

5. ATLANTA, GEORGIA, WORKSHOP - WRITTEN COMMENTS AND CORRESPONDENCE

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July 17, 1981

Felix Y. Yokei
U.S. Department of Commerce
National Bureau of Standards
Washington, D.C.

Re: Review of Working Draft of Suggested Revision in Subpart P
of the Safety and Health Regulations for Construction Part
1926, Excavations and Trenching based on Building Science Series
Report BSS127

The attached Summary represents Duke Power Company's Construction
Department's views on the suggested revision to subpart P of the
OSHA 1926 Standards.

If further interpretation or comment is needed please do not hesitate
in contacting my office.

J E Grogan, Manager
Construction Resources

R S Dugan
R S Dugan, Supervisor
Construction Safety

JFE:sr

cc: David Abernethy

Proposed Review

<u>Reference</u>	<u>Response</u>
1926.650(c)	It is requested that planking material and their use be specified in construction of raised walkways, runways, or sidewalks to insure an acceptable level of safety.
1926.650(j)	It is recommended that a qualified engineer be responsible for the critical function of inspection, design, and other related decisions concerning trenching and excavations. By the criteria document definition "qualified" carries more recognition and proven ability than does "competent". It is recommended that the engineer not be required to work at the location since multiple sites would present availability problems.
1926.651(e)	There is some concern on the proposed regulation to shore the sides of excavations as necessary where trucks and other vehicles may be parked or moved adjacent to the edges. It is agreeable that employees should not be in such a trench while a piece of equipment is nearby but the wording of the regulation may cause concern in back-filling operations where the truck is backed and dumped from the excavation or trench edge.
1926.651(f)	Where blasting is necessary then the soil should be treated as unstable in regard to shoring considerations.
1926.651(g)	The question is raised as to how adequate a barricade or stop log would be required as a stop for vehicles adjacent to excavation or trenches. Warning flagging may be adequate to similarly safeguard all employees.
1926.651(i)	It must be considered that <u>oil</u> cannot be used to minimize dust conditions caused by trenching and excavating activity where prohibited by some states (example-South Carolina) as a hazardous waste chemical and other government environmental agencies and regulations.
1926.651(o)	This section referring to work procedures in bell-bottom pier holes should <u>not</u> be dropped from the scope of subpart P since it deals with a type of excavation.

<u>Reference</u>	<u>Response</u>
1926.651(p)	The 4 feet depth requirement should be retained as a basis for requiring adequate means of exit from a trench. The phrase "negotiable slope" is vague and needs clarification.
1926.651(q)	The proposed regulation should read "shoring where needed" to clarify the intent of the standard.
1926.652(a)(2)	Excavation standards should not be relaxed to allow depth requirements to be extended from 20 ft. to 24 ft. before following specific requirements. The majority of excavations are less than 20 feet where the majority of injuries have been shown to occur.
1926.652(figure 1)	Slope requirements in the drawing should be omitted since the angle of repose would be a primary governing factor in determining shoring.
1926.652(figure 2)	Case IV should be limited to excavation by trenching machines.
1926.652(figure 2)	The allowable bank next to the work area should remain at 3 feet and not increased to 4 feet in the interest of increased safety to workers.
1926.652(table 1)	The steepest allowable slope should remain at 1:1 instead of 3/4:1 to allow a greater margin of safety.
1926.652(b)(1)	A short term excavation or trench should be redefined to extend from 1 to as much as 3 days.
1926.652(b)(4)(ii)	This information requiring specified strength of protection systems for trenches and excavations should be inserted at the end of subpart P with more options outlined.
1926.652(b)(5)(iii)	Excavation up to 2 feet below the bottom of trench boxes or sheeting should remain as a requirement and not extended to 3 feet.
1926.653(a)	The reference to a registered architect should be removed since the expertise of this field may not be concerned with soils.
Definition:	Mass movement of soil should be defined to give guidance in inspection and design specifications.
Appendix A	There is general use of the term "should" which perhaps to insure worker safety should be changed to "shall" items. Examples: A.3,2 Soil and Water Loads

There was concern from the workers responsible for actually installing shoring systems that more emphasis should be placed on system installation safety. The standards address finished shoring systems for other work processes but not in particular to how they are actually constructed as to working in trenches and excavations. This important area needs further consideration.

6. DALLAS, TEXAS, WORKSHOP - WRITTEN COMMENTS AND CORRESPONDENCE

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DISCUSSION OF:

WORKING DRAFT OF SUGGESTED REVISION IN SUBPART P OF
THE SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION
BASED ON BUILDING SCIENCE SERIES REPORT BSS 127

by Felix Y. Yokel

by

BUILDING AND CONSTRUCTION TRADES DEPARTMENT AFL-CIO
JACK L. MICKLE

DALLAS, TEXAS

JUNE 30, 1981

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Dr. Yokel is to be commended for his efforts to improve upon the Occupational Safety and Health Administration, (OSHA), 29 CFR Part 1926. Subpart P, Excavation, Trenching and Shoring Regulations document.

The Building and Construction Trades Department, AFL-CIO has been supportive of and assisted Dr. Yokel, where possible, since he began work on this project with the National Bureau of Standards in June, 1976.

In January, 1977 the B&CTD began the planning stage of a "Trenching Hazard Identification Task Force", hereinafter called the Task Force, to help the NBS obtain employee input aimed at hazard identification. In March, 1977 the Task Force met for a four day "retreat" type workshop; the six labor and management members brought with them 182 years of experience in trenching and related work. The charge was "to identify procedures and conditions that create safety hazards during excavation and trenching operations". Others present for the deliberations were Jim E. Lapping, Director of Safety and Health, B&CTD, as coordinator; Felix Y. Yokel as Technical Observer for the NBS and Jack L. Mickle, Chairperson. The final report (1)* was filed with the NBS in April, 1977. The final report appears in appendix G of NBSIR 80-1988 (2).

In September, 1978 Dr. Yokel (3) presented the preliminary findings and recommendations of the NBS study. Out of that two-day workshop came the agreement for this series of workshops to bring the results of Dr. Yokel's NBS study to the attention of labor, management and engineers in the field. Actually the essence of the working draft we are using for this workshop was printed in the Concrete Pipe News (4) in April of this year.

Since the 1978 workshop the B&CTD has responded to a number of requests for criticisms of drafts by Dr. Yokel.

*Numbers in parentheses refer to references given at the end of this paper.

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Two premises underlie all remarks and criticisms given in this critique:

That the worker be assured of safe and healthful working conditions, and

that the journeyman worker and the compliance officer as well as the management representative be able to fully understand the precautions that have been taken and the protective measures that have been provided to assure worker safety and health, or that the safety of the worker on the job be placed in the hands of a licensed professional.

The first premise is spelled out in the preamble of the Occupational Safety and Health Act of 1970.

The second premise assumes that an average journeyman or compliance officer, using the official OSHA regulations governing excavation and trenching safety, can determine whether or not the safety provisions on any jobsite are in compliance with the appropriate regulations. If the provisions are not "standard practice" as outlined in the regulations then there must be a certificate issued by a licensed professional which assures the worker that the jobsite safety and health measures have been designed by and certified by the licensed professional.

There are undoubtedly many "competent persons" and "qualified persons" who are quite capable of designing a safe worksite, but how are they to be identified by the worker or compliance officer? The license is the evidence. All licensing laws have encountered competent or qualified persons and have eventually incorporated them into or excluded them from practice. While there are probably quite capable people who know a great deal about medicine or law, the prudent individual seeks the licensed practitioner when medical or legal opinions or services are sought.

Actually suggesting that registered engineers need to be consulted is not new with this suggestion. Thompson and Tanenbaum (5) recommend substantial involvement of registered engin-

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ers in construction activities requiring trenching or excavations.

In view of the foregoing, this discussion will be concerned with only the first 20 pages of Dr. Yokel's working draft which outlines "standard practice". Even portions of the first 20 pages probably belong in the "guidelines" which have been included to assist professionals. It is also assumed that only the "standard practice" will eventually be recommended for inclusion in the OSHA regulations Subpart P; Dr. Yokel has indirectly suggested that by what was included in the article which he co-authored in the Concrete Pipe News.(4).

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COMMENTS ON SELECTED ITEMS ON PAGES 1-20 OF THE WORKING DRAFT

Page Location Comment

- 1 item 3 "...boxes. It is addressed to contractors, shoring manufacturers and engineers..." Why address it to the contractor unless the contractor is also an engineer?
- 2 item 5 "...which would aid field personnel and contractors in the selection of shoring." Once again, these persons are going to be dealing with the standard practice unless they are licensed professionals in their own right.
- 2 last line Note that a qualified person is not an engineer (recognizing this as just an example)
- 3&4 All Issues The items listed on pages 3 and 4 will be considered individually as they encountered in the text.
- 5 (g) ..be provided with and shall be instructed (required) to wear
- 5 (i) ...shall be permitted under loads handled by power-shevels, ~~derrieks~~, ~~ex~~-hoists, (equipment). This item is too specific for not listing all equipment which is used to handle loads; for example, backhoes are not listed.
- 6 (j) 2nd para. line 8 ...or the shoring system, and shall ~~increase-protection-against-slides-and-eave-ins-if-necessary~~, (see that all work in the excavation shall cease until necessary precautions have been taken to safeguard employees.)
- 6 (c)(1) line 3 "...shall be effectively stored and retained at least 2 (3) feet or more from the edge of the excavation." The Task Force specifically stated that 3 feet was necessary for proper protection.
- 6 (c)(2) line 3 "...may use effective barriers ~~or-other-effective-retaining-devices-in-lieu-thereof~~ in order..." Task Force recommended extending tight sheeting above ground level as an effective barrier. Twelve to 18 inch extensions were discussed.
- 8 (l) line 2 "... equipment, they shall be ~~designed-and~~ constructed by qualified persons..." Design implies work done by a licensed professional.
- 8 (o) This item is silent with respect to straight sided pier holes; some confusion has arisen because 1926, straight sided holes are covered elsewhere. 800(h)(3)
- 8 (p) When employees are required to be in trenches 4 (5?) feet deep...." Leave at 4 feet.

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Page	Location	Comment
8	(s)	"...boxes or shields are used they shall be designed (and certified as to use by a professional engineer and shall be maintained in a manner which will provide protection for the worker.)" Strike the balance of (s).
9	(a)(1)a	Excavations less than 5 ft. deep, except when examination-of-the-ground-by-a-competent-person-indicates-that hazardous ground movement may occur."
9	(a)(2)	"Excavations from 5 ft. to 20 ft. (20-ft. 2) deep." Why consider 24 feet? A better choice might be 15 feet for Standard Practice. Thompson and Tanebaum data (5) indicate that 87 per cent of the fatalities and injuries occur in excavations less than 20 feet deep and that 72 per cent occur in those less than 15 feet deep. Hinze and Carino (2) state in their summary that their "...study showed that most trenchwork is between 5 and 15 feet deep with the trench width usually being about 3 feet." Cass (6), speaking about the stacking of two standard 7 ft. aluminum hydraulic shores, notes that where the trench is over 14 feet deep (page 68) "other shoring systems should be applied" and on (page 72) "Maximum trench depth, this method, is 15' (4.58 m). Over 15' (4.58m), see Fig. 60.2, multi-type shoring." Multi-type shoring shown on Fig 60.2 is a different system using aluminum hydraulic shoring and plywood backing. A maximum depth of 15 feet for Standard Practice seems appropriate.
9	(a)(2)a line 3	"...sloping requirements must be determined by an engineer {a-qualified-person?}."
9	(a)(2)b Figure 1	May lead an individual to believe that FOOTING A is not a cause for concern; this could be dangerous. It is worthy of note that the role of the engineer has not been challenged at this point where property damage as well as personal injury is possible.
10	(a)(3)	See comments under: page 9 (a)(2). Fifteen ft. depth may be a better limit for Standard Practice rather than 20 ft.
10	(b)(1) line 6	The distinction between short-term and long-term is very difficult to reckon with; virtually no firm data exists. Not only stresses in the mass vary with time, but environmental factors may be critical. Twenty-four hours seems more logical than seven days.

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Page	Location	Comment
11	bottom of page last two lines	There may be some merit to allowing steeper slopes in some cases. The Task Force indicated that slopes flatter than 1:1 were probably not necessary for worker safety. Slopes of 1:1 were recommended for most conditions.
12	Fig. 2 Case IV	This particular configuration should be made a part of the "guidelines" proposed by NBS. While the configuration looks good on paper, it may be difficult to understand and/or enforce in the field. If included in Standard Practice the 3 ft. max bank should be retained.
13	(b)(4)(i)b.	See the first four lines at the top of page 13. Table 2 is necessary in Standard Practice only if Fig. 3(b) is retained. Moving the option shown as Fig. 3(b) to the Guidelines removes the need for Table 2 which is confusing and also removes the need for special tables and figures outlining the placement of shoring in the lower part of the ditch.
13	(b)(4)(i)c.	For Standard Practice it may be worthwhile to include all surcharges, including allowances for heavy equipment, in the adjusted depth. The Task Force recommended a minimum of 300 pounds per square foot for surcharge. Dr. Yokel has greatly simplified Table 3 but it still can be confusing. Moving Table 3 to the Guidelines and greatly increasing the surcharges to allow for heavy equipment may lead to "overdesigned" shoring and shields, but Standard Practice would thereby be greatly simplified.
13	(ii)b.	The Task Force recommended a 500 lb gravity load.
13	(ii)c.	This statement is not clear. Does this mean a 240 ft-lb impact load per square foot? The entire (ii)c. should become a part of the Guidelines and removed from Standard Practice.
13	(ii)	This entire section devoted to the required strength of shoring systems, trench shields and trench boxes needs to be moved to the Guidelines.
16	b.	If some of the previous suggestions are followed, hydraulic shores and other assemblies can be brought into Standard Practice. At a meeting in October, 1980 with NBS and members of the hydraulic shoring industry it was agreed that reasonably simple charts for the selection of shores can be developed. This seems to be in keeping with Cass' (6) recommendations for depth to 14 or 15 ft. There is no question that the resulting system would be greatly over-designed

Page	Location	Comment
		at times, but the freedom to use Standard Practice for most work (2) and thereby not requiring the services of an engineer seems to outweigh the disadvantages of overdesign.
16	c.	Timber shoring is properly located in the Guidelines; selection must be by an engineer. The Guidelines are for the use of licensed professionals.
16	(5)(ii) last two lines	The statement in parentheses is a vague performance specification which detracts from a well stated, precise paragraph.
16	(5)(iii)	Excavation below the bottom of the protective element has merit; exactly how much to allow is difficult to determine. Certainly engineers can design specific protection for unique circumstances, the Guidelines will help, but permitting excavation below the protection device in Standard Practice will require very careful consideration.
18	(a)	"...with standards required by a registered-architect , a registered professional engineer, or other duly licensed or-recognized authority. .."
19	(m)	Twenty-four hours for short term seems most reasonable.
19	(o)	Negotiable slope needs to be specified; 1½:1 seems reasonable.
19	(p)	How is a qualified person to be identified? Unless there is a specific procedure anyone can claim to be a qualified person. No objection if the qualified person is permitted to use Standard Practice only.
19	(t)	same argument; use 24 hours for short term.
19	(aa)	<u>Stable Slope</u> . A meaningless term unless it is arrived at by a licensed engineer. This term has no place in Standard Practice!
20	(gg)	Working loads are best relegated to the Guidelines where they can be dealt with by an engineer.

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Summary

There must be clear separation between Standard Practice and cases where an engineer has certified the procedure to be followed.

It is recommended that Standard Practice be permitted to a depth of cut of 15 feet; this includes most excavation and trenching work. At depths greater than 15 feet, or for special work, the engineer must assume full responsibility for the design of the protective system. The 15 ft. depth needs verified.

Standard Practice must be written such that the protective measures resulting from the application of Standard Practice are observable, measurable, understandable by all parties (with application of the regulations) and provide for the safety and health of the worker. It is recognized that Standard Practice may at times result in substantial overdesign, but this would not be new to the construction field.

It is anticipated that competent or qualified persons working for the contractor would select methods within Standard Practice to protect workers, but that any deviation from Standard Practice would need to be designed by an engineer. The engineer is recognizable by a professional license.

Several items which need consideration: construction right of way requirements, toxic materials, safety program as an item in the bid document, soil conditions and utilities in the bid document and better safety education for all. The Task Force final report lists other concerns.

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RECOMMENDATIONS

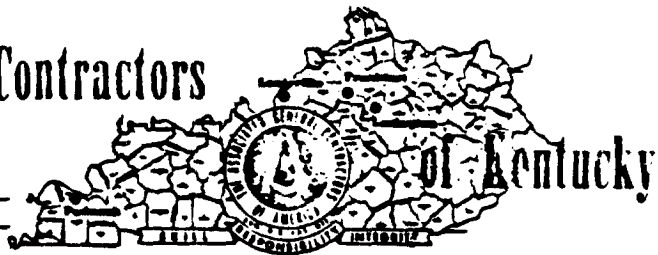
1. Use Standard Practice to a depth of 15 feet.
2. Over 15 feet or where Standard Practice is changed an engineer must assume full responsibility.
3. Standard Practice must be observable, measurable and understandable by all parties and above all must be effective.
4. Competent and qualified persons working for the contractor would select methods within Standard Practice but an engineer would be required where deviations occur.
5. Construction right-of-way needs to be considered.
6. Toxic materials need to be considered.
7. A safety program needs to be outlined in the bid documents.
8. Soil conditions and utilities need to be considered in the bid documents.
9. Safety education is a must for all.

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References

1. Building and Construction Trades Department AFL - CIO. Trenching Hazard Identification Task Force; Final Report. Prepared for the National Bureau of Standards; Building Safety Section; James O. Bryson, Chief. April, 1977.
2. Hinze, Jimmie and Nicholas J. Carino. A Study of Work Practices Employed to Protect Workers in Trenches; NBSIR 80-1988. National Bureau of Standards. March 1980.
3. Salomone, Lawrence A. and Felix Y. Yokel. Proceedings, Federal Workshop on Excavation Safety, September 19 and 20, 1978. National Bureau of Standards. July, 1979.
4. Yokel, Felix Y., Riley M. Chung and Ronald L. Stanevich. New Concepts for Construction Practice Standards for Excavations. Concrete Pipe News; pages 28-33, vol 33 no 2, April, 1981.
5. Thompson, Louis J. and Ronald J. Tanenbaum. Excavations, Trenching & Shoring: the responsibility for design and safety. Sponsored by the Associated General Contractors of America. A report of the Texas A & M Research Foundation. College Station Texas. September, 1975.
6. Cass, W. Martin "Red". Common Sense in the Common Trench. Equipment Guide-Book Company; 2800 West Bayshore Road, Palo Alto, California 94303. 1979.

Associated General Contractors



Offices in FRANKFORT, LEXINGTON, LOUISVILLE and PADUCAH

Please Address Reply To:

RECOMMENDED CHANGES TO WORKING DRAFT SUBPART P 2/20/81

Page 5 1926.650(d) Reword "Planks shall be installed in a manner to reduce the probability of tripping."
(g) Need to define what is meant by "Exposed To Vehicular Traffic".
(i) To restrictive; does not allow for the driver to stay in vehicle with cab protection. In most cases driver is exposed to a greater hazard outside of his/her vehicle. Remove second sentence.

Page 7 1926.651(g) Remove words "substantial stop logs or barricades shall be installed." Reword: If possible, the grade should be away from the excavation, when mobile equipment is utilized or allowed adjacent to excavations.
(i) Delete (This provision is covered under Air Pollution Standards).
(k) Delete (Should only apply to long term usage).

Page 8 Delete (Any structural ramp of this type would normally be in the project plans and specifications).
(p) Support the 5' trench. Also consideration should be given to the exit through pipes (48" in diameter and larger) in the trench. This would eliminate the emergency exit on a ladder with mud on the boots.
(q) Start paragraph with words "Proper Shoreing".
(r) Delete: repetitive of (q).
(t) Delete: Does not define unstable soils; to restrictive.

Page 9 1926.652(a) (2) Support 24 foot.
(2)(a) Support qualified person.

Page 10 (3) Support 24 ft. and an engineer.

Page 11 Table 1

<u>Soil Type</u>	<u>12' or less</u>	<u>12' & greater</u>	<u>Start Sloping</u>
A	1/2:1	1/2:1	5' level
B	3/4:1	1:1	3' level
C	1:1	1:1	0' level

Notes: 1) Use of Normal Construction Equipment used in the Trenching operation should not change the sloping requirements.

2) Type C: Soft Soils should not include cohesive soils defined under d/.

Page 12 Figure #2 Should be changed to consider depth at which slope would start. (See recommendations under Table 1).

Page 13 b. To restrictive.

Page 14 Table #2 More time for study is needed.

Additional comments:

1. Too much emphasis is placed on sheeting and shoring systems for semi-permanent excavations, such as building foundations?
 - a) Concentration in regulation changes seems to be on building excavations.
 - b) Greatest need is for uniformity of enforcement, clarification of regulation and training of compliance officers is in open trenching projects.
 - c) Regulations, even with proposed changes are still not simple enough for average compliance officer to comprehend. Regulations are not definitive enough to accurately classify various soil types. Most charts are thrown out window when decision as to bracing is made. Most superintendents rely on experience.
2. All backfill material is not soft or unstable, yet regulations assume so.
3. 1926.651(c) is redundant, is covered in several other regulations.
4. Short term trench opening should be less restrictive and should re-consider the effect weather has on long term trench opening, in evaluating soil type.

Presented: June 16, 1981, Atlanta, Georgia

Comments Made by: Michael D. Maguire on behalf of A.G.C. of Kentucky which represents Chapters in Louisville, Lexington and Paducah, Kentucky.

McCLURG & ASSOCIATES, INC. / CONSULTING ENGINEERS

June 25, 1981



Efficiency Production, Inc.
P.O. Box 24126
Lansing, Michigan 48909

Attn: Mr. John Cook

Re: Comments on "Working Draft of Suggested Revision
in Subpart P of the Safety & Health Regulations
for Construction based on Building Science Series
Report BSS 127" by Felix T. Yokel dated 2/20/81

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Robert E. Cooper P.E.
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Allen J. Nieber P.F.

1926.652 - Specific Shoring, Shielding & Sloping Requirements

- (a) (1) a. Change to excavations less than 4 ft. (vs. 5 ft.)
- (a) (2) Change to excavations greater than 24 ft. (vs. 20 ft.)
 - a. ... 'must be determined by an engineer'.
- (a) (3) Change to 24 ft. (vs. 20 ft.) and use engineer (vs. qualified person)
- (b) Standard Practice
 - (1) Change to 7 days (vs. 24 hours) -(this needs documentation or at least more study).
- (4) (1) Determination of adjusted depth
 - (a) eliminate the 2' surcharge here and in Figure 3 (a), therefore adjusted depth equals actual depth H as determined by a qualified person
 - (b) eliminate the 2' surcharge in figure 3 (b), make adjusted depth equal to actual depth.

Page 14 - eliminate Table 2.

(Discussion - the 2' allowance for spoil piles is not needed in many cases, e.g. paved streets - traffic maintained; and is not enough in many other cases erring on the side of danger. The design depth should be selected by a qualified person based on actual field

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conditions. This obviously includes spoil piles (which may be 10 ft. instead of 2 ft.) and any other surcharge loads which must be included in the estimation of depth of cut. Table 2 is an effort to lay down empirical rules for adjusting depths but it is not controlling and merely will confuse field personnel. We assume this table is based on a Rankine or Coulomb theory for sloping backfill utilizing a failure wedge of earth loading the retaining structure. The actual depth would control until you arrive at an exceedingly deep cut. For example, if H = 20 ft., slope 1:1, adjusted depth equals 3 times H equals 60 ft., which means within the normal range of excavation the actual depth of cut must exceed 60 ft. before Table 2 controls. Hopefully in excavation decisions of this magnitude an engineer would be investigating a method of determining lateral earth pressure based on engineering principles and accepted soils mechanics data available to him and Table 2 would be of no value to him.)

(4) (1)

- c. delete the reference to a 2 ft. surcharge allowance. (Table 3 and Figure 3 (c) would probably be helpful to field personnel who might be required to evaluate the effects of heavy equipment in close proximity to the trench excavation for depths up to 20 ft.)

Page 11 - Table 1

Type B medium soil should be w_e 30 lbs./ft³ in accordance with generally accepted engineering practice. This covers sand, gravel, sand-gravel, clayey sand-gravel and silty sand with unit weights ranging from 100 to 140 lbs./ft³ and friction angles from 28 to 45 degrees. Soil classifications exerting pressures greater than 30 lbs./ft³ such as clay-silt, clays, uniform silts and hydrostatic conditions are special cases which generally exert pressures greater than 40 lbs./ft³ and require more detailed analysis.

We also fail to understand why the "steepest allowable slope" should be any different for depths greater than 12 ft. than it is for depths less than 12 ft. We propose they should be as follows in accordance with average angle of repose, regardless of depth:

Type A	3/4	horizontal	:	1	vertical
B	1 1/2	horizontal	:	1	vertical
C	3	horizontal	:	1	vertical

(4) (ii) Required Strength of Shoring Systems

- a. Change to - lateral pressure at the bottom of excavation equal to the equivalent weight effect (w_e) in Table 1 times the depth of cut with lateral pressure diagram appropriate to the construction as determined by an engineer. (Discussion - the present statement is an over simplification more correct for closely cross braced sheeting, but not applicable to trench boxes and not correct for all cases of braced sheeting).
- c. Delete the entire last sentence. Allowing a 33% allowable stress increase would reduce the safety factor against yield for A36 steel to 1.12. This approach is not recognized by any known building code and if reasonable criteria is used for determining lateral earth pressure it is unwarranted.

(5) Special Provisions

- (iii) Excavation up to 3 ft. below the bottom of

1926.653 Definitions

- (m) Long term excavations - which are open more than 7 days.
- (t) Short term excavations - which are open 7 days or less.

Guidelines Supplementing Subpart P of the Safety and Health Regulations for Construction

Page 22 - Section 2 Strength Requirements for Pre-Designed Shoring Systems, Trench Boxes and Trench Shields to be used in the Standard Practice.

2.1 Design of Shoring Systems

- A. Delete the 33% increase in working stress. The lateral pressures should be accurately estimated and no distinction made in working stresses as to short or long term loading.
- B. Delete 1.3 times the working load - use 1.7 for short and long term excavations.

2.2 Loads Acting on Shoring Systems, Trench Shields and Trench Boxes

- 2.2.3 Lateral Soil Pressures - See comment (4) (ii) a. Trench boxes are designed on the basis of yielding supports for active soil pressure rather than passive pressures as in the case of cross braced sheeting with nonyielding supports. This entire section should be re-written to make this distinction.

Efficiency Production, Inc.
Page 4
June 25, 1981

Page 25 - Figure 1. Lateral earth pressure diagrams are for braced sheeting, this figure should be revised or supplemented with diagrams applicable to trench boxes, i.e. triangular or prismatic not rectangular.

2.3.2 Rating Procedures

The annual renewal of this rating may be a worthy objective but is impractical and not enforceable. Why not a statement to the effect that it is the contractor's responsibility to periodically inspect trenching equipment and insure they are in satisfactory condition.

Page 37 Section 5 (b) Delete last sentence allowing 33% increase

Section 5 (c) Delete "1.3 times the working load for short-term excavations.

Page 40 Add lateral earth pressure diagrams for the active soils case utilizing Rankine and Coulomb earth pressure solutions.

Respectfully submitted,

McCLURG & ASSOCIATES, INC.


Allen J. Nieber, P.E.

AJN/cj

Definition in
Dallas Workshop

STATEMENT OF POSITION AND RECOMMENDATIONS ON REVISION
TO SUBPART P OF THE SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

PRESENTED BY

THE MAJOR MANUFACTURERS OF TRENCH BOXES
AND TRENCH SHIELDS OF THE UNITED STATES

John B. Cook
Efficiency Production, Inc.

Wendell Wood
Griswold Machine & Engineering

GENERAL STATEMENT OF POSITION

A review in detail has been made of the proposed revisions in Subpart P 1926.650 - .651 - .652 and the attached guidelines and appendix.

This review was made by, and on behalf of, the major trench box manufacturers of the United States, and represents their consensus opinion of the changes in the proposed standards.

It is our position that the intent to clarify and simplify, as it relates to the revised changes of Subpart P, has failed, and in fact, has made it more confusing and more difficult to apply in the field. The proposed design criteria as they relate to trench boxes do not conform to accepted engineering practices, and at the proper time we have specific recommendations for changes in the proposed revisions.

1926.650 GENERAL PROTECTION REQUIREMENTS - NO COMMENT

1926.651 - SPECIFIC EXCAVATION REQUIREMENTS

PAGE

- 8 - item (s) Should read ... Portable trench boxes or sliding trench shields may be used for the protection of personnel. Where such trench boxes or trench shields are used they shall be designed, constructed and maintained in a manner which will provide equivalent protection to that provided by the shoring required for the excavation as defined by accepted engineering practice.

1926.652 - SPECIFIC SHORING, SLOPING AND SHIELDING REQUIREMENTS

PAGE

- 9 - item 2a Should read ... Qualified Engineer
- 10 - item b (2) b (3) Should read ... Engineer
- 10 - item (b) (i) Change to 7 days
- 10 - item (4) (i) Based upon the education, training and experience of our professional engineers, it is our position that there is no foundation in standard practice for the application of an adjusted trench depth standard as delineated in section 1926.652 (b) (4) (i). We recommend that this section and it's tables 2 and 3 and figure 3 be eliminated in their entirety.
- 10 - item (4) (1) a We recognize the importance of surcharge loads and it should be dealt with within the realm of accepted engineering practice. We recommend the elimination of section 4 i - a,b, and c and table 2.
- 11 Regarding table 1 on page 11 - type B medium soil should be (we) 30 lbs./FT³ in accordance with generally accepted engineering practice. Regarding slopes in table 1 page 11 - the steepest allowable slope table, in our opinion, does not conform to standard engineering practice
- 13 - item (11) a Should read ... lateral pressure at the bottom of excavation equal to the equivalent weight effect (We) in table 1 times the depth of cut with lateral pressure diagram appropriate to the construction as determined by an engineer.

- "We object to the footnotes attached to table 1 as being too technical and overly complicated for interpretation by field personnel, and recommend they be simplified."
- 13 (11) c The last paragraph of this section should read...shoring systems shall be designed in accordance with accepted engineering practices.
- 13 (11) Paragraph 2 Should read... Shoring systems and trench shields shall be selected in the field on the basis of accepted engineering practice.
- 13 (11) (a) Trench shields, trench boxes, and pre-fabricated strutwale assemblies and other pre-fabricated assemblies shall be rated for the maximum depths in Type A, B, and C soils in which they can be used and selected accordingly.
- 16 - item (4) (11) (c) Should read.... prepared by an engineer.
- 16 - item (5) (11) Should read ... Excavation up to 3 feet below the bottom of sheeting, trench boxes, or trench shields, excavation up to 3 feet below the bottom is allowable in short term excavations. (and we agree with items a & b.)
- 1926.653 - DEFINITIONS APPLICABLE TO THIS SUBPART
- 18 a Should read ... Accepted engineering practices, those requirements or practices which are compatible with standards required by a registered professional engineer.
- 18 c We recommend the elimination of this item.
- 19 m Should read... Long term excavations are excavations that are open more than 7 days.
- 19 o Should read... Negotiable slope is a slope on which a person can egress from or ingress to an excavation with relative ease and speed to insure reasonable safety.
- 19 t Should read... 7 days or less.
- 19 z Should read... See figure 4. (Correction)

GUIDELINES SUPPLEMENTING SUBPART P

Page

22 - 2.1

First paragraph should read... Shoring systems, trench shields, and trench boxes shall be designed in accordance with accepted engineering practices.

22 - 2.1 A

Should read... Are not to exceed 1.0 times the allowable working stresses....

22 - 2.1 B

Change 1.3 to 1.7

22 - 2.23

Should read... Lateral pressure at the bottom of excavation equal to the equivalent weight effect (w_e) in Table 1 times the depth of cut, with lateral pressure diagram appropriate to the construction as determined by an engineer, and figure 1 should be eliminated.

27 - 2.3.2

We question how the annual renewal of the rating can effectively be accomplished.

30

"Is it the intent that Appendix A become a part of Subpart P?"
If the answer is yes, and Appendix A is to become a part of Subpart P we would like to take exception to several specific items that, as they were applied to Subpart P, do not conform to accepted engineering practice."

37 - 5. (b)

Should read... Allowable stresses should be determined in accordance with the applicable standards.

37 - 5. (c)

Should read... Ultimate strength, rather than working stress design may be used whenever such a procedure is stipulated in the applicable standard or load capacity is determined by test. Ultimate loads should be taken as 1.7 times the working load in accordance with accepted engineering practice.

38 A.5.3.

First paragraph is O.K.

Add second paragraph, which should include a diagram covering the active soil pressure case utilizing either the Rankine or Columb solutions.

ANSWERS TO MR. YOKEL'S QUESTIONS

#1 No comment

#2 No comment

#3 No comment on 24 foot limitation.

On question of should qualified person be substituted for engineer...

"No, as it relates to this specific question. There are other areas in the working draft where qualified person should apply."

#4 7 days. We do not need more conservative requirements.

#5 We feel that the allowable slope in table 1 is not in accordance with acceptable engineering practice and that the stable slope concept should be used.

#6 No comment

#7 Yes, and should be conveyed as part of the definitions.

#8 No comment

#9 Yes

#10 Yes

#11 No comment

#12 No

#13 No - Statement should not be deleted.