



Geotechnical Aspects of IEBs

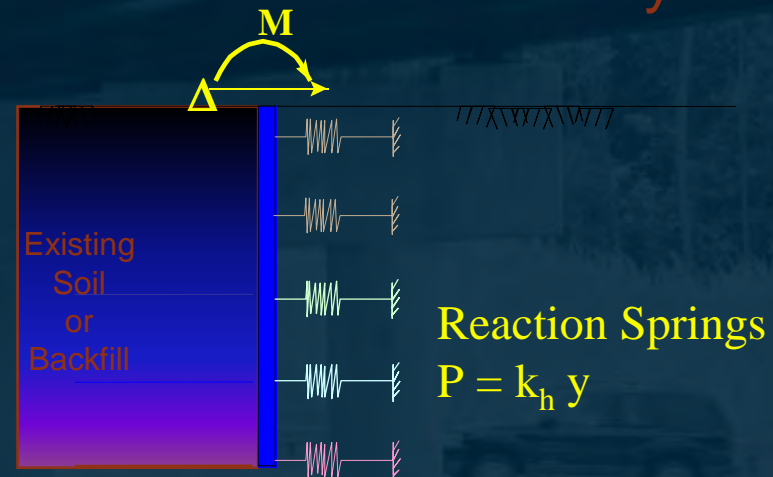
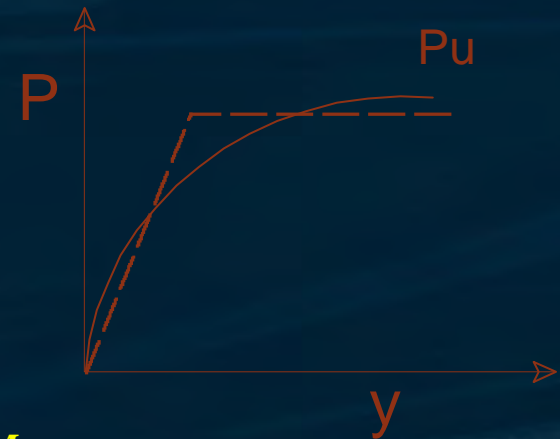
Geotechnical Aspects of IEBs

- Lateral Analysis Required (Soil-Pile Interaction)
- Simplified Approach
- Model Input - LPILE
- Allowable Movement and Moments Required
- Moment and Shear vs. Depth Provided
- Iterations and Interaction
- Rigorous Approach
- Model Input – FB Multiplier
- P-y Curves

Geotechnical Aspects of IEBs

The Concept of P-y Analysis

- Discrete Springs
- Soil-Layering
- Soil Non-linearity
- Soil Geometry
- Shaft Non-linearity
- Relatively Simple



Geotechnical Aspects of IEBs

- LPILE Analysis
- Simple Inputs
- Quick
- Linear or Non-linear

The screenshot displays the LPILE Plus 4.0 software interface. The main window title is "LPILE Plus 4.0 - Acec_integralEB". The menu bar includes File, Data, Options, Computation, Graphics, Tools, Window, and Help. The toolbar contains various icons for file operations and analysis settings.

The "Project Title" section shows the project description: "Integral End Bent Lateral Analysis".

The "Pile Properties" section includes the following input fields:

- Total Pile Length (in): 300
- Number of Increments: 100
- Distance from Pile Top to Ground Surface (in) (negative if pile top is below ground): 0
- Combined Ground Slope and Baker Angles (degrees): 0

The "Pile Sections" table is as follows:

Section	Depth (in)	Diameter (in)	Mom. of Inertia (in ⁴)	Area (in ²)	Mod. of Elasticity (lb/in ²)
1	0	12	393	15.6	30000000
2	300	12	393	15.6	30000000

The "Soil Layers" table is as follows:

Layer	Soil Type	Layer Top (in)	Layer Bottom (in)	Data for Soil
1	Sand (Reese)	0	120	Sand (Free
2	Stiff Clay w/o Free Water (Reese)	120	240	w/o Free W
	Stiff Clay with Free Water (Reese)			

The "Sand (Reese) 1" dialog box shows the following parameters:

1=Top, 2=Bottom	Effective Unit Weight (lbs/in ³)	p-y Modulus k _s (lbs/in ³)	Friction Angle (degrees)
1	0.07	60	30
2	0.07	60	30

The "Stiff Clay w/o Free Water: 2" dialog box shows the following parameters:

1=Top, 2=Bottom	Effective Unit Weight (lbs/in ³)	p-y Modulus k _s (lbs/in ³)	Cohesive Strength c _v (lbs/in ²)	Soil E
1	0.064	500	7	0.007
2	0.064	500	7	0.007

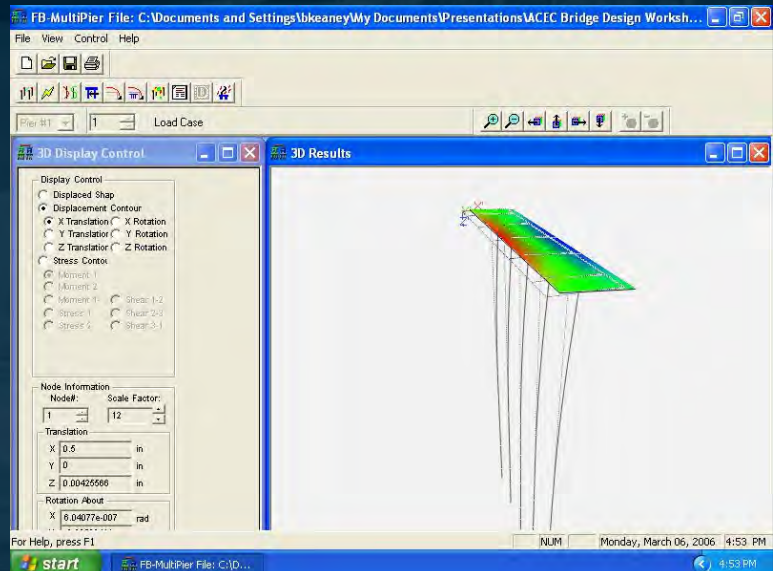
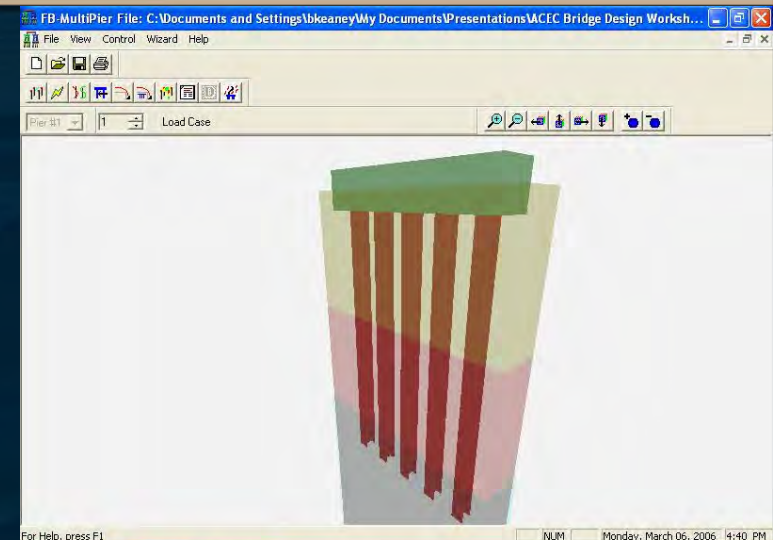
The "Pile-Head Boundary Conditions & Loading" table is as follows:

Pile-Head Fixity Conditions	Condition 1	Condition 2	Axial Load (lb)
1 Displacement (L) & 2 Moment (F)	0.5	1000	120000
1 Displacement(L) & 2 Slope (rad)	0.5	0	120000

The Windows taskbar at the bottom shows the Start button, the LPILE Plus 4.0 application icon, and the system clock displaying 3:54 PM.

Geotechnical Aspects of IEBs

- FB Multiplier Analysis
- Very Detailed
- More Interaction
- Longer



The background of the slide is a dark blue, semi-transparent image of a highway interchange. In the lower right portion, a dark-colored car is visible on the road. The central text is overlaid on a light beige horizontal band.

NCDOT Policy

NCDOT Policy

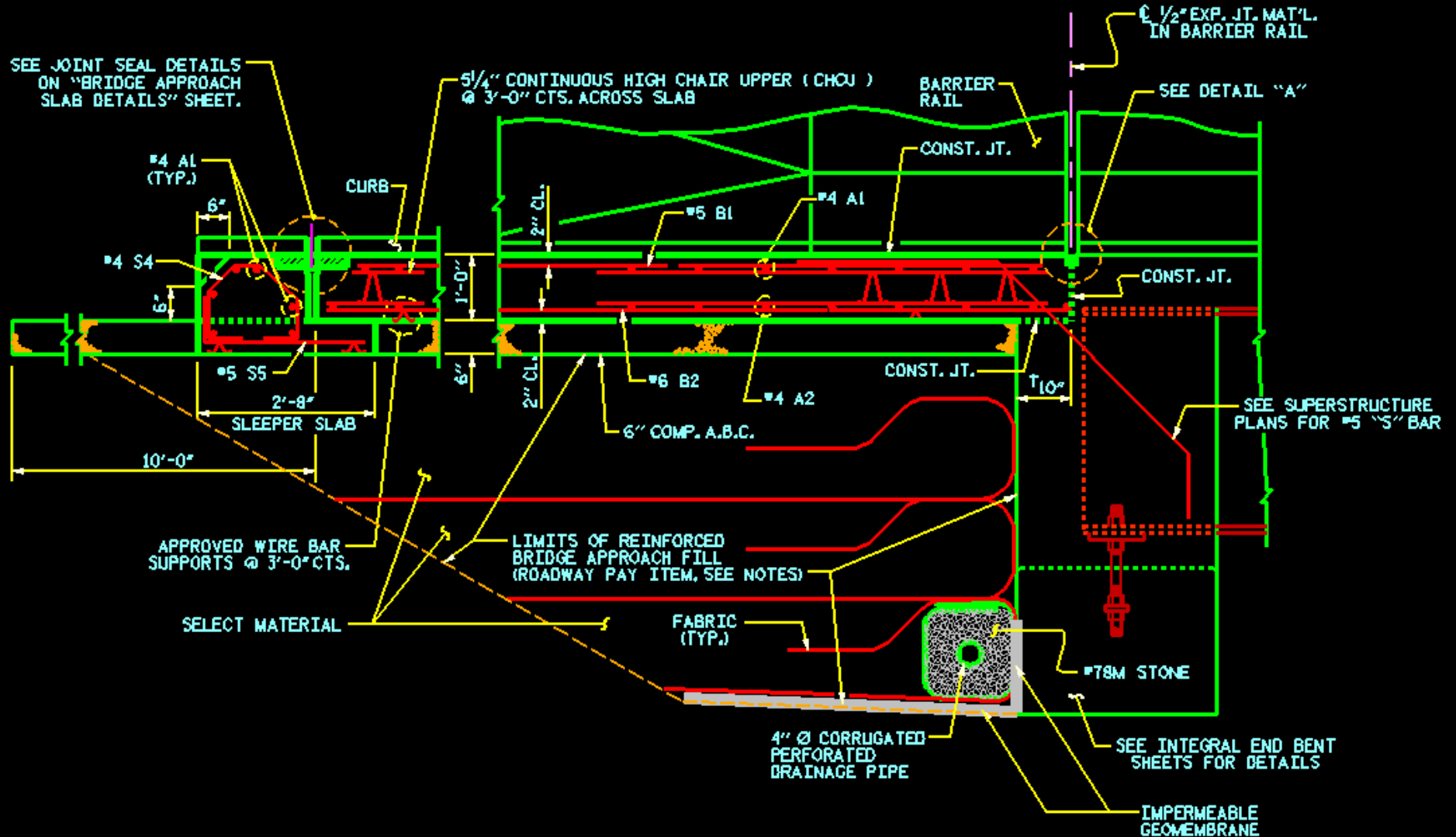
Draft Policy includes:

- Skew Limits
 - $70^{\circ} \leq \text{skew} \leq 110^{\circ}$
- Total Bridge Length Limits
 - 300ft. (91.44m) - steel
 - 400ft. (121.92m) - concrete
- Single Row of Vertical Piles
 - Oriented for bending about the strong axis

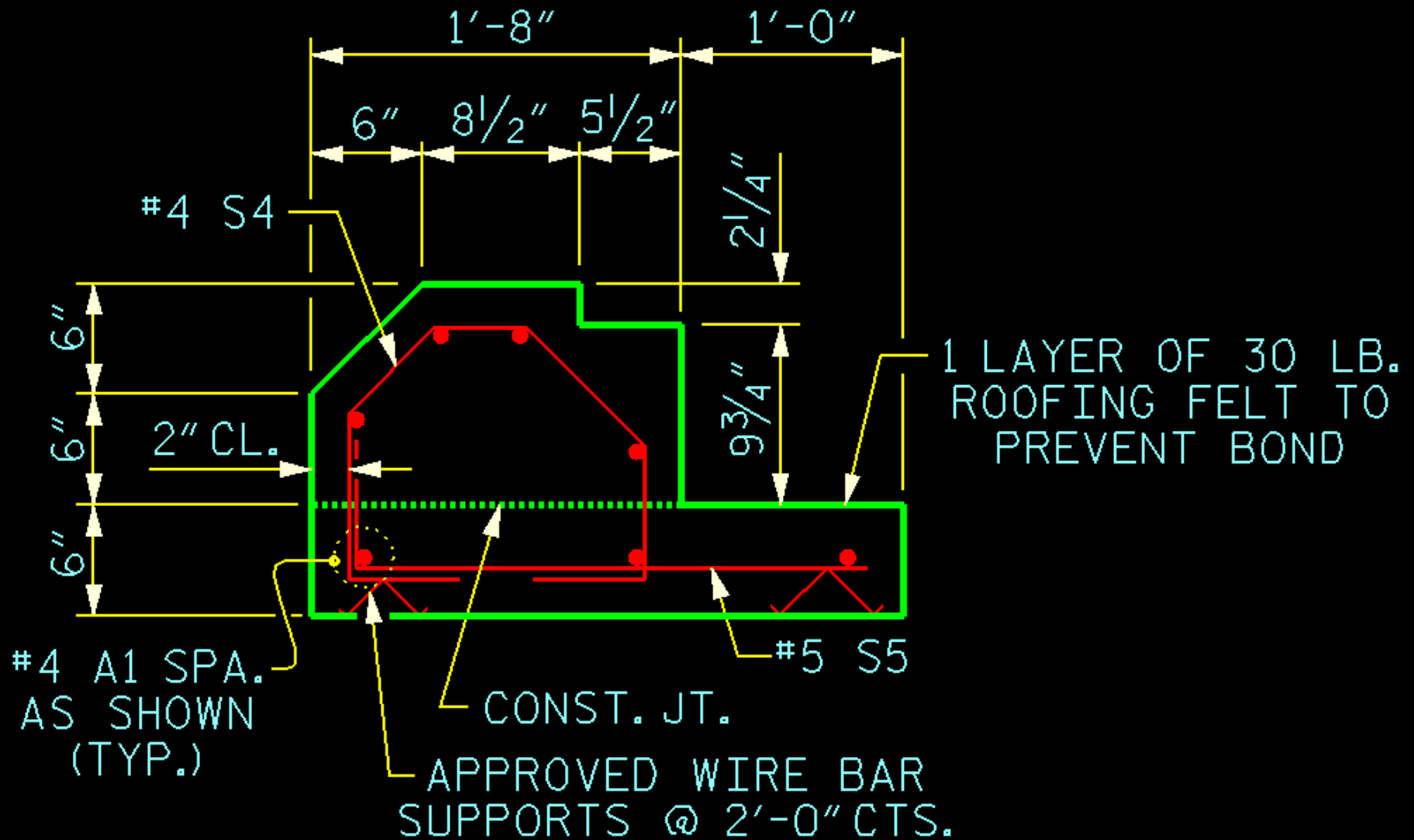
NCDOT Policy

- Wing Walls
 - No brace piles
 - May be tapered to reduce resistance to longitudinal bridge movements
- Tangent Alignment

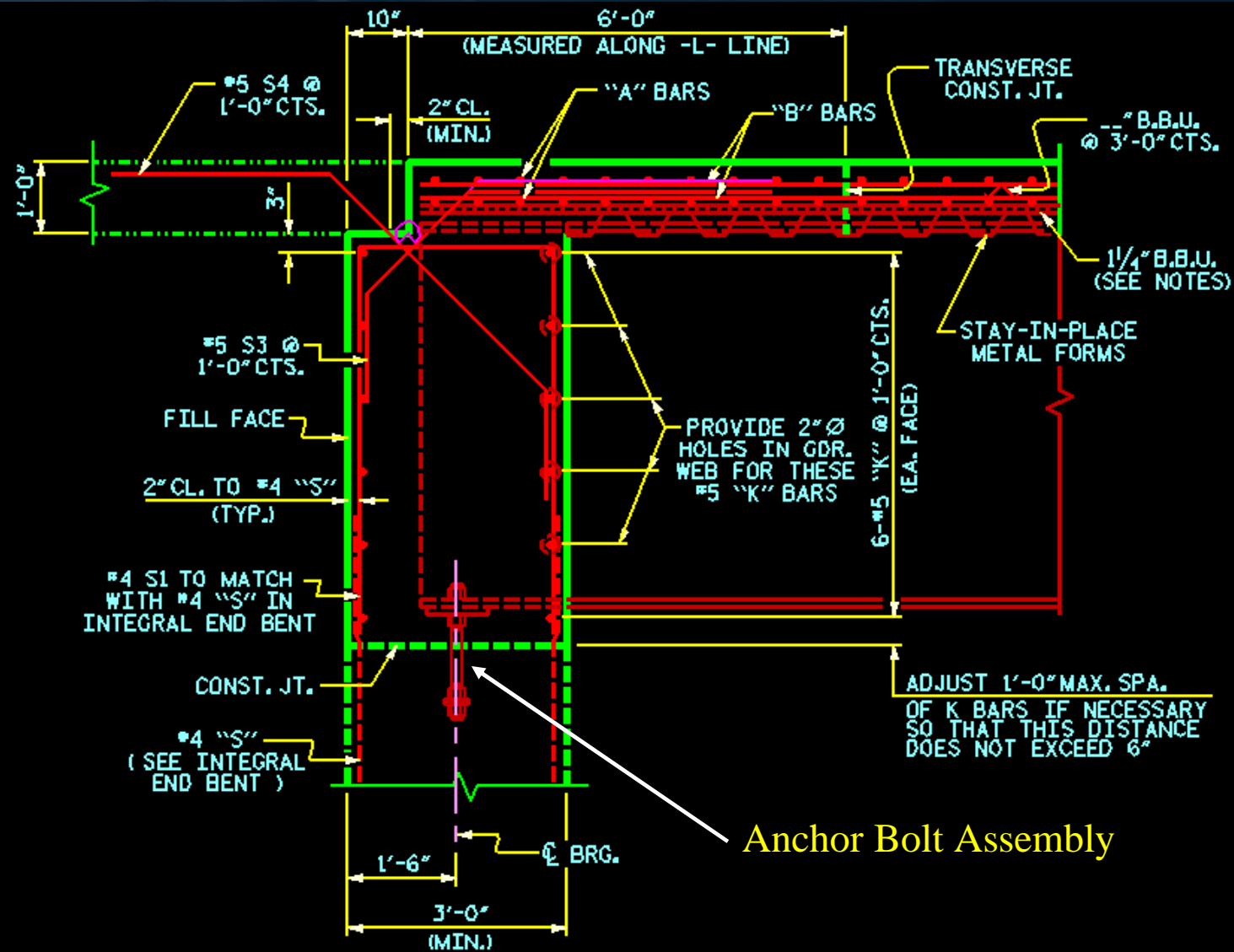
NCDOT Policy – Approach Slab



NCDOT Policy – Sleeper Slab

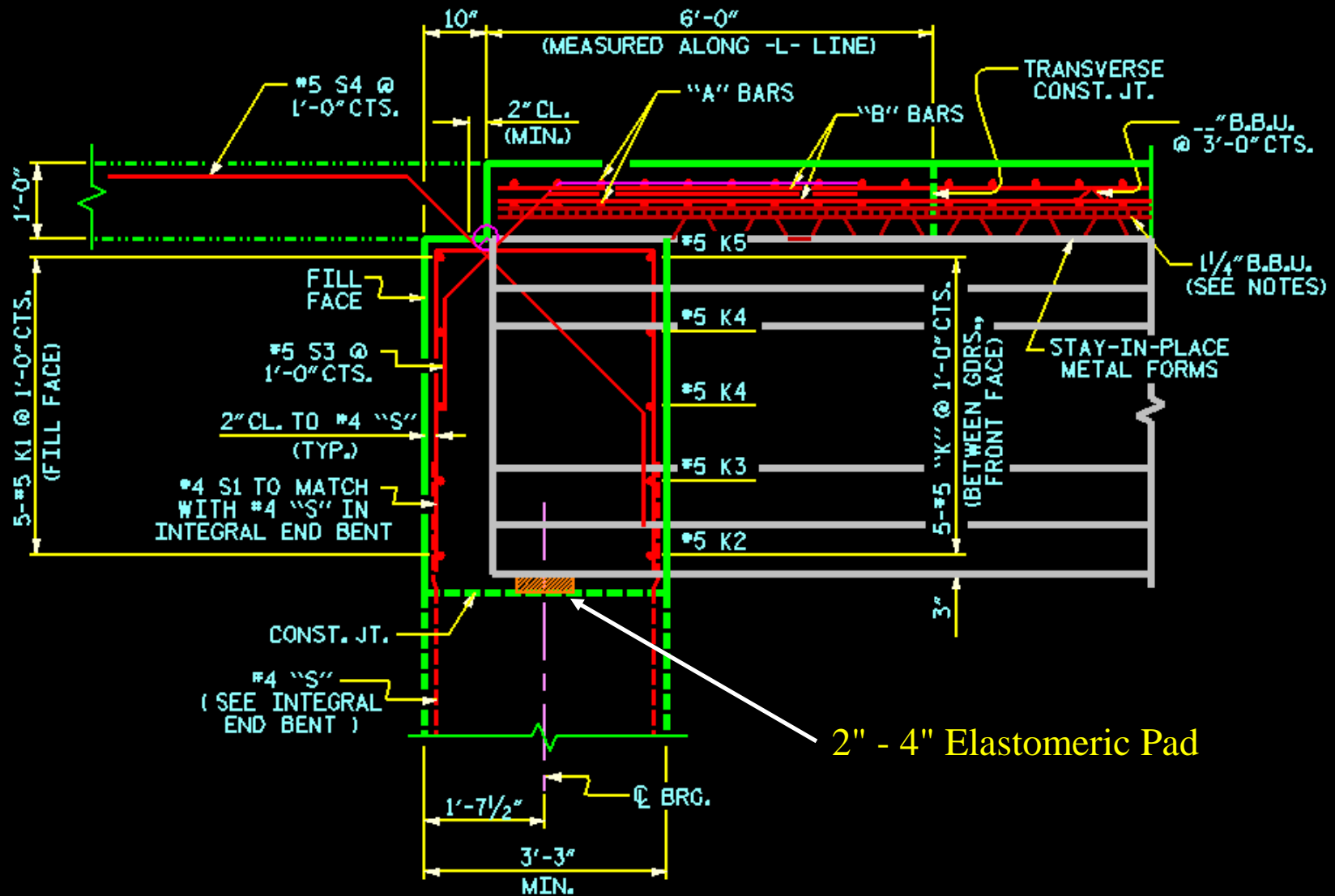


NCDOT Policy – End Bent Steel

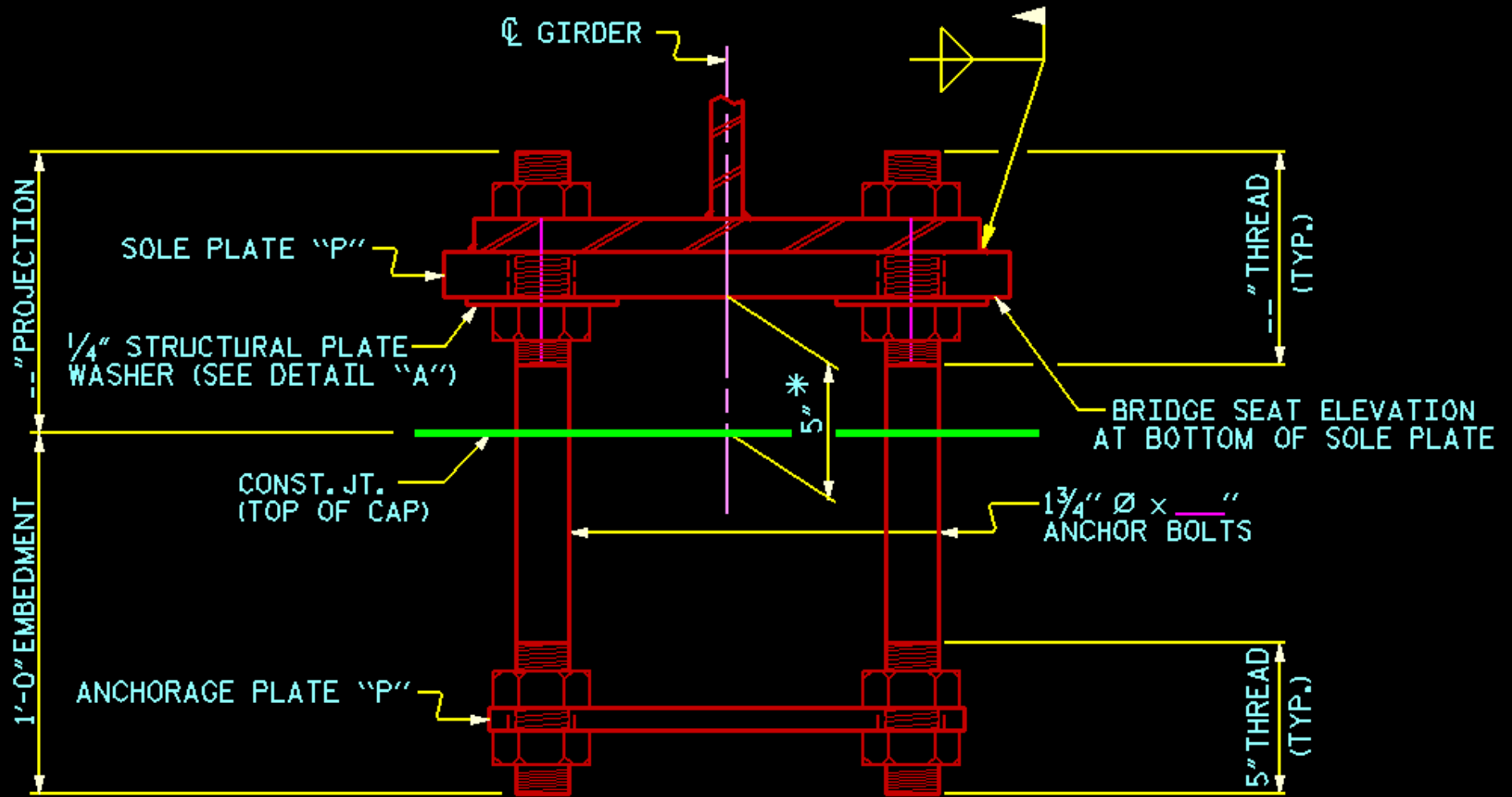


Anchor Bolt Assembly

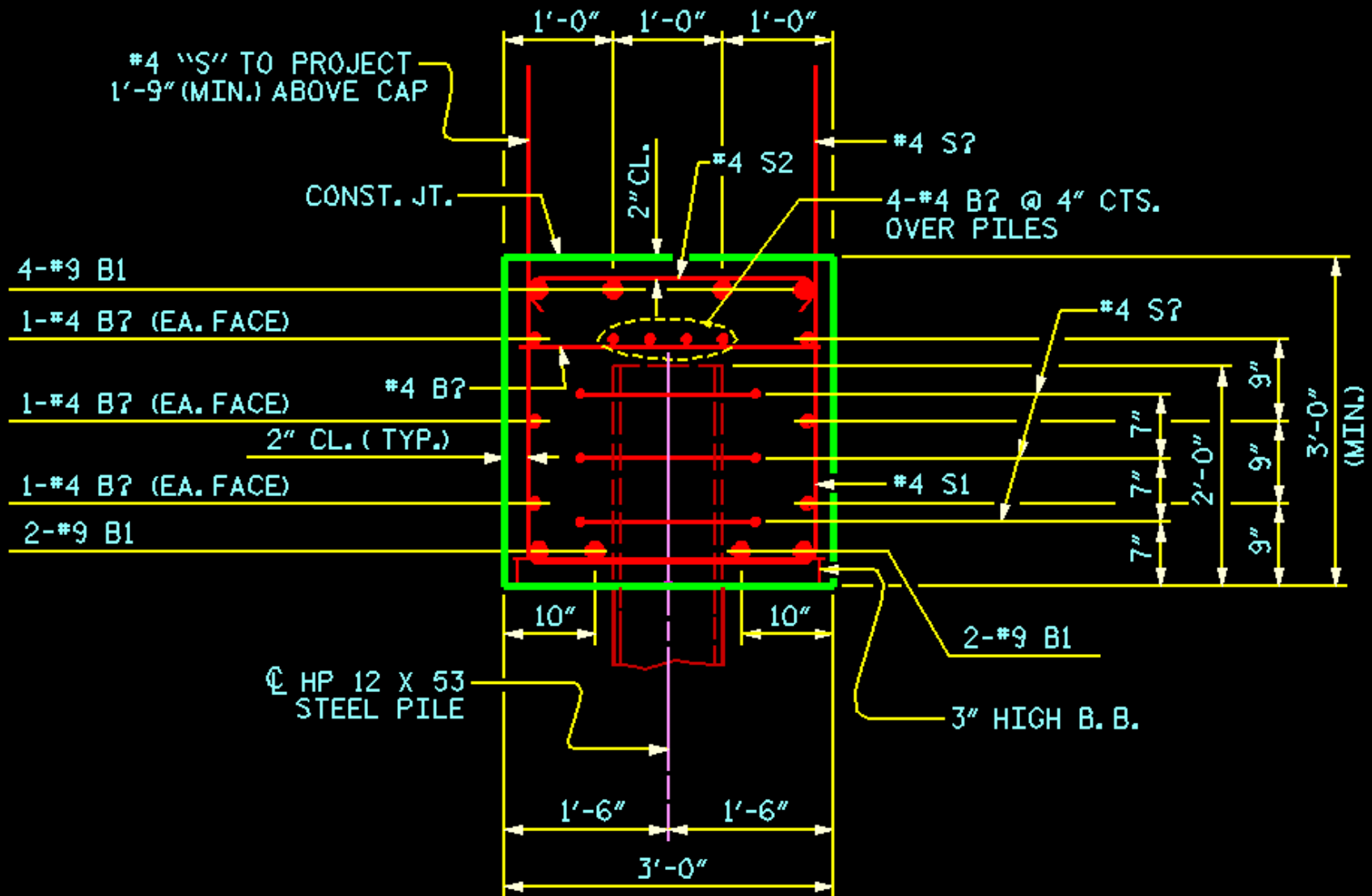
NCDOT Policy – End Bent Concrete



NCDOT Policy – Anchor Bolt Assembly Steel



NCDOT Policy – End Bent Cap





Conclusion

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- Thanks to the speakers
- Plans for future workshops
- Q&A time