10. MISCELLANEOUS INPUT AND INFORMATION

The correspondence in this section was sent to NBS at various times and is not associated with any particular workshop.

American Gas Association

1515 Wilson Boulevard Arlington Va 2220.
Telephone (703) 841-8400

September 11, 1981

Dr. Felix Y. Yokel
Center for Building Technology
National Engineering Laboratory
National Bureau of Standards
Washington, D.C. 20234

Dear Dr. Yokel:

The American Gas Association (A.G.A.) is a national trade association which represents nearly 300 national gas transmission and distribution companies serving over 160 million consumers in all 50 states. The gas utility industry employs about 215,000 people with a payroll in excess of $4 billion.

Representatives from the A.G.A. attended two of the recent workshop sessions on NBS Building Science Series 127 "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations," written as a basis for proposed changes to Subpart P of 29 C.F.R. Part 1926. Two of the potential changes discussed cause particular concern. First, consolidating excavation and trenching rules into a single regulation and, second, comments proposing a 3 foot set-back for excavations.

The A.G.A., although not in the construction industry, is currently being regulated under 29 C.F.R. Part 1926, including Subpart P for trenching and excavations. We, therefore, have a vital interest in these standards.

As a primary goal we desire to be exempted from construction industry standards. Since we have not yet attained that goal we must in the meantime insure that any changes to the current regulations on trenching and excavations in 29 C.F.R. Part 1926 consider our special interest in trenching. As implied previously, we see particular significance in retaining the distinction between trenching and excavations.

Our distribution companies, which by nature of our business operate in urban areas, are greatly affected by the OSHA trenching and excavation regulations, especially the 2 foot set-back rule. Inspection of gas lines by OSHA have occurred in spite of the fact that trenching cave-ins are not a problem within our industry as documented by our safety record. Equally as important, trenching operations by gas companies, both distribution and transmission, come under the safety jurisdiction of the Office of Pipeline Safety within the Department of Transportation. The DOT rules are promulgated under 49 C.F.R. Parts 191 and 192. This potential for dual jurisdiction over trenching safety regulations between OSHA and DOT causes confusion. For additional discussion of our safety record in trenching and the jurisdictional issue—see the attachment.

We, therefore, request that any revision to excavation and trenching standards in 29 C.F.R. Part 1926 include the following statement: "Natural Gas companies directly involved in pipeline activities covered by 49 C.F.R. Parts 191 and 192, as promulgated by the Department of Transportation are exempt from Subpart P of 29 C.F.R. Part 1926 standards relating to excavation and trenching operations."

For additional information on this subject, please contact Larry T. Ingels, 703/841-8454 or Randall Griffin, 703/841-8481 at A.G.A. Headquarters in Arlington, Virginia.

Sincerely,

Larry T. Ingels
Manager, Engineering
Services Programs

LTI:lbp

OVERLAPPING JURISDICTION BETWEEN OSHA AND DOT

SUMMARY OF ARGUMENT

I. The natural gas utility industry should not be grouped with the construction industry. Standards developed for the construction industry should not, therefore, be applied to the natural gas utility industry.

A. The natural gas utility industry is fundamentally distinct from the construction industry. Safety records support this contention.

B. The natural gas utility industry took no part - and had no opportunity to take part - in the development of the Construction Industry Standards 29 C.F.R. Part 1926.

II. OSHA jurisdiction is preempted under Section 4(b)(1) of the Occupational Safety and Health Administration Act of 1970 (OSH Act) when other Federal agencies "exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety or health."

A. The Department of Transportation exercised its statutory authority under the Pipeline Safety Act of 1968 by promulgating regulations relating to pipeline operations and maintenance (49 C.F.R. Part 192) and by enforcement of those regulations.

B. DOT's regulations preempt OSHA jurisdiction over pipeline and trenching operations, rendering OSHA regulations in Part 1926 inapplicable to the natural gas utility industry.

III. The American Gas Association (A.G.A.), therefore, requests that OSHA refrain from citiation of the natural gas utility industry under Part 1926.

INTRODUCTION

The American Gas Association (A.G.A.) is a national trade association which represents nearly 300 natural gas transmission and distribution companies serving more than 160 million consumers in all 50 states. These companies account for nearly 85% of the nation's total annual gas utility sales.

The natural gas utility industry is regulated at each and every stage of their business. Many of these regulations, including OSHA's "General Industry" standards in 29 C.F.R. Part 1910, are recognized as validly applying to our industry. We do not believe, however, that the "Construction Industry" standards of 29 C.F.R. Part 1926 should be enforced against the natural gas utility industry. We recommend that OSHA institute a policy of not citing the natural gas utility industry under Part 1926 for the following reasons.

I. The natural gas utility industry should not be grouped with the construction industry.

According to the National Safety Council data for 1978, the gas utility industry had an incident rate of 2.69 per 100 full-time workers and a severity rate of 15.98 lost work days per injury. This compares very favorably with the construction industry statistics of 3.94 injuries per 100 full-time workers with a severity of 20.81 lost work days per injury. Furthermore, a review of safety statistics relating directly to trenching and pipeline activities indicates that the natural gas utility industry has an exceptionally good safety record.

- During the six year period (1975 - 1980) 3,837 immediate injury reports were received by A.G.A.
- Of the above total only 7 were in the accident category which includes cave-ins and none have been documented as fatalities.
- These few injuries generally occurred in trenches or excavations belonging to someone else who called the gas company to repair a line damaged during excavation.
- Scaled to the entire industry, this type of accident - "caught under, in or between a mineral item" which would include cave-ins - would represent only one-sixth of one percent of the total injuries.
- From this extremely low rate of incidence, it may be concluded that cave-ins involving trenches or excavations are not a significant problem within the natural gas industry.

Additionally, the segment of the gas utility industry most likely to be engaged in the pipeline and trenching activities labelled "construction" by OSHA - natural gas transmission companies - have incident rates of less than half of the overall gas utility rate.

The large difference in the incident rates between transmission companies engaged in trenching activities and construction companies occurs because trenching and pipeline activities of gas utility companies are performed by relatively few employees at any given workplace. Construction industries, on the other hand, may have a large number of employees performing a wide variety of tasks at the same workplace. Due to disparate rates and levels of risk, the standards designed for the construction industry are not appropriate to apply to the natural gas utility industry.

The construction industry standards of Part 1926 have been applied to the natural gas utility industry without giving that industry an opportunity to provide input. These standards were developed under the Contract Work Hours and Safety Standards Act of 1962, (as amended Pub. L. 91-54 of 1969; 40 U.S.C. §333), to regulate construction crews working under government contracts. In order to cover these crews comprehensively, the standards were defined very broadly to cover, "construction, alteration, and/or repair including painting and decorating..."

The OSH Act of 1970 gave the Secretary of Labor the authority to promulgate as occupational safety and health standards, without the notice and comment requirements of the Administrative Procedures Act, any "national consensus standard and any established Federal standard." §6(a) of the OSH Act, 29 U.S.C. Section 655(a). The natural gas utility industry had no need to comment on proposed regulations when these regulations applied only to Federal contractors. There was no opportunity for the gas utility industry to comment on the regulations when they were promulgated as occupational safety and health standards.

In this context, the 10th Circuit opinion U-30, Inc. v. Marshall and OSAHRC, 7 OSHC 1253 (10th Circuit 1980). should be reviewed. The Court found that there was "no indication in the record...that the oil drilling industry had any part or was consulted in the development of the construction industry standards." The Court then held that the construction industry standard relating to cranes and derricks used in constructing buildings could not be applied under the "general duty clause" of Section 5(a)(1) of the OSH Act to the oil drilling industry.

A.G.A. believes that the safety record of the natural gas utility industry and the rationale outlined above strongly support the establishment of an OSHA policy of not citing the natural gas industry under Part 1926.

II. A Policy of Not Citing Under Part 1926 is Legally Justified

OSHA has been granted authority by the Secretary of Labor to make and enforce regulations for the minimum federal safety standards for all industries. The Secretary of Labor's authority in this area is derived from the OSH Act of 1970, 29 U.S.C. Section 651, et seq. In order to avoid overlapping jurisdiction and the inefficiencies and costs of overlapping jurisdiction, Congress limited the Secretary's authority. The limitation, Section 4(b)(1) of the OSH Act (20 U.S.C. Section 653(b)(1)), provides that:

> "Nothing in this chapter shall apply to working conditions of employees with respect to which other Federal agencies... exercise statutory authority or regulations affecting safety or health."

It is A.G.A.'s position that the Office of Pipeline Safety (OPS) of the Department of Transportation has exercised its statutory under the Natural Gas Pipeline Safety Act of 1968 by promulgating regulations entitled "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards." 49 C.F.R. Parts 191 and 192. These regulations comprehensively cover operation and maintenance of pipelines, mandate safe working procedures to be documented in an operating and maintenance plan, and impose strict reporting and other requirements in case of emergency, among other safety related requirements.

An important concept to keep in mind when reviewing the OSHA Part 1926 regulations is that the OPS regulations need not be parallel in form or substance to the OSHA regulations in order to preempt jurisdiction.

> "Whether the OPS standards are the same or substantially different from the OSHA standards their content is of little moment. In Mushroom Transportation Co., Inc., No. 1588 (1974) own authority over specific working conditions, OSHA cannot enforce its own regulations covering the same conditions. Section 4(b)(1) does not require that another agency exercise its authority in the same manner, or an equally stringent manner." Secretary v. Texas Eastern Transportation Corp., 20 OSHA 712, 717 (1975) (emphasis added by Commission) (Citations omitted.)

This concept is important to keep in mind because the OPS regulations are generally structured in terms of maintaining the integrity of the pipeline and prevention of hazardous situations. The prevention of hazardous situations is mandated through performance language rather than the prescriptive language generally employed by OSHA.

An example of preemption of an OSHA standard by an OPS standard which varied significantly from the form of the OSHA standard can be found in Columbia Gas of Pennsylvania v. secretary and OSAHRC, No. 80-1459, (erd Cir., December 23, 1980.) In that case, Columbia Gas was cited for a serious violation of an OSHA regulation — 29 C.F.R. §1926.652(v) — requiring atmospheric testing of an excavation where oxygen deficiency or gaseous conditions are possible, prior to use of equipment that could cause accidental ignition. It should be noted that Section 1926.652(v) requires compliance with Subparts C and D of Part 1926 in which a large number of specific requirements are mandated as to personal protective equipment and engineering controls. In contrast, the OPS regulation, 49 C.F.R. Section 192.751, provides simply that:

> Section 192.751 Prevention of Accidental Ignition
>
> Each operator shall take steps to minimize the danger of accidental ignition of gas in any structure or area where the presence of gas constitutes a hazard of fire or explosion, including the following:
>
> (a) When a hazardous amount of gas is being vented into open air, each potential source of ignition must be removed from the area and a fire extinguisher must be provided.
>
> (b) Gas or electric welding or cutting may not be performed on pipe or on pipe components that contain a combustible mixture of gas and air in the area of work.
>
> (c) Post warning signs, where appropriate.

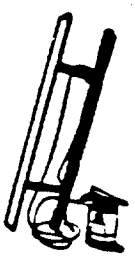
The OPS regulation does not specifically refer to the repair of a pipeline using a "hot tap" procedure at issue in the case, (tapping into a pipeline without interrupting the flow of gas in the pipeline), nor does it mandate detailed requirements in a manner similar to OSHA's. Nevertheless, the Third Circuit held that the OPS regulation covered the "exact working conditions" purportedly within OSHA's jurisdiction.

Therefore the Court ruled that "this OPS regulation provides safety standards for the exact conditions of this case and hence find that Section 4(b)(1) preempted OSHA's authority over the matter."

The above case strongly supports the argument that the DOT has exercised its statutory authority and preempted OSHA's jurisdiction over the natural gas utility industry in the areas of pipeline-safety and trenching.

A.G.A. recommends that OSHA examine closely its regulations, particularly the excavation and trenching regulations, under Part 1926 for overlap with DOT regulations. We recommend that special attention be given to the safety provisions found in Subparts L and M of Part 192 of the OPS regulations. We believe that such an examination will demonstrate that the DOT regulations comprehensively provide for employee safety during pipeline and trenching activities. A policy of not citing these activities under Part 1926 will leave no gap in the safety net protecting gas utility industry employees.

ALUMINUM HYDRAULIC SHORING SYSTEMS



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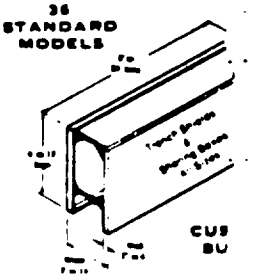


May 28, 1981

Felix Y. Yokel PhD P.E.
Center for Building Technology
National Bureau of Standards
Washington, D. C. 20234

Dear Felix:

Have just received the schedule for the A.G.C. Workshops and I shall be attending by invitation of the AFL-CIO.

I think the guide lines fall somewhat short because you did not include isometric drawings to cover good trench shoring and bracing practices. I have prepared the enclosed drawings and recommend they be included with the documents.

I also suggest the following changes:

1. Ref: p.9

I see no reason why the depth limitation in the "Standard Practice" cannot be extended to 24' depth. Also no reason why the limits of Class C soils should be more stringent than they already are, since we recommend tight sheeting as it is now, so long as the bracing (struts, wales and sheeting) are strong enough to withstand the expected loads.

2. Ref: Should a qualified person be substituted for an engineer?

In the defination of who is a qualified person, to whom is the ability demonstrated?

3. Ref: p.10

I think the short term excavation defination could be extended to 3 days or 72 hours, but no more. Reason being the one day short-term would unduly penalize contractors as over the week-end he would have to shore for long term excavations as it is now written.

4. Ref: p.11

I do not feel the stipulation of maximum slope should be limited to 3/4:1 because there are a number of soil conditions that could require a 1:1 slope and even a 1½:1 slope.

5. Ref: p.12

Under certain conditions I feel the bank next to the work area in cases 2,3, and 4, could be increased to 4'. I do not believe that in case 4 we should try to limit to excavations by trenching machines only.

6. Ref: p.13

I believe this section should be included in the engineering section as this could be lost on the man in the field.

7. Ref: p.16

In this case I think the specified options identified as examples of implementing the performance statement should be persued.

8. Ref: p.16

Excavations up to 3' below the bottom of the sheeting or trench boxes, I feel could be allowed under conditions as stated in iii A. & B.

9. Ref: p.18

In "accepted engineering requirements" I think that a regular architect should be omitted, since architects do not deal with excavations.

10. Ref: p.18

I do not see how we could not require that a competent person be working at the excavation site.

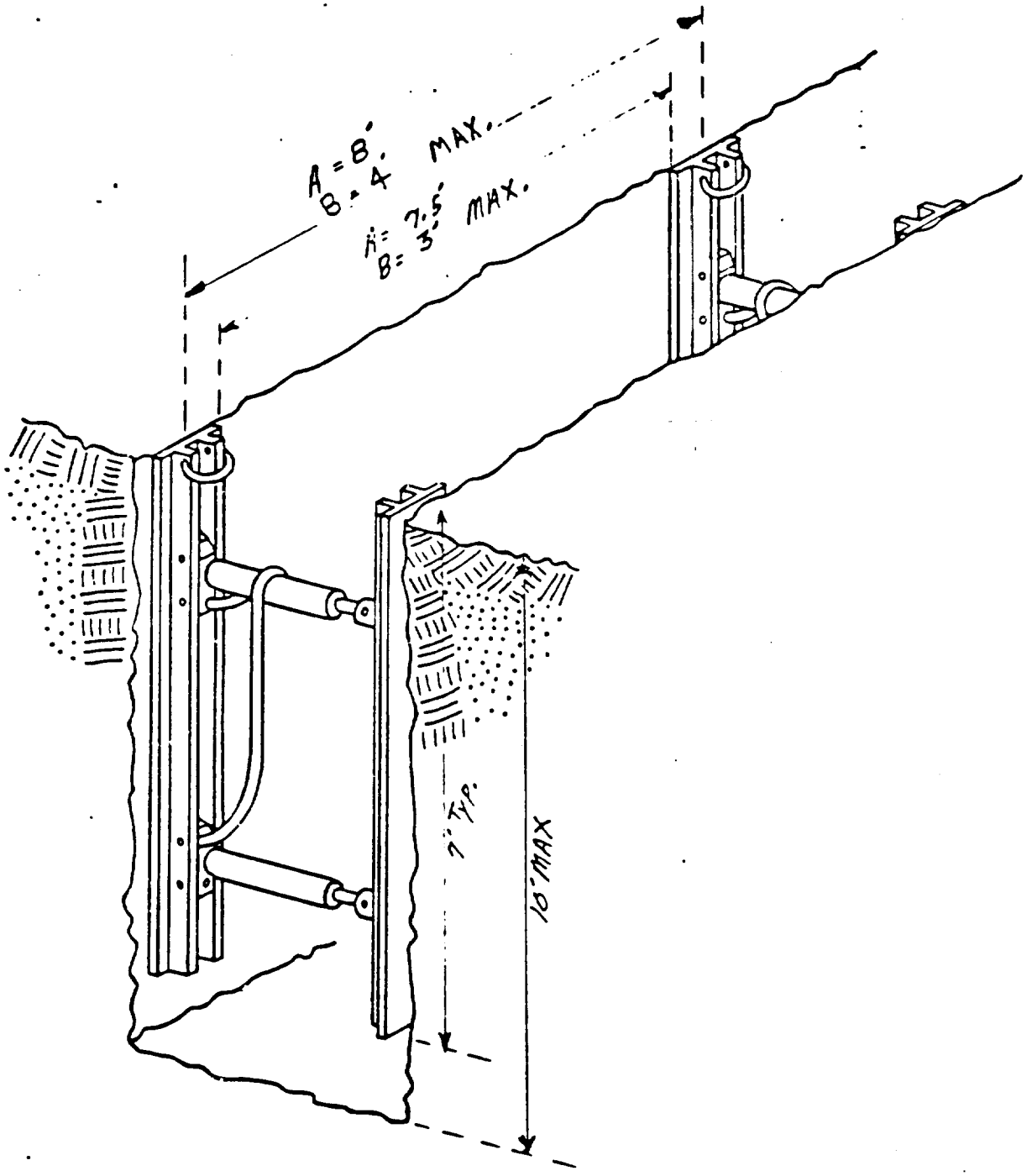
Sincerely yours,

George Bradberry

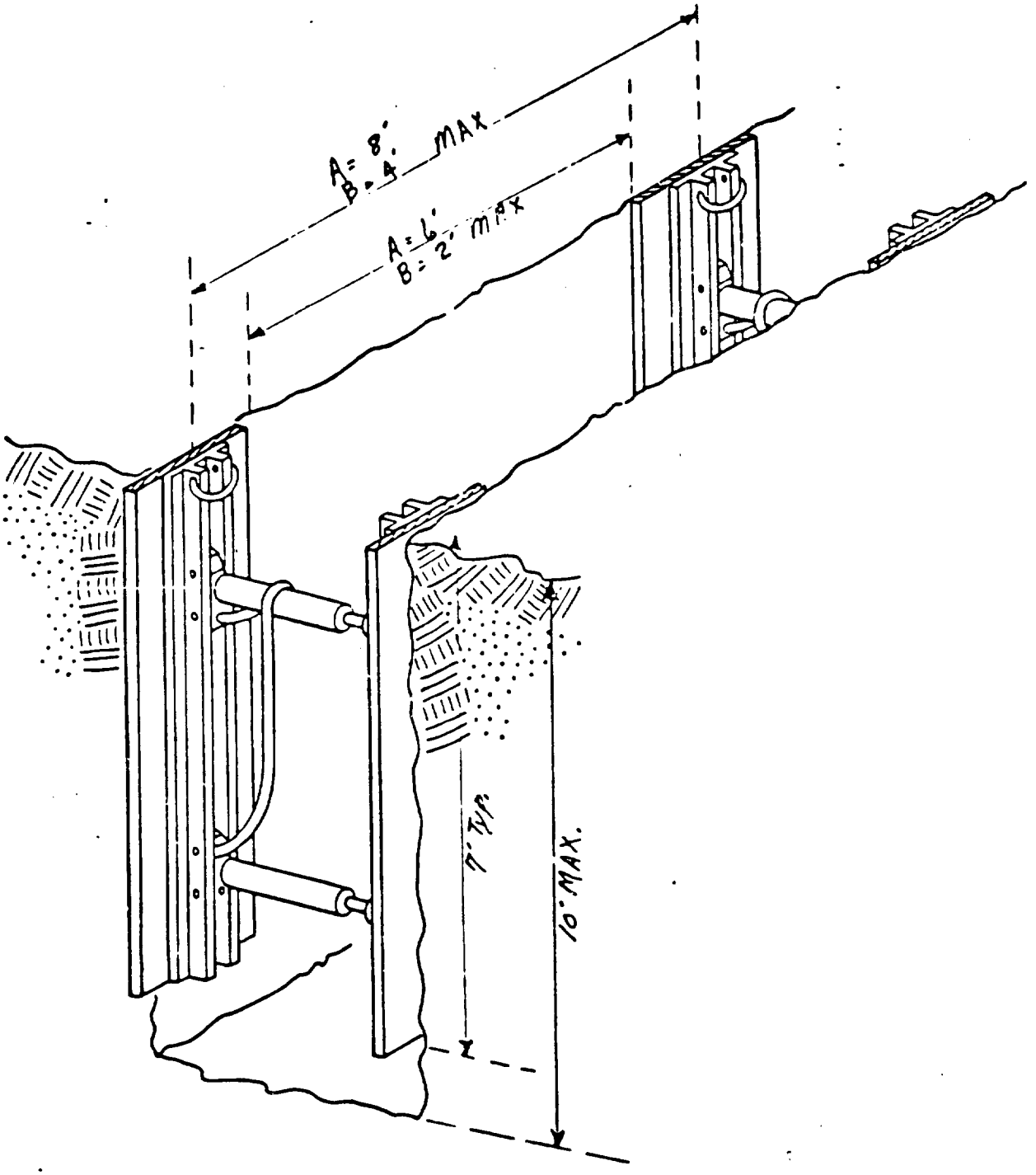
GB:gtb

6

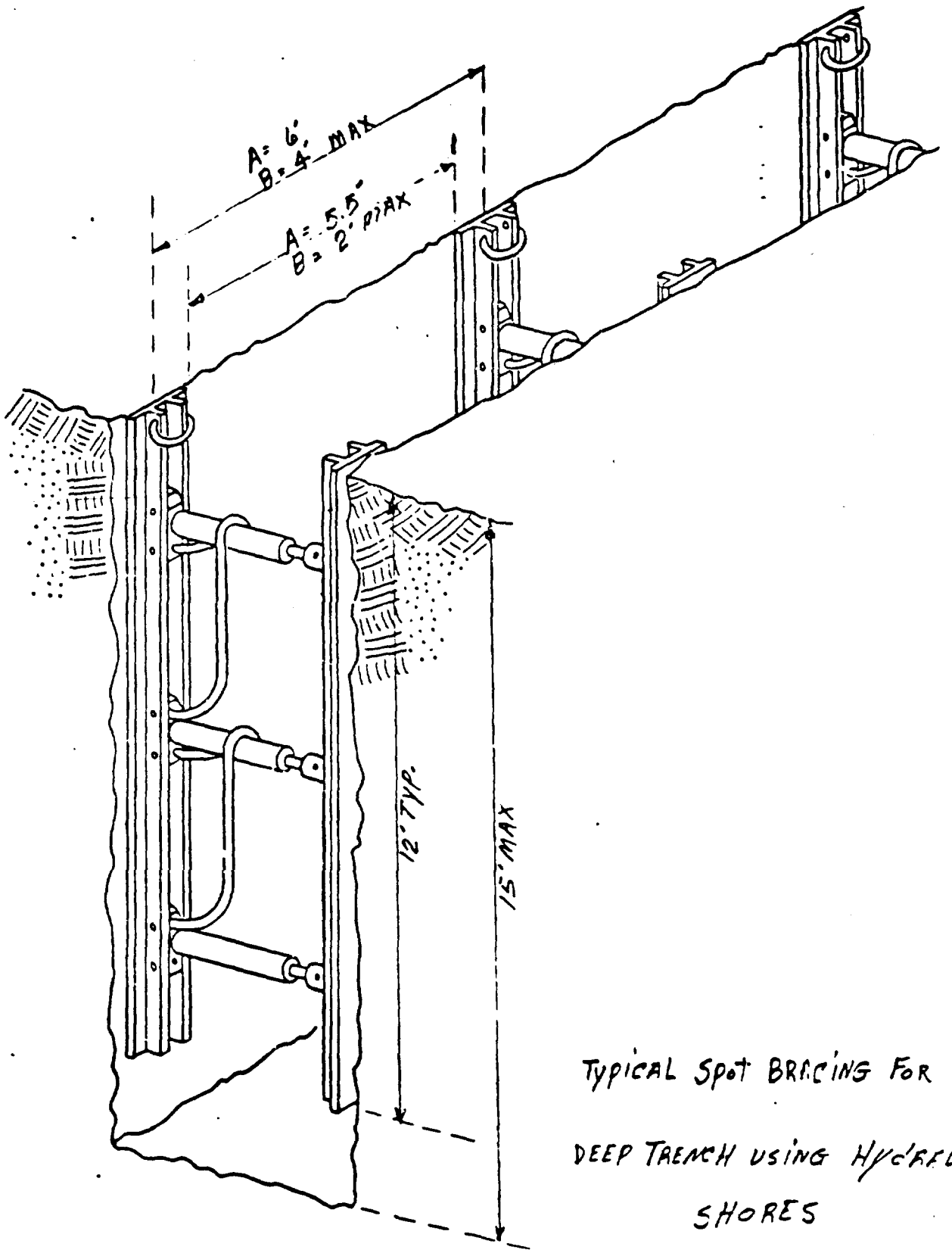
713 623 6755



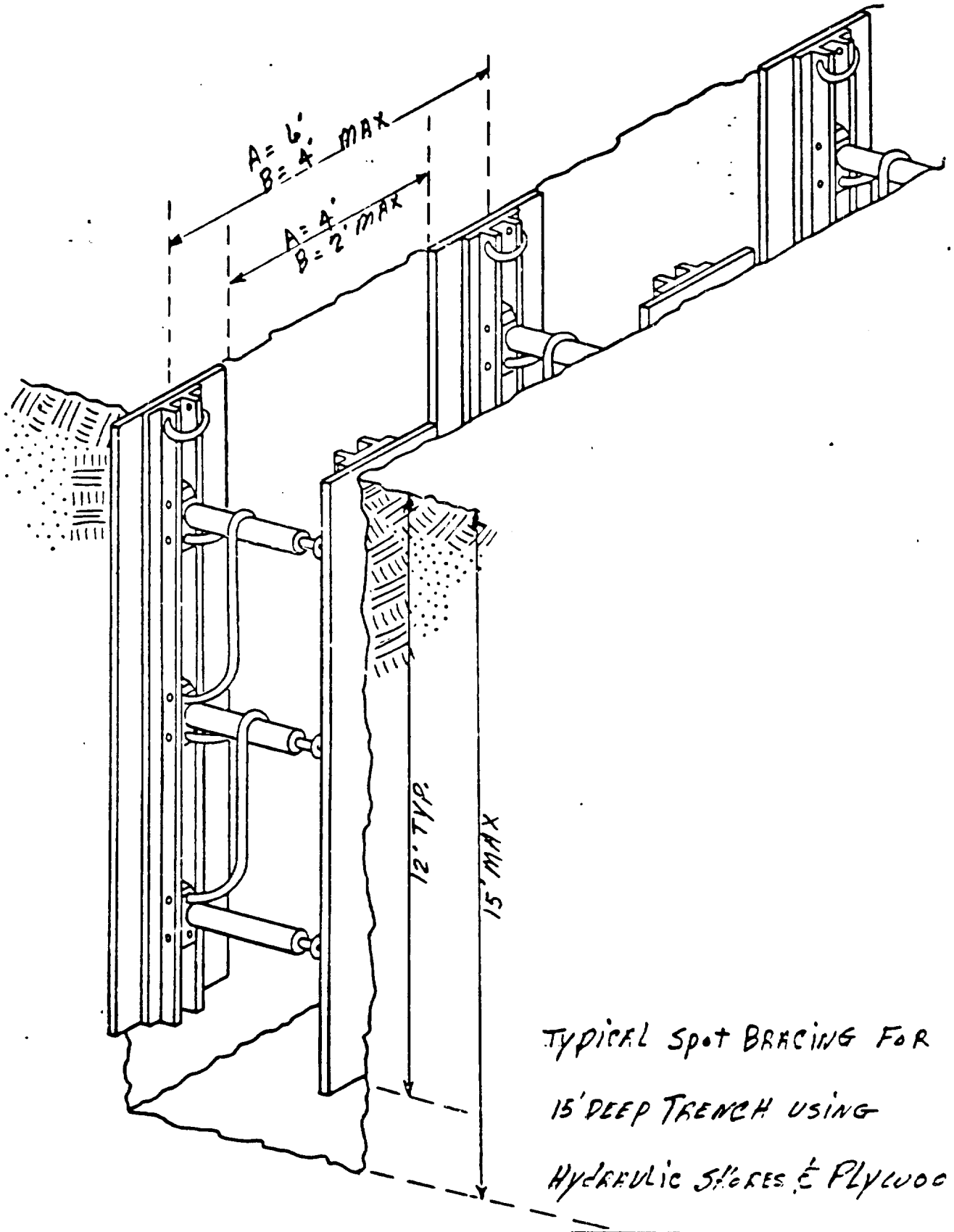
TYPICAL SPOT BRACING FOR 10 FT. DEEP TRENCH USING HYDRAULIC SHORES



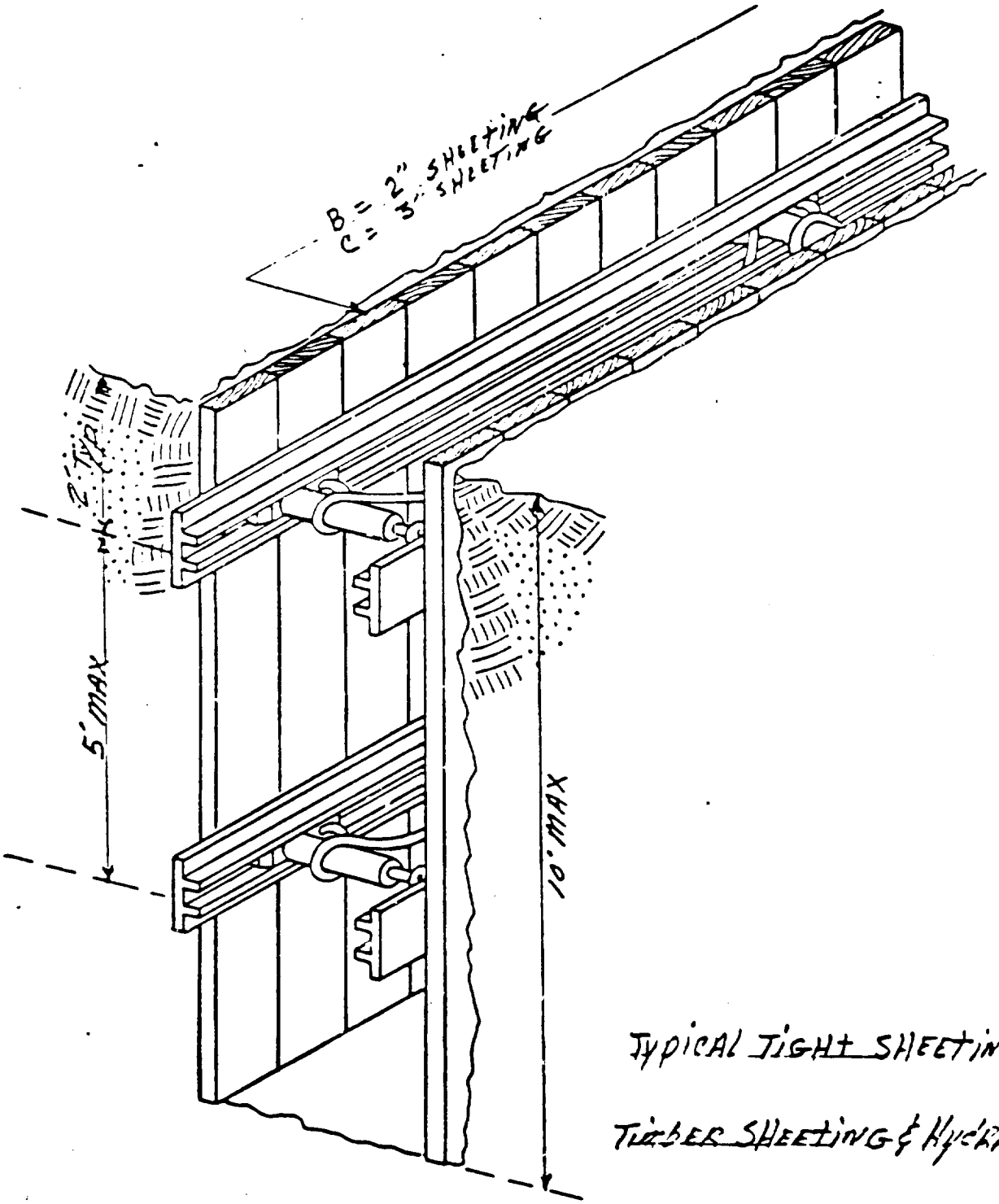
Typical spot Bracing for 10ft. deep Trench using Hydraulic shores and Plywood



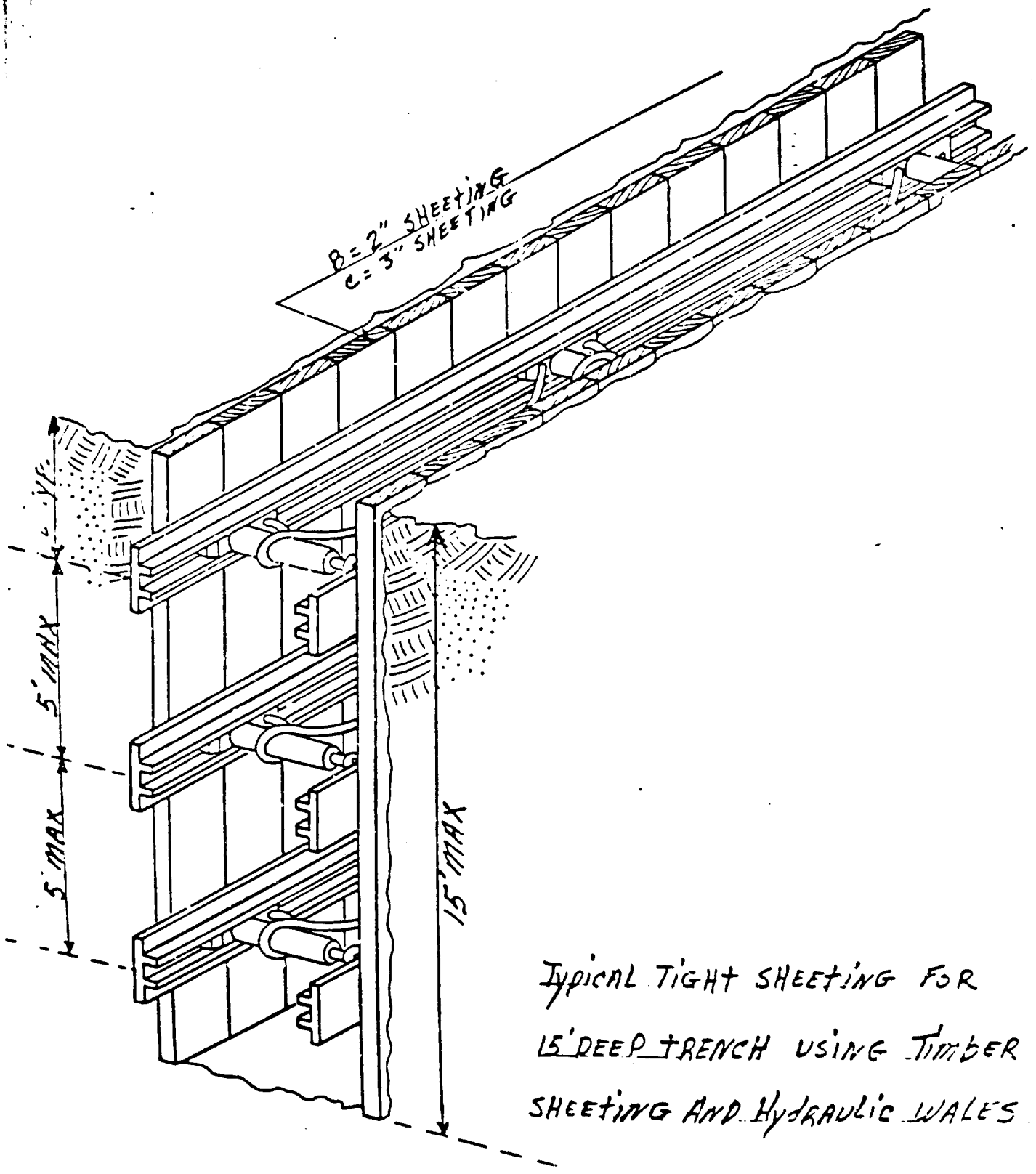
Typical Spot Bracing For 15' Deep Trench using Hydraulic Shores



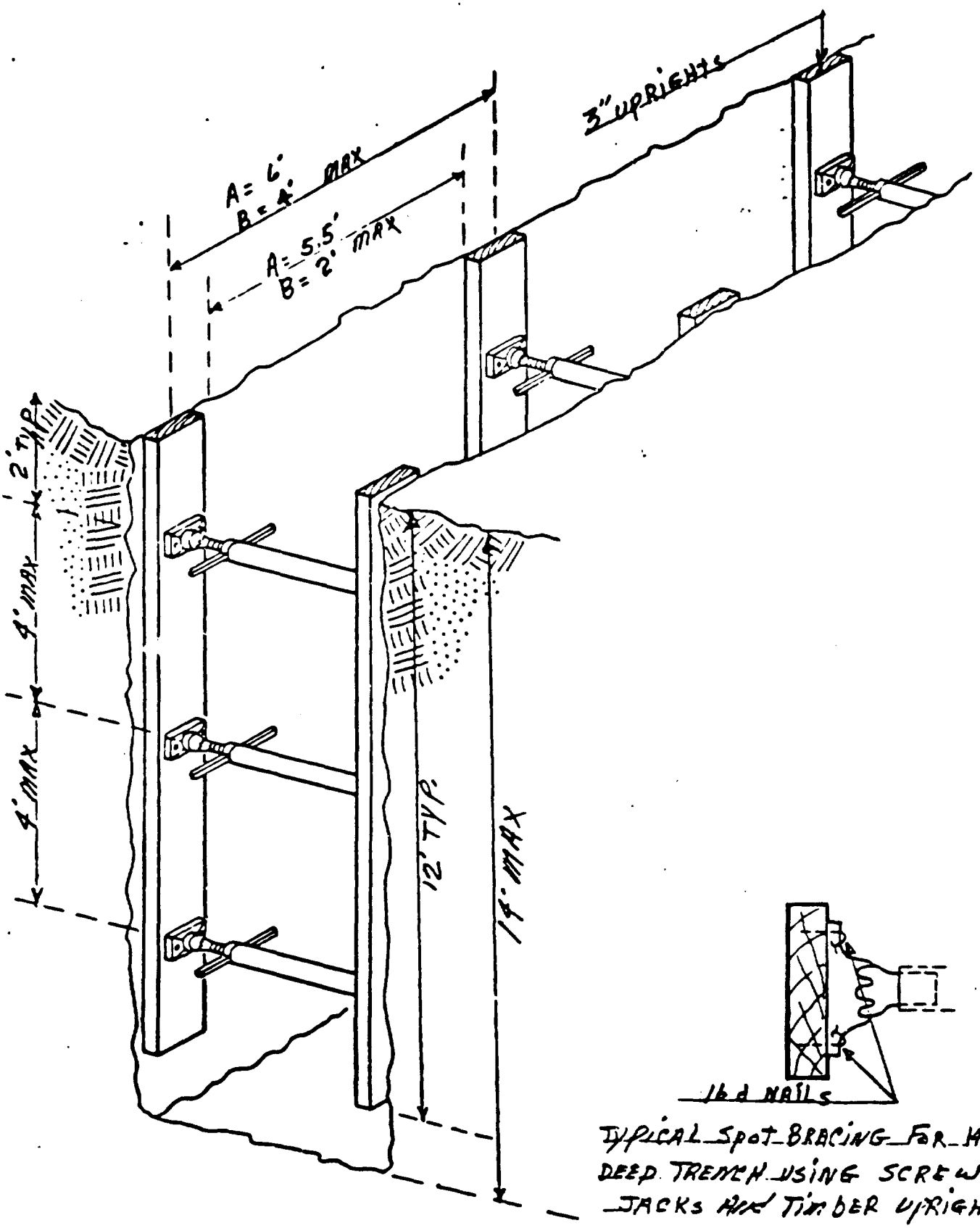
TYPICAL SPOT BRACING FOR 15' DEEP TRENCH USING HYDRAULIC STRUTS & PLYWOOD



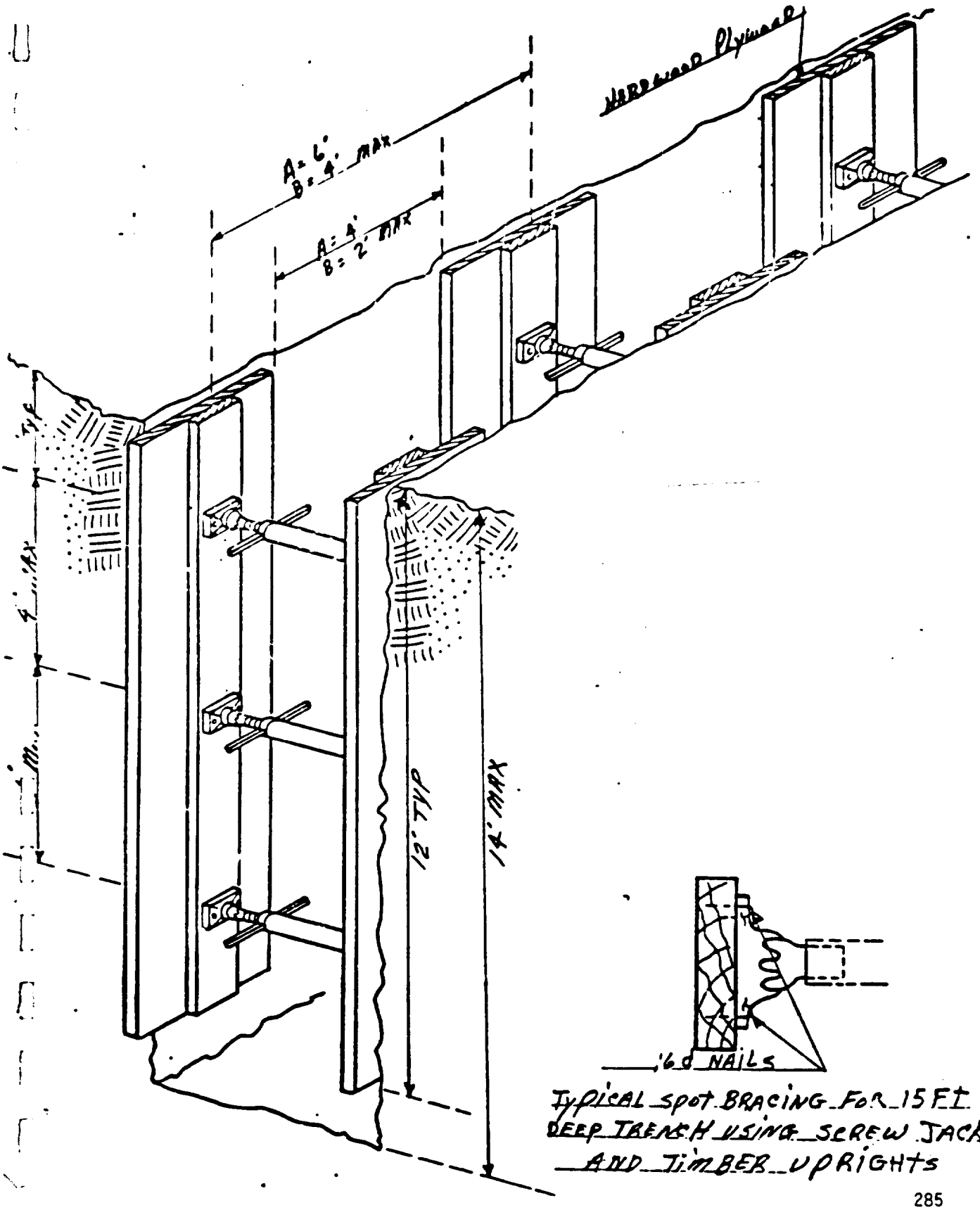
TYPICAL TIGHT SHEETING USING TIMBER SHEETING & HYDRAULIC WALE



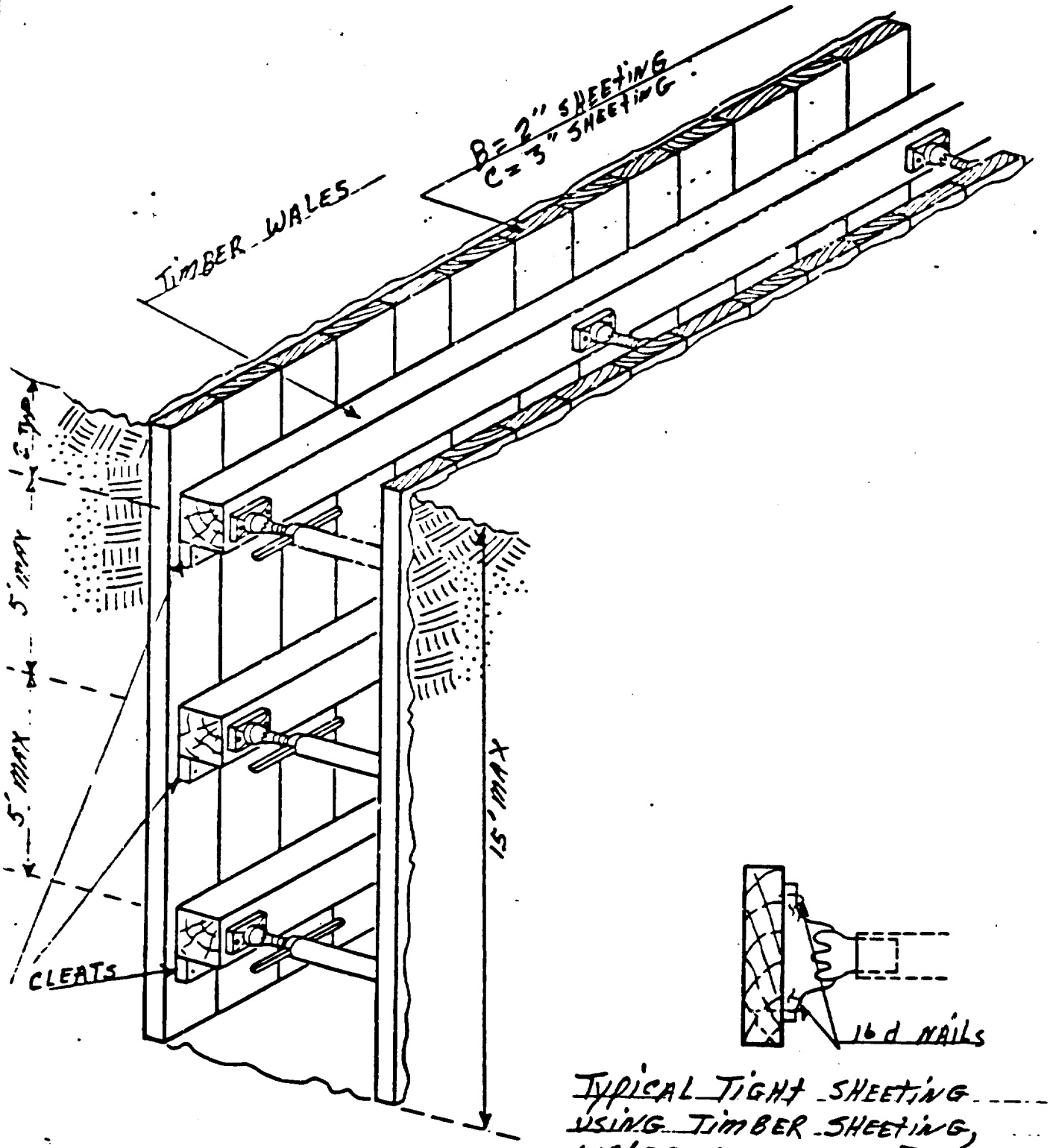
Typical Tight Sheeting for 15' Deep Trench using Timber Sheeting and Hydraulic Wales



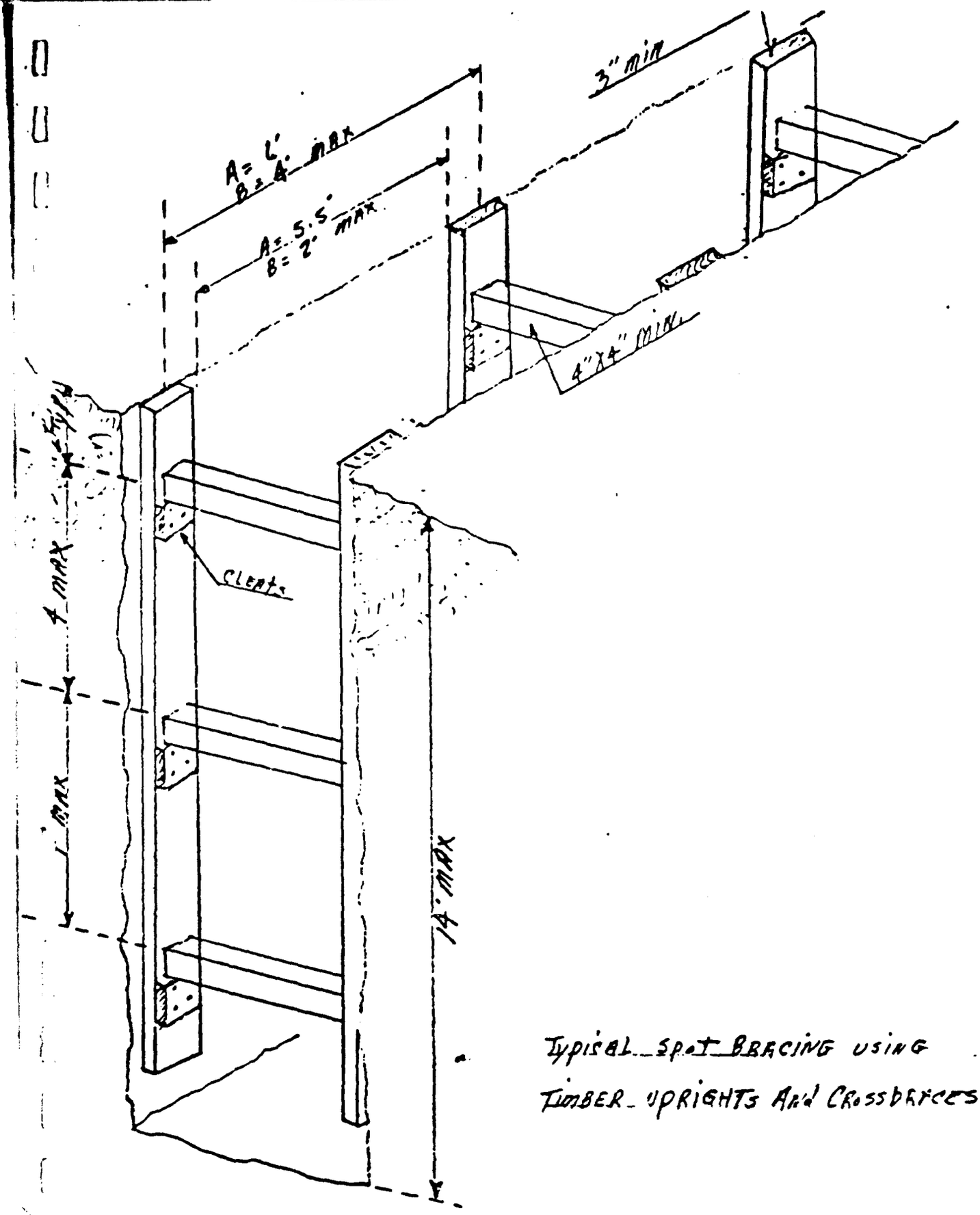
TYPICAL SPOT BRACING FOR 14 FT DEEP TRENCH USING SCREW JACKS AND TIMBER UPRIGHTS



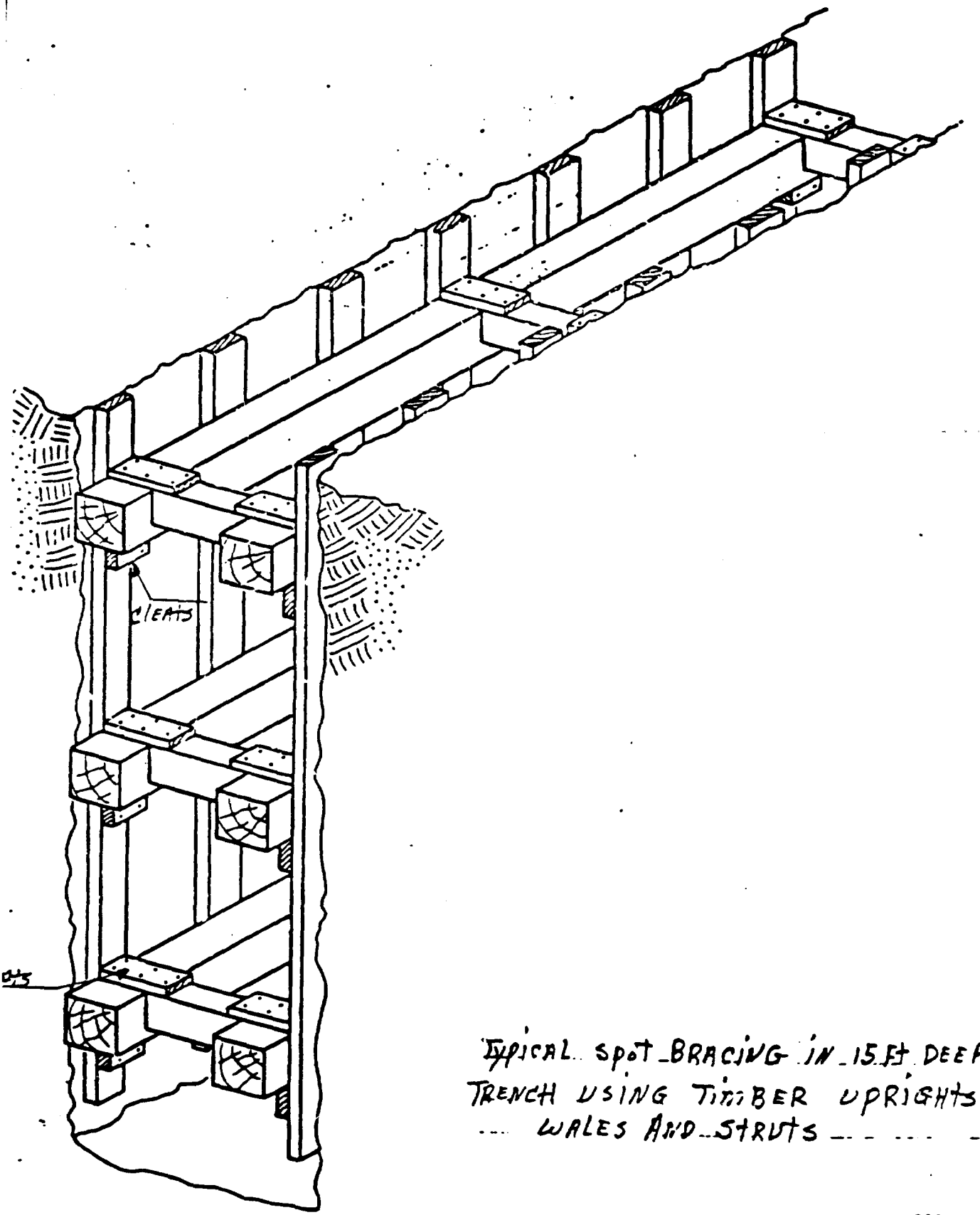
Typical spot bracing for 15 ft. deep trench using screw jacks and timber uprights



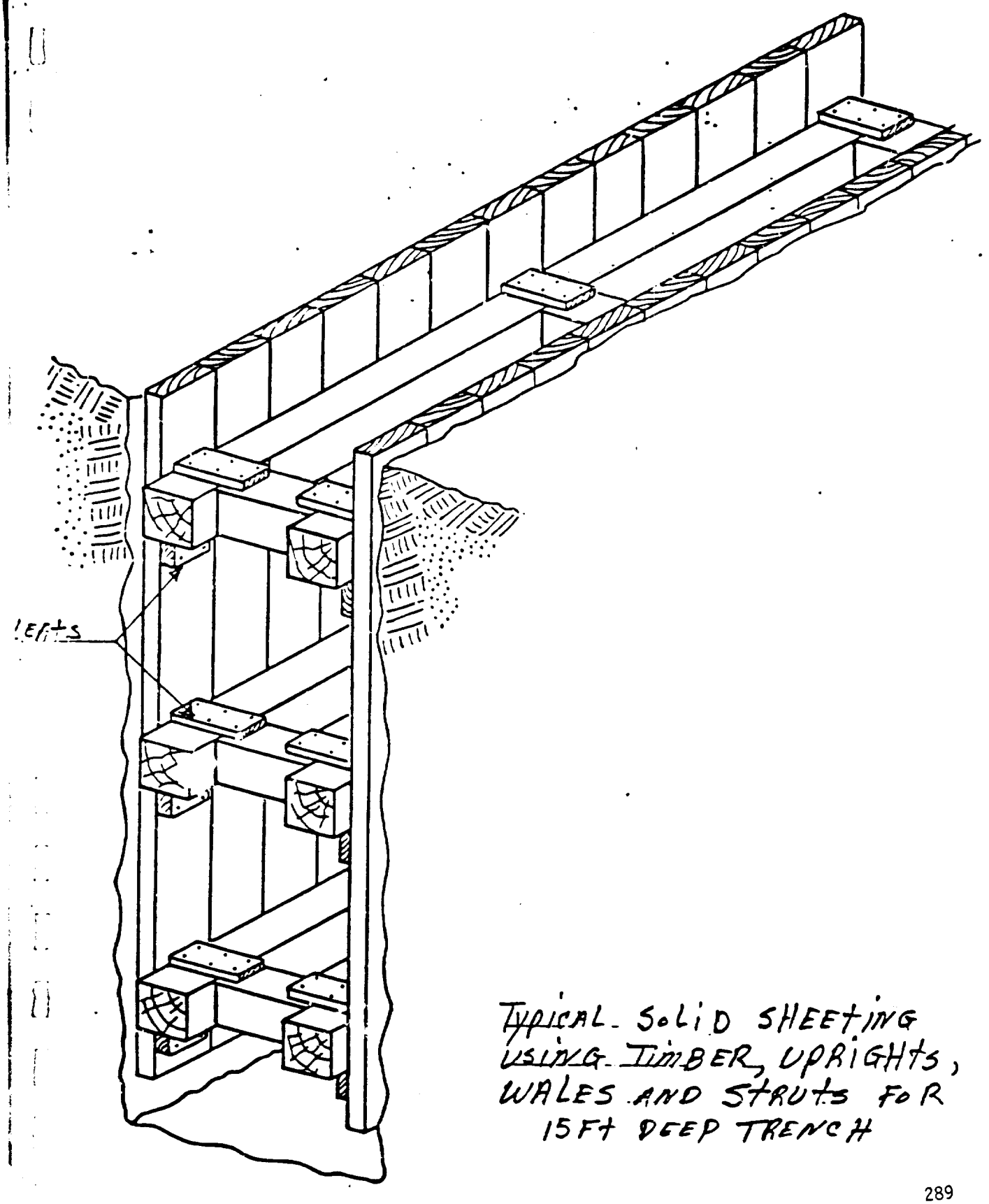
TYPICAL TIGHT SHEETING USING TIMBER SHEETING, WALES AND SCREW JACKS



Typical Spot Bracing using Timber Uprights and Crossbraces



Typical spot bracing in 15 ft deep trench using timber uprights ... wales and struts



Typical Solid Sheeting using Timber Uprights, Wales and Struts for 15 Ft Deep Trench

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April 9, 1982

Dr. Felix Yokel
Geotechnical Engineering Group
National Bureau of Standards
United States Department of Commerce
Washington, D.C. 20234

Dear Felix:

Here is the work that has been approved by the State of California for inclusion in the upcoming reprint of the CAL/OSHA Safety Orders, Title 8, Trench Shoring Tables. As you see, they have addressed themselves to three separate Tables concerning materials for the bracing of trenches - (1) - Timber, (2) - Screw Jacks, and (3) - Hydraulic. All concerned, and including California contractors, feel this clarifies the Code to where they can follow it with ease. The only thing I really disagree with is their decision to go to two classifications of soil - either hard or running with respect to the Tables. I feel they should adopt your system of three classifications of Tables. You might write Mr. Bobis a letter concerning that matter.

Yours very truly,

David O. Plank
President

DOP:ers

Attachments

cc: Mr. Jim Lapping

STATE OF CALIFORNIA
DEPARTMENT OF INDUSTRIAL RELATIONS

EDMUND G. BROWN JR., Governor

OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD
1006 FOURTH STREET
SACRAMENTO, CA 95814
(916) 322-3649

March 24, 1982

Mr. David O. Plank, President
SPEED SHORE CORPORATION
P.O. Box 12591
Houston, Texas 77217

Dear Mr. Plank:

We have received your telegram dated March 23, 1982 with respect to the proposed revisions to the Trenches and Shoring Tables 1 through 6, Section 1541 as contained in the Construction Safety Orders, which will be considered by the Standards Board at their Public Hearing on March 25, 1982 in San Diego, California.

Your telegram will be made part of the Board's official record of proceedings in this matter.

We appreciate your interest in this matter and can assure you that your comments will be given every consideration by the Members of the Occupational Safety and Health Standards Board.

Sincerely,

R. T. RINALDI
Executive Officer

/tlm
cc: Dr. Alvin Greenberg
John L. Bobis
All Standards Board Members

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ADM. DEPT.

State of California
Department of Industrial Relations

Memorandum

Call March 17th
Dave Jap

To : EXCAVATIONS, TRENCHES AND EARTHWORK ADVISORY COMMITTEE MEMBERS

Date: March 10, 1982

From : Occupational Safety and Health Standards Board
JOHN L. BOBIS, Principal Safety Engineer

Subject: Trenching Tables, March 25, 1982 Public Hearing

The attached proposed tables will be considered by the Occupational Safety and Health Standards Board at its public hearing scheduled on March 25, 1982 in San Diego, California.

The proposed tables were developed by the Standards Board's staff in response to written comments submitted by persons subsequent to the Board's September 24, 1981 Public Hearing relative to the new proposed regulations on the subject of excavations, trenches and earthwork. Since the suggested revisions to the tables constituted a substantive revision to the September 24, 1981 proposal, the tables could not be incorporated into that proposal without further public hearing. Therefore, this matter will be considered by the Board at its March 25, 1982 Public Hearing. The attached tables are proposed to be incorporated into the new Section 1541 previously heard by the Board and are forwarded to you for your information.

Should you have any questions regarding this matter, please feel free to contact this office.

/tlm
attachment (March 25, 1982 Public Hearing Packet)

TE OF CALIFORNIA
ARTMENT OF INDUSTRIAL RELATIONS

EDMUND G. BROWN JR., Governor

OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD
6 FOURTH STREET
RAMENTO, CA 95814
(6) 322-3640

NOTICE OF PUBLIC MEETING AND HEARING
OF THE OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD
AND NOTICE OF PROPOSED CHANGES TO [illegible] 8
OF THE CALIFORNIA ADMINISTRATIVE COD[illegible]

Notice is hereby given pursuant to the provisions of Sections 142, 142.2, 142.3, and 144.6 of the Labor Code, that the Occupational Safety and Health Standards Board of the State of California has set the time and place hereinafter set forth for a Public Hearing, Public Meeting, and Business Meeting:

Public Meeting: On March 25, 1982 at 10:00 a.m. in the Auditorium, of the California State Building, 1350 Front Street, Room B-109 San Diego, California.

At the Public Meeting, the Board will make time available to receive comments or proposals from interested persons on any item concerning occupational safety and health.

PUBLIC HEARING: On March 25, 1982, following the Public Meeting, in the Auditorium of the California State Building, 1350 Front Street, Room B-109 San Diego, California.

At the Public Hearing, the Board will consider the public testimony on the proposed changes noticed below to occupational safety and health regulations in Title 8 of the California Administrative Code.

BUSINESS MEETING: On March 25, 1982, following the Public Hearing, in the Auditorium of the California State Building, 1350 Front Street, Room B-109 San Diego, California.

At the Business Meeting, the Board will conduct its monthly business.

In the event it becomes necessary to continue the Public Meeting, Public Hearing, or Business Meeting, the meetings or hearing will be continued on April 1, 1982 at 10:00 a.m., in the Auditorium of the California State Building, 1350 Front Street, Room B-109, San Diego, California.

These meeting facilities are accessible to the physically handicapped.

OCCUPATIONAL SAFETY AND HEALTH
STANDARDS BOARD

Gerald P. O'Hara

GERALD P. O'HARA, Chairman

NOTICE OF PROPOSED CHANGES TO TITLE 8 OF THE CALIFORNIA ADMINISTRATIVE CODE BY THE OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD

Notice is hereby given pursuant to the provisions of Section 142, 142.2, 142.3, and 144.6 of the Labor Code that the Occupational Safety and Health Standards Board will consider the following proposed revisions to the Title 8 Safety Orders of the California Administrative Code, as indicated below, at its Public Hearing on March 25, 1982:

1. TITLE 8: CONSTRUCTION SAFETY ORDERS
(Trench Shoring Tables 1 through 6)

Informative Digest of Proposed Action: Existing Cal/OSHA regulations in the Construction Safety Orders, concerning trench shoring systems do not address the use of hydraulic shoring units in both a vertical mode (as uprights) or horizontally (as walers) when shoring a trench. The proposed repeal of Section 1541 and the adoption of a new subsection and tables were previously noticed in the California Administrative Register 81, No. 30-Z and considered at Public Hearing on September 24, 1981, to clarify the use of hydraulic shoring systems or units. As a result of testimony received at the September Public Hearing, the Board is now proposing new tables subdivided into 3 types of trench shoring systems used to support the sides of an excavated trench--wood, metal and hydraulic systems. The revised tables relating to hydraulic systems include appropriate spacing of these units in a horizontal or vertical position. There are no Federal counterpart regulations addressing this specific subject matter.

These tables are proposed to be incorporated into the new Section 1541 previously noticed.

A copy of the proposed changes in STRIKEOUT/UNDERLINE format is available upon request to any interested persons from the Occupational Safety and Health Standards Board's Office, 1006 Fourth Street, Third Floor, Sacramento, California 95814. Copies will also be available at the Public Hearing.

An INITIAL GENERAL STATEMENT OF REASONS outlining the purpose and factual basis for the proposed regulation(s) and the substantive facts upon which the Standards Board is relying for proposing the regulation(s) is also available upon request from the Standards Board's office. Inquiries may be directed to Mr. R. T. Rinaldi, Executive Officer at (916) 322-3640.

The following statement of costs will apply to all the proposed regulations to Title 8 to be considered by the Board:

Costs to State Agencies: None

Impact on Housing Costs: None

Federal Funding to State: None

To Local Agencies and School Districts: Pursuant to Section 36, Chapter 1284, Statutes of 1974, the proposed action does not create any obligation for reimbursement by the State to any local agency under Section 2231 of the Revenue and Taxation Code for costs that may be incurred by it in complying with these orders because these orders merely implement Federal law and regulations.

Notice is also given that any interested person may present statements or arguments orally or in writing at the hearing on the proposed actions under consideration. Written comments should be received no later than five (5) working days prior to the date of the hearing. The Occupational Safety and Health Standards Board, upon its own motion or at the instance of any interested person, may thereafter adopt the above proposals substantially as set forth without further notice.

The Occupational Safety and Health Standards Board's rulemaking files on the proposed action(s) are open to public inspection Monday through Friday, from 8:30 a.m. to 4:30 p.m. at the Standards Board's Office, 1006 Fourth Street, Third Floor, Sacramento, California 95814.

There are no building standards contained in these proposed revisions as defined by Health and Safety Code Section 18909.

OCCUPATIONAL SAFETY AND HEALTH
STANDARDS BOARD

Gerald P. O'Hara

GERALD P. O'HARA, Chairman

STANDARDS PRESENTATION
CALIFORNIA OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD

TITLE 8: CONSTRUCTION SAFETY ORDERS
(Trenches and Shoring Tables 1 through 6)

SECTION	SUBJECT
1541, including Tables 1 and 2	Repeal existing regulation on Standard Shoring System, including Tables 1 and 2. Note: The repeal of Section 1541 and the adoption of a new Section 1541 were previously noticed (California Administrative Register 81, No. 30-Z) and heard by the Standards Board on September 24, 1981. Because substantive charges to the proposed tables were recommended at the public hearing, the tables are being renoticed for hearing. The tables are proposed to be revised to be consistent with the testimony received by the Standards Board at its September 24, 1981, public hearing.
Tables 1 through 5	Adopts new Tables 1 through 6.

There are no building standards contained in this proposal.

Pursuant to Section 36, Chapter 1284, Statutes of 1974, the above order does not create any obligation for reimbursement by the State to any local agency under Section 2231 of the Revenue and Taxation Code for costs that may be incurred by it in complying with this order because this order merely implements Federal law and regulations.

TABLE 1
WOOD SHORING FOR HARD COMPACT SOIL

DEPTH (Feet)	Uprights		Braces (Struts) at 8' on centers	Stringer (Waler)
	Horizontal Spacing (Feet)	Size (Inches)	Wood Size (Inches) and Trench Width (Feet)	Size (Inches)
5 to 7	8	3 x 8	4 x 4 All widths	-------
	4	2 x 10	up to 15'	4 x 4
	2	2 x 8		4 x 4
Over 7 to 10	8	4 x 10	4 x 4 up to 12' width,	------
	4	3 x 10	over 12' up to 15',	6 x 8
	2	3 x 8	6 x 6	6 x 8
Over 10 to 12	8	6 x 8	4 x 4 up to 8' width,	------
	4	4 x 8	over 8' up to 15',	8 x 8
	2	3 x 8	6 x 6	8 x 8
Over 12 to 15	8	6 x 8	4 x 4 up to 6' width,	------
	4	4 x 10	over 6' up to 15',	8 x 10
	2	3 x 10	6 x 6	8 x 10
Over 15 to 20	8	6 x 10	6 x 6 up to 14' width,	------
	4	4 x 12	over 14' up to 20',	6 x 12
	2	3 x 12	8 x 8	6 x 12
Over 20	See Section 1541(a)(6)			

GENERAL NOTES

1. Timber shall be "selected lumber" quality. (See Definitions Section 1504.)
2. Timber members of equivalent "section modulus" may be substituted for uprights and stringers shown in these tables.
3. These tables may be modified by a civil engineer in accordance with Section 1541(a)(6).

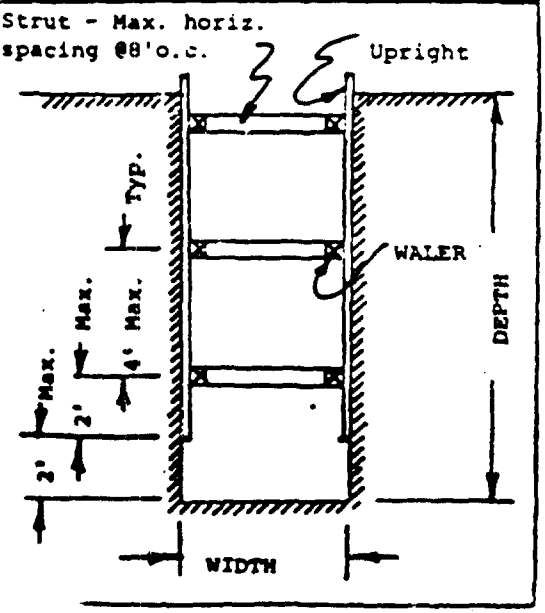

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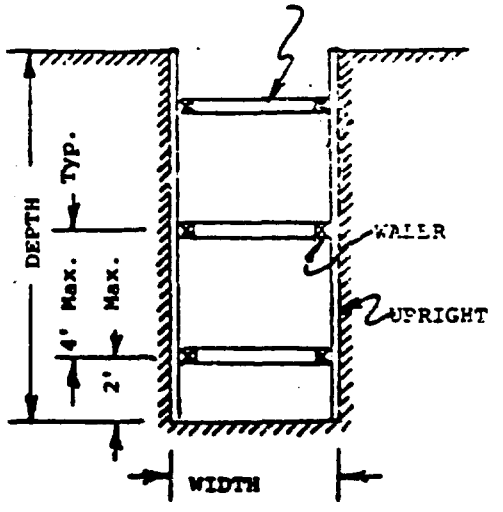
TABLE 2
WOOD SHORING FOR RUNNING SOIL

DEPTH	Uprights		Braces (Struts) at 8' on centers	Stringer (Waler)
	Horizontal Spacing (Feet)	Size (Inches)	Wood Size (Inches) and Trench Width (Feet)	Size (Inches)
5 to 8	Solid	2	6 x 6 All widths up to 15'	8 x 10
Over 8 to 10	Solid	3	6 x 6 up to 10' width, 8 x 8 over 10' width up to 15'	10 x 10
Over 10 to 12	Solid	3	6 x 6 up to 8' width, 8 x 8 over 8' up to 15'	10 x 12
Over 12 to 15	Solid	3	8 x 8 All widths up to 15'	10 x 12
Over 15 to 20	Solid	4	8 x 8 up to 12' width, 10 x 10 over 12' up to 20'	12 x 12
Over 20	See Section 1541(a)(6)		Strut - Max. horiz. spacing @ 8' o.c.	



CALIFORNIA OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD

TABLE 3
METAL SHORING FOR HARD COMPACT SOIL

DEPTH (Feet)	Uprights		Braces (Struts) at 8' on centers				Stringer
	Horizontal Spacing (Feet)	Size (Inches)	Aluminum Pipe		Std. Steel Pipe		(Waler) Size (Inches)
			Min. Dia. (Inches)	Max. Trench Width (Ft.)	Min. Dia. (Inches)	Max. Trench Width (Ft.)	
5 to 7	8	3 x 8	2½ (3½)	8 (10)	1½	3	------
	4	2 x 10	2½ (3½)	8 (14)	1½	3	4 x 4
	2	2 x 8	2½ (3½)	8 (20)	1½	3	4 x 4
Over 7 to 10	8	4 x 10	2½ (3½)	6 (8)	2	6	-----
	4	3 x 10	2½ (3½)	9 (11)	2½	12	6 x 8
	2	3 x 8	2½ (3½)	12 (16)	3	15	6 x 8
Over 10 to 12	8	6 x 8	2½ (3½)	6 (7)	2 (2½)	8 (12)	-----
	4	4 x 8	2½ (3½)	8 (10)	2 (2½)	10 (11)	8 x 8
	2	3 x 8	2½ (3½)	10 (15)	2½ (3)	13 (15)	8 x 8
Over 12 to 15	8	6 x 8	2½ (3½)	5 (6)	2 (2½)	6 (10)	-----
	4	4 x 10	2½ (3½)	7 (9)	2 (2½)	8 (12)	8 x 10
	2	3 x 10	2½ (3½)	9 (13)	2½ (3)	13 (15)	8 x 10
Over 15 to 20	8	6 x 10	2½ (3½)	4 (5)	2½ (3)	8 (12)	------
	4	4 x 12	2½ (3½)	6 (8)	2½ (3)	10 (15)	6 x 12
	2	3 x 12	2½ (3½)	8 (11)	2½ (3)	12 (15)	6 x 12
Over 20	See Section 1541(a) (6)						

GENERAL NOTES

1. Metal pipe braces permitted by these Orders shall be schedule 40, standard steel pipe, or equivalent and installation shall be as set forth by these Orders.
2. Timber shall be "selected lumber" quality. (See Definitions - Section 1504.)
3. Timber members of equivalent "section modulus" may be substituted for uprights and stringers shown in these Tables.

(continued - Table 4)

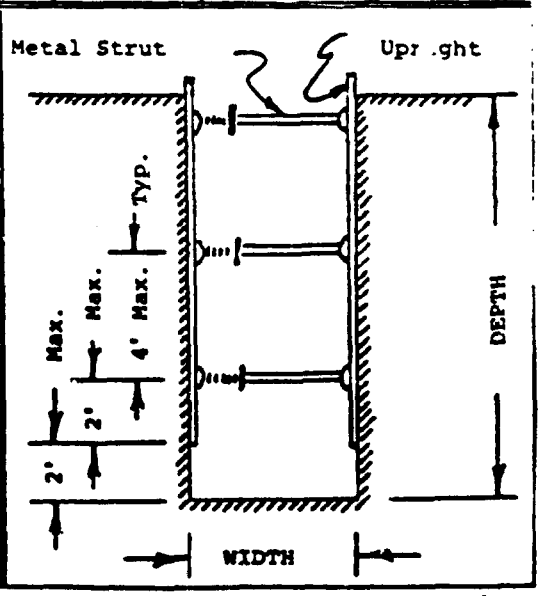
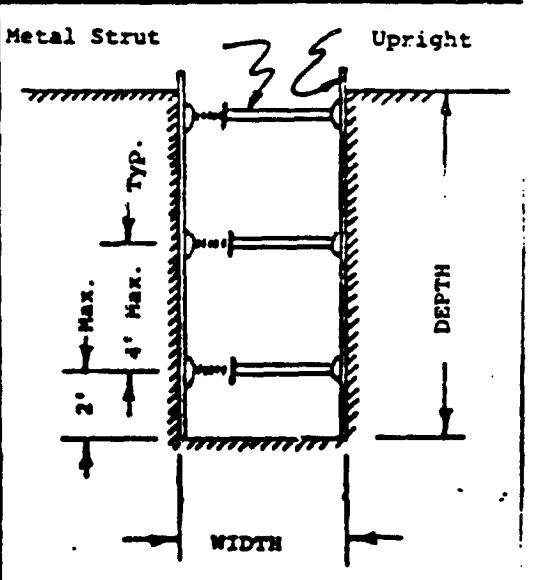


TABLE 4
METAL SHORING FOR RUNNING SOIL

DEPTH (Feet)	Uprights		Braces (Struts) at 8' on Centers				Stringer (Waler) Size (Inches)
	Horizontal Spacing (Feet)	Thickness (Inches)	Aluminum Pipe		Std. Steel Pipe		
			Min. Dia. (Inches)	Max. Trench Width (Ft.)	Min. Dia. (Inches)	Max. Trench Width (Ft.)	
5 to 8	Solid	2	2½ 3	8 10	1½ 2	3 6	8 x 10
Over 8 to 10	Solid	3	2½ 3	6 8	2 2½	6 12	10 x 10
Over 10 to 12	Solid	3	2½ 3	4 6	2 2½	6 10	10 x 12
Over 12 to 15	Solid	3	2½ 3	3 6	2½ 3	8 15	10 x 12
Over 15 to 20	Solid	4	3 3½ 4	6 8 10	2½ 3 3½	6 12 15	12 x 12
Over 20	See Section 1541(a)(6)						

4. These tables may be modified by a civil engineer in accordance with Section 1541 (a)(6).



SPEED SHORE CORP.
ADM. DEPT.

TABLE 5

HYDRAULIC SHORING FOR HARD COMPACT SOIL

DEPTH (Feet)	Uprights		Stringers (Waler)		Braces (Struts)			
	Horizontal Spacing (Feet)	Size Aluminum Rail	Size Aluminum Rail	Vertical Spacing (Feet)	Hydraulic Cylinders	Horizontal Spacing (Feet)	Max. Trench Width (Feet)	
5 to 7	8 No Sheeting 6 * (See Note)	8" Wide *** Standard	6" Wide *** Standard	5 5 5	2" ID - 2½" OD " " " " " " " "	8 cc	12	20**
Over 7 to 12	8 No Sheeting 6 * (See Note)	8" Wide *** Standard	6" Wide *** Standard	5 5 5	2" ID - 2½" OD " " " " " " " "	8 cc	9	20**
Over 12 to 16	6 No Sheeting 4 * (See Note)	8" Wide Std. or HD	6" Wide Std. or 8" Wide HD	5 5 5	2" ID - 2½" OD " " " " " " " "	6 cc	9	20**
Over 16 to 20	6 No Sheeting 4 * (See Note)	8" Wide Std. or HD	6" Wide Std. or 8" Wide HD	4 4 4	2" or 3" ID - or 2½" or 3½" OD	4 cc	9	20**
Over 20	See Section 1541(a)(6)							

GENERAL NOTES

1) * For closer sheeting, plywood may be used behind uprights or other effective sheeting of user's choice.
2) ** A 3½" x 3½" x 3/16" steel oversleeve is required to Std. 2" I.D. No steel oversleeve required on 3" I.D.
3) *** See Hydraulic Shoring Association Manual for strength of rails.

TABLE 6
HYDRAULIC SHORING FOR RUNNING SOIL

DEPTH (Feet)	Uprights		Stringers (Walers)		Braces (Struts)			
	Horizontal Spacing (Feet)	Size Aluminum Rail	Size Aluminum Rail	Vertical Spacing (Feet)	Hydraulic Cylinders	Horizontal Spacing (Feet)	Max. Trench Width (Feet)	
5 to 7	Solid *	8" Wide Standard	6" Wide Standard	4	2" ID - 2½" OD	6 cc	9	20**
Over 7 to 12	Solid *	8" Wide Standard	6" Wide Standard	4	2" ID - 2½" OD	6cc	9	20**
Over 12 to 16	Solid *	8" Wide Standard	6" Wide Standard	4	2" or 3" ID or 2½" or 3½" OD	4 cc	8	15**
Over 16 to 20	Solid *	8" Wide Standard	6" Wide Standard	3	2" or 3" ID or 2½" or 3½" OD	3 cc	6	15**
Over 20	See Section 1541(a)(6)							

GENERAL NOTES

1) * Use plywood or other effective sheeting behind the vertical uprights.
2) ** Use steel box encasement in this range.

AMERICAN PLYWOOD ASSOCIATION

October 7, 1980

Felix Y. Yokel, Ph.D., P.E.
U.S. Department of Commerce
National Bureau of Standards
Geotechnical Engineering Group
Building 226, Room B162
Washington, D.C. 20234

Dear Mr. Yokel:

We appreciate your desire to include plywood as a material in your revisions to the regulations for "Excavation, Trenching and Shoring." I hope that we can agree on a criteria that will permit us to supply you with some type of tabular load information for the use of plywood sheeting in trench shoring.

The four-page leaflet I sent to you earlier entitled, "Plywood Trench Shoring," was produced some six or seven years ago and all of the people involved with it are no longer working at APA. This causes a problem in trying to reconstruct the thinking and decisions that went into production of the tables in that publication. After searching our file, I have some answers, but in some cases I can only speculate on the reasoning.

APA at that time saw plywood used in trench shoring in situations that definitely could not be justified from a theoretical engineering calculation standpoint. Thus, in developing the tabular data, generous assumptions were made in any case where they could be substantiated with reasonable engineering judgement. Not being experts in soil engineering, we sidestepped that issue by quoting from some handbooks and giving pressures in terms of a number of levels of equivalent fluid density.

All tolled, there are a number of areas where our computations and judgements vary from the BSS 127 "standard practice." In the tabular data the depth of the trench did not have built into it any surcharge allowance. Thus, the two-foot mandatory surcharge you are implying would reduce the effective depth of the trench by two feet for the tabular information given in the APA brochure.

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TLX 32 7430

While not stated in our publication, the design example implies that thinner sheeting could be used for the upper part of the trench and a thicker panel for the lower part. This requires the assumption that the earth pressure varies from a maximum at the trench bottom to zero at the surface of the ground.

In developing the APA publication, information was borrowed from a California publication on excavations and trenches to justify using a 6/10 factor times the depth times the equivalent fluid density to determine effective pressure on the plywood. This 6/10 factor would apparently correspond to the 67% tributary loaded area factor given in BSS 127. Though not stated, I assume this factor is inserted to account for the nonuniform pressure of the earth on the retaining structure. As it is pointed out, if the structure can deflect slightly, it will essentially unload itself in that area.

In designing the retaining structure, APA computed on the basis of wet stresses whereas most plywood structures utilize dry stress levels. After starting from a normal duration stress level, (ten years) a 33% increase on the stress was applied for the shoring duration. Since a 33% duration increase is only appropriate for durations of about one day, I suspect that it is in fact more appropriately entitled "experience factor" with duration of loading as only one aspect of this stress increase.

The tabulated information given in the APA brochure covers the equivalent fluid density range from 20 to 80 pcf, and thus we have covered the range for soil types A, B and C.

In the computations for the table in the APA literature, we have used span lengths from center of support to center of support. We have at the same time reviewed computations by other design engineers where the clear span distance was used since the supports may be relatively wide. If one is using verticle supports for the plywood sheeting, that is a 2 or 3 x 8 flat, the span length changes substantially and the ability of the plywood panel to resist load increases greatly. However, since the width of the support is a variable and not necessarily one easily controlled, this becomes an individual matter. I suppose, one could assume a minimum six-inch width of support in all cases. This would be about the least that could be expected.

I'm enclosing an APA laboratory report on the effect of support width on plywood deflection. While trench shoring is not deflection critical, the information gained from the research regarding deflection certainly indicates that something other than center-to-center span length is appropriate for strength calculations as well as for deflection calculations.

In order to fit APA data into the criteria you have suggested in your BSS 127, I would suggest the following:

1. Normal duration wet stresses increased 33% for short duration shoring.
2. A 67% tributary load factor for the plywood sheeting.
3. Trench depth computed with a two foot surcharge.

4. Span length computed as clear span plus 5/8 inch, six-inch support width assumed.
5. Same thickness plywood from top of trench to bottom.

Sincerely yours,

RAYMOND C. MITZNER, P.E.
Project Manager, Industrial Markets
Engineering Technology

RCM/sew

Enclosure: Lab Report 120

Plywood Trench Shoring

AMERICAN PLYWOOD ASSOCIATION 1119 A St. Tacoma, WA 98401 206 272-2283

This leaflet has been prepared as an aid in designing trench shoring using APA® grade-trademarked plywood. Four basic framing systems are illustrated, and plywood recommendations are given.

Plywood may be used most readily for trenches up to 8 feet deep. Greater depths are permissible in some soils. In most shoring systems, it is best to orient the plywood face grain across the supports in order to have the strongest and stiffest system. For some conditions, however, plywood panels may be used more efficiently if oriented vertically; that is, with face grain parallel to supports. Minimum support framing is also desirable, since horizontal support jacks restrict work inside the trench.

With these points in mind, four plywood-support configurations have been calculated for commonly available plywood grades. Tabular information is also presented to aid the designer in estimating soil pressures, and in selecting appropriate plywood grades and thicknesses.

Four steps are involved in plywood trench shoring design:

1. Determine equivalent fluid density of soil.
2. Select a suitable plywood-support system.
3. Select the proper plywood grade and thickness for the support framing.
4. Design the support framing.

Earth Pressures on Shoring

Soil-engineering references generally refer to three types of soil pressures for shoring design: active, at rest, and passive. At-rest pressures assume no movement of the wall. Passive pressures result from the wall pushing against the soil until it fails. For most shoring, these two types of soil pressure are not design factors.

Active soil pressure can be safely assumed for most trench shoring. Active soil pressure can be used where design permits slight movement of the shoring away from the soil. For most systems, this movement is provided by the inherent flexibility of the plywood and framing.

The active soil pressure depends on the angle of internal friction of the soil; soil cohesion, density, and water content; and depth of the trench. The interaction of these variables is explained in detail in various references.[1]

The general properties of some soil classifications are known. Using these properties, the soil can be transformed into an "equivalent fluid" whose density relates to the pressure exerted by the soil. Some building codes specify a 30 pcf equivalent fluid density as a minimum design requirement for foundations.[2]

Table 1 shows equivalent fluid densities for various common soil classifications. A range of densities has been shown since these soil classifications are not definitive of every soil property.

Table 1 Equivalent Fluid Density of Soils*

Soil Classification	Equivalent Fluid Density (pcf)
Soft flowing mud	75-85
Wet fine sand	35-70
Dry sand	25-45
Gravel	25-45
Compact loam	15-40
Loose loam	25-55
Clay	15-85

* Based on tabular information given in *Building Construction Handbook* by Merritt.

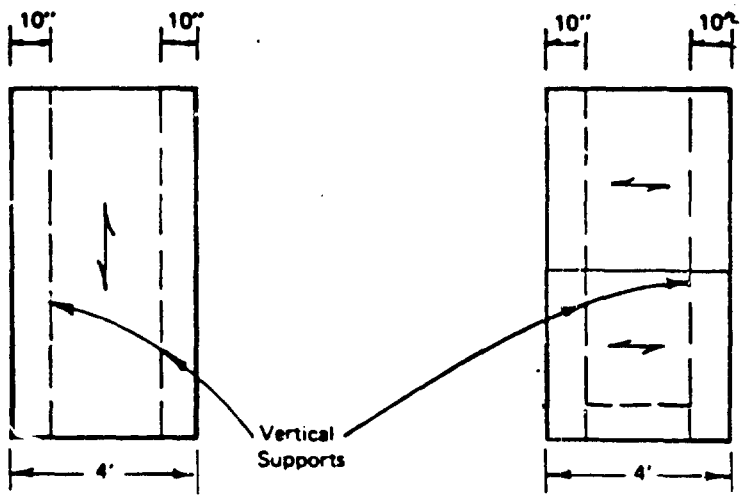
After determining which soil classification applies to the soil at the job site, the designer must use professional judgment in selecting the appropriate equivalent fluid density for his application. For instance, Table 1 shows an equivalent fluid density of 35 to 70 pcf for wet fine sand. The designer may determine by inspection that the actual soil is sand that does not contain a high percentage of fines. After comparing the properties given for dry sand, he may decide that an equivalent fluid density of 50 or 60 pcf would be more appropriate. In any event, the designer should regard Table 1 as a general guide for *estimating* soil pressure. After selecting an equivalent fluid density, the design pressure is six-tenths of the product of the equivalent fluid density times the depth of the trench.[3]

[1] *Soil Mechanics in Engineering Practice* by Terzaghi & Peck.
[2] *Uniform Building Code*, 1973.
[3] *Excavation and Trenches*, Agricultural and Services Agency, Department of Industrial Relations, State of California.

Framing Systems

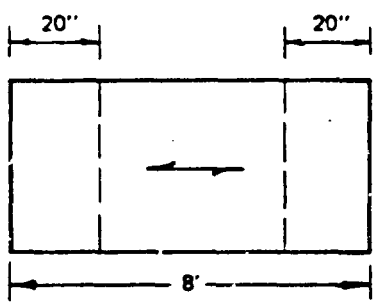
The following illustrations show four basic framing systems for trench shoring.

In Types A, B, and C, each panel is supported by only two framing members, but they are so spaced that the bending moments in the panel will be minimized. That is, the moment at the supports is the same as at the midspan of the panel. Spacing of supports for Type D has been selected in a similar manner.

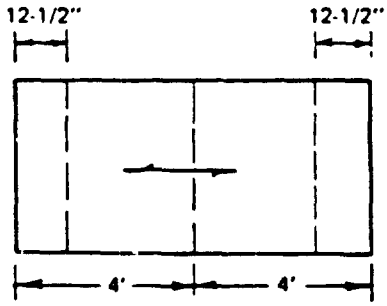


Type A

Type B



Type C



Type D

The moment in all four systems is determined by the following equation:

$$M_{supports} = M_{\ell} = K\,wB^2$$

M = Moment (ft lb)
K = 0.0214 (Types A, B, C)
= 0.00853 (Type D)
w = soil pressure (psf)
B = total panel dimension (ft)
B = 4 ft for types A and B
= 8 ft for Types C and D

In some cases, the shear stress may be critical in the design, so this should also be checked. Shear is maximum at the supports and is determined by the following equation:

$$V = ZwB$$

V = maximum shear (lb)
Z = 0.293 (Types A, B and C)
= 0.185 (Type D)

By using the equations for maximum moment and shear, the engineer can determine the required plywood system In order to simplify the plywood design, Table 2 has been prepared, giving the maximum depth of fill behind each support system for various equivalent fluid densities.

Table 2 Allowable Depths of Plywood Trench Shoring (Ft)

Required Plywood Grade	Support Type	Equivalent Fluid Density (pcf)						
		20	30	40	50	60	70	80
C-D 32/16 INT APA w/ext. glue	B	7.5	5.0	3.8				
	D	4.7	3.1					
C-C 32/16 EXT APA	B	9.0	6.0	4.5	3.6			
	D	5.6	3.8					
C-D 42/20 INT APA w/ext. glue	B	11.5	7.7	5.8	4.6	3.8		
	D	7.2	4.8	3.6				
C-C 42/20 EXT APA	B	13.8	9.2	6.9	5.5	4.6	3.9	
	D	8.6	5.8	4.3	3.5			
C-D 48/24 INT APA w/ext. glue	A	7.6	5.1	3.8				
	B	15.0	10.0	7.5	6.0	5.0	4.3	3.8
	D	9.4	6.3	4.7	3.8			
C-C 48/24 EXT APA	A	9.0	6.0	4.5	3.6			
	B	18.0	12.0	9.0	7.2	6.0	5.1	4.5
	C	4.4	3.0					
	D	11.3	7.5	5.7	4.5	3.8		
5/8" PLYFORM Class I	A	8.0	5.3	4.0				
	B	11.5	7.6	5.7	4.6	3.8		
	D	7.2	4.8	3.6				
3/4" PLYFORM Class I	A	13.3	8.9	6.7	5.3	4.4	3.8	
	B	14.6	9.7	7.3	5.8	4.9	4.2	3.7
	D	9.2	6.1	4.6	3.7			
2-4-1 w/ ext. glue	A	23.2	15.4	11.6	9.3	7.7	6.6	5.8
	B	30.2	20.1	15.1	12.1	10.1	8.6	7.6
	C	7.5	5.0	3.7				
	D	19.0	12.7	9.5	7.6	6.3	5.4	4.7

The plywood specified in Table 2 is based on the minimum structural properties for the indicated grades. Basic plywood design stresses for wet applications were taken from *Plywood Design Specification* (Form Q510) and then increased 33% for duration of load.

A similar level of design stress was used in development of a shoring system for the Northwest National Gas Company in Portland, Oregon. Their tests demonstrated "safety factors" within the range required by the Occupational Safety and Health Administration.

Design Example

Requirements

Shoring is to be designed for a pipe trench varying from 4 feet to 8 feet deep. Horizontal supports are to be kept to a minimum.

Solution

1. Determine soil properties: No soil-test report is available, but inspection at the job site reveals a loose loam in most areas, with a coarse sand and gravel mixture in others. Road cuts in the area indicate these general soil characteristics to a depth of more than 10 feet.

   From Table 1, an equivalent fluid density of 40 pcf is selected as appropriate for the overall design. (With fine-grain soils such as clays, the possibility of wet conditions should also be considered. Rain runoff, or other drainage could produce a hydrostatic head of water under extreme conditions.)

2. Select a suitable plywood-support system: Since the trench depth will vary, Type B support system will be used.

3. Select the proper plywood: Table 2 shows that C-C EXT 32/16 plywood will be adequate for the Type B system up to a trench depth of 4.5 feet, and C-C EXT 48/24 will be required for the Type B system for depths up to 9.0 feet.

4. Design of support framing is beyond the scope of this technical note, but basic engineering beam formulas for uniform loading can be applied. Vertical-support design will depend on the number and placement of horizontal supports. Use of horizontal supports across the vertical framing can reduce the required number of support jacks—especially for Type A and Type B systems. For most applications at least two support jacks will normally be required for each framing member in trench depths up to 8 feet. Vertical framing should be designed to be stable under lateral impact loads due to workmen and equipment in the trench. This factor is of particular importance for trench depths over 4 feet.

Note

The Identification Index given in Table 2 as a set of two numbers in the plywood grade (e.g. C-D 32/16) refers to spacing of framing members. The left-hand number is maximum recommended spacing in inches o.c. for roof framing. The right-hand number is the recommendation for floor framing. The Identification Index on any given panel is based on panel thickness and species makeup and indicates relative along-the-grain stiffness of the panel.

The recommendations in this leaflet are based on use of plywood that bears the grade-trademark of the American Plywood Association. For these engineered applications that involve safety, it is best to use plywood that meets manufacturing standards of U.S. Product Standard PS 1 and Association performance requirements. The APA grade-trademark is positive identification by the manufacturer that the plywood has been subject to the rigid inspection and testing program of the Association.

AMERICAN PLYWOOD ASSOCIATION

1119 A Street / Tacoma, Washington 98401

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