

NORTH CAROLINA

Department of Transportation



Roadway Design Unit

ORD Training Modules Update

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The MODULES:

- Module 1 – File Management
- Module 2 – Existing Terrain Model
- Module 3 – Horizontal Alignments
- Module 4 – Vertical Alignments
- Module 5 – Initial Corridor Modeling
- Module 6 – Plan Geometry
- Module 7 – Superelevation
- Module 8 - Intermediate Modeling
- Module 9 - Detailed Modeling
- Module 10 – Sheeting
- Module 11 – Hearing Map Production

Name
Appendix A (Project Conversion Guideline)
Appendix B (Digital Delivery Guideline)
Module 1 (Overview)
Module 2 (Terrain)
Module 3 (Geometry)
Module 4 (Corridor Modeling)
Module 5 (Superelevation)
Module 6 (Resurfacing Grade)
Module 7 (OpenBridge Integration)
Module 8 (Plan Sheets)
Module 9 (Profile Sheets)
Module 10 (Cross Section Sheets)
Module 11 (Earthwork)
Module 12 (Drainage)
Module 13 (Intersection)
Module 14 (Interchange)
Module 15 (Asset Manager)
Module 16 (Right of Way Plans)
Module 17 (Review)
Module 18 (Construction)
out
NCDOT Quick Start to ORD.pdf

MODULE Structure:

Written Document

Workset

Videos

- Made using ORD version 10.09
- Modules were made with the *beginner* in mind
- Standard “Flow” of a Module ...

MODULE “Flow”: (1) Overview



Module 3 – Horizontal Alignment

Overview

There are some significant changes to the process of Horizontal Alignment design and development between ORD and Geopak. There is no more GPK file for storing geometry, that is stored within the elements. There are no more input files for Open or Incomplete Alignments, the alignments are designed graphically.

When using ORD the design of a horizontal alignment will be based on graphics and intelligent elements. These are referred to as Rule-Based elements and provides Design Intent.

Rule Based elements store all the geometry associated with that element. Elements are also Ruled by other elements. These rules are created by snapping to specific points, for example when placing a line between two points. Or selecting elements as a reference, for example placing a curve between two tangents. Rules can be created by offsetting elements or by using Civil Accudraw. The type of rule created depends on the specific design tool used to create it and how it was created.

Design Intent creates associations between elements based on the rules that were established

MODULE “Flow”: (2) Top Ribbon (Toolbar) and Introduction of the Module



Module 3 – Horizontal Alignment

Geometry Ribbon Tab



The **Geometry** Ribbon contains tools that the designer will use to create Horizontal and Vertical Geometry and plan elements that are based on Civil Geometry. The Ribbon is broken into 6 sections.

This section of the training Module will only focus on the tools used to create Horizontal alignments. These tools will include Lines, Arcs, and Points. The tools and methods used to combine individual components into a Complex Horizontal Alignment. How to create a Complex Horizontal Alignment with know PIs. How to station an alignment, report on the horizontal geometry.

In addition to the specific tools required to create an alignment this section will also cover additional topics that are not specific to the alignment but are important concepts to understand when using CONNECT and ORD. These include Feature Definitions, Civil Rules, Design Intent and 2D and 3D models. These concepts will be covered throughout the training manual and it is critical the user understand how these concepts work.

MODULE “Flow”: (3) Tool Groups



Module 3 – Horizontal Alignment

Primary & Selection Tool Group

These two (2) groups are common throughout the ribbons. To see all the tools in these sections, use the Home Ribbon. The other Ribbons include a partial group of the tools included in these two sections



General Tool Group



Horizontal Tool Group



Vertical Tool Group



MODULE “Flow”: (4) Individual Tool Usage



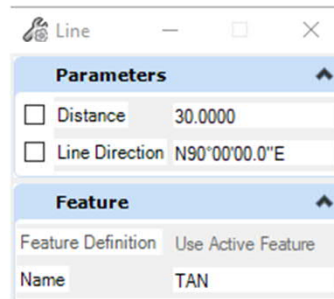
Module 3 – Horizontal Alignment

1. Override Feature Definition

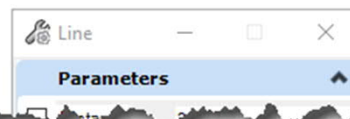
- A. Selecting the **Override Feature Definition** icon will force the active tool to use the Feature Definition shown in the Feature Definition Toggle Bar. The user will not have to select the feature definition when placing the element.



- B. This dialog for placing a line between two points will display like this with the override *ON*. Note that the Feature Definition displays *Use Active Feature* and the name has been populated.



- C. This dialog for placing a line between two points will display like this with the override *OFF*. Note that the Feature Definition displays *No Feature Definition* and the name field is blank.



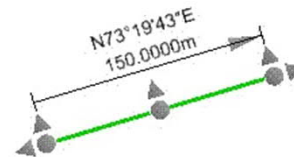
MODULE “Flow”: (5) Various Exercises



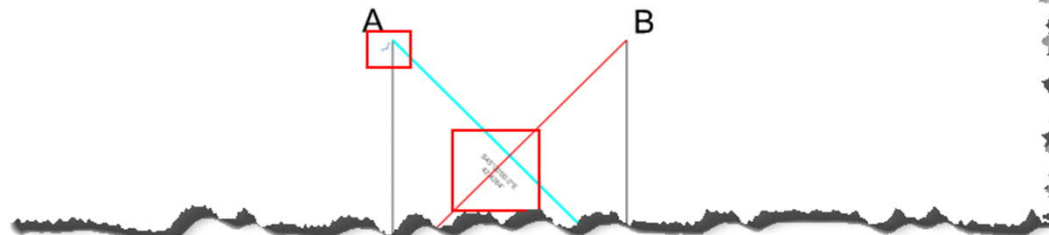
Module 3 – Horizontal Alignment

4. Block 1 – Editing Geometry with Drag Handles

A. Drag Handles are another easy way to change the Civil Rules.



- An arrow shaped drag handle - redefines the point with one or more directions constrained. In the previous example, the parallel arrows (that are parallel to the line) are constrained to change the distance only; the arrows that are perpendicular to the line are constrained to change the direction only.
 - A circular shaped drag handle moves the points without constraint.
 - Drag Handles will break Civil Rules based on Snaps and care must be exercised when manipulating drag handles to avoid unwanted results. As seen in the previous example the UNDO (Ctrl+Z) command can reverse any unwanted commands.
- B. The **Select** tool can be configured to enable or disable handles. Activate the Select tool and pick the line segment from Point A to Point B. The snap constraint icon will show near Point A, the Text Manipulators will show at the midpoint and the Drag Handle Icon will show near Point D. The Handles are enabled.



MODULE 1: File Management

1. Computer Specifications
2. Overview
3. New ORD Concepts
4. NCDOT ORD Workspace Setup
5. Project ORD WorkSets
6. Create WorkSet Files
7. ORD Folder Naming Convention
8. Archiving Files at Project Stages
9. ORD Design File Naming Conventions
10. ORD File List with File Contents and References
11. Create Design Files
12. Open Design Files
13. Open Design Files Troubleshooting
14. Copying Files from Windows to ProjectWise
15. Exporting Files from ProjectWise to Windows

KEY CONCEPTS

- **Getting Started / Setup**
- **FEATURE DEFINITIONS**
- **Working with Multiple Models**

Design



Drawing



Sheet



MODULE 2: Existing Terrain Model

1. Making a blank ETM File
2. Import Geopak TIN File
3. Import XYZ Data
4. Import LIDAR Data
5. Feature Definitions
6. Symbology in Reference Files
7. Clipped and Complex Terrain Models
8. Terrain Analysis & Labeling

KEY CONCEPTS

- **FEATURE DEFINITIONS**
- ***** DISCLAIMER *****

Disclaimer: This module provides basic knowledge to work with Existing Terrain Models and begin conceptual level designs in the absence of mapping or surveys from Photogrammetry & Location and Surveys. The training in this module is not meant to replace, duplicate, or supplement the 3D DGN supplied by these units.

MODULE 3: Horizontal Alignments

Creating & Editing Horizontal Alignments

- Between Points
- Line to & From Elements
- Chamfers
- Arc Tools & Editing
- Complex by P.I.
- Complex by Element
- Define By Best Fit
- Stationing
- Horizontal Geometry Report

KEY CONCEPTS

- **Graphical Construction**
- **Establishing Element Rules**
- **Establishing Design Intent**
- **Design Intelligence Stored with Elements**



MODULE 4: Vertical Alignments

1. Overview of Vertical Line Tools
2. Navigating the Profile Model View
3. Understanding Profile Model View Symbology
 - Exaggerate the Vertical Scale
4. Using Civil AccuDraw
5. Making Corrections
6. Setting a Profile Intersection Point
7. Profile Elements
 - Tangents
 - Curves
 - Refining the Profile Design
 - Manipulators (Station, Elevation)
 - Context Menu Values (Grades, VC Lengths)
8. Complexing Profile by PI
9. Complexing Profile Elements
10. (Vertical) Table Editor
11. Defining a Profile by “Best Fit” Method

KEY CONCEPTS

- **Horizontal & Vertical Designs both stored in the ALG file**
- **Vertical Alignments MUST be associated with a Horizontal Alignments**

MODULE 5: Initial Corridor Modeling

- Summary Corridor Modeling Workflow
 1. Create CMD file (2D Seed File)
 2. Attach ETM & ALG
 3. Set your Active Terrain
 4. Define Templates
 5. Run you proposed corridor
 6. Add Template Drop(s)
 7. Make template adjustments
 - Parametric Constraints
 - Point Controls
 - Feature Constraints
 8. Assign Superelevation
 9. Process corridor
 10. Review (2D/3D) & Revise
- Corridor Object Dialog
- Access the Dynamic Cross Sections

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KEY CONCEPTS

- **Modeling Workflow**
- **Broad Module – Good to start with (bridge job)**

MODULE 8: Intermediate Modeling

- Intermittent Longitudinal Features
 - Turn Lanes
 - Pavement Tapers
 - Atypical End Conditions
- Pavement Shearing
 - Add –Y- Lines, Ramps, Bulbs
 - Median Crossovers, Islands
- Template Point Constraint Overrides
 - Parametric Constraints
 - Horizontal Feature Constraints
 - Point Controls
- Feature Definition Toggle Bar
- Targeting Construction Class Elements
- Key Stations
 - Pavement Shear Limits
 - Target Shear Areas

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KEY CONCEPTS

- **Design Intent**
- **TARGETING**
“Be Careful”

MODULE 9: Detailed Modeling

- Linear Templates
- Surface Templates
- Terrain Modeling
 - Intersections
 - Turning Raddii
 - Curb Profiling
 - Islands
 - Bulbs Outs

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KEY CONCEPTS

- **Design Intent**
- **Targeting**

MODULE 6: Plan Geometry

- Lane Tapers, Shoulder Tapers
- Offsets and Tapers
- Reverse Curves
- Islands, Intersection Radius
- Turnarounds & Cul De Sacs
- Bridges
- Concrete Barrier
- Guardrail, Guiderail
- Right of Way, Easements, Marker Stations and offset labels
- Shoulder Berm Gutter, Expressway Gutter
- Superstreet – Protected Left Turn Island at U Turn, Intersection Islands
- Attach OneMap
- Google Earth Integration

KEY CONCEPTS

- **Primary Class Feature Definitions (Shows on Plan Sheets)**
- **Construction Class Feature Definitions (Model will Target)**
- **Majority of the plan graphics will be generated from the model**

MODULE 7: Superelevation

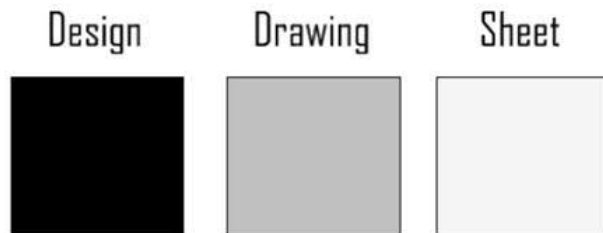
- Superelevation Workflow
- Determine Superelevation Sections
- Create Superelevation Sections:
 - Alignment (Manual Method)
 - Corridor (Automatic Method)
- Superelevation Lane Creation Methods:
 - Templates
 - Manual
- Superelevation Rule File (XML)
(Interpretation of AASHTO Tables:
Calculation, Rounding, Increments)
- Review/Editing Superelevation
- Import Superelevation
- Generate Reports
- Assign Superelevation to Corridor

KEY CONCEPTS

- **In creating superelevation sections “Corridor Method” *preferred***
- **NCDOT provides an XML Rule File in the Roadway Workspace**
- **ORD does not *currently* provide a way to automatically label superelevation in the plan view**

MODULE 10: Sheeting

- DGN Model Types and how they are used



- Container File Creation
- Named Boundary Tool
- Create Drawing Tool
- Sheet Clipping & Sheet Annotation
 - Plan, Profile, Plan/Profile, X-S
- Sheet Modifications
- Best Practices
- Sheet Index
- Printing / Plotting

KEY CONCEPTS

- **Sheet Index !!! IMPORTANT !!!**
- **Project dgn.WS file integration and customization**



MODULE 11: Hearing Map Production

Basic Public Hearing Map Workflow

1. Create PHM file
2. Attach References
3. Layout Maps (Sheets)
4. Create Shapes (Exist & Prop)
5. Add Labels & Cells
6. Generate 3D Typical (New Req)
7. Setting Display Style
8. Attach Raster Imagery
9. Final Clipping & Masking
10. Print

KEY CONCEPTS

- **3D Typical – Proposed Methodology**
- **Translucent Shapes (New Req)**
 - *Reference Update Sequence*
 - *Reference Clip Masking*



STAY IN TOUCH!

Please let us know:

- If something doesn't work.
- If something is wrong.
- If something is needed or missing.
- If something changes.

Help us help you!

roadwaysupport@ncdot.gov

<https://connect.ncdot.gov/projects/Roadway/Pages/default.aspx>

QUESTIONS?