

Increasing Awareness of Factors that Influence Trench Safety

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Presenters:

- Scott Ketcham, Director, OSHA Directorate of Construction
- Joe Wise, Regional Customer Training Manager at United Rentals Trench Safety
- Dr. Alan Echt, Sr. Industrial Hygienist, NIOSH Office of Construction Safety and Health

OSHA Excavation and Trenching: Agency Priority Goal

Scott C. Ketcham MPA, CSP

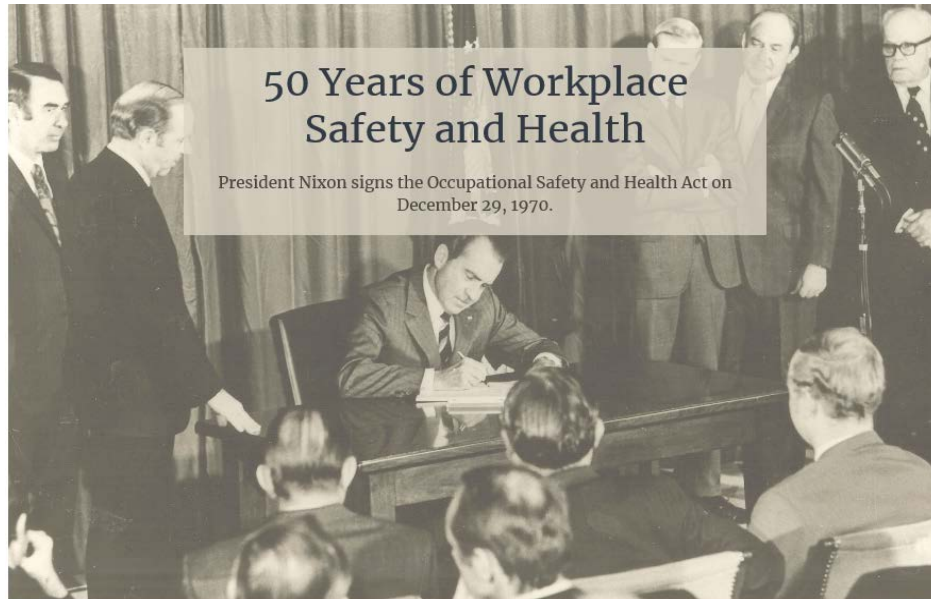
**Director, Directorate of Construction
Occupational Safety and Health Administration**

Agenda

- Trenching and Excavation –
Top 10 Construction Violations
- Inspection Stats
- Focus 4
- Excavation Incidents
- OSHA's Trenching Initiative
- Agency Priority Goal
- Top Excavation Violations
- Trench Safety Summits / Stand Down
- Trenching and Excavation Resources



OSHA at 50



- **50th anniversary of the OSH ACT**
- **Landmark legislation:** establishing OSHA and providing federal workplace safety and health protections.

Top 10 Violations in Construction



1. Fall Protection – General Requirements (1926.501)
2. Scaffolding (1926.451)
3. Ladders (1926.1053)
4. Fall Protection – Training (1926.503)
5. Eye and Face Protection (1926.102)
6. **Specific Excavation Requirements (1926.651)**
7. General Safety and Health Provisions (1926.20)
8. Head Protection (1926.100)
9. Aerial Lifts (1926.453)
10. Fall Protection Systems Criteria and Practices (1926.502)

Top Ten Violations in Construction FY 2019

Standard	Total Violations	Serious Violations	Willful Violations	Repeat Violations
1926.501- Fall Protection	6,881	5,557	164	1,008
1926.451 - Scaffolding	3,169	2,885	14	158
1926.1053- Ladders	2,708	2,406	5	130
1926.503 - Fall protection Training	2,015	1,549	8	100
1926.102 - Eye and Face Protection	1,618	1,435	7	124
1926.651-.652 - Specific Excavation Requirements	1,500	1,173	35	81
1926.20 - General Safety and Health Provisions	1,007	834	0	48
1926.100 - Head Protection	933	833	1	36
1926.453 - Aerial Lifts	783	719	3	27
1926.502 - Fall Protection Systems Criteria and Practices	758	653	4	24

SOURCE : OIS
As of 1/14/20



Top Violations in Excavation Work: FY 2019

<u>STANDARD</u>	<u>Conditions Cited</u>
1926.652(a)(1) - <i>Protection of employees in excavations.</i>	805
1926.651(c)(2) - <i>Means of egress from trench excavations.</i>	396
1926.651(j)(2) - <i>Protection of employees from loose rock or soil</i>	330
1926.651(k)(1) - Daily inspections of excavations	302
1926.651(k)(2) - Where the competent person finds evidence of a situation that could result in a possible cave-in	106
1926.651(h)(1) - <i>Protection from hazards associated with water accumulation.</i>	49

Construction Focus Four

The actual breakdown of the causes of fatalities on construction sites in 2018 is as follows (numbers are a percentage of the 1,008 total construction-related fatalities that occurred in 2018):

- Falls: 338 (**33.5%**);
- Struck by object: 112 (11.1%);
- Electrocutions: 86 (8.5%);
- Caught in/between: 55 (5.5%).



Note: These "Fatal Four" were responsible for more than half (58.6%) the [construction worker deaths in 2018](#), BLS reports. Eliminating the Fatal Four would save 591 workers' lives in America every year.

“Focus 4” Outreach Training Program

The screenshot shows the OSHA website's Focus 4 Outreach Training Program page. The page features a red header with the OSHA logo and the text "UNITED STATES DEPARTMENT OF LABOR". Below the header is a navigation menu with links for "ABOUT OSHA", "WORKERS", "EMPLOYERS", "REGULATIONS", "ENFORCEMENT", "TOPICS", "NEWS & PUBLICATIONS", "DATA", and "TRAINING". The main content area is divided into several sections:

- Focus Four Hazards:** A section with four hazard icons: Falls, Caught-In or -Between, Struck-By, and Electrocution. Below the icons is a "Start Here" link: "Introduction to the Construction Focus Four Outreach Training Packet [PDF]".
- Outreach Training Program:** A section with a blue header and a yellow background. It includes a navigation bar with "Construction", "General Industry", "Maritime", and "Disaster Site". Below this is a yellow box with the text "Construction Focus Four Training".
- Quick Links:** A red box containing three links: "OSHA's Fall Prevention Campaign", "Focus Four Objectives [PDF]", and "Recently Asked Questions (FAQs)".
- In Focus:** A red box with a black background and white text that reads "CONSTRUCTION SAFETY:". Below this is a link: "Construction Safety: Close at Hand Video".


At the bottom of the page, there are four yellow hazard icons with labels: "Falls", "Caught-In or -Between", "Struck-By", and "Electrocution".

https://www.osha.gov/dte/outreach/construction/focus_four/index.html

Why Focus on Trenching?



Excavation Fatalities

- 2012 through 2014 average:  17 fatalities
- 2015: 25 fatalities
- 2016: 37 fatalities
- 2017: 24 fatalities
- 2018: 17 fatalities

Source: Bureau of Labor Statistics (BLS)

Where are trenching incidents happening?

Trenching/Excavation Incidents by End Use Type of Construction				
Type of Construction	Number	Percent		
single family or duplex dwelling	29	24%		
pipeline	19	16%		
highway street road	16	13%		
commercial building	10	8%		
other heavy construction	10	8%		
sewer/water treatment plant	9	8%		
other building	8	7%		
multi-family dwelling	7	6%		
bridge	4	3%		
powerline transmission	4	3%		
excavation landfill	2	2%		
manufacturing plant	1	1%		
power plant	1	1%		
	120	100%		

Note: Out of 156 total incidents, for which 36 end use unspecified.
Source: OSHA OIS Accident Investigation Report, FY 2013 - FY 2017



Preventing Trenching Incidents

- DOL's Strategic Plan identifies trenching hazards as an agency priority.
- OSHA's goal is to increase the number of corrected trenching hazards through enforcement and consultation.



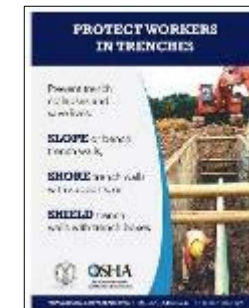
Excavations
in Construction

[English](#)
[Spanish](#)

5 Things You
Should Know
To [Stay Safe](#)
in a Trench



sticker



poster

OSHA's Trenching Initiative





OSHA Trenching Initiative Goals

- Increase safety awareness in trenching and excavation work;
- Reinforce the value of using proven protective measures ... sloping, benching, shoring and shielding; and
- Prevent future trenching injuries and fatalities through balanced Enforcement and Compliance Assistance



Achieving Trenching Goal

- Enforcement
 - Increase of hazards corrected
 - National Emphasis Program Inspections
 - *A revised OSHA National Emphasis Program for Trenching became effective on October 1, 2018*
 - *Enforcement*
 - *Compliance Assistance*
- Compliance Assistance
 - Consultation Program requests
 - Area Office Outreach programs
 - Online tools




Agency Priority Goal



- **Worker Safety:** Reduce Trenching and Excavation Hazards
- **Goal Leader:** Loren Sweatt, Deputy Assistant Secretary for Occupational Safety and Health
- **Deputy Goal Leader:** Scott Ketcham, Director, Directorate of Construction
- **Goal Statement:** By September 30, 2021, increase trenching and excavation hazards abated by 12% compared to FY2017 through inspections and compliance assistance at workplaces covered by the Occupational Safety and Health Administration.

APG FY 2019 Report

	Goal	Total
FY 2020	2,619	TBD
FY 2019 (Final)	 2,710	2,710
FY 2018 (Final)	None	2,324

As of May 21, 2020
Source: OIS

OSHA Trenching Outreach Activities

OSHA is working with trade associations to increase trenching and excavation hazard awareness that include the North American Excavation Shoring Association (NAXSA), the National Utility Contractor Association (NUCA) and the Association of Equipment Manufacturers (AEM).



Trench Safety Summits

Coming
this Fall

- The cities picked to host the 2020 NAXSA/OSHA Safety Summits are:
 - Boston
 - Orlando
 - Los Angeles
 - Denver
 - Seattle



Trenching Safety Stand-Down



June 15-19, 2020



Approximately 50,000 participants in 2019



JUNE IS TRENCH SAFETY MONTH!

Safety Training and Protective Systems Save Lives



Trench Safety Stand Down Week June 15–19, 2020

Make plans for your company to participate in this year's NUCA Trench Safety Stand Down Week. Being a part of our popular 5th annual TSSD Week will help educate your employees on trenching hazards at the jobsite.

OSHA's National Emphasis Program on Trenching and Excavation is a high agency priority. NUCA and OSHA have teamed up again this year for our annual trench safety program. Almost 48,000 industry and NUCA member company employees participated in last year's TSSD.

Every company or organization that holds a TSSD will receive a certificate of participation, as well as hard-hat stickers for every employee who participated. Recognition will also be given in NUCA publications.



Also sponsored by NUCA's Safety Ambassadors Club

Alex E. Paris Contracting	John Deere
Atlas Excavating	Johnson Bros.
Barber Utilities	Komatsu America Corp.
Case Construction Equipment	L.G. Roloff Construction
Caterpillar, Inc.	McLaughlin Boring Systems
Cemen Tech, Inc.	National Trench Safety
Core & Main	Oxford Plastics USA
CNA	Petticoat-Schmitt Civil Contractors
Ditch Witch	Safety Management Services
Efficiency Production	Sunstate Equipment Co.
Ferguson Waterworks	Team Fishel
Greg Strudwick & Associates	United Rentals
HCSS	Xylem
HRP Construction	Wacker Neuson Corp.
Hymax by Krausz	

For more details and TSSD materials: nuca.com/tssd #TSSD20 #TrenchSafetyMonth



Trenching and Excavation Resources

PROTECT WORKERS IN TRENCHES

Prevent trench collapses and save lives:

SLOPE or bench trench walls,

SHORE trench walls with supports, or

SHIELD trench walls with trench boxes



OSHA Occupational Safety and Health Administration
U.S. Department of Labor

WWW.OSHA.GOV/TRENCHING • 800-321-OSHA (6742) • TTY 877-889-5627

OSHA QUICK CARD

Working Safely in Trenches

When done safely, trenching operations can reduce worker exposure to cave-ins, falling loads, hazardous atmospheres, and hazards from mobile equipment.

OSHA standards require that trenches and protective systems be inspected daily and as conditions change by a competent person before work begins.

Never enter a trench unless:

- It has been properly inspected by a competent person.
- Cave-in protection measures are in place.
- There is a safe way to enter and exit.
- Equipment and materials are away from the edge.
- It is free of standing water and atmospheric hazards.


Prevent trench collapses:

- Trenches 5 feet deep or greater require a protective system.
- Trenches 20 feet deep or greater require a protective system designed by a registered professional engineer.

Protective systems for trenches:

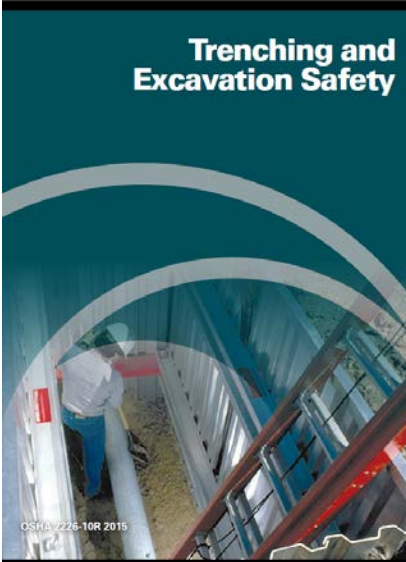
- SLOPE or bench trench walls by cutting back the trench wall at an angle inclined away from the excavation.
- SHORE trench walls by installing aluminum hydraulic or other types of supports to prevent soil movement.
- SHIELD trench walls by using trench boxes or other types of supports to prevent soil cave-ins.

For more information:
OSHA Occupational Safety and Health Administration
www.osha.gov (800) 321-OSHA (6742)



OSHA Occupational Safety and Health Administration
www.osha.gov

Trenching and Excavation Safety



OSHA 226-10R 2015

Trenching and Excavation Toolkit



Revised OSHA 2226 Excavation



www.osha.gov

DOC: 202-693-2020



2019 Trench Survey

OSHA-NIOSH-CPWR r2p Working Group

OSHA Construction Directorate

NIOSH Office of Construction Safety and Health

CPWR Research to Practice (r2p) Program

Ruth Ruttenberg & Associates

United Rentals

Speed Shore, Inc.

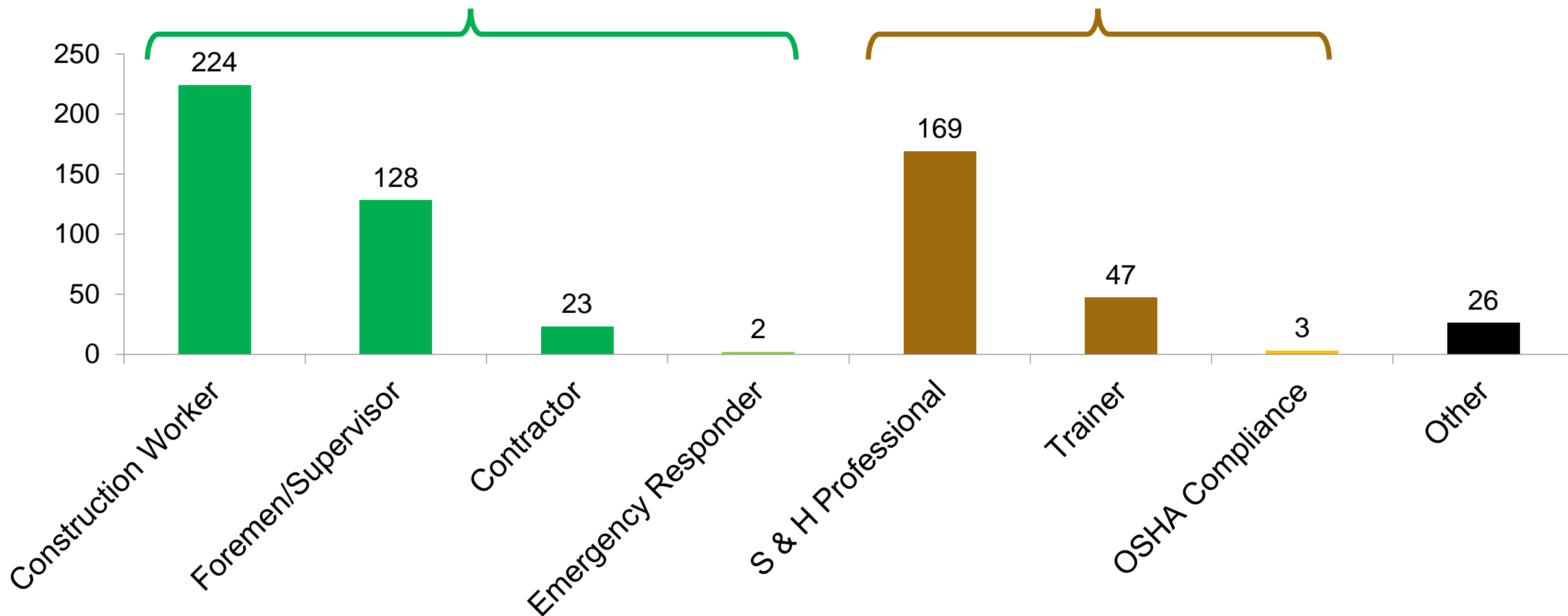


Trench Survey Responses

Sample	# Surveyed	# Responses	Response Rate
United Rentals	461	411	89.2%
CPWR Outreach Database (convenience sample)	3,162	226	7.1%
Total	3,623	637	17.6%

Participants by current position

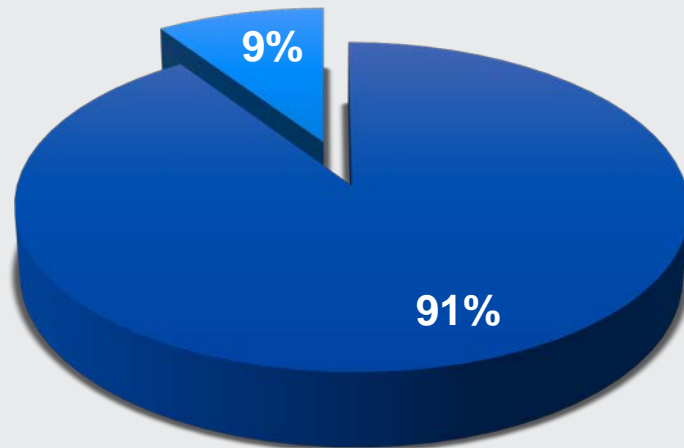
Perform Trench Work - "Industry" Group = 60.6% "Safety & Health" Group = 35.2%



Construction establishments by employment size compared to the size of survey participants' employers

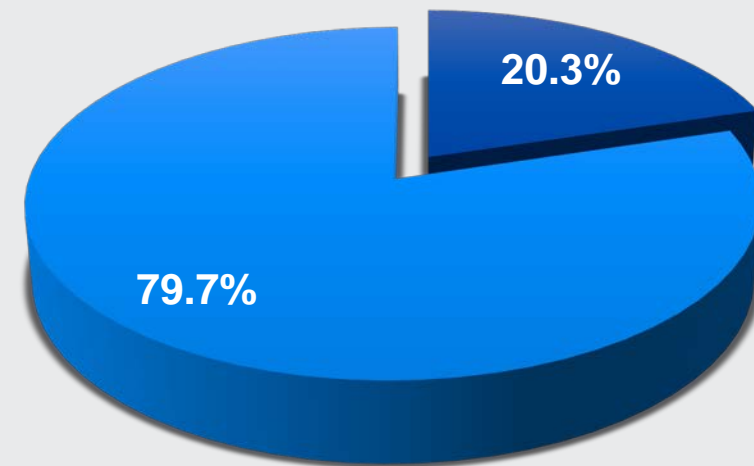
Construction Industry

■ 1-19 ■ 20 or more

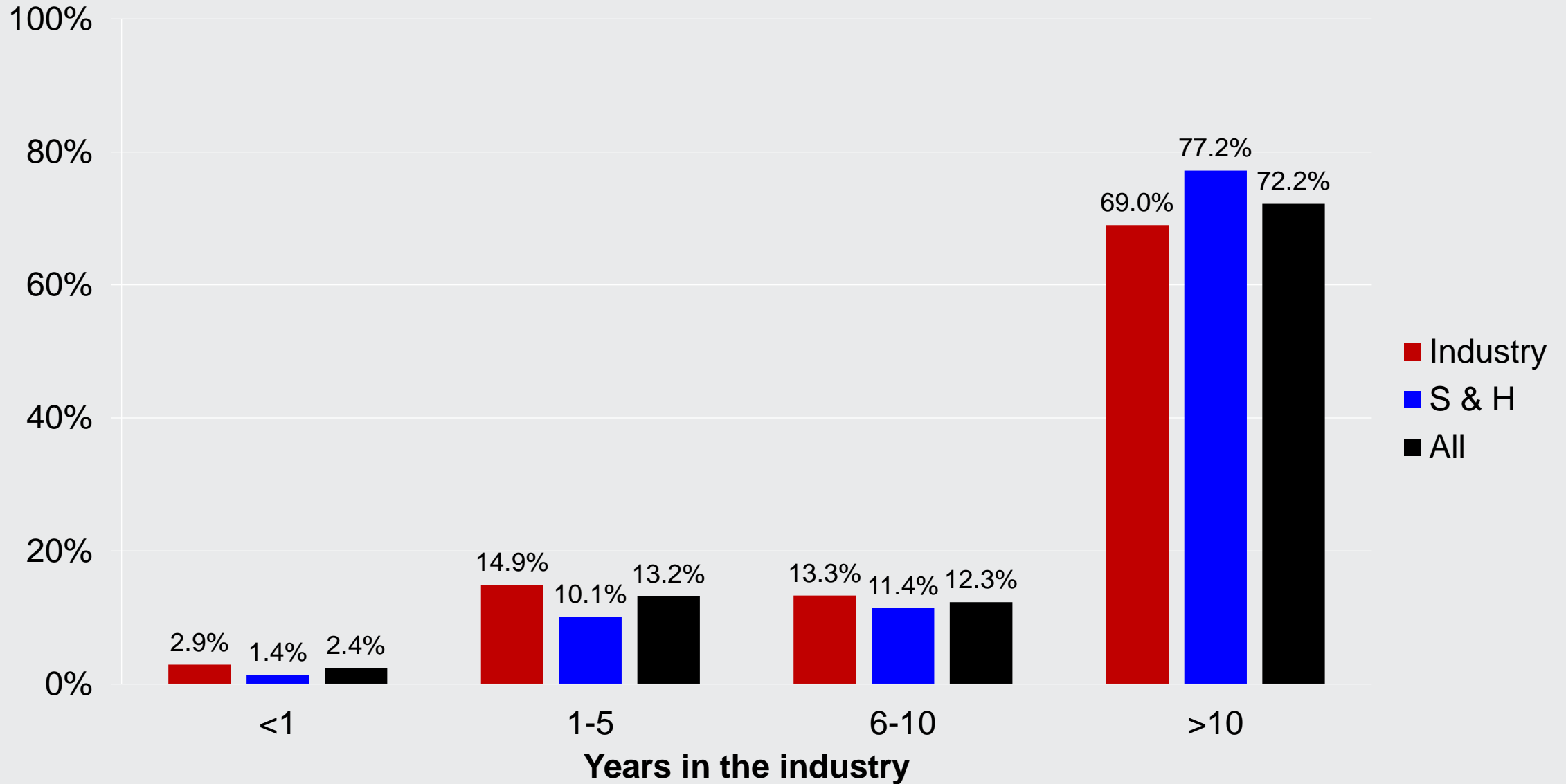


Survey Participants

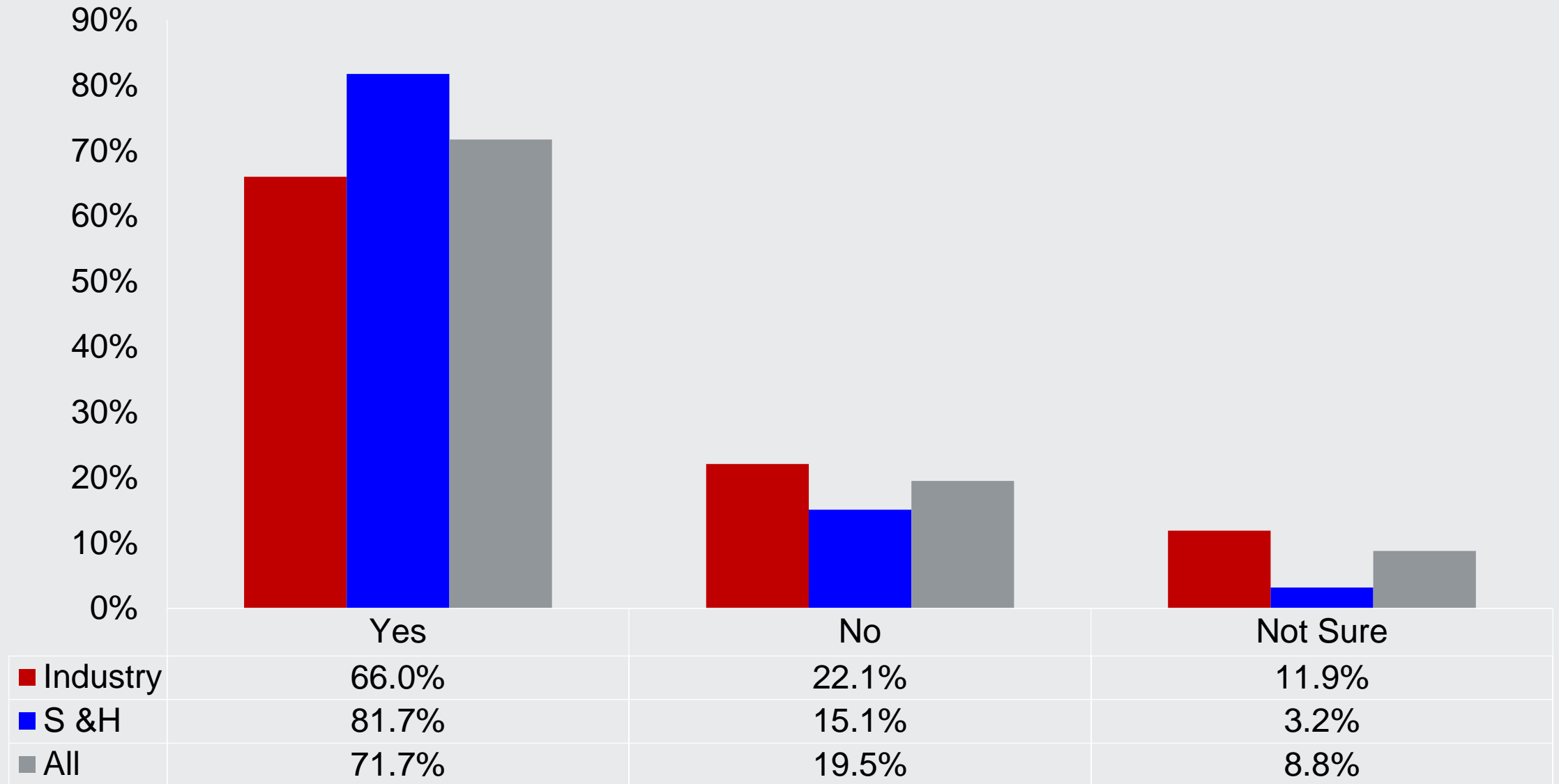
■ 1-20 ■ 21 or more



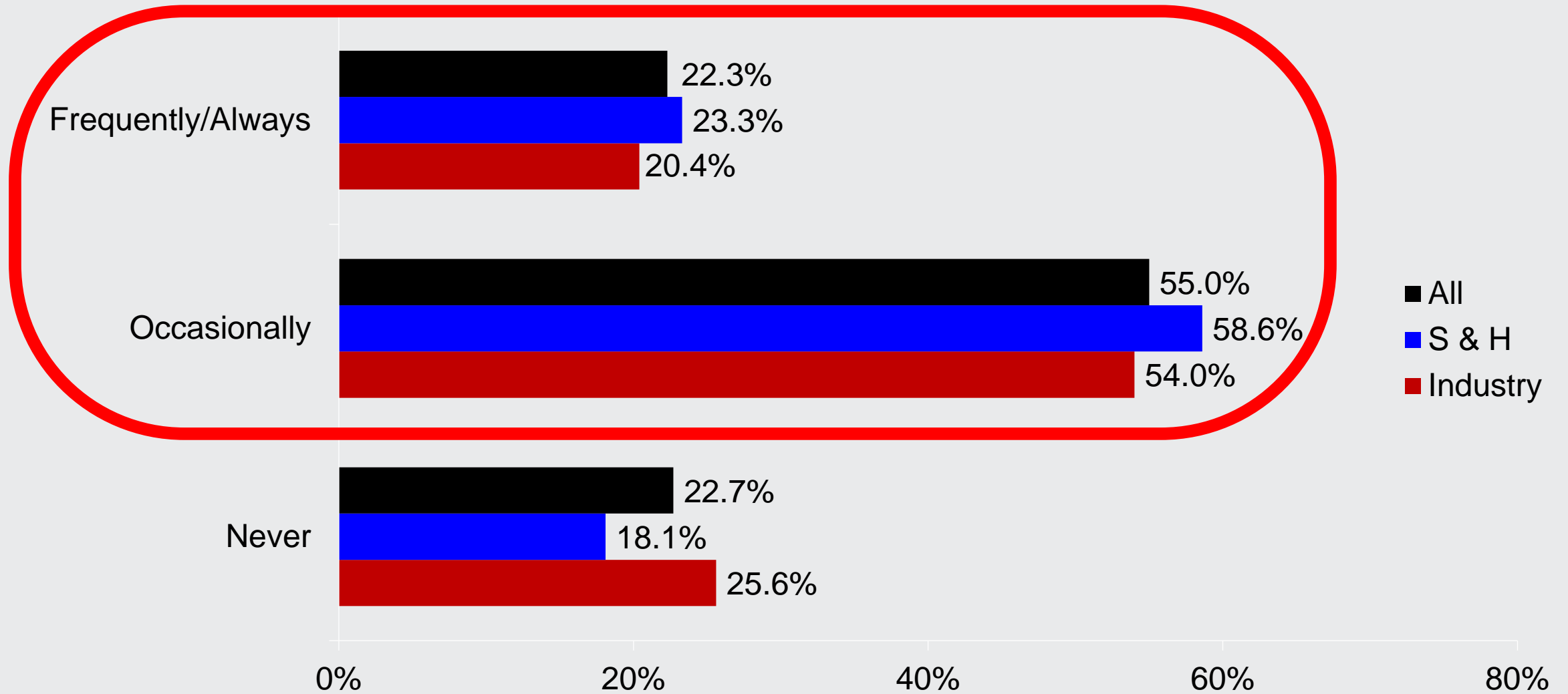
Participants' industry experience



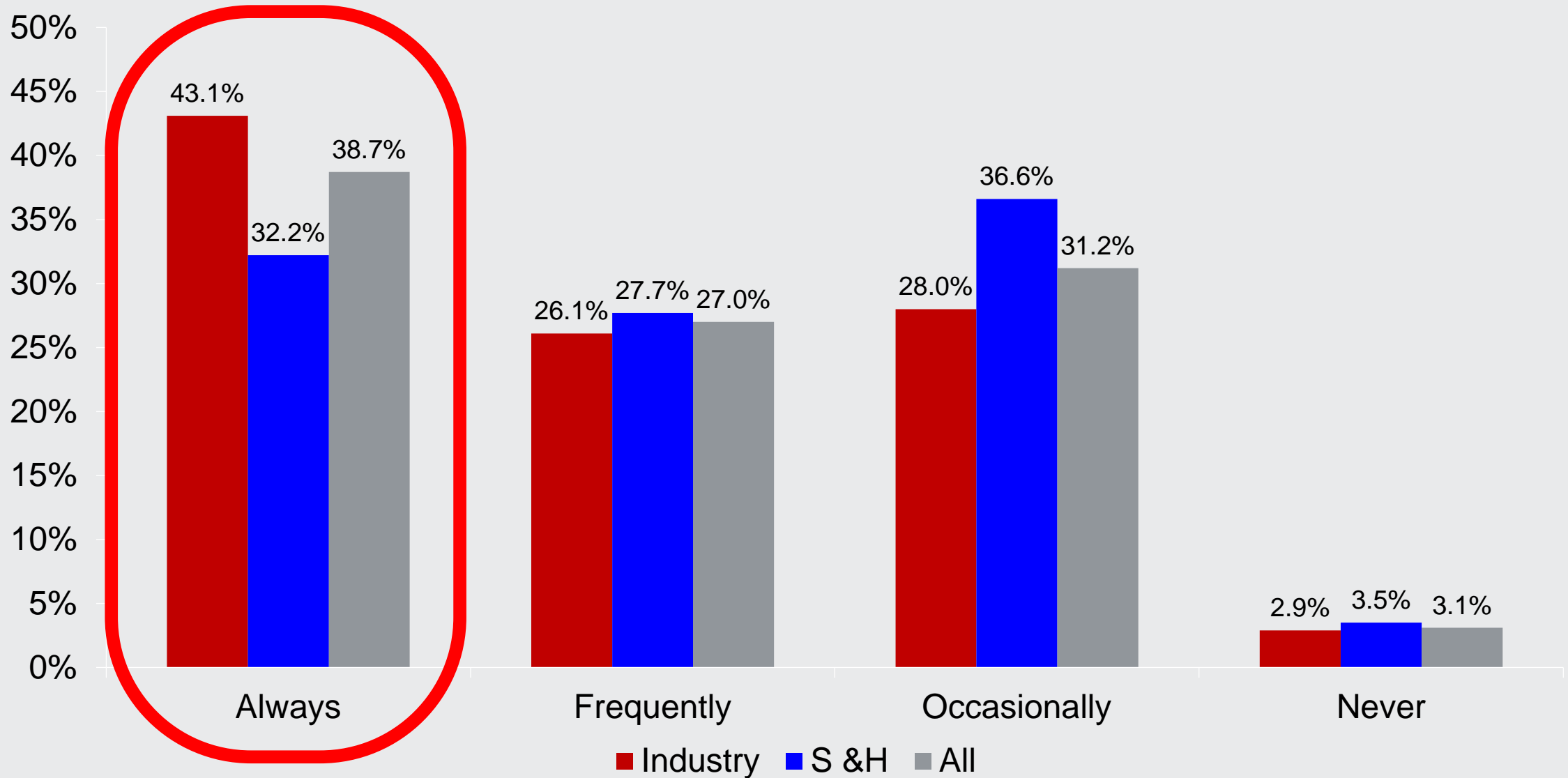
Do you qualify as a competent person for trench work?



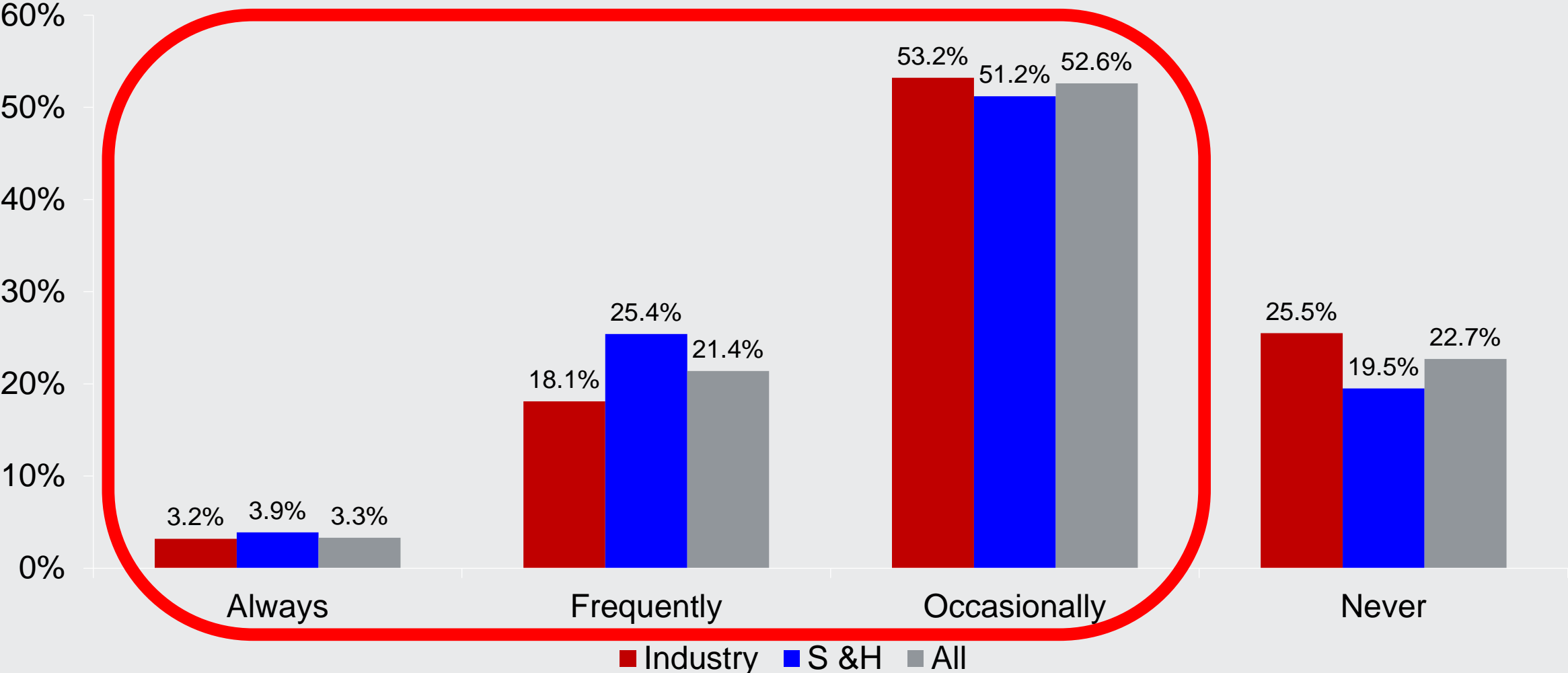
How often do they see no protection ...



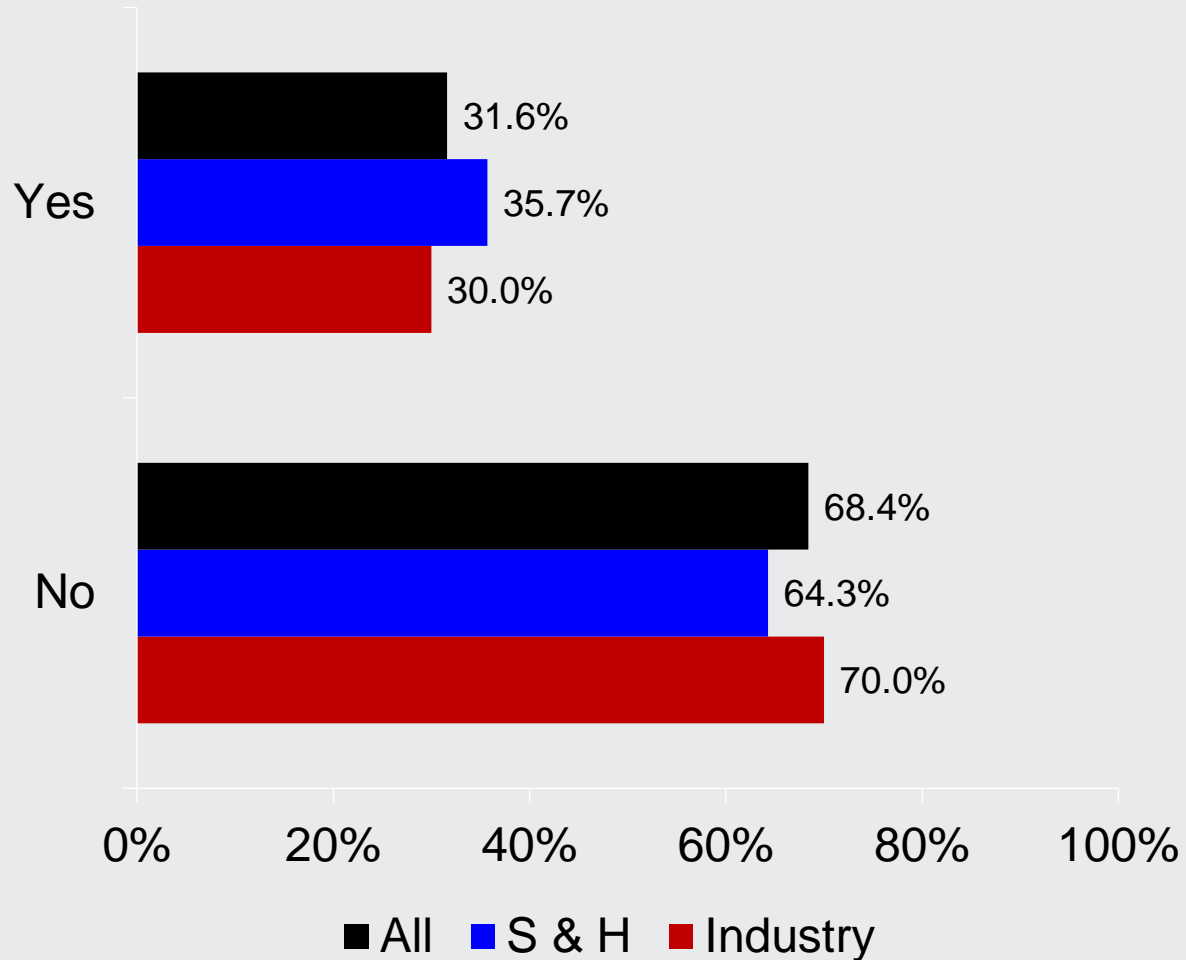
Is there a competent person trained in trenching on the jobsite?



Do you see incidents where new workers are exposed to trench/ excavation work without proper competent person supervision?



Are there any parts of OSHA's Trench Standard that may be confusing to those required to comply?



If yes, which of the following parts of the standard are confusing?

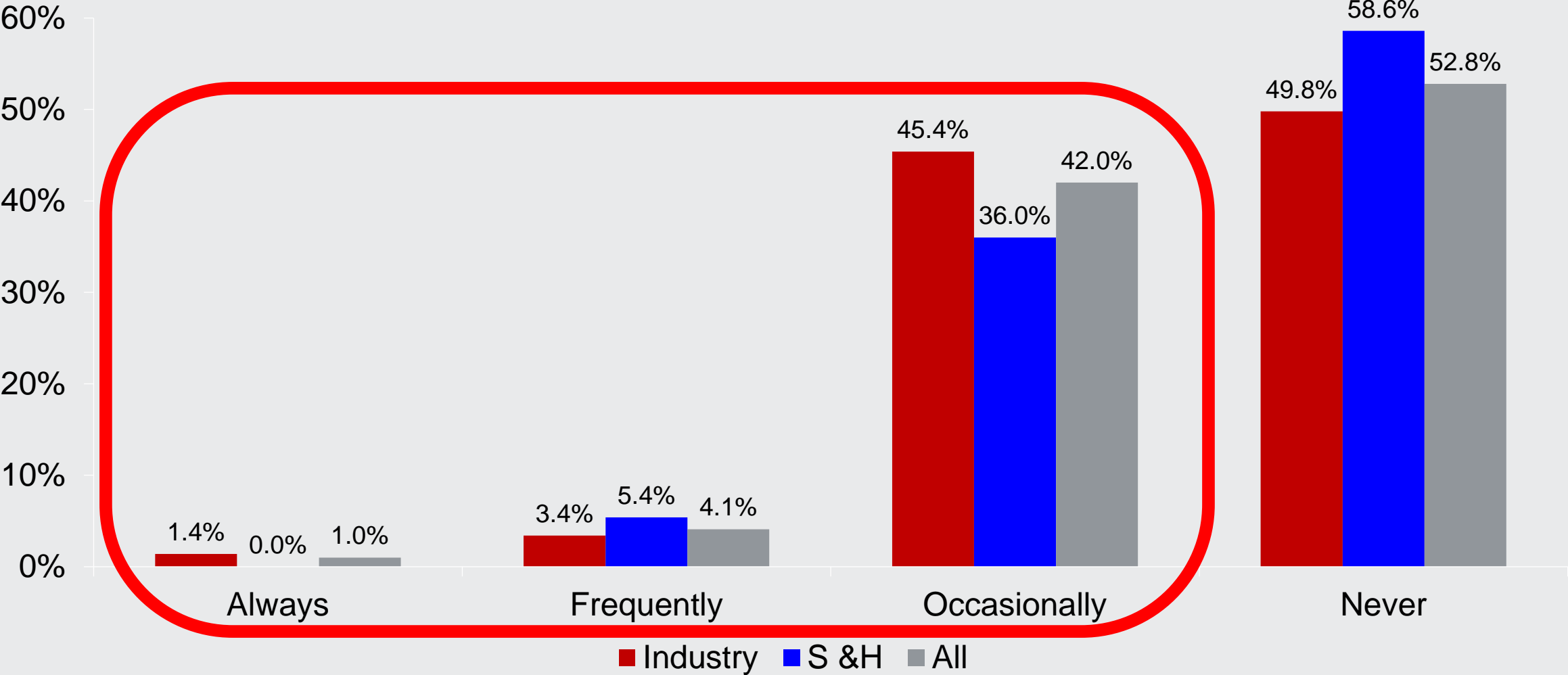
57.7% - Trench sloping and benching safety measures (depth and width requirements)

43.4% - Protective systems

33.7% - Competent Person's role and responsibilities

18.3% - Access and Egress

How often do you have trouble with proper installation, understanding manufacturers' tabulated data, and use of trench safety equipment?



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

	Industry	Safety & Health	Total
Lack of training on trench safety (i.e., inspections, hazards)	66.6%	67.6%	67.0%
Trying to stay on schedule/production	65.2%	67.1%	66.0%
Indifference (i.e., it won't happen on my watch)	50.6%	70.5%	58.1%
Lack of knowledge of the OSHA 1926.650 trenching and excavation standard (i.e., requirements, soil analysis, and protective system solutions)	48.3%	58.6%	52.2%
Tight budgets (i.e., didn't estimate into job costs)	29.0%	43.8%	34.5%
Language barriers	18.8%	26.2%	21.3%
Other	6.9%	10.0%	8.4%

What we learned...

- ✓ More pre-planning is needed
- ✓ Trenches often are unprotected
- ✓ Trench projects often do not have a competent person on site
- ✓ Incidents often involve contractors who are inexperienced or new to trench work, or new workers without proper competent person supervision
- ✓ There is a need to increase training and education on the standard and safe practices

Alternatives to Trenching

CAPT Alan Echt, DrPH, CIH

NIOSH Office of Construction Safety and Health

Increasing Awareness of Factors that
Influence Trench Safety

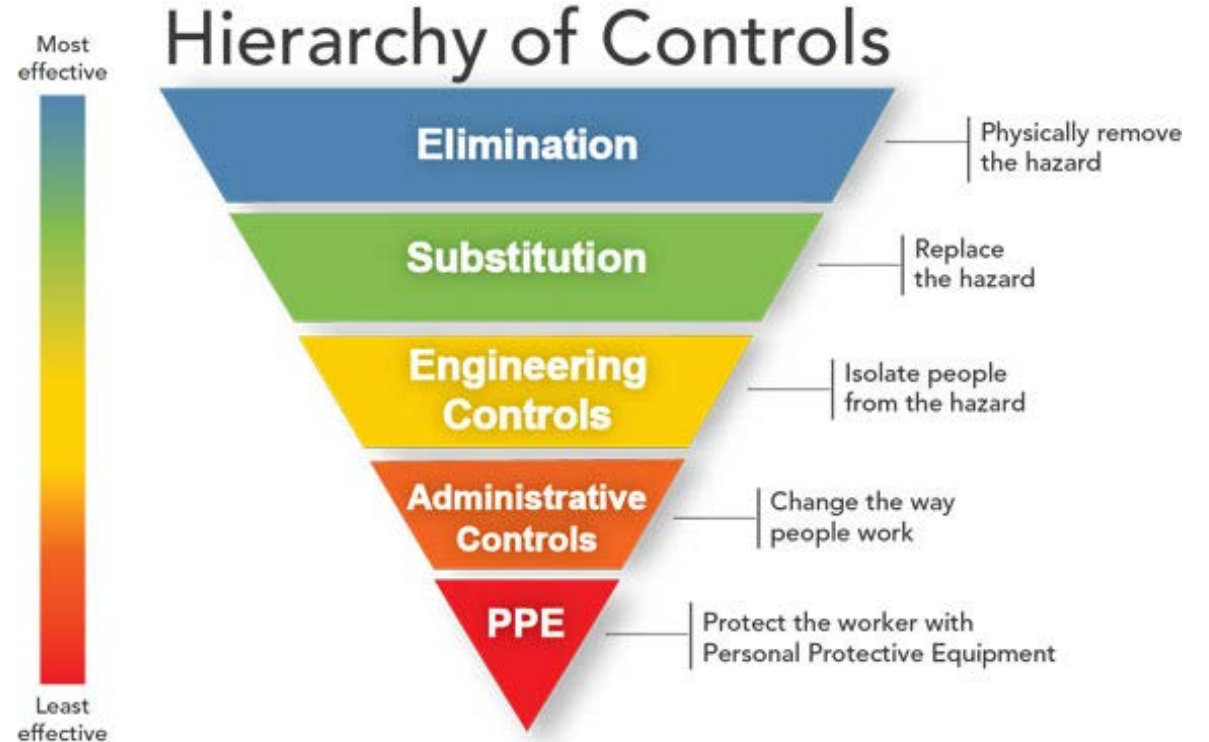
May 28, 2020



Photo credit: Scott Haviland, Oregon Occupational Safety and Health

Alternatives to trenching

- Substitution
- Use alternative methods
- Some still require limited trenching or excavation
- Not without their own hazards



Directional boring

- No excavation
- Drill to target
- Attach swivel and pipe
- Pull drill pipe, reamer, swivel and product pipe



Photo credit: Ditch Witch

Relining using cured-in-place pipe

- No excavation
- Popular for water and sewer repair
- Chemicals and processes may create new hazards



Photo credit: U.S. Air Force photo/Lea Johnson

Pipe ramming

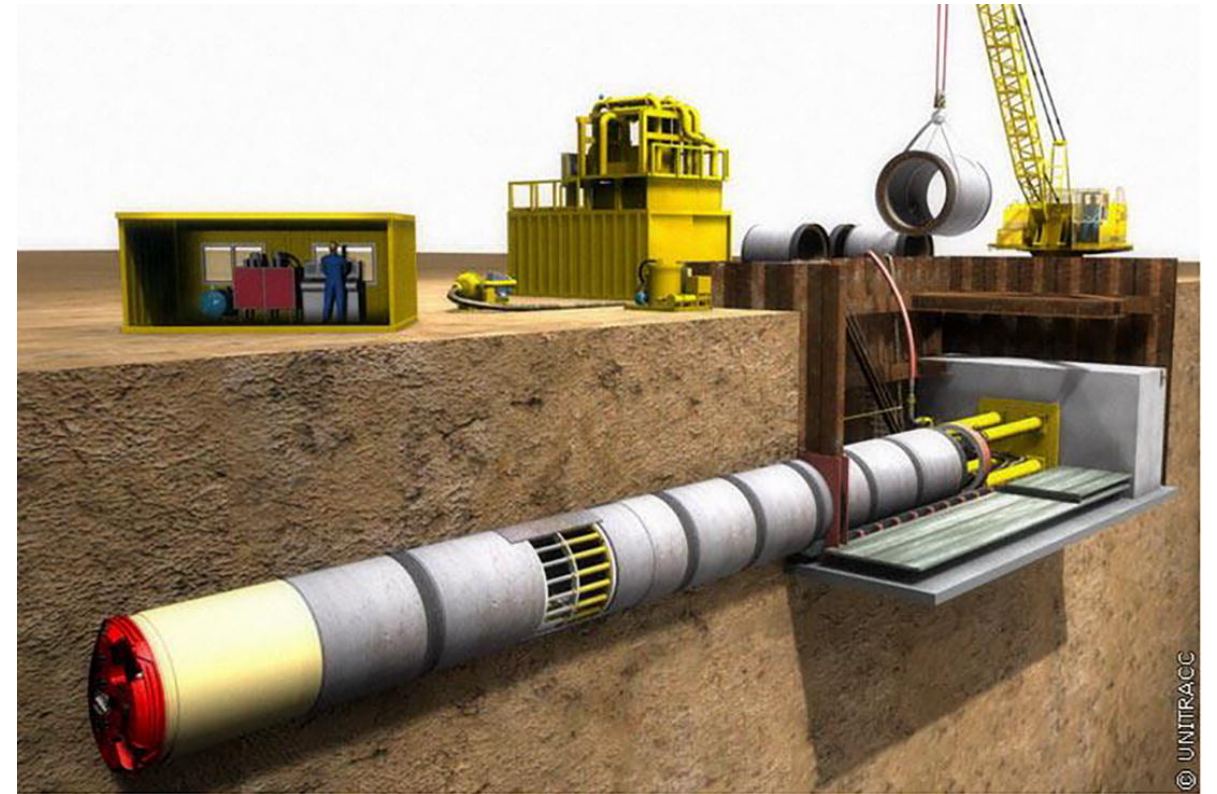
- Trenching or excavation may be required
- May be faster than other methods
- Can't be used in solid rock



FHWA [2013]. Vermont demonstration project: rehabilitation of culverts in South Burlington and Colchester. Washington, DC: Office of Infrastructure Federal Highway Administration

Utility tunneling and pipe jacking

- Excavation required
- Concrete slab supports equipment
- Thrust wall may be needed



Sterling RL [2020]. Developments and research directions in pipe jacking and microtunneling. Underground Space. 5:1-19.

References

IDBA [2019]. The directional boring advantage. Grand Junction, CO: International Directional Boring Association, <http://www.directionalboring.pro/>.

FP McCann [2016]. Pipejacking microtunnelling animation. Magherafelt, Northern Ireland: FP McCann, Ltd, <https://youtu.be/zjXYZAYUYi8>.

NYFACE [2011]. Operator killed when horizontal auger boring machine overturned. Albany, NY: New York State Department of Health, Bureau of Occupational Health and Injury Prevention, New York State Fatality Assessment and Control Evaluation (NY FACE) program.

OSHA [2019]. Accident search results. Washington, DC: U.S. Department of Labor, Occupational Safety and Health Administration, https://www.osha.gov/pls/imis/AccidentSearch.search?p_logger=1&acc_description=&acc_Abstract=&acc_keyword=trench&Fatal=fatal&sic=&naics=&Office=All&officetype=All&endmonth=01&endday=01&endyear=2018&startmonth=12&startday=31&startyear=2018&InspNr=.

Simicevic J, Sterling RL [2001]. Guidelines for pipe ramming. Vicksburg, MS: U.S. Army Corps of Engineers, Engineering Research and Development Center. TTC Technical Report #2001.04.

Stuedlein AW [no date]. Pipe ramming research. Oregon State University. http://web.engr.oregonstate.edu/~stuedlea/index_files/Page432.html.

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QUESTIONS?