Excavation presentation
for
Minnesota OSHA
Construction Seminar
March 19, 2019

Presented by MNOSHA
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National emphasis program
Excavation inspections
Trenching safety

“The time to think about worker protection in trenches is before the digging even begins.”
Consider the risks

The trenching fatality rate is 112% greater than that for all construction accidents.
Consider the risks

Fifty percent of those who perish in cave-ins were people attempting a rescue.
Consider the risks

The majority of trench fatalities occur in trenches five to 15 feet deep.
Consider the risks

One cubic yard of soil weighs approximately 3,000 pounds.
Trench inspections

• Determine what protective system is being used: sloping, shielding or shoring.
• Sloping and shielding (trench boxes) are the most common forms of protection.
• Sloping is dependent on the soil type and must meet the following angle/ratio:
  – class “C” soil = 3x or 1.5:1, which is = to 33°;
  – class “B” soil = 2x or 1:1, which is = to 45°;
  – class “A” soil = 1.5x or .75:1, which is = to 53°.
Trench inspections

Competent persons should know what type of soil it is by completing the following:

• a visual analysis; and
• a manual test, such as a thumb penetration, pentrometer or plasticity test.
Soil classification

However, no soil is type A if:
• the soil is fissured;
• the soil is subject to vibration; or
• the soil has been previously disturbed.
Inspection example

What does the OSHI see as they approach?

OSHIs will take pictures as they approach.

Find the person or C.P. in charge.
Inspection example

OSHI will ask employees to exit the trench and have the operator stop moving dirt.

Determine the soil type.
Inspection example

• Class “C” soil – sand/gravel or uncohesive soil

• Class “B” soil will stick together.
Inspection example

- Class “A” – employers will tell OSHIs class “A.” A majority of the soil in Minnesota is disturbed.

- OSHIs will take a soil sample; and measurements.
Inspection example

Measurements needed:
• top width (red);
• depth (green);
• bottom width (pink); and
• soil type.

With these measurements, you can determine compliance.
Measurements

- Depth = 8 feet
- Bottom width = 4 feet
- Top width = 21 feet

Which type of soils are in compliance?

- Class “C” soil = 3x or 1.5:1, which is = to 33°
- Class “B” soil = 2x or 1:1, which is = to 45°
- Class “A” soil = 1.5x or .75:1, which is = to 53°
Measurements

- Class “A” soil = 1.5 x (depth) + bottom width = top width
- Class “B” soil = 2 x (depth) + bottom width = top width
- Class “C” soil = 3 x (depth) + bottom width = top width
Measurements

If you have an eight-foot deep, class “C” soil excavation, with a bottom width of four feet – $8\times 3 + 4' = 28'$. 

If you have an eight-foot deep, class “B” soil excavation, with a bottom width of four feet – $8\times 2 + 4' = 20'$. 

• The correct answer is “B” and “A.”
Example continued

Evaluate the excavation to determine where measurements can be taken from (look for cracks along the top).

The OSHI will have the foreman or C. P. assist with measurements.
Example continued

The OSHI may have to ask what the bottom width is because it cannot be measured.

The OSHI will ask for agreement on the numbers.
# Sloping

## Table 1: Maximum allowable slopes for excavations fewer than 20 feet

<table>
<thead>
<tr>
<th>Soil type or rock type</th>
<th>Maximum slope (H:V)</th>
<th>Maximum slope (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable rock</td>
<td>Vertical</td>
<td>90</td>
</tr>
<tr>
<td>Type A</td>
<td>.75:1</td>
<td>53</td>
</tr>
<tr>
<td>Type B</td>
<td>1:1</td>
<td>45</td>
</tr>
<tr>
<td>Type C</td>
<td>1.5:1</td>
<td>34</td>
</tr>
</tbody>
</table>
Mobile equipment warning systems

When an equipment operator does not have a clear and direct view of the edge of the excavation:

- use a warning system;
- barricades;
- hand or mechanical signals; or
- stop logs.
Additional items

Employees working around earth-moving equipment must wear a high-visibility vest.

Employees with overhead hazards or working around equipment need to wear hardhats.

Spoil piles and equipment must be located at least two feet from the edge of the excavation.
Class 2 high-visibility warning vest

Look for a label stating "This garment meets or exceeds ANSI/ISEA 107-1999 standard for Class 2 garments" or, for small sizes, "... greater than or exceeding ANSI/ISEA 107-1999 standard for Class I garments."
Competent person

A competent person:

• is designated by the employer and has the authority to take appropriate actions;

• by way of training and experience, is knowledgeable of applicable standards; and

• is capable of identifying commonly foreseeable workplace hazards, inspections of excavations.
Competent person

The competent person is the key to a safe trench excavation. The decisions he or she makes will determine the safety of all employees working in and around trenches.
Powerline clearance

50 kV or less
10 feet

Greater than 50 kV
10 feet + (0.4”) (number of kV over 50 kV)
Powerline clearance
Egress and access

Required in trench excavations more than four feet in depth

Must be within 25 feet lateral travel distance

Examples include ladders, ramps
Ladders and ramps

Ladders:
• side rails of ladders must extend at least three feet above the landing surface; and
• must be inside of trench boxes when used.

Ramps: The excavation may be sloped so people can walk out in an upright manner (cannot use tools or hands to climb out).
Hazard identification
## Most frequently cited standards in construction federal-fiscal year 2018

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926.501</td>
<td>Fall protection</td>
<td>150</td>
</tr>
<tr>
<td>Minnesota Statutes 182.653, subd. 8</td>
<td>A Workplace Accident and Injury Reduction (AWAIR) program</td>
<td>68</td>
</tr>
<tr>
<td>1910.1200</td>
<td>Hazard communication</td>
<td>46</td>
</tr>
<tr>
<td>1926.1053</td>
<td>Ladders</td>
<td>41</td>
</tr>
<tr>
<td>1926.451</td>
<td>General requirements for scaffolds</td>
<td>35</td>
</tr>
<tr>
<td>Minnesota Rules 5207.1100</td>
<td>Elevating work platform equipment</td>
<td>31</td>
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<tr>
<td>1926.503</td>
<td>Fall protection training requirements</td>
<td>29</td>
</tr>
<tr>
<td>1926.405</td>
<td>Electrical wiring, components and equipment</td>
<td>26</td>
</tr>
<tr>
<td>1926.652</td>
<td>Protective systems for excavations</td>
<td>19</td>
</tr>
<tr>
<td>1926.651</td>
<td>Specific requirements for excavations</td>
<td>17</td>
</tr>
</tbody>
</table>
Common excavation standards cited

- 1926.651(c)(2) – Means of egress from excavations
- 1926.651(j)(2) – Excavated material or equipment not retained at least two feet from edge
Common excavation standards cited

- 1926.651(k)(1) or (k)(2) – Inspections by a competent person or inspected but failed to abate hazards
- 1926.652(a)(1) – Unprotected excavation or trench
Minnesota OSHA
Excavation Safety Stand-down
April 15-19, 2019
Excavation Safety Stand-down

MNOSHA conducted its first Excavation Safety Stand-down in 2017. The topic of excavation safety was selected because:

• there are many hazards when working in excavations or trenches;

• excavation accidents resulted in three fatalities to Minnesota workers since 2015; and

• the excavation season was starting
Excavation Safety Stand-down

The purpose of this stand-down was to raise awareness among employers and workers about preventing excavation accidents.
Excavation Safety Stand-down

A excavation safety stand-down is a way for employers and workers to pause during the workday and talk about excavation safety.

Types of events used:
- job-safety analysis talks;
- lunch and learn events;
- toolbox talks.
Excavation Safety Stand-down

The first excavation safety stand-down was a great success. Nine companies and 106 employees participated.
2017 Excavation Safety Stand-down Participant

Minnesota Department of Labor and Industry
Occupational Safety and Health Division

WEISER BROTHERS, INC.

has successfully conducted a training event in April 2017 to raise awareness about ways to keep their workers safe from hazards during excavation projects.

KEN PETERSON, COMMISSIONER
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