NAXSA
North American
Excavation Shoring Association

8th Annual Convention May 4-6, 2022

Shoring Checklist
From Planning to Compliance

Key Steps to a Successful Project

Understanding project scope and collecting accurate information

Recognizing dangers and risks

Interpreting soils & site information

Singling out feasible shoring options

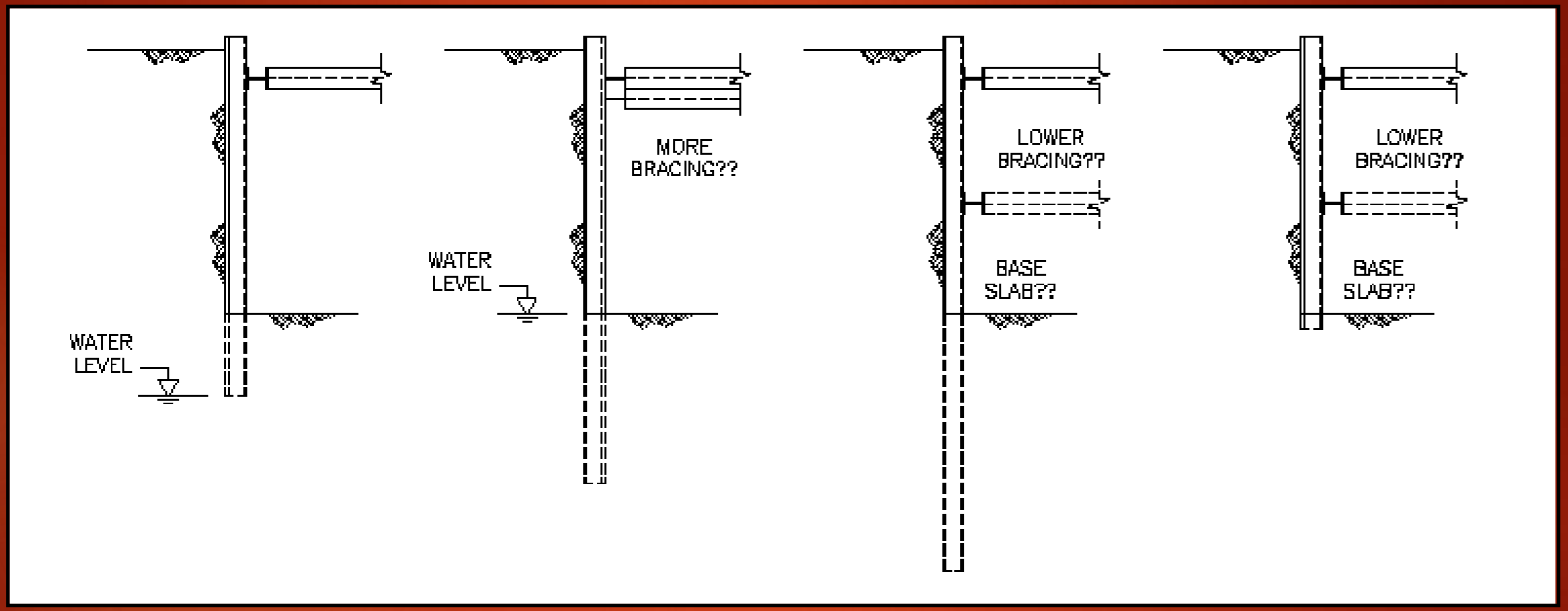
Determining equipment needs and costs

Finalizing shoring paperwork (site specific or tab data)

The challenge of collecting info

“Just give me worst case - I need numbers today - No, I don’t have soils info”

Design for “Worst Case”



Loose dry sand

Loose saturated sand

Soft clays

Solid rock

Apples to Apples

- What is each bidder assuming when told to use “Worst Case”
- Most aggressive (reckless) bidder gets the job
- Once awarded the job
  - Change order approach?
  - Hope for the best?
    - Eat engineering costs
    - Shoring failure
- Having all necessary information levels playing field

Nothing is more important than getting <u>complete and accurate</u> information

Shoring checklists have become the norm, so get customer familiar with them

General Information

Project Name: _____ City, State: _____

What is being constructed: _____

(Pipeline, lift station, etc…) _____

Soils information is available: _____

(Borelogs, Geotech report…) _____

Will contractor dewater to base of cut behind shoring: _____

If not, what are dewatering plans if any: _____

Adjacent building structures: _____

Description and distance from shoring: _____

Adjacent railroad tracks/how many: _____

Distance from centerline of tracks to closest edge of shoring: _____

Any utilities crossing shoring: _____

Depth, size, angle to shoring: _____

Is deflection of shoring a concern (if so, explain): _____

Any special provisions in project specs regarding shoring:

Borelogs

- Depth
  - Elevation
  - Surface
  - Base of cut
- Blow Counts
  - Per 6" vs foot
  - Blow counts for clays
- Groundwater
- Difficult Soils
  - Soft clays
  - Shear strength

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
M. Shubert	8-17-09	8-17-09	1877363.8 ft / 6419767.1 ft	A-09-189
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATI
JET Drilling Inc.			199.12' Lt Sta 2044+97.96	~732 ft
DRILLING METHOD			DRILL RIG	BOREHOLE DIAME
Hollow-Stem Auger			CME 75	6 in
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIEN
Std Cal (2.5"), SPT (1.4")			140 lbs / 30-inch drop	76%
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING / AFTER DRILLING (DATE)	TOTAL DEPTH OF E
Backfilled with grout.			Dry	26.5 ft

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		CONCRETE.												Boring drilled in roadway (Street).
	1		SILTY SAND (SM); loose; brown; moist; medium to fine SAND; no cementation [FILL].												
730.0	2				S01	4 4 8	12			9	95				DS
	3														
728.0	4		SANDY SILT (ML); stiff; brown; moist; trace fine GRAVEL; about 40% fine SAND; about 60% fines.												
	5				S02	3 3 6	9			13					PA
726.0	6														
	7														
724.0	8														
	9		SILTY SAND (SM); medium dense; brown; moist; fine SAND [ALLUVIUM].												
722.0	10				S03	7 11 18	29			9	95				
	11														

Geotechnical Reports

KLEINFELDER
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upper few feet of the excavation. Where voids do occur behind the trench shield, they should be backfilled with pea gravel or a compacted backfill material to maintain the stability of the soils behind the shield.

It is our opinion that trench shield shoring is applicable at the above mentioned locations. The excavation walls are expected to stand long enough to facilitate excavation, installation of shields and back-loading without significant raveling and/or caving. Care must be taken during construction that installation of the proposed trench shield shoring system does not allow caving or sloughing that would cause damage to any existing improvements. If significant caving or sloughing occurs below the trench shield as the excavation is advanced, alternative shoring methods should be considered.

In level ground conditions, we recommend shoring for braced excavations should be designed based on a uniform pressure of 27H (psf), where H is the depth of the supported excavation in feet. An additional uniform lateral surcharge load of 100 psf should be assumed where traffic will be adjacent to the excavation. For heavy equipment loads (assumed 485 psf equivalent vertical surcharge load), a uniformly distributed lateral load of 160 psf should be assumed for design. Other surcharge loads should be determined based on a lateral pressure coefficient of 0.33 and in accordance with the recommendations contained in the Caltrans Trenching and Shoring Manual (2000). A minimum factor of safety of 1.25 should be included in the design.

The trench shields proposed at this location include Model Numbers TS834 and TS1145. We have reviewed the design calculations provided and concur that these trench shields are appropriate for support of the anticipated earth loads.

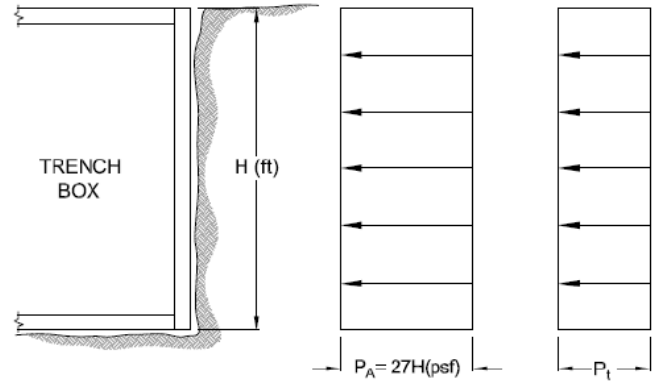
Reference:

Caltrans (2000), Trenching and Shoring Manual, Rev. 12, Division of Structure Construction, January.

Attachments:

- Figure 1 Temporary Shoring Design Earth Pressure
- Geological and Field Exploration Map
- Boring Logs
- Trench Shield Shoring Design Calculations

FILL/ALLUVIUM TEMPORARY SHORING DESIGN



NOTES:

1. TRAFFIC SURCHARGE (P_t) SHOULD EQUAL 100 PSF UNDER NORMAL TRAFFIC LOADS. P_t SHOULD EQUAL 160 PSF IF CONSTRUCTION EQUIPMENT IS EXPECTED ADJACENT TO SHORING BOX.
2. ALL OTHER SURCHARGES SHOULD BE ESTIMATED USING BOUSSINESQ OR OTHER METHODS RECOMMENDED IN THE CALTRANS TRENCHING AND SHORING MANUAL (2000).

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Project No.: 113062	**Temporary Shoring Design Earth Pressure Utility Trench Excavation**	Figure 1
Drawn by: HL		
Date: 07-18-11		
Checked by: EP	I-405 Sepulveda Pass HOV Stations between 2035+00 and 2060+00 Los Angeles, California	
Date: 07-18-11		

General Information

Project Name: _____ City, State: _____

What is being constructed: _____

(Pipeline, lift station, etc…) _____

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Adjacent railroad tracks/how many: _____

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Any special provisions in project specs regarding shoring:

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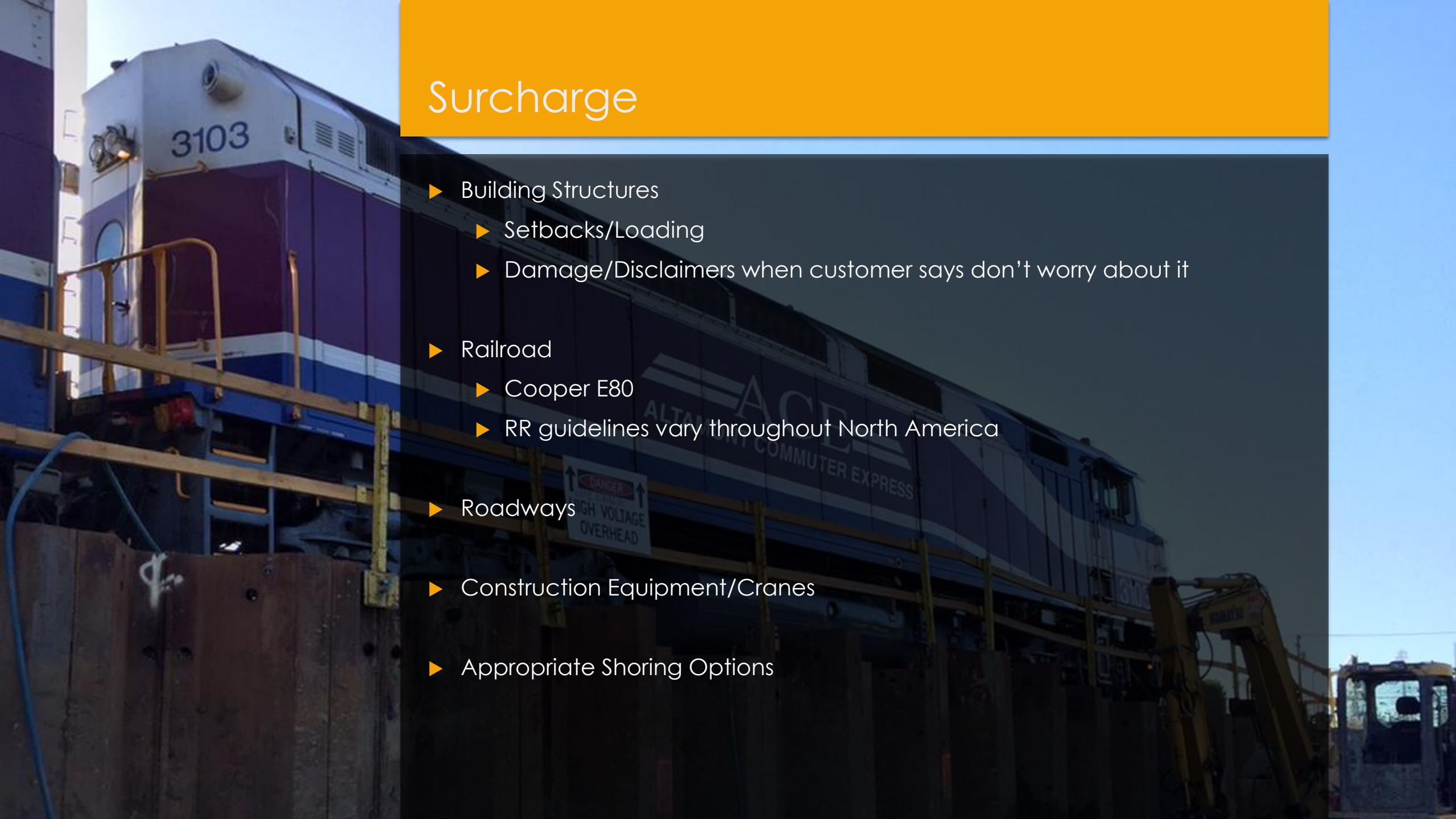
Depth, size, angle to shoring: _____

Is deflection of shoring a concern (if so, explain): _____

Any special provisions in project specs regarding shoring:

Surcharge



- Building Structures
  - Setbacks/Loading
  - Damage/Disclaimers when customer says don't worry about it
- Railroad
  - Cooper E80
  - RR guidelines vary throughout North America
- Roadways
- Construction Equipment/Cranes
- Appropriate Shoring Options

General Inform

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Any special provisions in project specs regarding shoring:

Trench Questions

Max cut depth: _____

If benching - Total cut depth: _____

If benching - Shored depth: _____

What is being constructed: _____

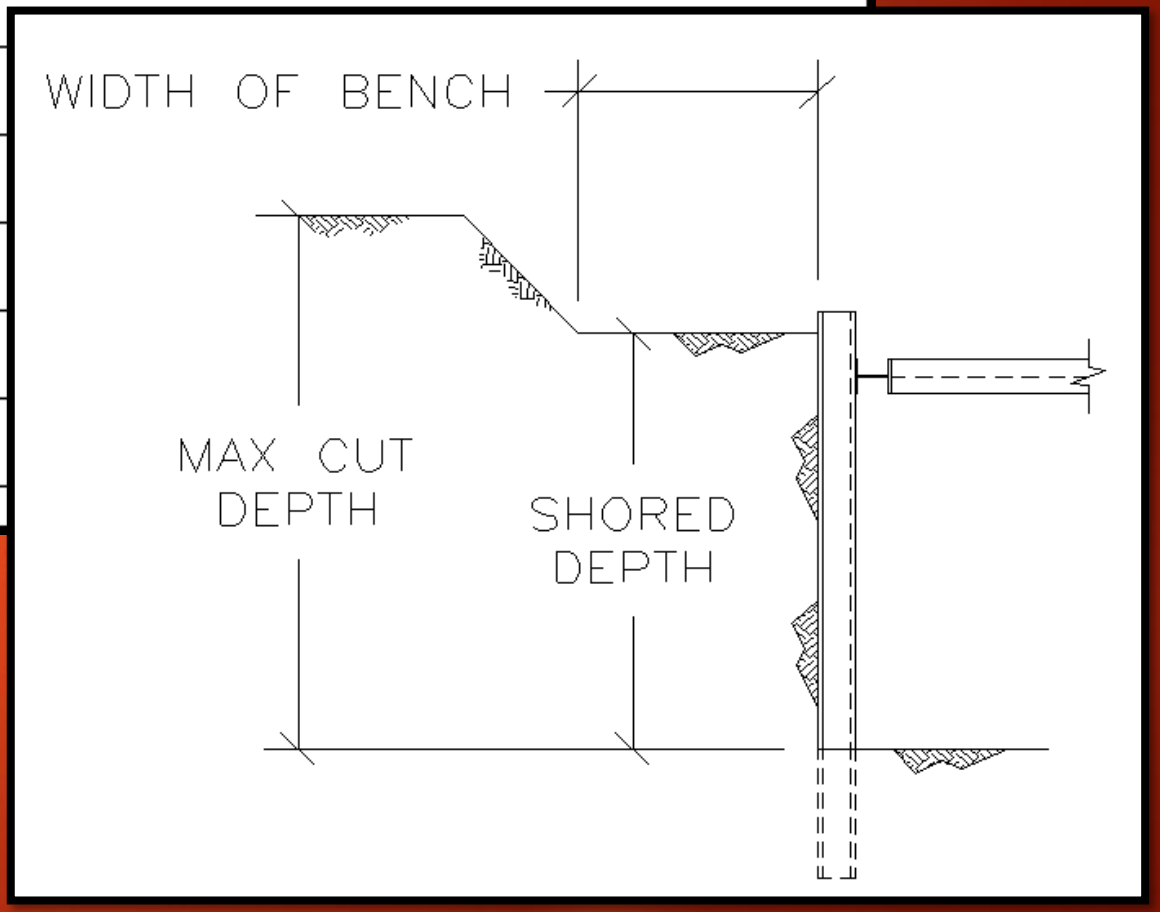
Width of trench: _____

Required horizontal clearance between struts: _____

Required vertical clearance from base of trench: _____

Pouring base slab or can sacrificial struts be used: _____

Preferred shoring or equipment: _____



Linear Wall Questions

Max cut depth: _____

What is being constructed: _____

If benching - Total cut depth: _____

If benching - Shored depth: _____

Length of wall or walls: _____

Preferred shoring or equipment: _____

Pit Questions

Max cut depth: _____ What is being constructed: _____

If benching - Total cut depth: _____ If benching - Shored depth: _____

Outside dimensions of structure/base slab: _____

Min inside clearance required to shoring: _____

Can bracing be phased and removed as soil is backfilled against structure: _____

Lift height of wall placement (if applicable for phasing:) _____

Preferred shoring or equipment: _____

Bore Pit Questions

Max cut depth: _____ What is being constructed: _____

If benching - Total cut depth: If benching - Shored depth: _____

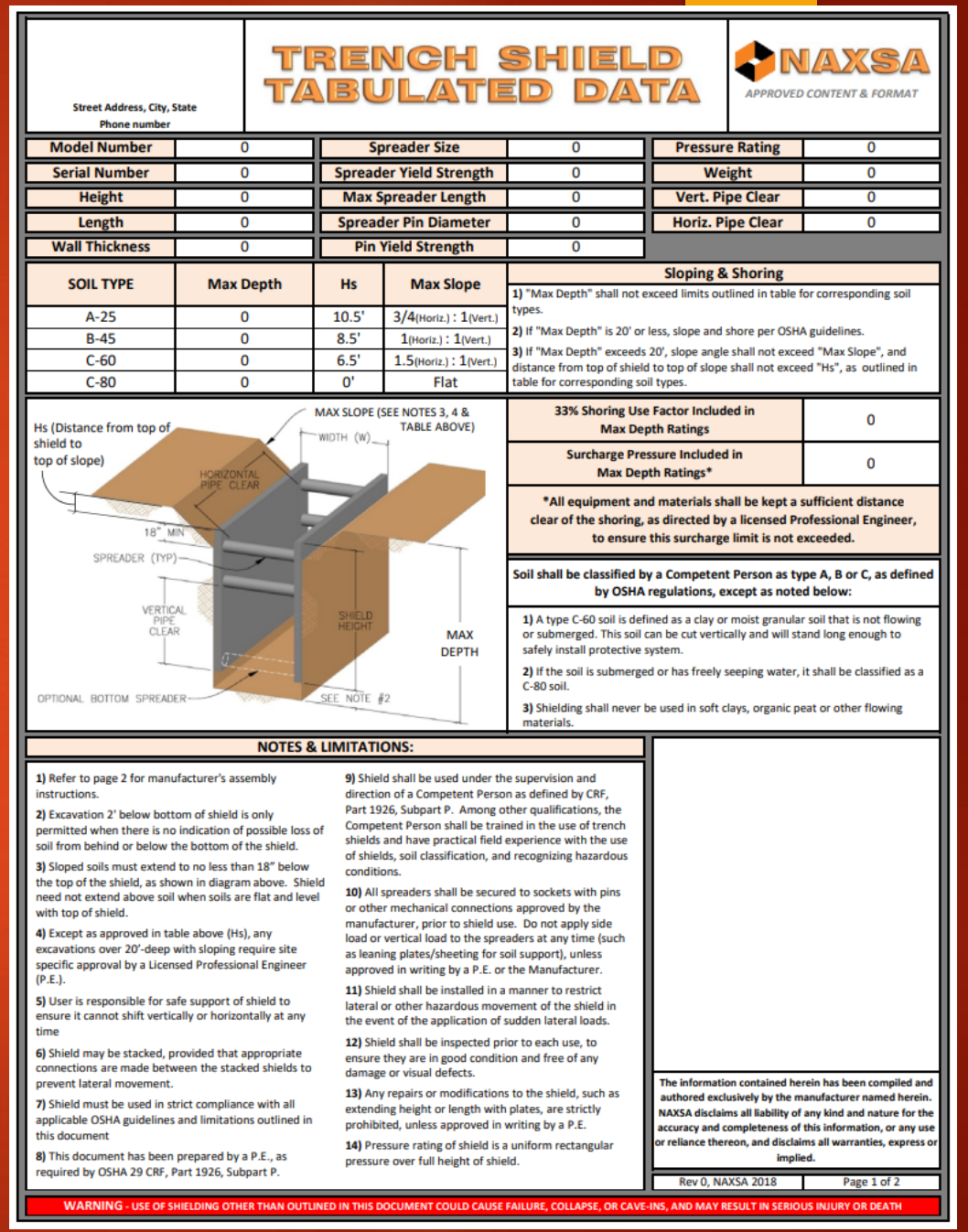
Required vert. clear: _____ Required horizontal clear: _____

Is base slab or base rock being placed: _____

Preferred shoring or equipment: _____

Tabulated Data

- Depth Rating
  - OSHA
    - A, B, C-60, C-80
    - Very conservative as contractors are evaluating soils on their own
  - Site specific advantage
    - Often the calculated "site specific" load is as much on the order of half that of C soil loading
- Certification letters
- Complex tabulated data



Street Address, City, State
Phone number

TRENCH SHIELD TABULATED DATA

NAXSA
APPROVED CONTENT & FORMAT

Model Number	0	Spreader Size	0	Pressure Rating	0
Serial Number	0	Spreader Yield Strength	0	Weight	0
Height	0	Max Spreader Length	0	Vert. Pipe Clear	0
Length	0	Spreader Pin Diameter	0	Horiz. Pipe Clear	0
Wall Thickness	0	Pin Yield Strength	0		

SOIL TYPE	Max Depth	Hs	Max Slope
A-25	0	10.5'	3/4(Horiz.) : 1(Vert.)
B-45	0	8.5'	1(Horiz.) : 1(Vert.)
C-60	0	6.5'	1.5(Horiz.) : 1(Vert.)
C-80	0	0'	Flat

Sloping & Shoring

1) "Max Depth" shall not exceed limits outlined in table for corresponding soil types.

2) If "Max Depth" is 20' or less, slope and shore per OSHA guidelines.

3) If "Max Depth" exceeds 20', slope angle shall not exceed "Max Slope", and distance from top of shield to top of slope shall not exceed "Hs", as outlined in table for corresponding soil types.

33% Shoring Use Factor Included in Max Depth Ratings	0
Surcharge Pressure Included in Max Depth Ratings*	0

***All equipment and materials shall be kept a sufficient distance clear of the shoring, as directed by a licensed Professional Engineer, to ensure this surcharge limit is not exceeded.**

Soil shall be classified by a Competent Person as type A, B or C, as defined by OSHA regulations, except as noted below:

1) A type C-60 soil is defined as a clay or moist granular soil that is not flowing or submerged. This soil can be cut vertically and will stand long enough to safely install protective system.

2) If the soil is submerged or has freely seeping water, it shall be classified as a C-80 soil.

3) Shielding shall never be used in soft clays, organic peat or other flowing materials.

NOTES & LIMITATIONS:

1) Refer to page 2 for manufacturer's assembly instructions.

2) Excavation 2' below bottom of shield is only permitted when there is no indication of possible loss of soil from behind or below the bottom of the shield.

3) Sloped soils must extend to no less than 18" below the top of the shield, as shown in diagram above. Shield need not extend above soil when soils are flat and level with top of shield.

4) Except as approved in table above (Hs), any excavations over 20'-deep with sloping require site specific approval by a Licensed Professional Engineer (P.E.).

5) User is responsible for safe support of shield to ensure it cannot shift vertically or horizontally at any time

6) Shield may be stacked, provided that appropriate connections are made between the stacked shields to prevent lateral movement.

7) Shield must be used in strict compliance with all applicable OSHA guidelines and limitations outlined in this document

8) This document has been prepared by a P.E., as required by OSHA 29 CRF, Part 1926, Subpart P.

9) Shield shall be used under the supervision and direction of a Competent Person as defined by CRF, Part 1926, Subpart P. Among other qualifications, the Competent Person shall be trained in the use of trench shields and have practical field experience with the use of shields, soil classification, and recognizing hazardous conditions.

10) All spreaders shall be secured to sockets with pins or other mechanical connections approved by the manufacturer, prior to shield use. Do not apply side load or vertical load to the spreaders at any time (such as leaning plates/sheeting for soil support), unless approved in writing by a P.E. or the Manufacturer.

11) Shield shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

12) Shield shall be inspected prior to each use, to ensure they are in good condition and free of any damage or visual defects.

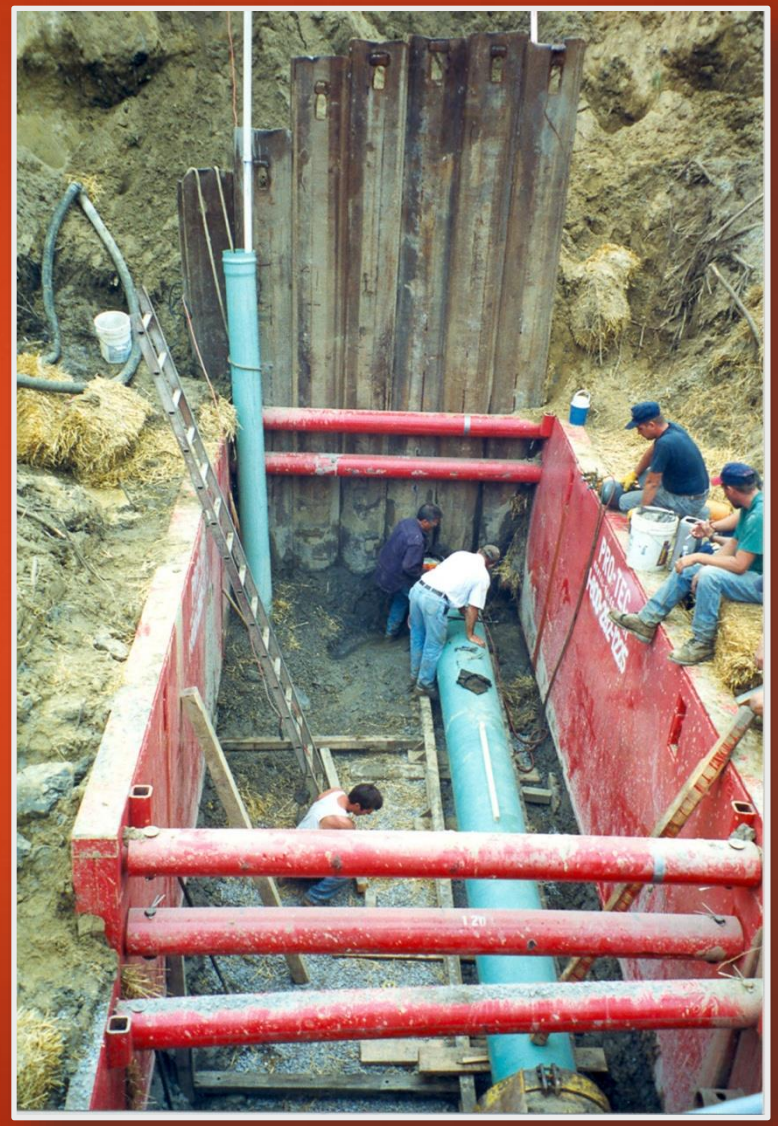
13) Any repairs or modifications to the shield, such as extending height or length with plates, are strictly prohibited, unless approved in writing by a P.E.

14) Pressure rating of shield is a uniform rectangular pressure over full height of shield.

WARNING - USE OF SHIELDING OTHER THAN OUTLINED IN THIS DOCUMENT COULD CAUSE FAILURE, COLLAPSE, OR CAVE-INS, AND MAY RESULT IN SERIOUS INJURY OR DEATH

Tabulated Data

- What voids tab data
  - Surcharges is most common
    - NAXSA setback table?
  - End plating on spreaders
  - Side plating on shields
  - Sloping exceeding 20' deep
  - Spreader length
- Responsibility to customer
  - Don't turn blind eye to non-compliance as you are responsible and liable



Don’t Be Intimidated to Ask

- Engineers
  - Call us as we are happy to help, and if tab data is the solution, we will always guide you there
- NAXSA
  - Be involved and make sure we are bringing training and content that is beneficial to YOU
- Experienced co-workers
  - You are likely surrounded (in this room or at your company) by people that have been in the industry for decades and are happy to help!


Questions?