCDOT Review Checklist for Corridor Public Hearing Maps](#) in the preparation of all Corridor Public Hearing Maps.

2.6.2 Design Public Meeting/Hearing Maps

A Design Public Meeting/Hearing Map is used to solicit feedback from the public on the proposed design and the associated impacts that will be further developed into the final plans.

Refer to the [NCDOT Public Involvement Map Information Guide](#) for additional guidance regarding the development of Design Public Meeting/Hearing Maps.

Download and use the [NCDOT Review Checklist for Design Public Meeting/Hearing Maps](#) in the preparation of all Design Public Meeting/Hearing Maps.

2.7 Location and Design Approval

Location and Design Approval (LADA) is a trigger document for obtaining right of way authorization, which is required for the release of the right of way funds. The LADA's purpose is to ensure the location and scope of work for the project found in the environmental document agree with the project plans, including any necessary environmental commitments. LADA letters are required for all Environmental Impact Statement and Environmental Assessment projects. LADA letters are not required for Minimum Criteria Determination Checklist, Programmatic Categorical Exclusion, or Categorical Exclusion projects. Design-Build projects will conduct their own consistency review and supply the materials to the Roadway Design Unit service account for DocuSign processing of the LADA letter.

The process involves a consistency review of the environmental document and the project plans at least two months prior the project right of way date. To begin this review, the Project Manager will ensure the final environmental document and latest project plans are available on the Preconstruction project site on Connect NCDOT. For centrally managed projects, send an e-mail to the [Roadway Design Unit Service Account](#) requesting location and design approval. Notify the Project Manager if any discrepancies are found during the consistency review. The Project Manager will need to resolve the irregularities with the planner and designer and notify the Roadway Design Unit.

Upon resolution, the LADA letter will be prepared and submitted by the Roadway Design Unit through a DocuSign process, requiring signatures from the State Roadway Design Engineer and Director of Technical Services for centrally managed projects. Highway Division offices may also conduct their own consistency review, led by the Division Project Manager and approved by the Division Engineer. The approved LADA letter will be placed on the preconstruction project site in the Roadway Design–Discipline, Correspondence–RDY Topic, Approvals–Location.

2.8 Roadway Aesthetics Review Process

Project managers may receive requests for aesthetic treatments (usually from a municipality). Address these requests as early in the project development process as possible so that the necessary agreements can be secured to make sure design adjustments, special details, and provisions can be included in final plans.

Most aesthetic requests take the form of a betterment to an already proposed design feature such as stamped or colored retaining walls, crosswalks, or roundabout aprons, decorative bridge rails (which may include lighting), and fencing or guardrail coloring options. In these instances, the project manager will need to coordinate the selection from available options with the requesting party and secure the necessary maintenance and cost share agreements before the treatments are included in the project plans and specifications.

Some aesthetic requests take the form of public artwork to be placed on NCDOT right of way. This can occur during an active project or under a standard encroachment agreement with the Division/District. The Department has a formal review and approval procedure for these instances, detailed in the [North Carolina Public Art on the Right of Way Policy](#). A Right of Way Art Committee, consisting of units designated by the Secretary of Transportation, is responsible for reviewing and approving art proposals. The [Aesthetic Engineering Section Supervisor](#) typically administers this process, submitting aesthetic reviews to the committee members and coordinating communication with the requesting municipality.

The Roadway Design Unit has a representative on this committee. The typical roadway design review will evaluate the proposal in terms of (but not limited to): sight distance, clear zone requirements, pedestrian passage, vertical and horizontal clearances, and breakaway aspects of the art installation. Contact the [Lighting and Electrical Team Lead](#) in the Roadway Design Unit when the art feature involves lighting and electrical features.

Local government and municipal signs or gateway signs are not covered under the North Carolina Public Art on the Right of Way Policy, and are addressed under the [NCDOT Standard Practice for Gateway Signs](#) and the [NCDOT Traffic Engineering Policies, Practices, and Legal Authority \(TEPPL\)](#). Coordinate gateway signs with [NCDOT Signing and Delineation](#).

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