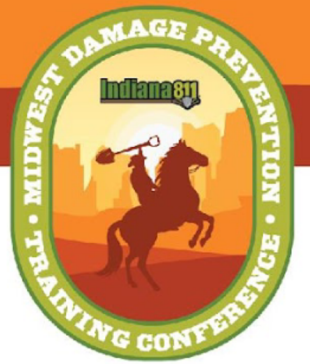
2022

MIDWEST DAMAGE PREVENTION TRAINING CONFERENCE

Good Dirt !

Trenching and Excavation Safety

AUDIOVISUAL SERVICES
PROVIDED BY



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ON THE SPOT
UTILITY RESOURCES LLC

Objectives

- Soil mechanics and classification
- Protective systems
- Other specific requirements of the excavation standard

Trenching Fatalities

❖22 fatalities first 6 months of 2022 – more than all of 2021

❖July 2022 -- OSHA launched enhanced enforcement initiatives to protect workers from hazards in trenching/excavation which includes

-- more trenching inspections

-- evaluation of penalties related to trenching

-- criminal referrals to state or federal prosecutors

2021

<u>Federal</u>
1053 citations --- over 6.1 million $ in fines

Center for Construction Research and Training and United Rentals – 2019 Trench Survey

Which of the following do you believe are the biggest contributors to trench incidents or collapses?

- Lack of training on trench safety (i.e., inspections, hazards) --- 67%
- Trying to stay on schedule/production --- 66%
- Indifference (i.e., it won't happen on my watch --- 58%
- Lack of knowledge of the OSHA 1926.650 trenching and excavation standard (i.e., requirements, soil analysis, and protective system solutions) 52.2%
- Tight budgets (i.e., didn't estimate into job costs) --- 34.5%
- Language barriers --- 21.3%
- Other --- 8.4%

Excavation – any man-made cut, cavity, trench, or depression in the earths surface formed by earth removal

Trench – narrow excavation made below the surface of the ground. Generally, depth is greater than the width but the width is not greater than 15 feet.

What is soil ?

- Mixture of small particles of gravels, sand, clay, silt, dirt
- Water
- Air
- Organic material (dead leaves and plants – animals) humus

Soil strength is dependent upon:

- Type of soil
- Amount of moisture in the soil
- Whether the soil has been previously disturbed.
- Surcharge loads

COHESIVE SOIL

- Soil with a high clay content which has cohesive strength
- It does not crumble
- It can be excavated with vertical side slopes
- It is hard to break up when dry
- It can be molded
- It exhibits significant cohesion even when submerged

Granular Soil

- Soils that include gravel, sand, silt
- Very low clay content
- It has no cohesive strength
- Some moist granular soils exhibit apparent cohesion
- It cannot be molded when moist and crumbles easily when dry

Saturation is the amount of water that the soil is currently holding.

Complete saturation is much less stable than soil that is only slightly damp.

However, soil with no water content is unstable

Cohesiveness is how well the soil sticks together.

The more it sticks together, the more stable the trench walls will be.

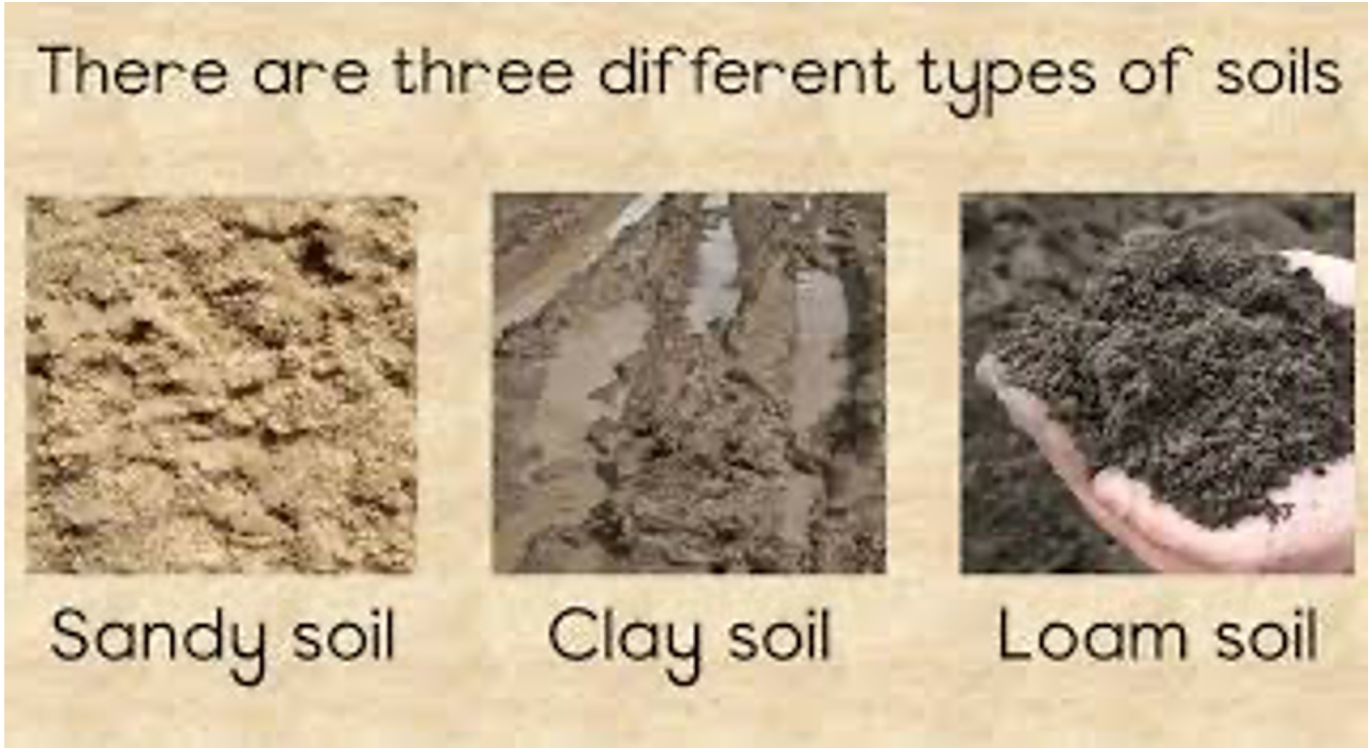
Soil Types

STABLE ROCK

TYPE A

TYPE B

TYPE C



Stable Rock

A natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Type A Soil = unconfined compressive strength of 1.5 TSF or greater

Clay, silty clay, clay loam, and cemented soils

Not Type A if:

- Subject to other factors that would require it to be classified as a less stable material
- Fissured / cracks
- Subject to vibration
- Previously disturbed

Type B Soil = unconfined compressive strength greater than .5 TSF but less than 1.5 TSF

- Granular soils, gravel, silt, loam, or sandy loam
- Soil that meets Type A but is fissured or subject to vibration.
- Some previously disturbed soils

Type C Soil = unconfined compressive strength of 0.5 TSF or less

- Granular soils, gravel, sand, and sandy loam
- Submerged soil or soil from which water is freely seeping
- Previous disturbed soil

Classification of soil

- Soils need to be classified by a competent person
- The classification shall be made based on the results of at **least one visual and one manual analysis** conducted by a competent person

Competent Person = capable of recognizing existing and predictable hazards in excavation work and able to take prompt corrective measures. One must have specific training in and be knowledgeable about soils analysis, the use of protective systems, and the requirements of the standard.

Acceptable visual tests - observations

- Determine qualitative information on site in general
- Soil adjacent to excavation and excavated material
- Soil forming the sides of the open excavation
- Estimate range of particle sizes - If the soil remains in clumps, it is cohesive; if it appears to be coarse-grained sand or gravel that does not clump, it is considered granular.
- Observe evidence of surface water
- Water seeping from the sides
- Location of the level of the water table

Visual observations

- Evidence of previously disturbed soil -- look for existing utilities or other underground structures that indicate that the soil has previously been disturbed
- Check for **surcharging** and the spoil distance from the edge of the excavation.
- Check for crack-line openings along the failure zone that would indicate tension cracks
- Signs and sources of vibration that may affect stability

Acceptable manual tests

- Plasticity
- Ribbon and thread test
- Dry strength test
- Thumb penetration test
- Pocket pentrometer
- Hand-operated shearvane

Dry Strength Test

- If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder it is granular (sand or silt).
- If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty it is a fissured clay.
- If the dry soil breaks into clumps which do not break up into smaller clumps and which can only be broken with difficulty it may be an intact clay, provided the visual examination of the trench and its vicinity did not give any indication of fissures.

Thumb Penetration Test

- The thumb penetration procedure involves an attempt to press the thumb firmly into the soil in question.
- If the thumb makes an indentation in the soil only with great difficulty, the soil is probably Type A.
- If the thumb penetrates no further then the length of the thumb nail, it is probably Type B soil.
- If the thumb penetrates the full length of the thumb it is Type C soil.

The Ribbon Test

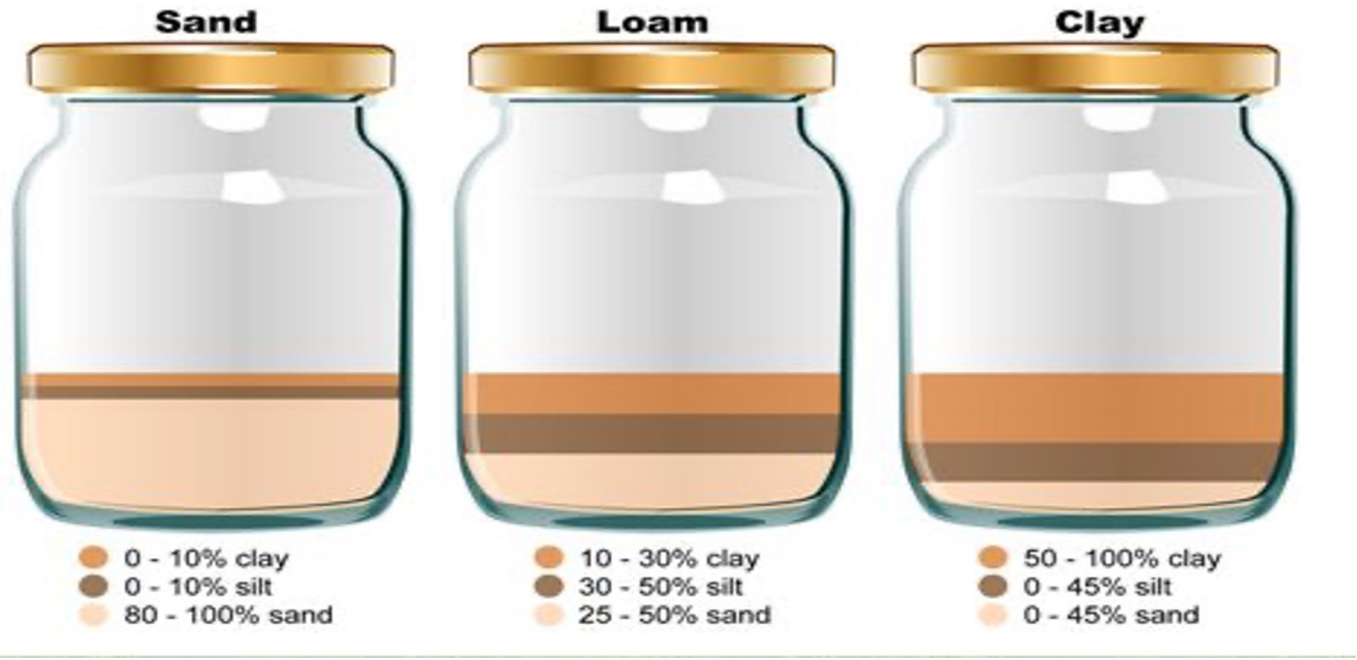
- Roll into cylindrical shape 1/2 to 3/4 inch diameter
- Lay across palm of hand
- Press between thumb and second joint of index finger
- Pass through thumb
- Squeeze until it takes the shape of a 1/8 to 1/4 inch thick strip
- Allow to hang freely from hand
- Clay loam will barely ribbon and break easily
- Clay = relatively long ribbon 6 to 8 inches or more
- More clay = longer and stronger ribbon
- Silt has tendency to produce short ribbon with broken appearance

Plasticity or Penciling

If a 2 inch or longer thread can be held without breaking, the soil is cohesive.

Field Sedimentation Test

- Glass jar
- 1 1/2 to 2 inches of soil in jar
- 5 inches of water on top of soil
- Shake, set down, twist jar

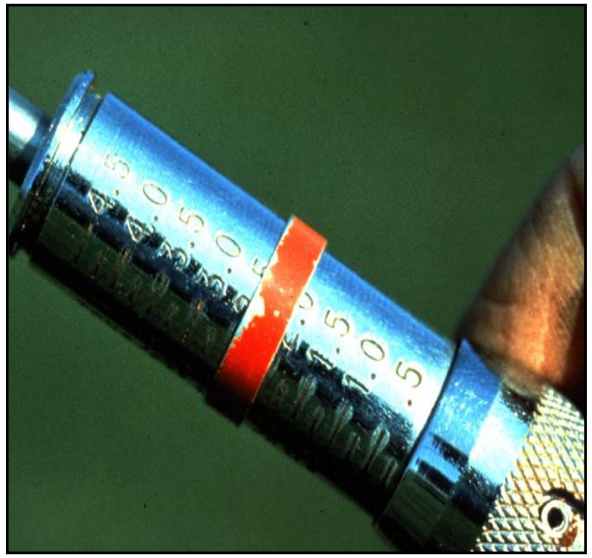


Torvane – Shear Strength

- Measures the soil shear strength or shear stress the soil can maintain without experiencing failure or cave in
- Failure can be defined as the maximum principal stress difference, which is the same as the (unconfined) compressive strength
- Shear strength is typically ½ of the unconfined compressive strength.

Pocket Penetrometer Test

- Measures unconfined compressive strength
- Amount of pressure in tons per square foot (tsf) required to cause the soil to fail in compression.
- Each foot of depth adds more side pressure. Once the pressure exceeds the ability of the soil to support itself, failure will occur. The amount of force required to cause this failure is called the **unconfined compressive strength** of the soil.



Soil

- Cubic foot of soil weighs 100 to 140 pounds
- A cubic yard of soil can weigh 2700 - 3200 pounds ----- 1 to 1 ½ tons

One Cubic Yard of Soil

=

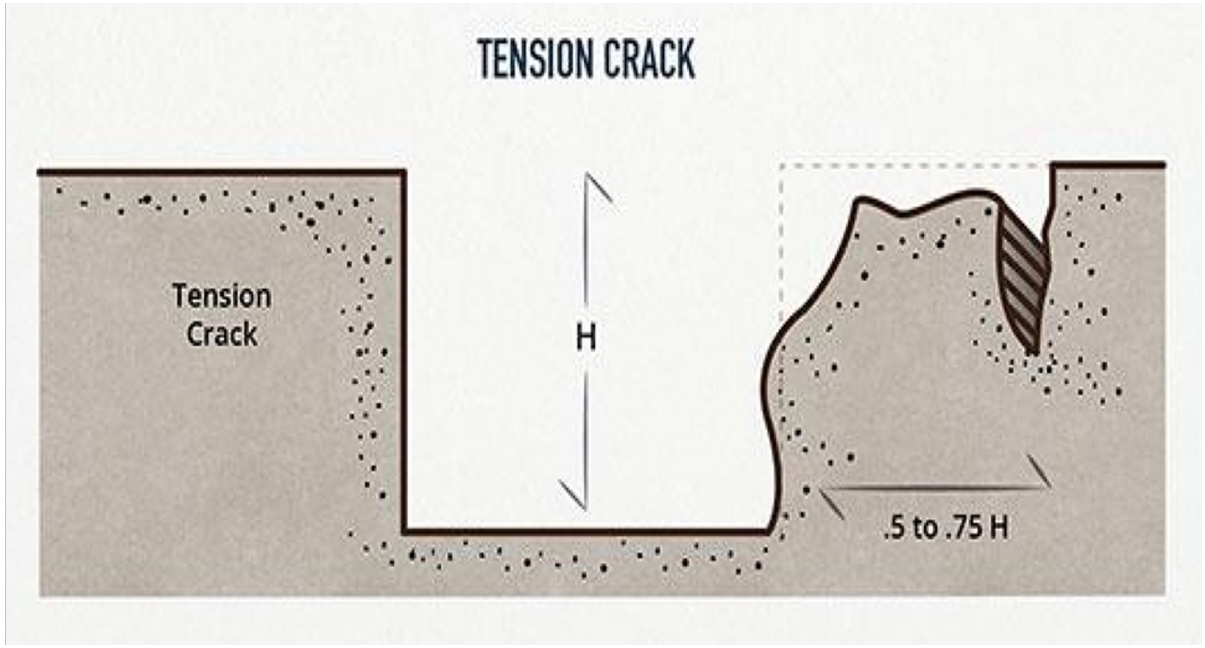
Automobile

What Is a Cave-in ?

- Soil or rock suddenly falls or slides into an excavation
- The weight of the soil causes it to gravitate downward and the pressure pushes soil inward toward the trench
- A cave-in occurs anytime the strength of the soil is overcome by the weight of the soil.

Tension Cracks

- Tension cracks usually form at a horizontal distance of 0.5 to 0.75 times the depth of the trench, measured from the top of the vertical face of the trench



- A shear wall collapse speed can be 45 mph
- The speed of collapsing dirt is often less than 1/10th of a second

Protective systems

1926.652(a)(1) -- Employees have to be protected from cave-ins in accordance with paragraphs (b) or (c) unless in stable rock or less than 5 feet and when there is no indication of a potential cave-in

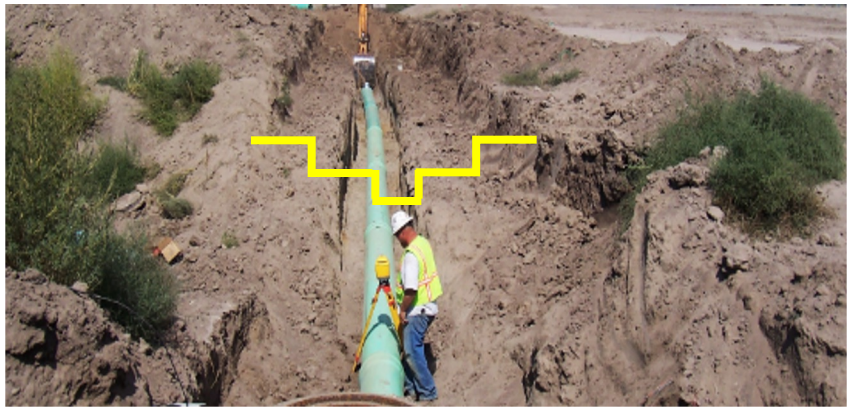
- Sloping and benching
- Support systems, shield systems, or other protective systems

*** Excavations over 20 feet require the design of a protective system by a licensed professional engineer.

Types of Protective Systems

Sloping

Benching



Shielding

Shoring

Can distance alone is adequate to protect employees from the hazards of cave-ins.

- Employees maintain a distance of at least two times the height of the vertical sidewall from the toe of the sidewall
- Employees must be instructed not to enter the danger zone
- A warning system must be provided to prevent workers from entering the danger zone. Roping off the area or adequately marking the area with cones, flags or other highly visible means

Sloping and Benching

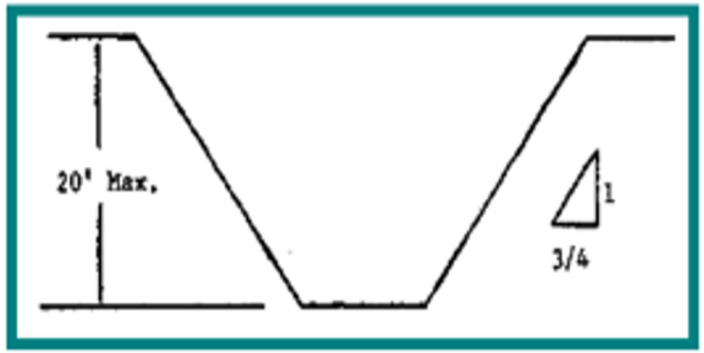
1926.652(b) -- Design = 4 options

- Sloped 1½ H:1V - at angle not less than 34°
- Use of appendices A and B
- Use of other tabulated data
- Design by RPE Registered Professional Engineer.

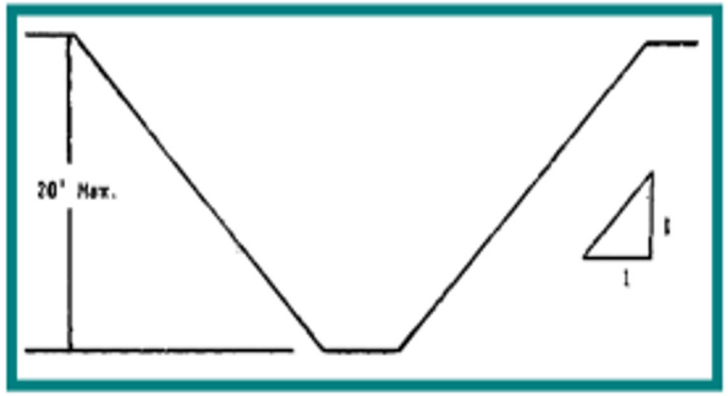
Slope Configurations

Soil or Rock Type	***Maximum Allowable Slopes for Excavations Less than 20′***		***Unconfined Compressive Strength***
Stable Rock	Vertical	90°	_____
Type A	¾ to 1	53°	≥ 1.5 tons/sq ft
Type B	1 to 1	45°	.5 - 1.5 tons/sq ft
Type C	1½ to 1	34°	≤ .5 tons/sq ft

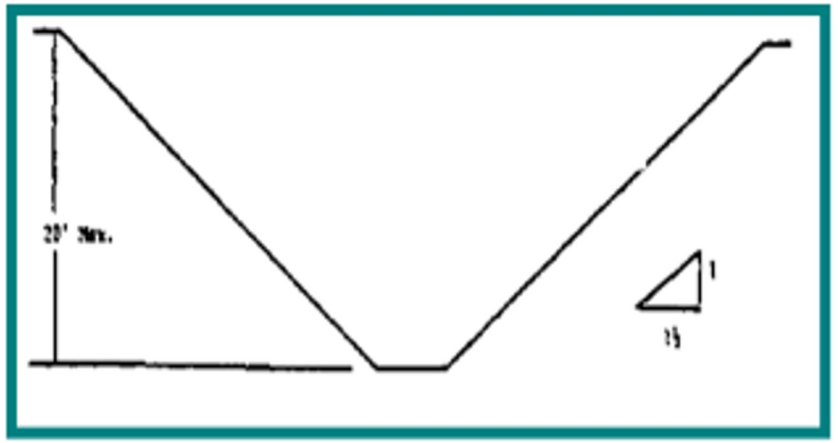
Type A Soil Slope – ¾:1



Type B Soil Slope – 1:1

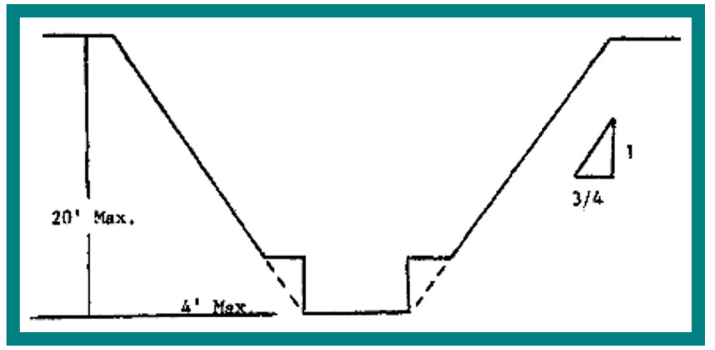


Type C Soil Slope –1½:1

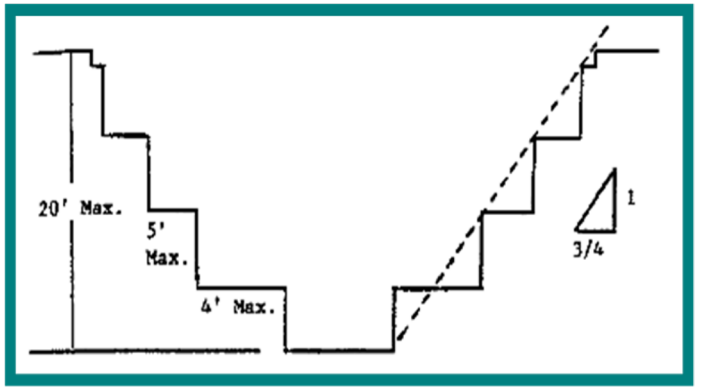


Benching

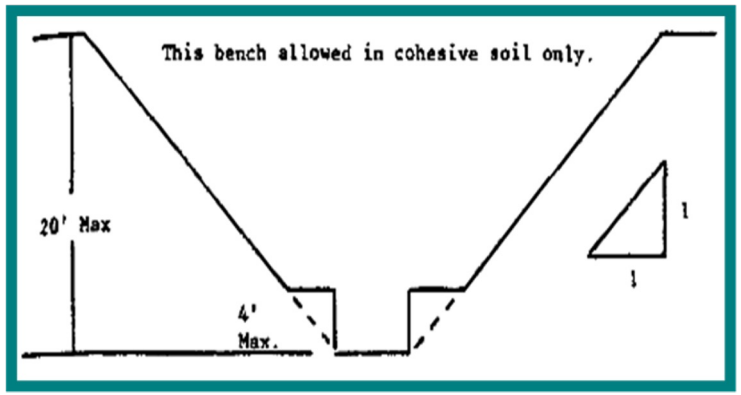
- Simple and multiple benching
- Soil type determines horizontal to vertical ratio of the bench
- General rule – bottom vertical height of first bench must not exceed 4 feet

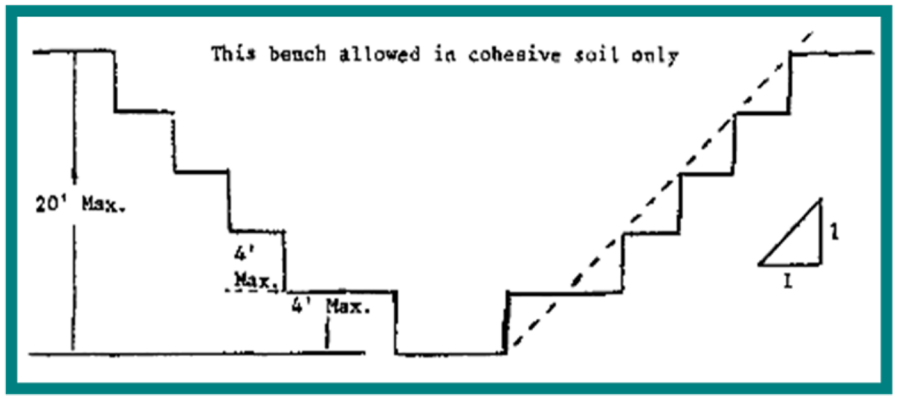


Type A



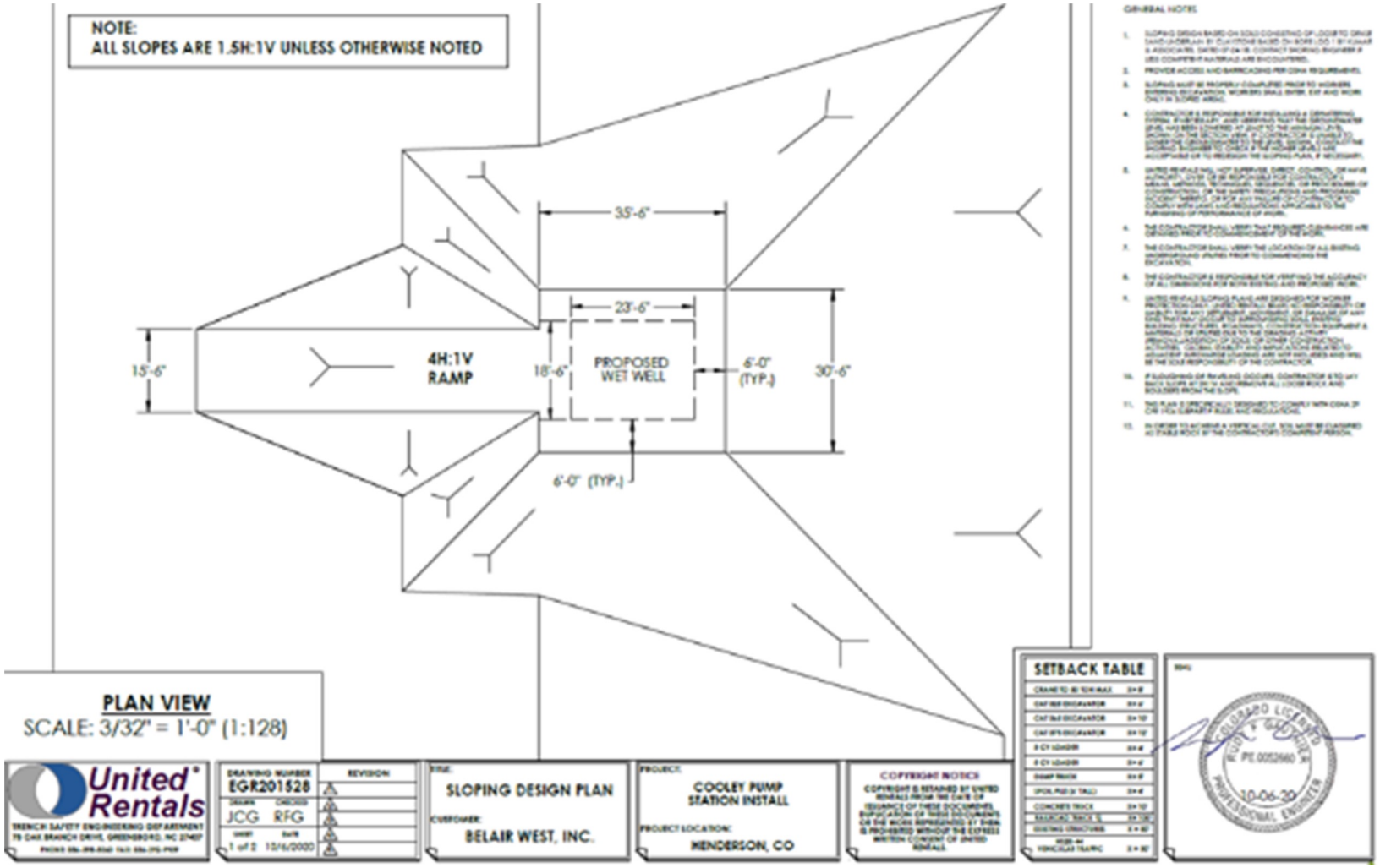
Type B





Design of sloping and benching systems

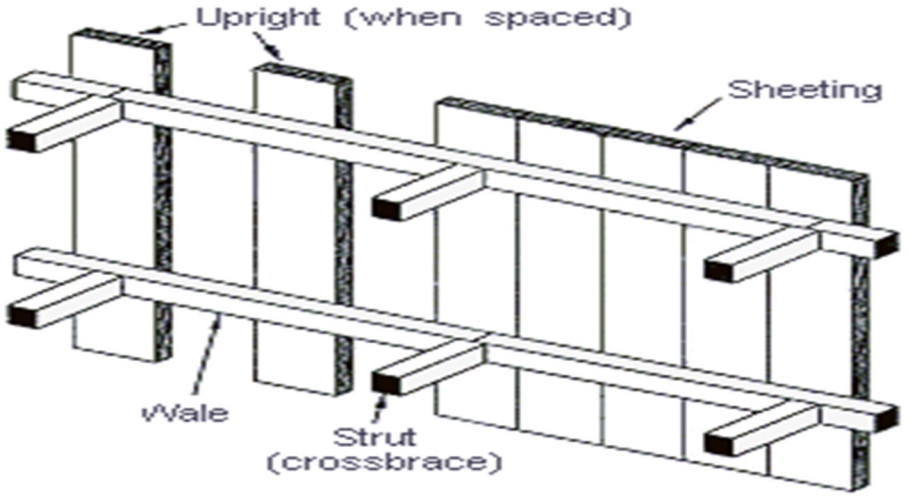
1926.652(b)(4) Option (4)-Design by a registered professional engineer



Support systems and shield systems

1926.652(c) -- Design = 4 options

- Use of appendices A, C, and D – designs for timber shoring and aluminum shoring
- Design using manufacturers data
- Use of other tabulated data
- Designs not utilizing above approved by RPE



DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	CROSS BRACES							WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	4	5	6	8
4 TO 10	UP TO 6	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	Not Req'd				4X6	
	UP TO 8	4X4	4X4	4X4	4X6	4X6	4	Not Req'd	Not Req'd					4X8
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			4X6		
	UP TO 12	4X6	4X6	4X6	6X6	6X6	4	8X8	4				4X6	
10 TO 15	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	Not Req'd	Not Req'd				4X10	
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	6X8	4		4X6			
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4			4X8		
	UP TO 12	6X6	6X6	6X6	6X6	6X6	4	8X10	4		4X6		4X10	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X6	6X6	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X6	6X6	4	8X8	4	3X6	4X12			
	UP TO 10	6X6	6X6	6X6	6X6	6X8	4	8X10	4	3X6				
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	8X12	4	3X6	4X12			
OVER 20	SEE NOTE 1													

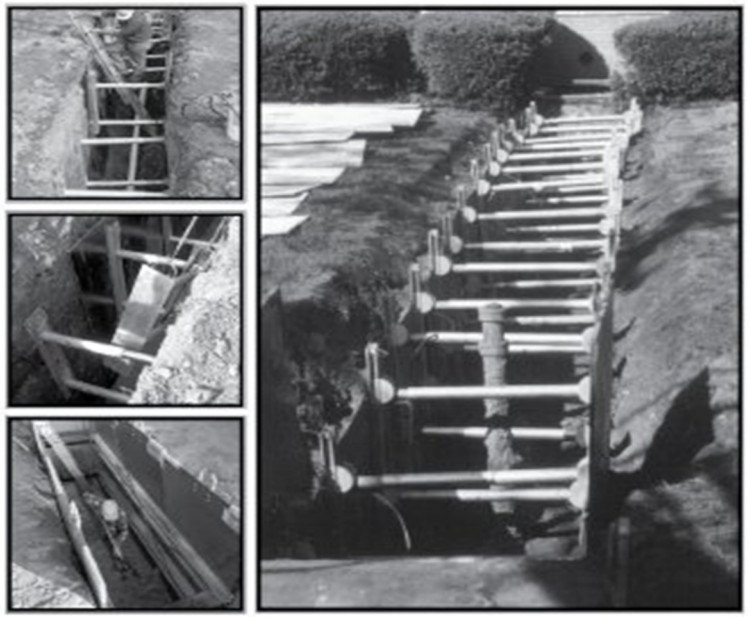
TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	8				
OVER 15 UP TO 20	7				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
Note (1): See Appendix D, Item (g) (1)
Note (2): See Appendix D, Item (g) (2)

EFFICIENCY PRODUCTION
INCORPORATED

Hydraulic Aluminum Shoring



Tabulated Data
Effective Dec. 4, 2007

EFFICIENCY PRODUCTION, INC. AMERICA'S TRENCH BOX BUILDER™

www.efficiencyproduction.com 800-552-8800 517-676-8800 Fax: 517.676.0373

EFFICIENCY PRODUCTION, INC.
Hydraulic Shoring Tab Data 2007

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SHORING

Timber - Aluminum – Hydraulic - Pneumatic

- System must fit tight against trench walls

- The system design and materials depend upon trench dimensions

Appendix C – Timber Shoring

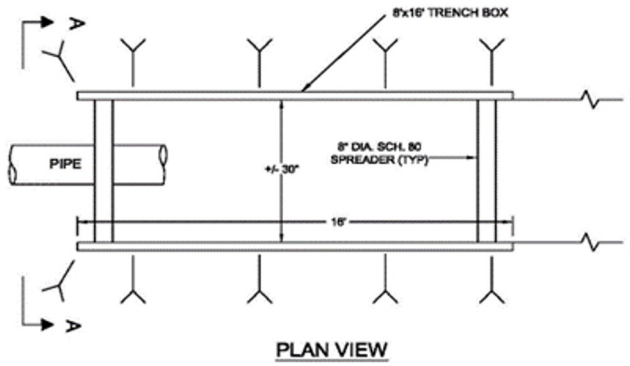
- Table has the minimum sizes of timber members for particular type of soil
- Timbers must be Douglas Fir or Oak
- Spacing of cross braces, uprights, and walers

Appendix D – Aluminum Hydraulic Shoring

- Spacing of various aluminum members (vertical shore rails and horizontal walers) and various hydraulic cylinder sizes

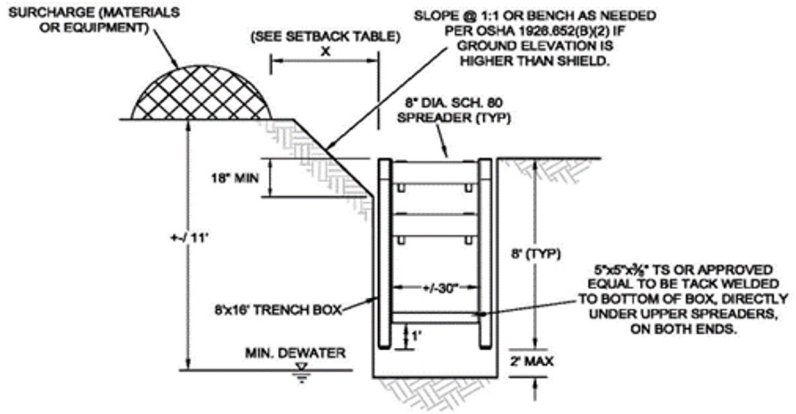
- Shoring systems like sheet pile and wale typically are a combination of steel shapes and are not designed as a shoring systems.
- Tabulated design data for the component's but still requires an engineer to apply the component data to design the system.

Site Specific Engineering



PLAN VIEW

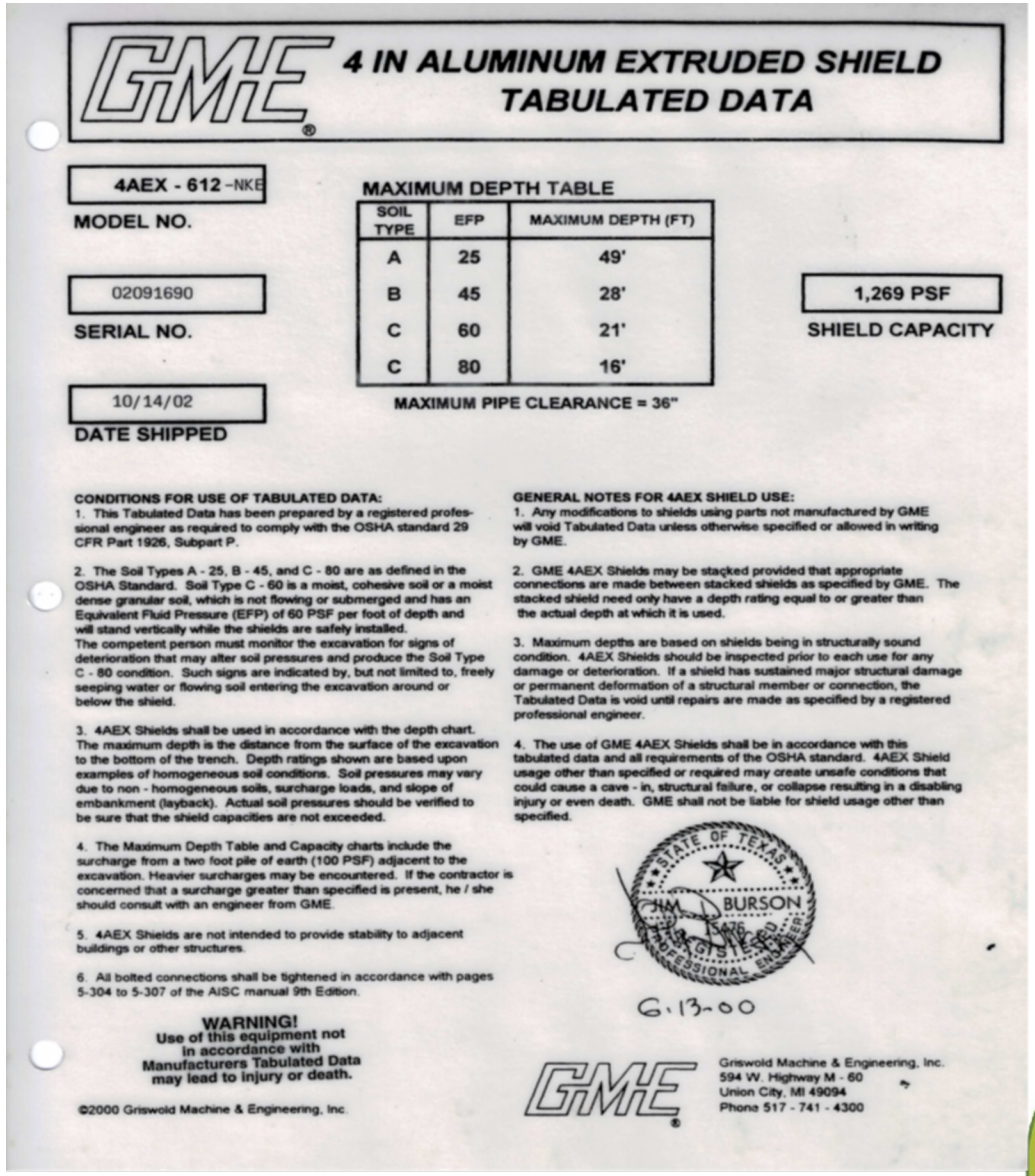
SETBACK TABLE	
CRANE (30 TON MAX)	X = 8'
CAT 315 EXCAVATOR	X = 3'
CAT 325 EXCAVATOR	X = 3'
CAT 345 EXCAVATOR	X = 7'
3 CY LOADER	X = 3'
5 CY LOADER	X = 4'
DUMP TRUCK	X = 3'
SPOIL PILE (4' TALL)	X = 3'
CONCRETE TRUCK	X = 4'
BUILDING STRUCTURES	X = 10'
RAILROAD TRACKS	X = 20'
STREET TRAFFIC	X = 4'



SECTION A-A

Shield systems – Trench boxes

- Shields do not prevent cave-in – they just protect when a wall collapses
- Can be used with all classes of soils
- Rated by manufacturer for specific depths in different classes of soil
- Tabulated data must be on-site



GME

4 IN ALUMINUM EXTRUDED SHIELD TABULATED DATA

4AEX - 612 -NKE
MODEL NO.

02091690
SERIAL NO.

10/14/02
DATE SHIPPED

MAXIMUM DEPTH TABLE

SOIL TYPE	EFP	MAXIMUM DEPTH (FT)
A	25	49'
B	45	28'
C	60	21'
C	80	16'

MAXIMUM PIPE CLEARANCE = 36"

1,269 PSF
SHIELD CAPACITY

CONDITIONS FOR USE OF TABULATED DATA:

1. This Tabulated Data has been prepared by a registered professional engineer as required to comply with the OSHA standard 29 CFR Part 1926, Subpart P.
2. The Soil Types A - 25, B - 45, and C - 80 are as defined in the OSHA Standard. Soil Type C - 60 is a moist, cohesive soil or a moist dense granular soil, which is not flowing or submerged and has an Equivalent Fluid Pressure (EFP) of 60 PSF per foot of depth and will stand vertically while the shields are safely installed. The competent person must monitor the excavation for signs of deterioration that may alter soil pressures and produce the Soil Type C - 80 condition. Such signs are indicated by, but not limited to, freely seeping water or flowing soil entering the excavation around or below the shield.
3. 4AEX Shields shall be used in accordance with the depth chart. The maximum depth is the distance from the surface of the excavation to the bottom of the trench. Depth ratings shown are based upon examples of homogeneous soil conditions. Soil pressures may vary due to non - homogeneous soils, surcharge loads, and slope of embankment (layback). Actual soil pressures should be verified to be sure that the shield capacities are not exceeded.
4. The Maximum Depth Table and Capacity charts include the surcharge from a two foot pile of earth (100 PSF) adjacent to the excavation. Heavier surcharges may be encountered. If the contractor is concerned that a surcharge greater than specified is present, he / she should consult with an engineer from GME.
5. 4AEX Shields are not intended to provide stability to adjacent buildings or other structures.
6. All bolted connections shall be tightened in accordance with pages 5-304 to 5-307 of the AISC manual 9th Edition.

WARNING!
Use of this equipment not in accordance with Manufacturers Tabulated Data may lead to injury or death.

GENERAL NOTES FOR 4AEX SHIELD USE:

1. Any modifications to shields using parts not manufactured by GME will void Tabulated Data unless otherwise specified or allowed in writing by GME.
2. GME 4AEX Shields may be stacked provided that appropriate connections are made between stacked shields as specified by GME. The stacked shield need only have a depth rating equal to or greater than the actual depth at which it is used.
3. Maximum depths are based on shields being in structurally sound condition. 4AEX Shields should be inspected prior to each use for any damage or deterioration. If a shield has sustained major structural damage or permanent deformation of a structural member or connection, the Tabulated Data is void until repairs are made as specified by a registered professional engineer.
4. The use of GME 4AEX Shields shall be in accordance with this tabulated data and all requirements of the OSHA standard. 4AEX Shield usage other than specified or required may create unsafe conditions that could cause a cave - in, structural failure, or collapse resulting in a disabling injury or even death. GME shall not be liable for shield usage other than specified.

STATE OF TEXAS
JIM BURSON
5476
REGISTERED
PROFESSIONAL ENGINEER
6-13-00

GME

Griswold Machine & Engineering, Inc.
594 W. Highway M - 60
Union City, MI 49094
Phone 517 - 741 - 4300

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9. No surcharge load is considered in the tabulated maximum panel capacity and depth rating. Surcharge loads occur due to heavy equipment, vibrations, or soil piles adjacent to the trench where adjacent is defined as within a distance equal to the depth of the trench. State and Local Regulations and Previsions shall be followed for surcharge loading application.

VESTEK
INDUSTRIES

TRENCH SHIELD MANUFACTURER'S TABULATED DATA

C4M-URSB-420FB
MODEL NO.

C160438
SERIAL NO.

MAXIMUM DEPTH TABLE

SOIL TYPE	EFP	MAX DEPTH (FT)
A	25	35
B	45	20
C	60	16
C	80	12

855 PSF
SHIELD CAPACITY

8 IN SCH 80
SPREADER SIZE
(20' MAX LENGTH)

CONDITIONS FOR USE OF TABULATED DATA

1. This Tabulated Data has been prepared by a Registered Professional Engineer in accordance with the provisions of the OSHA standard 29 CFR Part 1926, Subpart P.
2. Shields must be used in a manner consistent with safe working procedures, Federal, State and Local regulations.
3. A "Competent Person", defined by OSHA, who has been trained in the proper use of trench shields, safe excavation practices and soil classification methods must direct and control the use of this shield.
4. The "competent person" must be knowledgeable and capable of complying with all federal regulations, state and local laws and ordinances.
5. [illegible] granular soil, which is not flowing or submerged and has an Equivalent Fluid Pressure (EFP) of 60 PSF per foot of depth.
6. The "competent person" must monitor the excavation for any signs of deterioration or condition change that may alter soil classifications. Such signs are indicated by, but not limited to, freely seeping water or flowing soil entering the excavation around or below the shield.
7. [illegible] bottom of the trench including adjacent slopes.
8. Depth ratings shown are based upon examples of homogeneous soil conditions. Soil pressures may vary due to non-homogeneous soils, surcharged loads, and slope or embankment (layback). Actual soil pressures should be monitored and verified to be sure that the shield capacity is not exceeded.
9. No surcharge load is considered in the tabulated maximum panel capacity and depth rating. Surcharge loads occur due to heavy equipment, vibrations, or soil piles adjacent to the trench where adjacent is defined as within a distance equal to the depth of the trench. State and Local Regulations and Previsions shall be followed for surcharge loading application.
10. This shield is not intended to provide stability to adjacent buildings or other structures susceptible to lateral instability of the supporting soils.
11. The spreader is a compression member and plays the most critical role for the integrity of the shield system. To prevent member buckling failure, any type of lateral load should not be applied to the spreaders.
12. 2 inch diameter pins with strength of 90 ksi shall be placed in all spreader to collar connections. Any spreader pins used on this shield that does not meet the required strength and diameter specified above will invalidate and void this data.

GENERAL NOTES FOR TRENCH SHIELD USE:

1. Modifications of any kind to this shield not specifically allowed by Vestek Manufacturing, LLC. in writing will void this data.
2. Maximum depths are based on shields being in structurally sound condition. This trench shield should be inspected prior to each use for damage or deterioration. If a shield has sustained major structural damage or permanent deformation of a structural member or connection, the Tabulated Data is void until repairs are made as specified by a Registered Professional Engineer.
3. The use of Vestek Manufacturing, LLC. Trench Shields shall be in accordance with this tabulated data and all requirements of the OSHA standard. Trench Shield usage other than specified or required may create unsafe conditions that could cause a cave-in, structural failure, or collapse resulting in a disabling injury or even death. Vestek Manufacturing, LLC. shall not be liable for shield usage other than specified. Use of this trench shield not in accordance with Manufacturer's Tabulation Data could cause injury or death.

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STATE OF TEXAS
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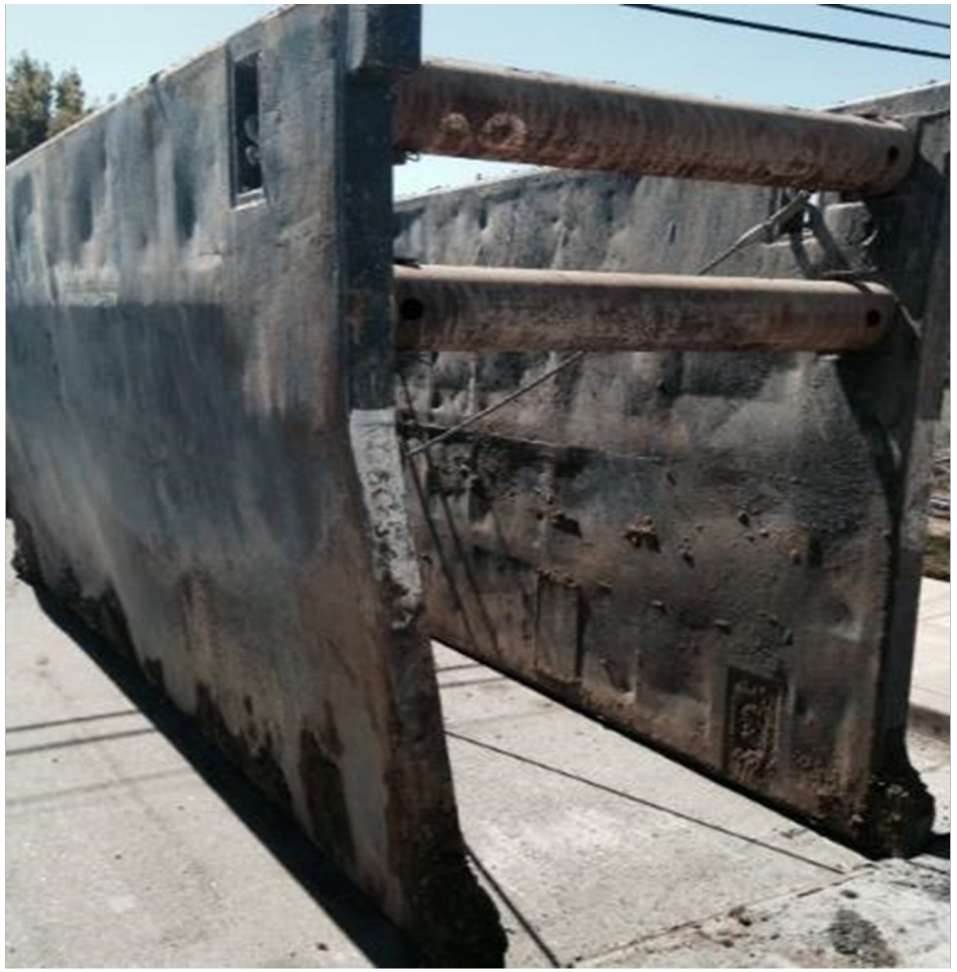
PROFESSIONAL ENGINEER

William Lee International, Inc.

Shield systems – Trench boxes

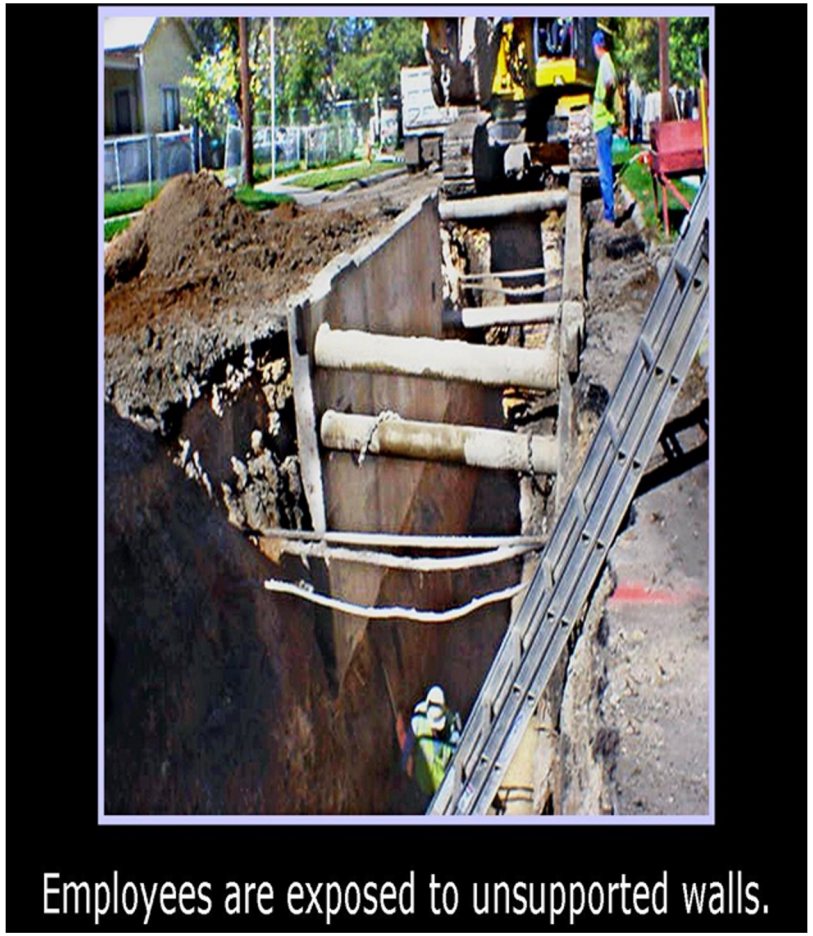
- Free from defects that would impair function
- When damaged a competent person needs to examine and evaluate if shield will support intended loads -- RPE
- Shields can be moved horizontally with workers inside but worker must stay inside shields
- No employees in the excavation when the shield is installed, removed, or raised vertically.

You may not exceed the rated capacity of any shield.



Shield systems

- No excavating more than 2 feet below the bottom of the shield



Shield systems

- Must be stabilized to prevent lateral movement

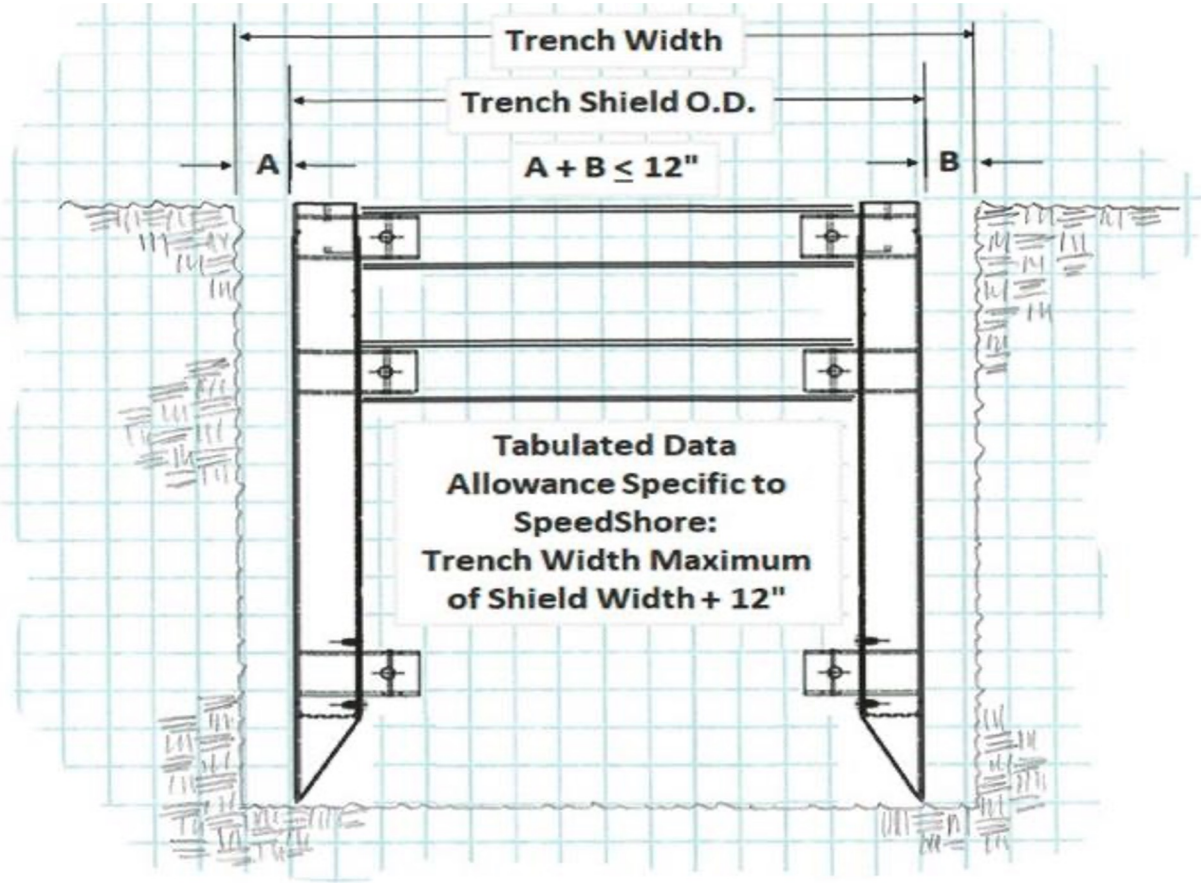
Question: How much clearance should there be between the box and the cut wall?

Depends which system and which manufacturer's tabulated data is being used, three basic guidelines are followed:

- Back fill to ½ of the height of your shoring system on each side.

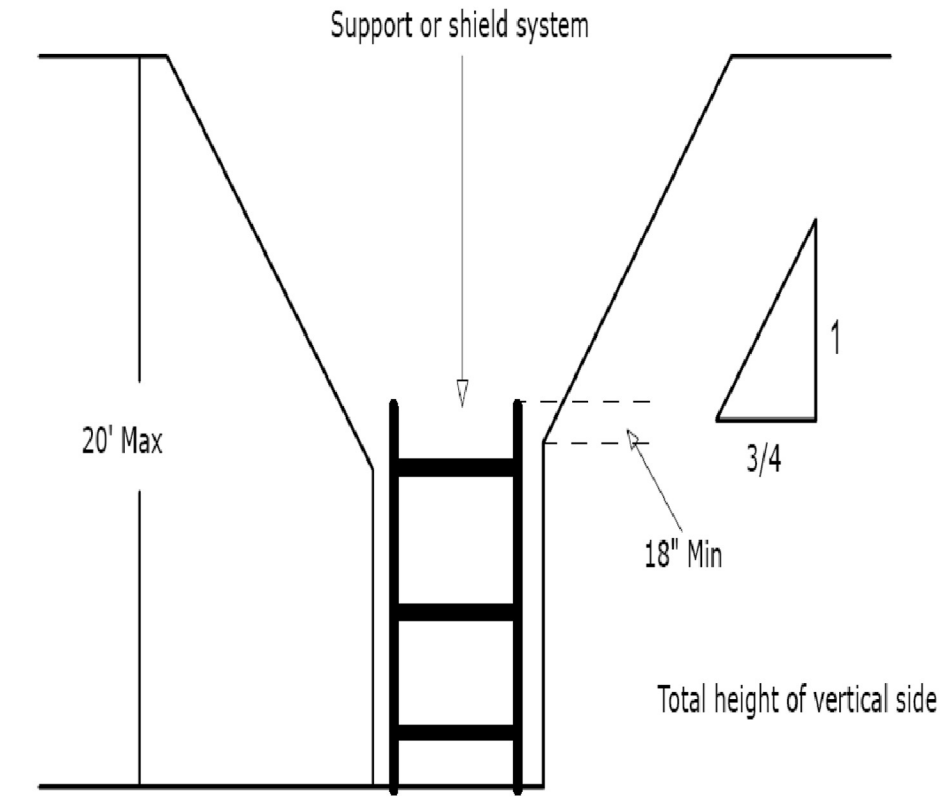
- GME's standard is a maximum of 4"gap on either side of the trench shield.

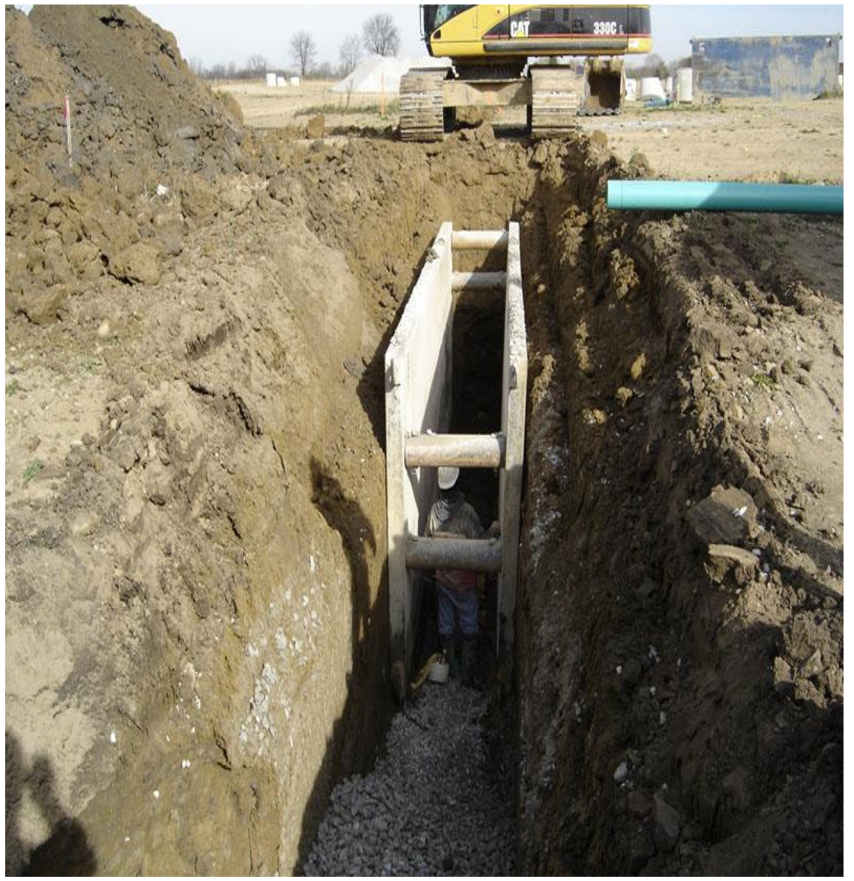
- Speed Shore's standard is "the width (ID) of the excavation shall be no wider than the width of the shield (OD) plus 12"


Trench Width
Trench Shield O.D.
A
A + B ≤ 12"
B
Tabulated Data
Allowance Specific to
SpeedShore:
Trench Width Maximum
of Shield Width + 12"

Shield systems

- Shield system must extend at least 18” above toe of trench slope or vertical side





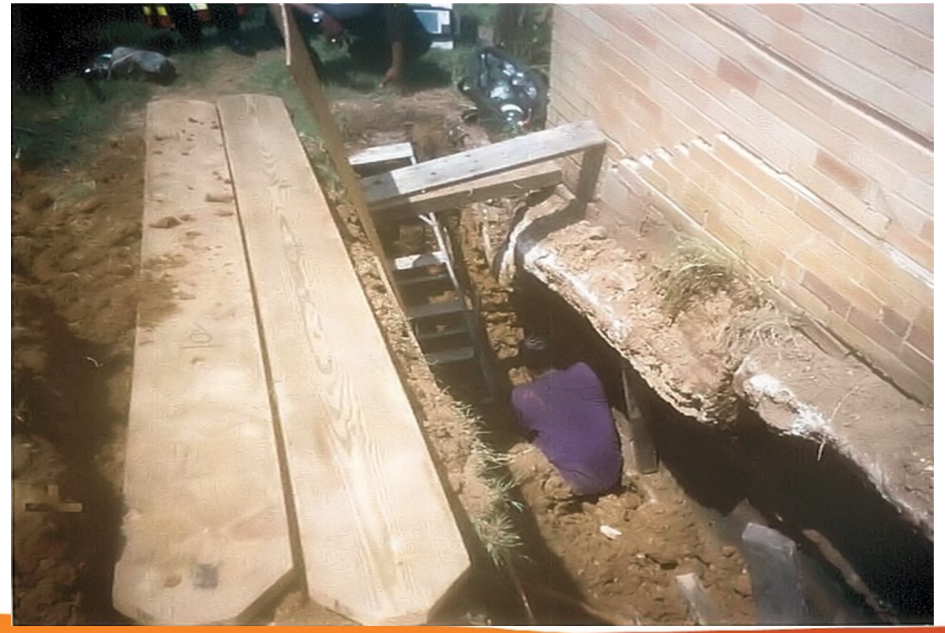
Specific Requirements -- Underground installations

- Utilities have to be determined prior to excavating
- When operations approach estimated location the installations have to be found by safe and acceptable means
- Installations must be protected, supported, or removed to safeguard employees

811® Know what's below. Call before you dig.

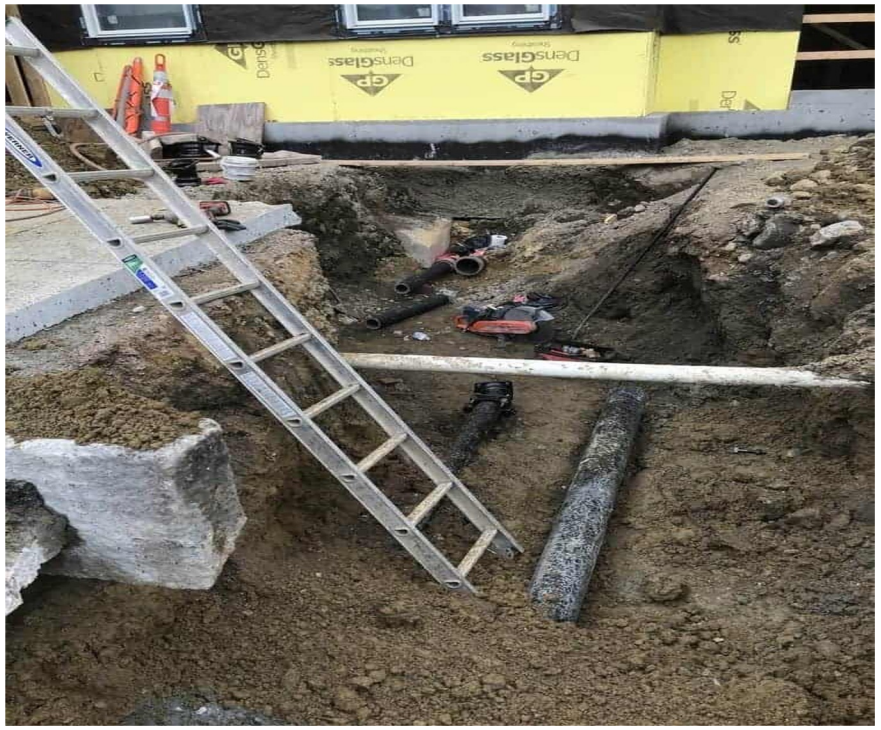
Specific Requirements

- Surface encumbrance must be removed or supported
- Adjoining buildings, walls, other structures have to be supported by shoring bracing or underpinning
- Sidewalks, pavements, other structures not undermined unless supported



Specific Requirements – Means of egress

- A stairway, ladder, ramp, or other safe means of egress must be provided if 4 feet or more in depth so as to require no more than 25 feet of lateral movement



Specific requirements

- Falling Loads – cannot be under loads handled by lifting or digging equipment

Specific requirements

- Mobile equipment – stop logs, barricades, or other system used at the edge of excavations when mobile equipment operated adjacent to excavation

Specific requirements – Hazardous atmospheres

- Oxygen deficient atmospheres - <19.5% or >23.0%
- Combustible gas >10% LEL (LFL)
- Near a sewer, landfill, storage area for hazardous substances, pipe systems used for fuel, etc.

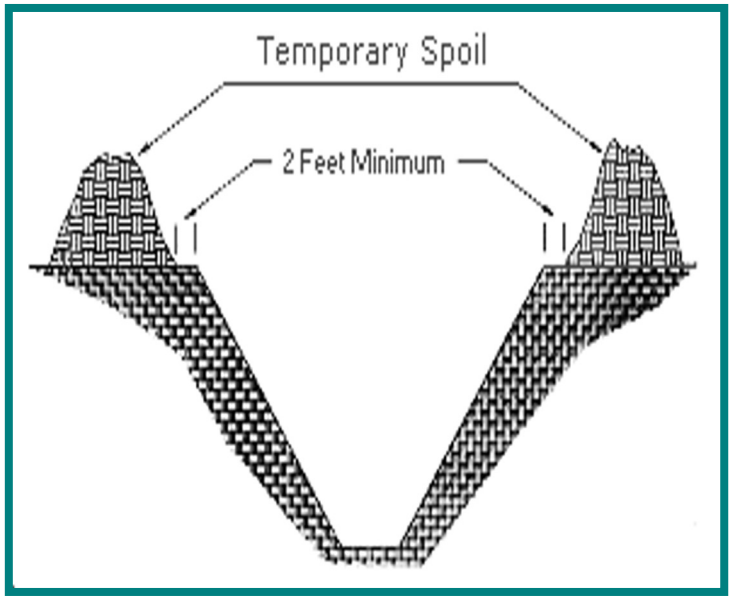
Testing atmosphere:
-- before workers enter an excavation deeper than 4 feet.
-- if equipment is operating in the trench
-- if welding, cutting, or burning is done in the trench

Specific requirements - water accumulation

- No work unless precautions taken for hazards posed by accumulating water
- Special shield systems or support systems
- Water removal equipment and monitored by competent person
- Use of dikes, ditches or other means when natural drainage is affected

Protection - loose rock-soil rolling into excavation

- Place and keep excavated spoil at least 2 feet from edge
- Scaling to remove loose material
- Protective barricades or shields –retaining devices



Use of Steel Plates

No Plywood

Inspections by a competent person

- Daily and before the start of work and as needed throughout the shift
- As work conditions change
- After every rainstorm
- When fissures, cracks, undercutting, water seepage, bulging at bottom, etc. occur
- When there is a change in the size, location or placement of the spoil pile
- When there is any indication of change or movement in adjacent structures
- After any hazard increasing occurrence
- Employees **REMOVED** until hazards are until safe

Summary

- Soil mechanics, testing, and classification
- Protective systems
- Specific requirements

Questions ?

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