Basic Construction Plan Reading
Don Neary
Nebraska LTAP
Learning Objectives

• Become familiar with project construction plans.
• Be able to locate specific items on the plans related to the project.
• Be able to write a narrative on why it is important that a County Highway or City Street Superintendent can read and interpret a set of construction plans.
Reading & Understanding Construction Plans

• On the Superintendent’s exam you may be asked to write a brief essay explaining why it is important, as a City Street or County Highway Superintendent, to be able to read and understand a set of construction plans.
Reading & Understanding Construction Plans

- Fulfills your job duties
- Professionalism to your position
- Interpret the project information
- Answer questions from public, contractor and governing body
- Monitor material quantities
- Act as a liaison between the contractor and the governing body and the public
- Explain and obtain Right of Way from landowners
- Monitor progress
Topics

1. Definitions & Abbreviations
2. Parts of a Contract
3. Legal Descriptions
4. Stationing
5. Title Sheet
6. General Notes
7. Summary of Quantities
8. Construction Plan Views
9. Drainage Structures
10. Bridge Plans
11. Right-of-Way
12. Traffic Control
13. Plan Reading Resources
14. Additional Information
Definitions

- **Grade Beam**  A concrete support on piling which supports approach slab
- **Longitudinal**  Parallel to project centerline or length of bridge
- **Pier**  Supports between abutments
- **Substructure**  Below girder bearing devices or below slab
- **Superstructure**  Above & including girder bearing devices
- **Transverse**  Perpendicular to project centerline or across bridge
Construction Plan Abbreviations

- Centerline
- Radius or Radius Point
- 4:1 Slope (Ratio of "rise" to "run", or as a fraction, "rise over run", in which run is the horizontal distance and rise is the vertical distance)
- Width
- Height
- No. 4 Bar 1/2” Diameter Concrete Reinforcing Bar
- Section
- Township
- Range
Construction Plan Abbreviations

- **R.O.W.** Right of Way
- **D.A.** Drainage Area
- **L.F.** Linear Feet
- **Curve Data**
  - D. - Degree of Curve
  - L. - Length of Curve
  - T. - Tangent Length of Curve
- **EOF** End of Floor
- **ADT** Average Daily Traffic: The total traffic volume during a given time period, ranging from 2 to 364 consecutive days, divided by the number of days in that time period, and expressed in VPD (vehicles per day).
Construction Plan Abbreviations

• **AADT** Annual Average Daily Traffic: Average daily traffic on a roadway link for all days of the week during a period of one year, expressed in VPD (vehicles per day).

• **B.M.** Bench Mark: A relative permanent object, natural or artificial bearing a marked point whose elevation is known
  - “PBM” – Permanent bench mark
  - “TBM” – Temporary bench mark
SESSION 1

- Parts of a Contract
- Legal Descriptions
- Definitions & Abbreviations
- Stationing
Parts of the Construction Contract Documents

1. CONTRACT
   - Proposal Forms
     - Includes items of work
     - Unit prices
     - Bidders signature
   - Contract Agreement
     - Specifies the completion date
     - Guarantee provisions, if any
   - Special Provisions
     - Modify the Standard Specifications
Parts of the Construction Contract Documents

2. PLANS

• Construction Drawings
  • Plan and profile sheets
  • Grade sheets
  • Utility sheets

• Special Plans
  • Detailed items unique to the project

• Standard Plans
  • Typical construction details
Parts of the Construction Contract Documents

3. SPECIFICATIONS

- General Requirements
  - Describe and define terms and conditions of contract
- Construction Details
  - Describe the work to be performed
  - The basis for payment

- Material Specifications
  - Provide detailed technical descriptions of all material
Project Location Descriptions

• Municipal projects
  • Use street names/numbers for location description.
    
    Example
    “1234 Main St., Lincoln, NE

• County projects
  • Use Section, Township and Range.
    
    Example
    “Between Sec. 15 and 22, Twp. 15 North, Rg. 47 West.”
Townships & Ranges

- **TOWNSHIP** measures the distance NORTH or SOUTH from the BASE LINE
  - A township USUALLY measures SIX MILES by SIX MILES
  - Township lines “run” East – West

- **RANGE** measures EAST or WEST from the PRINCIPAL MERIDIAN
  - A range USUALLY measures SIX MILES by SIX MILES
  - Range lines “run” North – South
Townships & Ranges

- In Nebraska:
  - Base Line is the 40th Parallel, the Nebraska-Kansas border
  - The Meridian is the 6th Principal Meridian (PM)
Townships & Ranges

- The “X” below is in Township 2N – Range 2E
Sections

- Townships are subdivided into SECTIONS
- Since each township is six miles by six miles, townships USUALLY contain 36 square miles, each one forming a section
Stationing

- A station is a unit of horizontal measurement
- Stations always follow along the centerline of the project
- Think of it in this way:
  - Just as 12 inches makes 1 foot, so 100 feet makes 1 station
- It is 100 feet from Station 1 to Station 2
Stationing

• 50 feet is *halfway* from one station to the next
• To show this location, write +50 after the station number
• +00 after a station number shows that a point is exactly on a “whole” station
• Example, Sta. 30+00 means Station 30 plus zero, exactly on Station 30
Stationing

50 feet is *halfway* from one station to the next
Stationing

• 2 feet ahead of Sta. 30 is written Sta. 30+02
• Ninety-nine feet ahead of Sta. 30 is written 30+99
• 2.75 feet ahead of Sta. 30 is written 30+02.75
• To convert stationing to feet, drop the plus sign
  • Sta. 30+02 = 3,002 feet
  • Sta. 1+50 = 150 feet
• Example: Length of project =
  • Ending Station minus Beginning Station
Stationing

• To find the distance between any two stations (on the same project)
  • Simply subtract the smaller station number from the larger one, ignoring the plus sign.
  • The resulting answer is in feet.
Stationing

• On a project, AHEAD means moving in the direction of *increasing* stationing
  • Station numbers get larger

• BACK means going in the direction of *decreasing* stationing
  • Station numbers get smaller
Stationing

Station Numbers increase AHEAD of you

Station Numbers decrease as you go BACK

AHEAD = Station numbers get larger
BACK = Station numbers get smaller
Exercise #1

Look at the sketch, then answer the questions below.

1. How far is it from Sta. 210+00 to Sta. 211+00? __________ feet

2. How far is it from Sta. 210+00 to Sta. 210+30? __________ feet

3. How far is it from Sta. 210+30 to Sta. 211+00? __________ feet

4. What is the Sta. Number of a point on 50 feet AHEAD of Sta. 211+00? _________

5. What is the Sta. Number of a point on 50 feet BACK of Sta. 212+00? _________

6. What is the distance between Sta. 211+50 and Sta. 212+50? __________ feet
Exercise #1 (Sheet 4)

1. 21,100 – 21,000 = 100 feet
2. 21,030 – 21,000 = 30 feet
3. 21,100 – 21,030 = 70 feet
4. 21,100 + 50 = 21,150 = Sta. 211+50
5. 21,200 – 50 = 21,150 = Sta. 211+50
6. 21,250 – 21,150 = 100 feet
Stationing

• It is 780’ from Sta. 12+80 to Sta. 20+60. We can check this mathematically, 2,060’ − 1,280’ = 780’

From Sta. 12+80 to 13+00 = 20 feet
From Sta. 13+00 to 20+00 = 700 feet
From Sta. 20+00 to 20+60 = 60 feet

Total = 780.0 feet
Exercise #2

From Sta. 12+80 to 13+00 = 20 feet
From Sta. 13+00 to 20+00 = 700 feet
From Sta. 20+00 to 20+60 = 60 feet

Total = 780.0 feet

Answer the following questions:

1. What is the distance from Sta. 14+10 to Sta. 15+00? ___________________________ feet
2. What is the distance between Sta. 80+10 and Sta. 85+20? ______________________ feet
3. What is the distance between Sta. 48+76.2 and Sta. 51+24.8? ________________ feet
Exercise #2

1. $1,500 - 1,410 = 90$ feet
2. $8,520 - 8,010 = 510$ feet
3. $5,124.8 - 4,876.2 = 248.6$ feet
Stationing

• Generally, station numbers increase from:
  • WEST to EAST, or
  • SOUTH to NORTH

• Since roadways curve and change direction, this is not always true

• Remember:
  • AHEAD means toward *higher* stations
  • BACK means toward *lower* stations
Exercise #3

1. If you are walking along the centerline of a project, reading the station numbers on the stakes, and these numbers are increasing as you go, there is a good chance you are walking toward the _______ or ________
   (east/west) (north/south)
Exercise #3

1. If you are walking along the centerline of a project, reading the station numbers on the stakes, and these numbers are increasing as you go, there is a good chance you are walking toward the **east** or **north** (east/west) (north/south)
Stationing

• Any point pertaining to a project may be located on the actual ground and on the plans
  • By its Station, and
  • The number of feet LEFT or RIGHT of the centerline

• Left and Right of centerline:
  • You are standing on the centerline facing AHEAD
Stationing

This point is at Sta. 3+50, 123'-6" left of C.

This point is at Sta. 2+00, 90'-0" right of C.

Point "B"

Point "A"
Exercise #4

1. What is the station and offset of Point A on the sketch above? ________________________

2. What is the station and offset of Point B on the sketch above? ________________________

3. Station numbers generally increase toward the ____________ or ______________

4. How many feet is it from Sta. 15+88.6 to Sta. 14+00? ______________ feet

5. Is Sta. 13+00 AHEAD of or BACK of Sta. 14+00? ____________________________

6. How many feet is it from Sta. 13+50 to Sta. 16+00? ______________ feet
Exercise #4

1. Sta. 14+00, 40 ft. left of centerline
2. Sta. 15+25 on the centerline
3. East; North
4. 1,588.6 – 1,500.0 = 88.6 feet
5. back of
6. 1,600 – 1,350 = 250 feet
SESSION 2

• Title Sheet
Title Sheet

- Project Name
- Project Number
- Project Control Number
- County Project Location Map
- Project Limits and Length
- Project Exceptions
- Traffic Design Designation

- Route Number
- Signature Box – Design
- Signature box – Chief Engineer or Official
- Date Plans Completed
- Groups
- Professional Engineer’s Stamp
- Index of All Sheets
- Legend
# INDEX OF SHEETS

<table>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2-T</td>
<td>TYPICAL CROSS SECTIONS OF IMPROVEMENT</td>
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<td>SUMMARY OF QUANTITIES</td>
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<td>2-W</td>
<td>WETLANDS</td>
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<td>2-N1 - 2-N2</td>
<td>GENERAL INFORMATION &amp; DETOUR LOCATION MAP</td>
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<td>2-L</td>
<td>EROSION CONTROL</td>
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<tr>
<td>3</td>
<td>PLAN &amp; PROFILE SHEET</td>
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<td>4 - 5</td>
<td>DRAINAGE STRUCTURE CROSS SECTIONS</td>
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<td>6 - 15</td>
<td>SPECIAL PLAN 1 PRESTRESSED CONCRETE IT-600 GIRDER BRIDGE STA. 16+25.00</td>
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<td>16</td>
<td>SPECIAL PLAN 1C EROSION CHECKS (ALL TYPES) &amp; FABRIC SILT CHECKS</td>
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<td>17 - 18</td>
<td>SPECIAL PLAN 2C TEMPORARY SILT CHECKS</td>
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<td>RIGHT-OF-WAY DATA</td>
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<td>X1 - X7</td>
<td>CROSS SECTIONS</td>
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Title Sheet – Upper Right

PROJECT NO.  BRO-7076(18)  SHEET NO.  1

CONTROL NO.  12850

CONTROL NO.

CONTROL NO.
Title Sheet – County Location Map

- Location of Project Using a Legal Description
- Section, Township, Range
- “Between Sections 35 & 36, Twp. 8 North, Rg. 1 East, Saline County, NE”
Title Sheet – Bottom Center

REFERENCE POST NO. TO REFERENCE POST NO.

EXCEPTIONS: FROM STA. TO STA.

TOTAL NET LENGTH OF PROJECT: 2,200.00 FEET 0.417 MILES
Project Length - Exceptions

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<td>TO STA. 26+70.00</td>
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<td>&quot; &quot; 32+55.00</td>
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<tr>
<td>&quot; &quot; 44+31.00</td>
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<tr>
<td>&quot; &quot; 72+90.00</td>
<td>&quot; &quot; 75+35.00</td>
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**TOTAL LENGTH OF EXCEPTIONS**: 7,837.00 FEET

**TOTAL NET LENGTH OF PROJECT**: 7,837.00 FEET, 1.484 MILES
Project Length - Exceptions

<table>
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<td>&quot; &quot; 72+90.00 &quot; &quot; 75+35.00</td>
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</table>

TOTAL LENGTH OF EXCEPTIONS: 7,837.00 FEET 1.484 MILES

Exceptions:
2670’ – 2535’ = 135’
3255’ – 3010’ = 245’
4769’ – 4431’ = 338’
7535’ – 7290’ = 245’

Total Exceptions = 963’
Project Length - Exceptions

\[
\begin{align*}
9500' - 700' &= 8800' \\
8800' - 963' &= 7837'
\end{align*}
\]

Total Net Length of Project = 7837' or 1.484 Miles

\begin{center}
TOTAL NET LENGTH OF PROJECT
\end{center}

\begin{center}
7,837.00 FEET \quad 1.484 MILES
\end{center}
Title Sheet – Groups

- Group 1 – Grading
- Group 4 – Culverts
- Group 6 – Bridges
- Group 7 – Guardrail
- Group 10 - General
Exercise #5

- Turn to the **TITLE SHEET**, Plans for Construction, Friend South to answer the questions for Exercise #5
Exercise #5

1. BRO-7076 (18)
2. 7+00.00
3. 29+00.00
4. (a.) 2,200.00 feet  (b.) 0.417 miles
5. Crushed rock
6. 2", 25’
7. 2,012.8 feet
8. 1-Grading, 4-Culverts, 6-Bridges, 7-Guardrail, 10-General
9. Sta. 16+25.00
10. Sec. 35 & Sec. 36
SESSION 3

• General Notes
• Summary of Quantities
• Construction Plan Views
• Drainage Structures
General Notes

- Clarifies items not completely covered elsewhere in specifications or plan details
- General notes instruct the Contractor
  - Incidental items of work
  - Tack coat application requirements
  - ROW access restrictions
  - Pavement smoothness requirements
  - Soil compaction requirements
General Notes

- Sheet 2-N1
- Compaction Requirements
- Earthwork Quantities
- Culvert Pipe Legend
- Mailbox Location
- NOTES!
General Notes

- Sheet 2-N2
  - Detour Map
  - Access Crossing
Summary of Quantities (2-S)

• Shows all the pay items of work included in the contract
• Items are listed in numerical order by item code
• Each section lists the item, quantity of item, & item units
# Summary of Quantities Sheet (2-S)

## Grading Items
### Group 1

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Units</th>
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<tbody>
<tr>
<td>Roadway Cuts</td>
<td>1.000</td>
<td>LS</td>
</tr>
<tr>
<td>Cuts, all other</td>
<td>0.000</td>
<td>LS</td>
</tr>
<tr>
<td>Greater, cleaning and grading</td>
<td>0.000</td>
<td>TO</td>
</tr>
<tr>
<td>Waterway</td>
<td>0.000</td>
<td>TO</td>
</tr>
<tr>
<td>Earthwork required to improve</td>
<td>0.000</td>
<td>CY</td>
</tr>
<tr>
<td>Raised Sidewalks</td>
<td>1.000</td>
<td>CY</td>
</tr>
<tr>
<td>Traffic Barriers Level</td>
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<tr>
<td>Traffic Barriers Height of</td>
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<td>CY</td>
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<td>Traffic Barriers Length of</td>
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<td>CY</td>
</tr>
<tr>
<td>Guardrail Posts</td>
<td>0.000</td>
<td>TO</td>
</tr>
<tr>
<td>Structural Steel for Example</td>
<td>0.000</td>
<td>TO</td>
</tr>
<tr>
<td>Special Surface Course for Example</td>
<td>0.000</td>
<td>TO</td>
</tr>
<tr>
<td>Heavy Fielding</td>
<td>0.000</td>
<td>TO</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.000</td>
<td>TO</td>
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<td>Construction - All Other</td>
<td>0.000</td>
<td>TO</td>
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<td>Sign, Poster Section</td>
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<td>Exclusion Control, Class II</td>
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## Bridge Items
### Group 6

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<td>Structural Steel for Example</td>
<td>0.000</td>
<td>TO</td>
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<tr>
<td>Special Surface Course for Example</td>
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<td>TO</td>
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<td>Heavy Fielding</td>
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<td>Transportation</td>
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<td>TO</td>
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## General Items
### Group 10

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<tr>
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## Culvert Items
### Group 4

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<tr>
<td>Culvert</td>
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## Guardrail Items
### Group 7

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<td>Special Surface Course for Example</td>
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<td>TO</td>
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<td>Heavy Fielding</td>
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<td>TO</td>
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<tr>
<td>Transportation</td>
<td>0.000</td>
<td>TO</td>
</tr>
<tr>
<td>Construction - All Other</td>
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# Group 4 – Culvert Items

## CULVERT ITEMS

### GROUP 4

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<tr>
<td>REMOVE HEADWALLS FROM CULVERTS</td>
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<td>EACH</td>
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<td>REMOVE CULVERT PIPE</td>
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<td>EXCAVATION FOR PIPE, PIPE-ARCH CULVERTS, AND HEADWALLS</td>
<td>350.000</td>
<td>CY</td>
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<tr>
<td>24” METAL FLARED-END SECTION</td>
<td>1.000</td>
<td>EACH</td>
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<tr>
<td>42” METAL FLARED-END SECTION</td>
<td>1.000</td>
<td>EACH</td>
</tr>
<tr>
<td>60” METAL FLARED-END SECTION</td>
<td>2.000</td>
<td>EACH</td>
</tr>
<tr>
<td>42” CULVERT PIPE, TYPE 3, 4 OR 5</td>
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<tr>
<td>60” CULVERT PIPE, TYPE 3, 4 OR 5</td>
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<td>LF</td>
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<tr>
<td>24” CULVERT PIPE, TYPE 3, 4, 5 OR 6</td>
<td>90.000</td>
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- **Lump Sum**
- **Cubic Yard**
- **Linear Feet**
Construction Plan Views

• **Plan View**
  • A drawing depicting a section of the road from a bird's eye view.

• **Profile View**
  • A drawing depicting the vertical plane along the longitudinal centerline of the road, expressed in elevation or gradient.

• **Cross-section View**
  • A drawing depicting a section of the road viewed vertically, as if cut across the width of the road.

• **Typical View**
  • A drawing depicting features of a particular design, installation, construction or methodology.
Construction Plan Views – Plan View

Plan View (Sheet 3)
Construction Plan Views – Plan View

• NOTES!
• Stationing

STA. 16+25
BUILD GUARDRAIL PROTECTION.
4-BRIDGE APPROACH SECTIONS
4-END TREATMENT, TYPE II
PLAN 740 & 743.

STA. 15+91
EXISTING TWIN SPAN 120'-0" (2-60'-0"") GIRDER
AND FLOORBEAM BRIDGE. CONCRETE DECK.
20'-0" CLEAR ROADWAY. REMOVE.
CONTRACTOR SHALL RETAIN TITLE TO THE OLD BRIDGE.
Profile View (Sheet 3)
Construction Plan Views – Profile View

- Bench Mark information
- Elevations
- Notes
- Stationing
Top & Bottom of Plan & Profile Sheet (Stationing)
Construction Plan Views – Cross Section View

Cross-Section View (Sheet 2-T)
Construction Plan Views – Typical View

Typical View #1

**TRENCH DETAILS SHOWN ARE MINIMUM REQUIREMENTS FOR DESIGN AND CONSTRUCTION. PAYMENT FOR EXCAVATION IS BASED UPON THE GUIDELINES IN THE STANDARD SPECIFICATIONS.**

**TRENCHES SHALL BE EXCAVATED IN ACCORDANCE WITH APPROVED SAFETY PRACTICE.**

**TYPICAL TRENCH INSTALLATION**
Construction Plan Views – Typical View

Typical View #2 (Sheet 8)

FIELD SPLICE DETAIL

NOTE:
Pipe for piles shall conform to the requirements of ASTM A252, Grade 2. Nominal shell thickness shall be not less than 3/8”.

1/4” thick circular plate. Diameter equal to O.D. of pipe. Weld all around to seal pipe after pile has been driven.

13” Max. O.D.
12” Min. O.D.

The backer plate for the field weld shall be 1/4” min. thickness.

1” thick circular plate. Diameter equal to O.D. of pipe.

PIPE PILE DETAIL
Drainage Structures

- Bridges
- Pipe Culverts
- Box Culverts
- Drop Inlets

- Headwalls
- Dikes
- Ditches
Drainage Structures – Sheet 4
Drainage Structures – Sheet 4

Inlet Elevation

Outlet Elevation

Culvert Notes

STA. 15+08, 42' RT. TO STA. 15+83, 42' RT.
DA= 4ac, Q<sub>10</sub>= 9cfs, HW<sub>10</sub>= 1.7'
BUILD 24' x 76' CULVERT PIPE,
TYPE 3,4,5 OR 6 WITH METAL FLARED
END SECTION ON INLET, 2-9° ELBOWS.

PLAN NO. 410-R3 & 411.
EXC.= 43 CU. YOS. FILL = 4'
Drainage Structures – Sheet 4
Drainage Structures – $Q = ciA$

• **Rational Method Equation**
  - The Rational equation is the simplest method to determine peak discharge from drainage basin runoff

• **Rational Equation**: \( Q = ciA \)

• The Rational Equation requires the following units:
  - \( Q = \) Peak discharge, cubic feet per second (CFS)
  - \( c = \) Rational method runoff coefficient
  - \( i = \) Rainfall intensity, inches/hour
  - \( A = \) Drainage area, acres
## Drainage Structures – $Q = ciA$

<table>
<thead>
<tr>
<th>Ground Cover</th>
<th>Runoff Coefficient, $c$</th>
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<tbody>
<tr>
<td>Lawns</td>
<td>0.05 - 0.35</td>
</tr>
<tr>
<td>Forest</td>
<td>0.05 - 0.25</td>
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<tr>
<td><strong>Cultivated land</strong></td>
<td><strong>0.08-0.41</strong></td>
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<tr>
<td>Meadow</td>
<td>0.1 - 0.5</td>
</tr>
<tr>
<td>Parks, cemeteries</td>
<td>0.1 - 0.25</td>
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<tr>
<td>Unimproved areas</td>
<td>0.1 - 0.3</td>
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<tr>
<td>Pasture</td>
<td>0.12 - 0.62</td>
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<tr>
<td>Residential areas</td>
<td>0.3 - 0.75</td>
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<tr>
<td>Business areas</td>
<td>0.5 - 0.95</td>
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<tr>
<td>Industrial areas</td>
<td>0.5 - 0.9</td>
</tr>
<tr>
<td><strong>Asphalt streets</strong></td>
<td><strong>0.7 - 0.95</strong></td>
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<tr>
<td>Brick streets</td>
<td>0.7 - 0.85</td>
</tr>
<tr>
<td>Roofs</td>
<td>0.75 - 0.95</td>
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<tr>
<td>Concrete streets</td>
<td>0.7 - 0.95</td>
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</table>
Drainage Structures – $Q = ciA$

- Drainage Area = 36 acres
- $Q_{10} = 80$ cubic feet per second
- Culvert designed for a 10-year storm

STA. 14+27, 42' LT. TO STA. 15+99, 42' LT.
DA = 360c., $Q_{10} = 80$ cfs., HW$_{10}$ = 5.0'
BUILD 42" x 172' CULVERT PIPE, TYPE 3, 4 OR 5 WITH METAL FLARED END SECTION
ON INLET. 2-4° ELBOWS. PLAN NO. 410-R3 & 411. EXC. = 223 CU. YDS. FILL = 4'
Design Year Storm

• A 10-yr, 25-yr, 50-yr, or even 100-yr storm frequency may be specified

• What is 100 Year Storm?
  • A 100-year storm refers to rainfall totals that have a one percent probability of occurring at that location in that year
  • Encountering a "100-year storm" on one day does not decrease the chance of a second 100-year storm occurring in that same year or any year to follow
  • In other words, there is a 1 in 100 or 1% chance that a storm will reach this intensity in any given year
  • Likewise, a 50-year rainfall event has a 1 in 50 or 2% chance of occurring in a year.
Design Year Storm

<table>
<thead>
<tr>
<th>Recurrence interval, in years</th>
<th>Probability of occurrence in any given year</th>
<th>Percent chance of occurrence in any given year</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1 in 100</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>1 in 50</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>1 in 25</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>1 in 10</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>1 in 5</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>1 in 2</td>
<td>50</td>
</tr>
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</table>
Exercise #6

• **Use Sheet 3**, Friend South Plan
  • Questions 1 – 2

• **Use Sheet 4**
  • Questions 3 – 5
Exercise #6

1. a.) Spike in power pole
   b.) BM #3
   c.) 1458.27’
   d.) 81’ Left

2. a.) Twin Span Girder & Floorbeam
   b.) 120’ – 0”
   c.) 20’ – 0”
   d.) Remove
Exercise #6

3. 8.7’
4. D.A. = 4 acres
5. Earth dike, elevation 1460.0’
SESSION 4

• Bridge Plans
### Bridge Plans – Sheet 6

#### NOTES

This structure is designed in accordance with the 2019 edition of the AASHTO "Standard Specifications for Highway Bridges," except where noted below. The dimensions of this structure are designed to fit within the Nebraska Department of Roads bridge design specifications.

- The dimensions of this structure are designed to fit within the Nebraska Department of Roads bridge design specifications.

#### QUANTITIES

<table>
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<th>Item</th>
<th>Description</th>
<th>Notes</th>
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<tr>
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<td>Lamp Seal</td>
<td>1 lamp seal</td>
</tr>
<tr>
<td>1</td>
<td>Lamp Seal</td>
<td>1 lamp seal</td>
</tr>
<tr>
<td>1</td>
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</tr>
<tr>
<td>1</td>
<td>Lamp Seal</td>
<td>1 lamp seal</td>
</tr>
</tbody>
</table>

#### INDEX

1. General notes, quantities, and index
2. General plan and elevation
3. Other structural and plan views
4. Nebraska plan and elevation
5. Street plan and elevation
6. Cover data
7. Cross section of approach
8. General notes, special bridges, and plan of rock riprap and filter fabric
9. Bill of goods
Bridge Plans – Sheet 6

- Project Name
- Project Number
- Notes
- Quantities
- Index
- Title Block
- NOTES -

This structure is designed in accordance with the 17th edition of the AASHTO "Standard Specifications for Highway Bridges", including subsequent interims.

The superstructure of this bridge is designed by the Load Factor Design Method. The girders and substructure are designed for a future wearing surface of 20 psf.

Concrete for slab, diaphragms and rails shall be Class "47BD" with a minimum 28-day strength of 4,000 psi.

All other cast-in-place concrete shall be Class "47B" concrete, with a 28-day strength of 3,000 psi.

All exposed edges of concrete shall be chamfered.

The minimum clearance, measured from the face of the concrete to the surface of any reinforcing bar, shall be 3", except where otherwise noted.

All reinforcing steel shall conform to the requirements of ASTM A615, Grade 60 steel.

All structural steel shall conform to the requirements of ASTM A709, Grade 36.

Tie Rods shall conform to ASTM A709, Grade 36 Steel. Turnbuckles shall conform to ASTM A668 Class C.

Prestressed concrete girders must be at least 9 days old before they can set on the bridge substructure. Surveying for shim shots, forming deck or diaphragms and placing construction material on the girder is not allowed until the girders are at least 30 days old.
### Bridge Plans – Sheet 6

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Abutment No. 1 Excavation</td>
<td></td>
</tr>
<tr>
<td>Bent No. 1 Excavation</td>
<td></td>
</tr>
<tr>
<td>Bent No. 2 Excavation</td>
<td></td>
</tr>
<tr>
<td>Abutment No. 2 Excavation</td>
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<tr>
<td><strong>Class 47B-3000 Concrete for Bridge</strong></td>
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<td>Abutments</td>
<td>134.3 Cu. Yd.</td>
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<tr>
<td>Bents</td>
<td>109.8 Cu. Yd.</td>
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<td><strong>Class 47BD-4000 Concrete for Bridge</strong></td>
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<tr>
<td>Concrete Rails</td>
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<td>Precast/Prestressed Concrete Superstructure at Station</td>
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<td>16+25.00</td>
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<td>Girders</td>
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<td><strong>Reinforcing Steel for Bridge</strong></td>
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<tr>
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<td>Concrete Rails</td>
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<td>Bents</td>
<td>7010 Lbs.</td>
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</table>

1 Lump Sum

244.1 Cu. Yd.

148.3 Cu. Yd.

1 Lump Sum

48860 Lbs.
Bridge Plans – Sheet 6

- INDEX -

GENERAL NOTES, QUANTITIES AND INDEX 1
GENERAL PLAN AND ELEVATION 2
GEOLOGICAL PROFILE AND PILE LAYOUT 3
ABUTMENT PLAN AND ELEVATION 4
BENT PLAN AND ELEVATION 5
GIRDER LAYOUT 6
GIRDER DATA 7
CROSS SECTION OF ROADWAY 8
CONCRETE RAIL ON BRIDGE, PLAN OF ROCK RIPRAP AND RIPRAP FILTER FABRIC 9
BILL OF BARS 10

“Special Plan” sheet numbers
Bridge Plans – Sheet 6

- "Special Plan" sheet numbers
- Location
- Bridge Information
  - Skew
  - Clear Roadway Width
  - Design Live Load
- Length
- Number of Spans
- Bridge Type
- Bridge Number
- Project Number
- Engineering Firm

Title Block
Bridge Plans – Sheet 7

• Sectional Elevation
Bridge Plans – Sheet 7

- General Plan
Bridge Plans – Sheet 7

• Bridge Length
  • *End of Floor to End of Floor Length*
  • Centerline Abutment to Centerline Abutment Length*

• Span Lengths

• Number of Spans

<table>
<thead>
<tr>
<th>Bridge Plans – Sheet 7</th>
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<tr>
<td><strong>End of Floor to End of Floor Length</strong> = 187'-2 3/8&quot;</td>
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<tr>
<td><strong>Centerline Abutment to Centerline Abutment Length</strong> = 185'-2&quot;</td>
</tr>
<tr>
<td>Span No. 1 = 61'-6&quot;</td>
</tr>
<tr>
<td>Span No. 2 = 62'-2&quot;</td>
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<tr>
<td>Span No. 3 = 61'-6&quot;</td>
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</table>
Bridge Plans – Sheet 7

- Clear Roadway Width
Bridge Plans – Sheet 7

• Hydraulic Information
  • Waterway (stream)
  • Drainage Area (D.A.)
  • Peak Discharge (Q)
  • Design Year Storm (100)

**BRIDGE HYDRAULIC INFORMATION**

- **Stream**: Turkey Creek
- **D.A.**: 303.8 sq. mi.
- **Q100**: 15,000 cfs (Base Flood)
- **Q100**: 12,654 cfs (Bridge-Base Flood)
- **H.W. Elev.**: 1463.56 ft. (D.S.)
- **W.W.A. Below H.W.**: 2,360 sq. ft.
- **Q20**: 8,550 cfs (Overtopping Flood)
- **Low Road Elev.**: 1462.00 ft.
- **Q(OHW)**: 70 cfs.
- **Ordinary High Water Elev.**: 1445.00 ft.
- **Q100 General Scour**: 14.3 ft.
- **Q100 Local Scour**: 4.6 ft.
- **Q500 Scour Elev.**: 1423.3 ft.
Bridge Plans – Sheet 8

- Pile Data
  - Pile Location
  - Pile Number
  - Cut-Off Elevation
  - Minimum Penetration
  - Pile Length
  - Design Bearing
  - Type

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<tr>
<th>LOCATION</th>
<th>PILE NUMBER</th>
<th>CUT-OFF ELEVATION</th>
<th>MINIMUM PENETRATION BELOW CUT-OFF (feet)</th>
<th>PILE ORDER LENGTH (feet)</th>
<th>DESIGN PILE BEARING (tons/PILE)</th>
<th>TYPE</th>
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<td>45</td>
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<td>70</td>
<td>45</td>
<td>Pipe</td>
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<td></td>
<td>9,10</td>
<td>1451.49</td>
<td>40</td>
<td>45</td>
<td>20</td>
<td>Pipe</td>
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<td>Bent No. 1</td>
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<td>80</td>
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<td>Pipe</td>
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<td>65</td>
<td>75</td>
<td>45</td>
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<td>60</td>
<td>45</td>
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<td>1451.43</td>
<td>40</td>
<td>45</td>
<td>20</td>
<td>Pipe</td>
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Bridge Plans – Sheet 8

- Pile Detail
  - Field Splice Detail
  - Field Weld Notes

Pipe for piles shall conform to the requirements of ASTM A252, Grade 2. Nominal shell thickness shall be not less than 3/8".

11/4" thick circular plate. Diameter equal to O.D. of pipe. Weld all around to seal pipe after pile has been driven.

The backer plate for the field weld shall be 1/4" min. thickness.

NOTE:

1" thick circular plate. Diameter equal to O.D. of pipe.

PIPE PILE DETAIL
Bridge Plans – Sheet 9

- Abutment Elevation
Bridge Plans – Sheet 9

- Location (point) Elevations

\[ \text{Elev.} = A \]

\[ \text{Elev.} = B \]
Bridge Plans – Sheet 9

- Abutment Location Elevations

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tr>
<td>ABUTMENT NO. 1</td>
<td>1466.24</td>
<td>1463.66</td>
<td>1463.99</td>
<td>1463.71</td>
<td>1466.29</td>
<td>1449.49</td>
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<td>ABUTMENT NO. 2</td>
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<td>1463.93</td>
<td>1463.65</td>
<td>1466.24</td>
<td>1449.43</td>
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</table>
Bridge Plans – Sheet 13

• Out to Out Width (30’ – 4”)
• Clear Roadway Width (28’ – 0”)
• Reinforcing Bar Spacing
Exercise #7

- Use Bridge Plan Sheets 6 – 13
Exercise #7 – Bridge Plans

1. 47BD
2. 4,000 PSI
3. ASTM A615, Grade 60
4. 1,260 Tons
5. 2,780 Lbs.
6. 16+25.00
7. 185’ – 2”
8. 28’ – 0”
9. 3 Spans
10. 1’ – 2”
11. Turkey Creek
12. 303.8 Square Miles
13. 100 Years
14. 42 Piles
15. 20 & 45 Tons/Pile
SESSION 5

• Right-of-Way (ROW)
Right of Way – Sheet R1

Right of Way Terms & Definitions

• ACQUISITION OR TAKING
  • The acquiring of a property in its entirety or a portion thereof, for highway purposes

• PARCEL NUMBER
  • The number designated on the plans, generally enclosed by a circle, which designates a parcel or tract of land

• PERMANENT EASEMENT
  • An easement in perpetuity that gives the Department the right to utilize property for an unlimited time
Right of Way – Sheet R1

• RIGHT OF WAY
  • This is a term denoting land, interest therein, or property which is acquired for highway purposes

• TEMPORARY EASEMENT
  • An easement granted to the Transportation Department on a temporary basis for construction usually for a specified time and specified purpose
Right of Way – Sheet R1
Right of Way – Sheet R1

R.O.W. LEGEND

NEW CONTROLLED ACCESS
PREVIOUS CONTROLLED ACCESS
LIMITS OF CONSTRUCTION
PREVIOUS R.O.W.
NEW R.O.W.
EXISTING PERMANENT EASEMENT
TEMPORARY EASEMENT
EXCESS TAKING
PERMANENT EASEMENT
EXISTING RAILROAD EASEMENT
NEW RAILROAD PERMANENT EASEMENT
NEW RAILROAD TEMPORARY EASEMENT
Right of Way – Sheet R1

- Section Corner Ties

<table>
<thead>
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<th>TIES:</th>
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<tbody>
<tr>
<td>SE CORNER SEC. 35-T8N-R1E</td>
</tr>
<tr>
<td>ALUM. CAP, STA. 0+00.00</td>
</tr>
<tr>
<td>NW 37.46' NAIL &amp; DISK IN FENCE POST</td>
</tr>
<tr>
<td>SW 37.79' NAIL &amp; DISK IN POWER POLE</td>
</tr>
<tr>
<td>NE 60.07' NAIL &amp; DISK IN PEDESTAL POST</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
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<th></th>
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<tbody>
<tr>
<td>E ¼ CORNER SEC. 35-T8N-R1E</td>
</tr>
<tr>
<td>ALUM CAP, STA. 26+43.57</td>
</tr>
<tr>
<td>W 34.91' NAIL &amp; DISK IN CORNER POST</td>
</tr>
<tr>
<td>NW 37.79' NAIL &amp; DISK IN PEDESTAL POST</td>
</tr>
<tr>
<td>NE 44.11' P-K NAIL NORTH END CORR. METAL PIPE</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
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</thead>
<tbody>
<tr>
<td>E ½6 CORNER SEC. 35-T8N-R1E</td>
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<tr>
<td>1&quot; IRON PIPE, STA. 39+65.13</td>
</tr>
<tr>
<td>E 33.00' 1&quot; IRON PIPE</td>
</tr>
<tr>
<td>ENE 32.65' NAIL IN TOP FENCE POST</td>
</tr>
<tr>
<td>ENE 34.70' NAIL IN STUMP</td>
</tr>
<tr>
<td>NE 58.60' NAIL IN STUMP</td>
</tr>
</tbody>
</table>
Right of Way – Sheet R1

- List of property owners with corresponding TRACT numbers
- Tract numbers reference individual parcels
- The location (legal description) of the property owned by that person, and
- What their land will be used for
  - New ROW, Easements

<table>
<thead>
<tr>
<th>TRACT NO.</th>
<th>OWNER</th>
<th>DESCRIPTION</th>
<th>TOTAL TAKING</th>
<th>NEW TAKING</th>
<th>EXCESS LAND</th>
<th>EASEMENT</th>
<th>REMAINDER</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>STEWART REVOCABLE TRUST, JL &amp; JM</td>
<td>PART OF SE ¼ SEC. 35-TBN-R1E</td>
<td>3.15ac.</td>
<td>1.94ac.</td>
<td></td>
<td>0.30ac.</td>
<td></td>
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<tr>
<td>2</td>
<td>ROYAL COMBS</td>
<td>PART OF SE ¼ SEC. 35-TBN-R1E</td>
<td>0.45ac.</td>
<td>0.19ac.</td>
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<td></td>
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<tr>
<td>3</td>
<td>ROY T. SCHUNK</td>
<td>PART OF NE ¼ SEC. 35-TBN-R1E</td>
<td>0.39ac.</td>
<td>0.16ac.</td>
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<td></td>
<td></td>
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<tr>
<td>4</td>
<td>STEWART REVOCABLE TRUST, JL &amp; JM</td>
<td>PART ⅛ SW¼ &amp; PART OF SW½ NW¼ SEC. 36-TBN-R1E</td>
<td>2.71ac.</td>
<td>1.39ac.</td>
<td></td>
<td>0.23ac.</td>
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<tr>
<td>5</td>
<td>ROGER COMBS</td>
<td>PART ⅛ SW¼ &amp; PART OF SW½ NW¼ SEC. 36-TBN-R1E</td>
<td>0.29ac.</td>
<td>0.10ac.</td>
<td></td>
<td>0.11ac.</td>
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Right of Way – Sheet R1

- New ROW
  - “New Taking” Column
- Easement
  - “Permanent” Column
  - “Temporary” Column

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<thead>
<tr>
<th>TOTAL TAKING</th>
<th>NEW TAKING</th>
<th>EXCESS LAND</th>
<th>ЕASEMENT</th>
<th>REMAINDER</th>
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<td></td>
<td>0.11ac.</td>
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Right of Way – Sheet R1

- **Temporary Easement**
- **New Taking (ROW)**
Right of Way – Easements
Right of Way – Easements

1. Temporary Easement for Driveway Construction.
2. Temporary Easement for Backslope Construction.
4. Temporary Easement for Construction Staging Area.

TRACT NO. 4
STEWART REVOCABLE TRUST, JL & JM
PART W ½ SW ¼ & PART OF SW ¼ NW

TRACT NO. 5
ROGER COMBS
PART W ½ SW ¼ & PART OF SW ¼ NW ¼ SEC. 36-T8N-R1E
TOTAL ROW = 0.29 ac.
PREV. ROW = 0.19 ac.
NEW ROW = 0.10 ac.
TEMP. EASE. = 0.11 ac.
Exercise #8

• Use ROW Sheet R-1 to complete Exercise #8
Exercise #8 - ROW

1. Refer to Parcel (Tract) #1
   a. Stewart Revocable Trust, JL & JM
   b. Part of SE ¼ Sec. 35, T8N, R1E
   c. 1.94 acres
   d. 0.00 acres
   e. 0.30 acres
Exercise #8 - ROW

2. 3.78 acres

3. Permanent Easements – 0.00 acres
   Temporary Easements – 0.64 acres

4.
   a. Construction staging area
   b. Stewart Revocable Trust, JL & JM
   c. 0.23 acres
SESSION 6

• Traffic Control
• Plan Reading Resources
Traffic Control

• Traffic Control Plan (TCP) consists of the plans and specifications developed for each individual construction project
  • Supplemented by such detailed plans as required by the contract

• The TCP complements the Traffic Control Specifications and the Manual on Uniform Traffic Control Devices (MUTCD)

• The TCP tells the contractor how traffic will be maintained while construction is being performed
Traffic Control

• When through traffic is detoured, the detour route is shown on either:
  • The title sheet
  • Location map
  • Schematic plan, or
  • Within the general notes
Traffic Control

- Detour Map, General Information, Sheet 2-N2
Detour Map Example
Traffic Control

• When traffic is maintained during construction, the plan will normally require a number of Traffic Control notes along with several details such as
  • Sequence of operations
  • Section details for maintaining traffic
  • Plan insert sheets
  • Crossover details
  • Temporary barrier details
  • Etc.
Traffic Control – Standard Plans

**FLAGGERS**

REQUIRED METHOD

TO STOP TRAFFIC

EMERGENCY USE ONLY

TRAFFIC PROCEED

TO ALERT AND SLOW TRAFFIC

**FLAGGER PADDLE**

The stop/slow paddle shall have an octagonal shape on a rigid handle. Stop/slow paddles shall be at least 18 inches wide with letters at least 6 inches high. If the stop/slow paddle is placed on a rigid staff, the minimum length of the staff, measured from the bottom of the sign to the end of this staff that rests on the ground, should be 5 feet. The stop/slow paddle should be the primary and preferred hand-signalung device because the stop/slow paddle gives road users more positive guidance than red flags. Use of flags should be limited to emergency situations.

**FLAGGERS**

A flagger must be dressed for safety. In addition to the requirements of the "worker visibility" section listed below, flaggers shall wear:

1. AN ORANGE OR YELLOW/GREEN CAP OR HARD HAT.
2. A SHIRT WITH SLEEVES, PANTS AND SHOES (TANK TOPS, SHORTS OR SANDALS SHALL NOT BE WORN).

Traffic Control – Standard Plans

REFLECTORIZED PLASTIC DRUMS

CONES

PORTABLE AND TEMPORARY MOUNTING

TYPE III BARRICADE

TYPE II BARRICADE
Traffic Control – Standard Plans
Traffic Control – Standard Plans
Traffic Control – Standard Plans

• This setup similar to the Friend South project
Traffic Control

- Page from the Nebraska Supplement MUTCD
Exercise #9 – Review

• Review Questions

• Use the FRIEND SOUTH plans to complete Exercise #9
Exercise #9 – Basic Plan Reading Review

1. Title Sheet
2. Summary of Quantities Sheet
3. Plan View
4. Profile View
5. 150 feet
6. Plan/Profile Sheet
7. Sheet 2-N2, General Information
8. South or West
9. 36 square miles
10. Sheet R1, ROW Data
Additional Plan Reading Resources

- [www.nhi.fhwa.dot.gov/training/course_search.aspx](http://www.nhi.fhwa.dot.gov/training/course_search.aspx)

Type in “plan reading”
All Topics in NHI Course Where Covered Today
SESSION 7

• Additional Information
  • Surcharge
  • Bridge Camber
  • Bridge Approach Grade
  • Radius Point
  • Lane Cross Slope and Minimum Lane Width
  • Horizontal Curves
Surcharge

• Surcharge
  • A pile of earth whose weight serves as a load to accelerate the compression of softer soils beneath a construction site.

• This compression reduces or eliminates the settlement of any structure subsequently built at the site
  • Preloading surcharge soil with other soil temporarily causes the soil to densify under the temporary weight
Surcharge

• Purposes of compacting soil
  • Increases soil strength
  • Increased bearing capacity
  • Slope stability
  • Pavement system strength
  • Decreases amount of settlement
  • Reduces damage to structure from foundation movement (especially from differential settlement)
  • Decreases permeability – e.g. dams, levees, lagoon (liner) bottoms,
  • Improve site conditions for the construction process itself (working platform)
  • Decrease frost susceptibility (decreased voids, less water infiltration)

• Usually located on the Plan and Profile Sheet
Surcharge
Bridge Camber

• The term *camber* actually has several different meanings

• Depending on the *engineering* principle involved
  • Bridges
  • Roadways
  • Airplane Wings

• It is the amount of curving or arching used to counteract the effects of a load
Bridge Camber

• When a number of heavy trucks cross over a bridge at the same time
  • If there was no camber, the center would sag, then spring back to level when the trucks leave
• By adding a slight upward curve
  • Engineers can ensure that the bridge only flattens out to a level position when weight is added
Bridge Camber

• When erected and the load applied the member becomes a compression member which is considerably stronger than a bending moment
Bridge Camber

Results in deflection in floor under Dead Load. This can affect thickness of slab and fit of non-structural components.

Beam with Camber
Bridge Camber

- Steel
  - Fabricated steel span members
- Concrete
  - Pre-tensioning
  - Post-tensioning

- See Sheet 12
  - *Prestressed Girder Notes*
Bridge Camber – Sheet 12

PRESTRESSED GIRDER NOTES:

FABRICATOR shall be responsible for exercising extreme care in lifting, handling, storing and transportation of the prestressed girders to prevent cracking or damage. Girders shall be maintained in an upright position and supported near the ends at all times. Proper support bearings shall be used to avoid twisting of the girders. Girders shall be lifted by devices designed by the fabricator.

PRESTRESSING STRAND shall be uncoated, seven-wire, low-relaxation steel strand of 0.5” nominal diameter, and shall conform to the requirements of ASTM A416, Grade 270. Strands shall be tensioned to 30.98 kips before release, unless specified otherwise. All methods employed and procedures to be followed in tensioning the strands shall be subject to the Engineer’s approval. The method chosen shall be executed in a manner to assure that both ends of all strands in the girder are uniformly tensioned. The prestressed strand shall be released in a manner that will minimize eccentricity.

CONCRETE in the girders shall have the strength at release and at 28 days (design strength) as shown in the data table. No bond stress shall be transferred to the concrete nor the end anchorage released until the concrete has attained the specified strength. All exposed edges of girders, except at top and ends, shall be chamfered 3/4”.

TOP OF THE STEM shall be rough finished by scarifying the surface transversely with a wire brush, and no laitance shall remain on the surface.

REINFORCING STEEL shall conform to the requirements of ASTM designation A615/A615M, Grade 60. Welded Wire Fabric (WWF) shall conform to the requirements of ASTM A490. As an alternate for WWF, an equivalent rebar area may be substituted for the design shear reinforcement. If an equivalent rebar area is substituted, the reinforcement must be detailed to develop the full shear capacity of the bar. Details shall be submitted to the Engineer for approval.

TOLERANCES shall be in accordance with the Prestressed Concrete Institute manual.

Fabricator to provide Project Engineer with a plan for strand detensioning on the Shop Plans prior to fabrication.

★ For rating purpose only, superimposed dead loads do not include future wearing surface.

★ Includes 1"-3" Lap Splice.
Bridge Approach Grade

- Found on the Sectional Elevation view of the Bridge Plans

**SECTIONAL ELEVATION**

Scale: 1" = 20'-0"
Bridge Approach Grade

Approach #1
Station = 15+79.28
Elevation = 1147.77

Center Line of Bridge
Station = 18+09.80
Elevation = 1150.73

Approach #2
Station = 20+40.33
Elevation = 1147.33
Radius Points

Plan View – “Geometrics & Grades”
Radius Points

30 ft. radius

3. 30.00’R.P.  46.00’LT  STA. 35+51.17
   P.C.  16.00’LT. STA. 35+51.17
   P.T.  45.61’LT. STA. 35+81.17

4. POINT 53.07’ LT. STA. 35+81.26

5. POINT 52.32’ LT. STA. 36+21.52

6. 30.00’R.P.  46.00’LT  STA. 36+51.49
   P.C.  46.12’LT. STA. 36+21.49
   P.T.  16.00’LT. STA. 36+51.49
Lane Cross Slope and Minimum Lane Width
Lane Cross Slope and Minimum Lane Width

- Information on Typical Cross Section sheets
- Location, Station, Construction Item
Lane Cross Slopes

- Cross slope is usually expressed as a percentage:
  - Cross Slope = Rise/Run X 100%
- May also expressed as a decimal fraction of a foot fall (or rise) per foot of run:
  - Cross Slope = 0.02'/Foot
Lane Cross Slope
Lane Cross Slopes

- 18 Foot Lane
- 2% Slope
- $18 \text{ ft.} \times 2\% = 18 \text{ ft.} \times 0.02$
- $18\text{Ft.} \times 0.02 = 0.36 \text{ ft.} \text{ or } 4.32 \text{ inches}$
- The lane slopes 4.32 inches from the centerline to the end of the 18 foot section
- The slope can be calculated for the remaining sections in the same manner
Lane Cross Slopes
Lane Cross Slopes

Diagram showing a lane with cross slopes, indicating a 0.02' per foot slope over a 32' length.
Lane Cross Slopes

- 12 Foot Lane
- Cross Slope = 0.02’/ft.
- 12Ft. X 0.02’/ft. = 0.24ft. or 2.88 inches
- The lane slopes 2.88 inches from the centerline to the end of the 12 foot section
- The slope can be calculated for the remaining sections in the same manner
Minimum Lane Widths

Typical Cross Section Sheet
Minimum Lane Widths

VAN DORN STREET
STA. 2+00 TO STA. 26+00
(Grading Only)
Minimum Lane Widths

Typical Cross Section Sheet
Minimum Lane Widths

VARES 16'-0" MIN.

0.02'/FT. 0.04'/FT. 0.04'/F

RAMPS A, B, C & D
(Grading Only)
Horizontal Curves

Plan & Profile Sheet
Horizontal Curves

SUPERELEVATION DATA, PLAN 108-R4
Normal Crown STA. 79+10.00
Adverse Crown Removed STA. 79+55.00
Reverse Crown STA. 80+00.00
Reverse Crown STA. 81+59.00
Full Superelevation STA. 82+49.00

P.I. STA. 86+20.99
Δ = 89° 27' 30.85" Rt.
T = 495.30
L = 780.67
R = 500.00
P.C. STA. 82+30.66
P.T. STA. 90+11.33

SUPERELEVATION DATA, PLAN 108-R4
Full Superelevation STA. 89+89.00
Reverse Crown STA. 90+79.00
Adverse Crown Removed STA. 91+24.00
Normal Crown STA. 91+69.00
Horizontal Curves

- **Curve Data**
  - **P. I.** Point of Intersection
  - **Δ** Central Angle
  - **T** Tangent Length
  - **L** Length of Curve
  - **R** Radius
  - **D** Degree of Curve \( (D = 5729.578 / R) \)
  - **P. C.** Point of Curvature
  - **P. T.** Point of Tangency

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<td>Δ</td>
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<td>Rt.</td>
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<tr>
<td>T</td>
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<td>P. C.</td>
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<td>P. T.</td>
<td>STA.</td>
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Basic Plan Reading

✓ Become familiar with project construction plans.
✓ Be able to locate specific items on the plans related to the project.
✓ Be able to write a narrative on why it is important that a County Highway or City Street Superintendent can read and interpret a set of construction plans.
✓ Call in or email any questions, anytime.
   ✓ (402) 472-2180
   ✓ dneary1@unl.edu
Basic Construction Plan Reading

QUESTIONS?