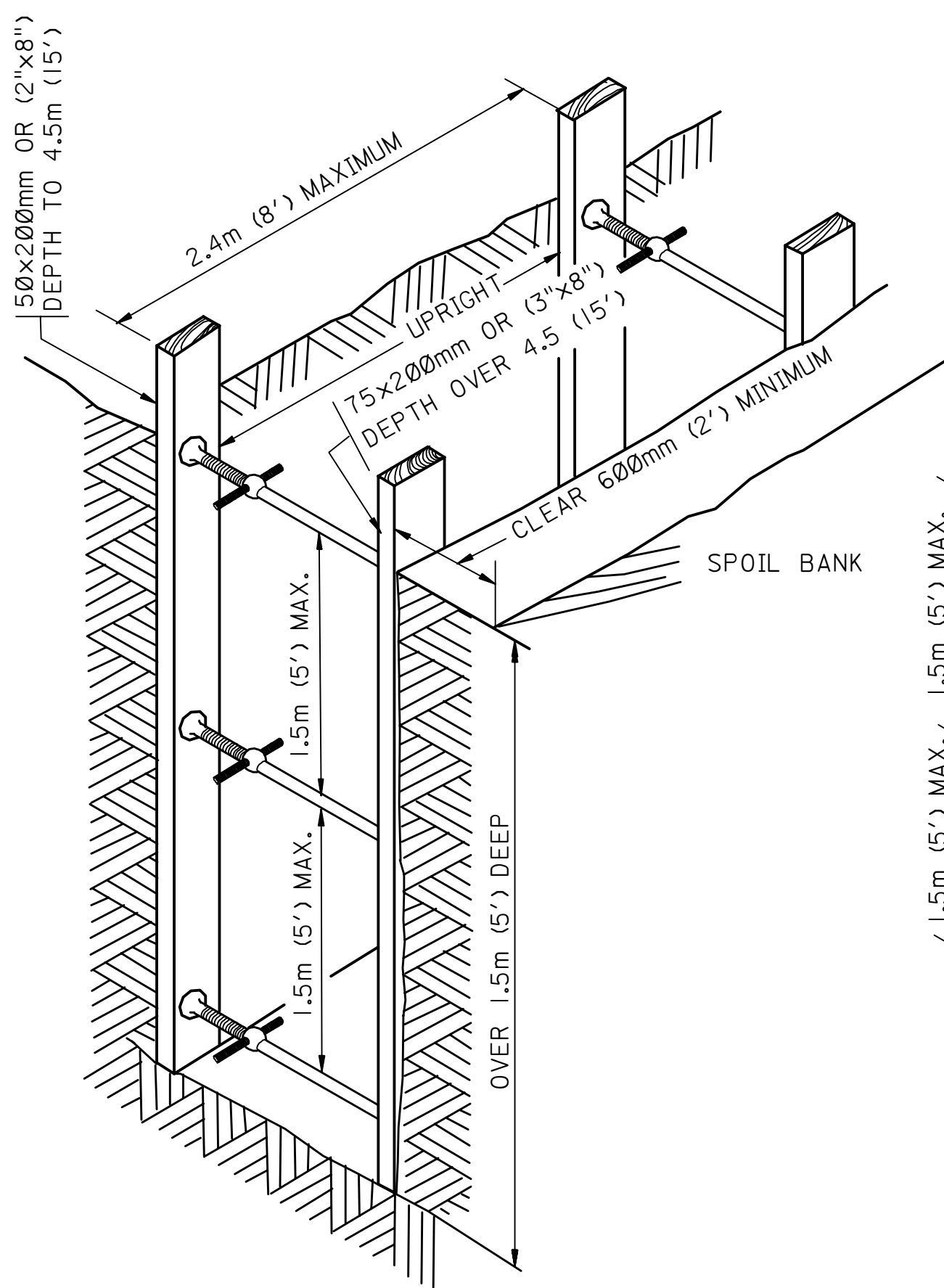
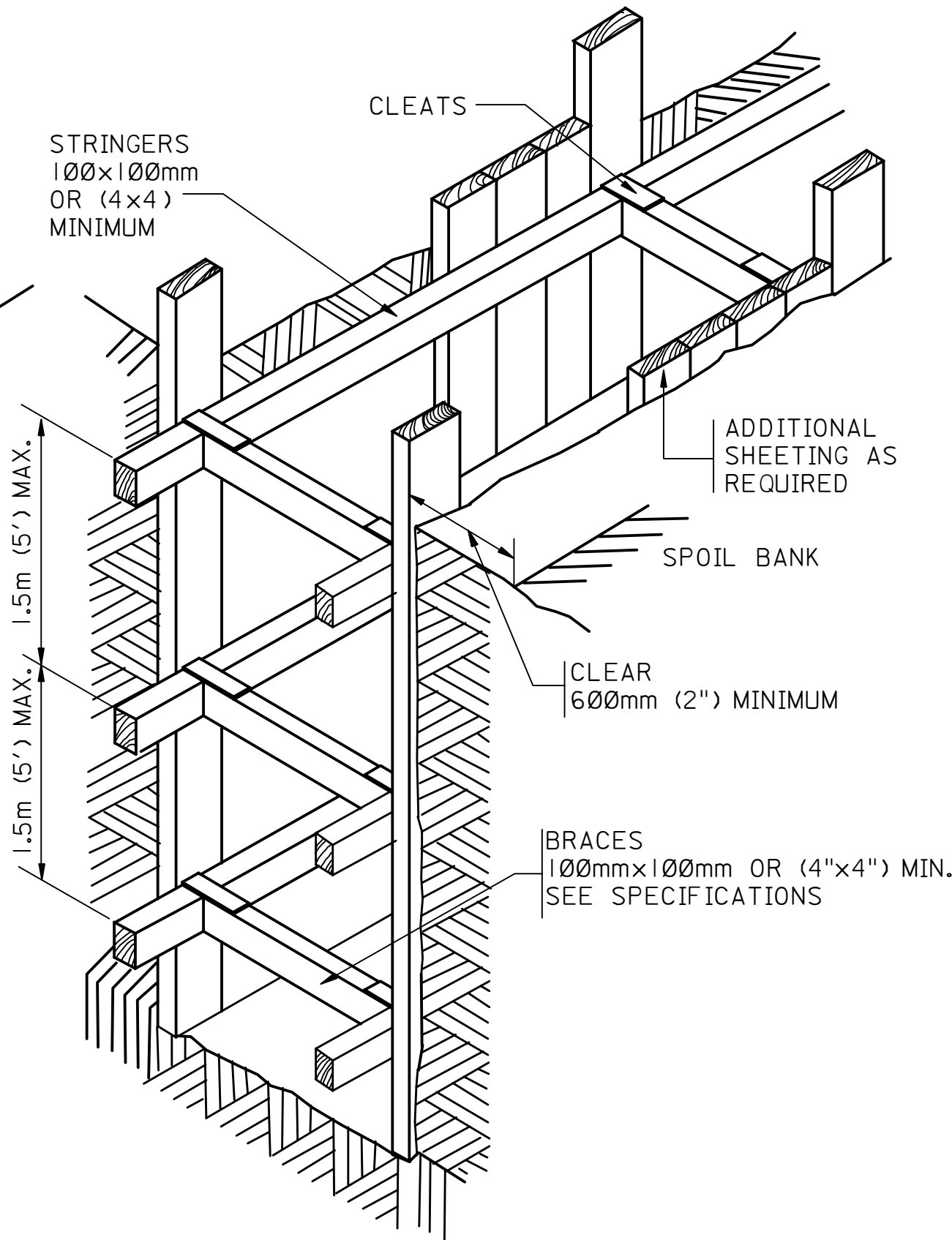


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HARD COMPACT GROUND

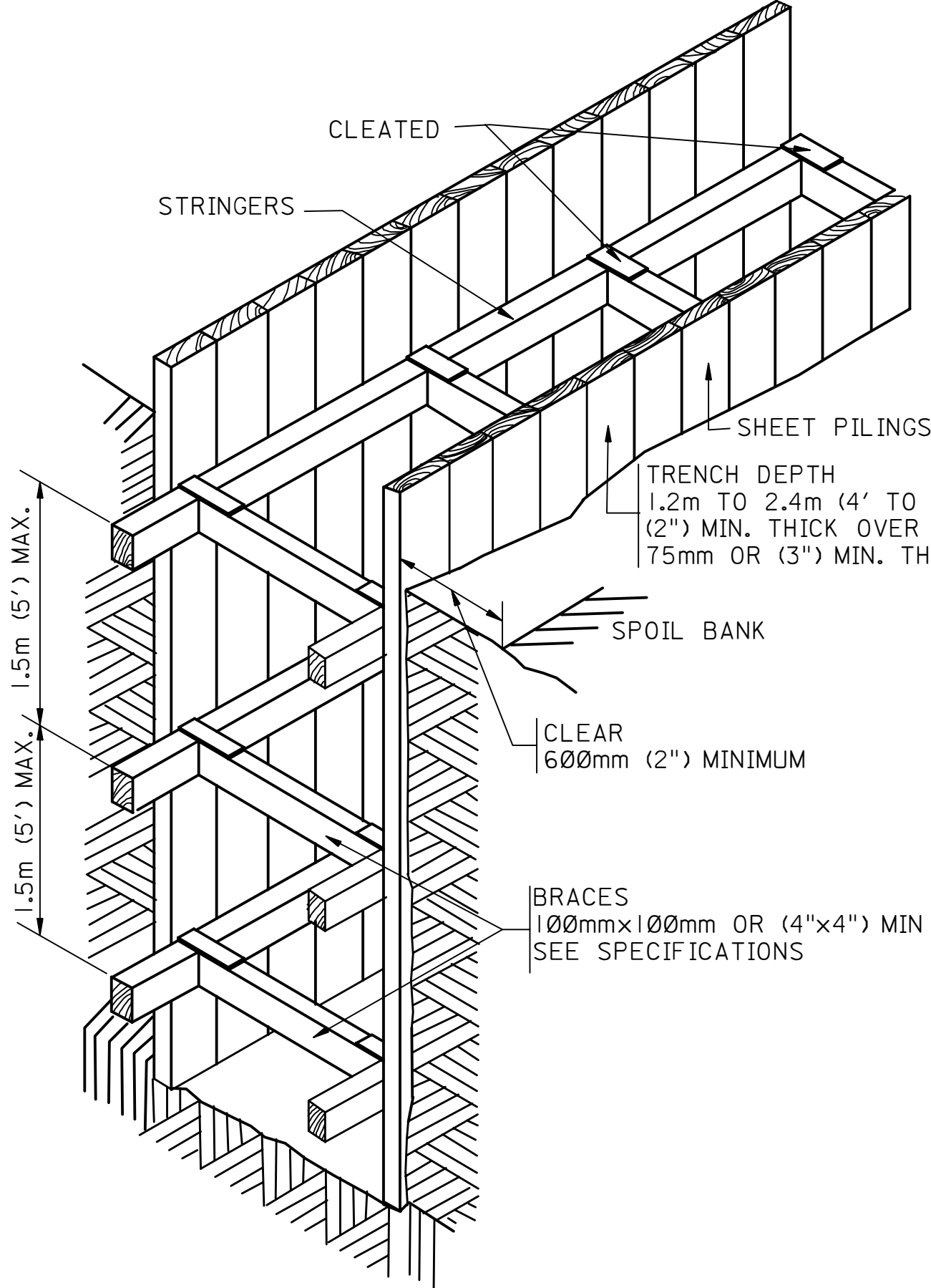
TRENCHES 1.5m (5FT) OR MORE DEEP AND OVER 2.4m (8FT) LONG MUST BE BRACED AT INTERVALS OF 2.4m (8FT) OR LESS.



SATURATED, FILLED OR UNSTABLE GROUND

SHEETING MUST BE PROVIDED AND MUST BE SUFFICIENT TO HOLD THE MATERIAL IN PLACE.

LONGITUDINAL STRINGER DIMENSIONS DEPEND UPON THE STRUT AND STRINGER SPACING AND UPON THE DEGREE OF INSTABILITY ENCOUNTERED.



RUNNING MATERIAL

SHEET PILING OR EQUIVALENT SOLID SHEETING IS REQUIRED FOR TRENCHES 1.2m (4FT) OR MORE DEEP.

LONGITUDINAL-STRINGER DIMENSIONS DEPEND UPON THE STRUT BRACES. THE STRINGER SPACING, AND THE DEPTH OF STRINGER BELOW THE GROUND SURFACE.

GREATER LOADS ARE ENCOUNTERED AS THE DEPTH INCREASES, SO MORE OR STRONGER STRINGER AND STRUTS ARE REQUIRED NEAR THE TRENCH BOTTOM.

NOTES:

LADDERS

IN TRENCHES 1.5m (5FT) OR MORE DEEP LADDERS MUST BE HIGH ENOUGH SO THAT THEY EXTEND AT LEAST 60mm (2FT) ABOVE THE TOP UNLESS A SAFER MEANS OF GETTING IN AND OUT OF THE TRENCH IS PROVIDED. THERE MUST BE A LADDER WITHIN 7.5m (25FT) OF ANY WORKER IN A TRENCH.

HORIZONTAL STRUT BRACES

A STRUT BRACE IS REQUIRED FOR EACH 1.2m (4 FT) ZONE INTO WHICH THE TRENCH DEPTH CAN BE DEVIDED.

SCREW JACK TYPES MAY BE USED. TIMBER TYPE BRACES MUST BE WELL CLEATED AND RIGIDLY WEDGE IN PLACE TO PREVENT SHIFTING.

IN NO CASE SHALL A 100x100mm OR (4"x4") BRACE BE LONGER THAN 900mm (3FT.) IN NO CASE SHALL A 100x150mm OR (4"x6") BRACE BE LONGER THAN 1.8m (6FT.) IN NO CASE SHALL A 150x150mm OR (6"x6") BRACE BE LONGER THAN 2.4m (8FT.)

SHORING TIMBER AND EQUIPMENT

WOOD USED MUST BE IN GOOD CONDITION AND FREE FROM ANY IMPERFECTIONS THAT WOULD REDUCE ITS STRENGTH. SCREW JACKS MUST BE IN GOOD WORKING ORDER.

SLOPING OF TRENCES

SLOPING OF TRENCH WALLS MAY BE SUBSTITUTED FOR SHORING AND BRACING,PROVIDED EQUIVALENT PROTECTION IS AFFORDED.

IF SLOPING IS SUBSTITUTED FOR SHORING, THE SLOPE MUST NOT BE STEEPER THAN 3/4 HORIZONTAL TO 1 VERTICAL, EXCEPT WHEN THE ANGLE OF REPOSE OF THE MATERIAL IS LESS STEEP, IN WHICH CASE THE SLOPE MUST CONFORM TO THIS ANGLE.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

ADDITIONAL CONSIDERATIONS

- BEWARE OF DISTURBED GROUND. GROUND THAT HAS BEEN FILLED OR DISTURBED WILL REQUIRE ADDITIONAL SHEETING AND BRACING. SO WILL HARD COMPACT GROUND IF THERE IS FILLED GROUND NEARBY. A TRENCH WALL THAT IS NEAR ANOTHER RECENTLY FILLED TRENCH, FOR EXAMPLE, IS UNSTABLE, EVEN THOUGH IT APPEARS TO BE HARD COMPACT MATERIAL.
- TAKE SPECIAL PRECAUTIONS WHERE MOISTURE IS PRESENT. PROVIDE EXTRA SHEETING WHERE THERE IS WATER OR SEEPAGE. KEEP THE EXCAVATION PUMPOUT AT ALL TIMES, AND AVOID ANY ACCUMULATION OF WATER DAY OR NIGHT UNTIL THE WORK IS DONE.

ADDITIONAL CONSIDERATIONS (CON'T.)

- GUARD AGAINST ROCK-LIKE MATERIAL THAT SOFTENS WHEN EXPOSED TO AIR. UPON EXPOSURE TO AIR AND MOISTURE, SOME ROCKS UNDERGO A SOFTENING CHANGE CALLED AIR-SLACKING. WALLS OF SUCH ROCK ARE HARD AND SOLID AT THE TIME OF EXCAVATION, BUT SOFTEN INTO A SLIPPERY, DANGEROUS MASS SOON AFTER EXPOSURE TO AIR. TO PREVENT THIS AIR-SLACKING APPLY A PROTECTIVE COATING OF GUNITE TO SUCH WALLS, IN ADDITION TO SHORING AND BRACING. OR PROVIDE EXTRA SHEETING TO HOLD WEAKENED WALLS IN PLACE.
- GUARD AGAINST CAVING HAZARD CREATED BY VIBRATION AND LOAD FROM ADJACENT TRAFFIC. TRENCHES LOCATED NEAR HIGHWAYS AND STREETS ARE MORE LIKELY TO CAVE THAN SIMILAR TRENCHES IN LOCATIONS NOT EXPOSED TO MOVING LOADS. EXTRA SHEETING IS NECESSARY, AND LOOSE ROCKS AND CHUNKS OF EARTH THAT COULD FALL ON MEN IN THE EXCAVATION SHOULD BE REMOVED.

- INSTALL UPPER TRENCH JACKS FIRST. WHEN TRENCH JACKS ARE USED TO HOLD UPRIGHTS IN PLACE AGAINST TRENCH WALLS, THE TOP JACK SHOULD BE INSTALLED FIRST. THE NEXT LOWER SHOULD BE HELD IN POSITION WITH HOOKS FROM ABOVE BEFORE A MAN ENTERS THE TRENCH AT THAT POINT TO PLACE THE LOWEST JACK. SHORING DOES NOT SERVE ITS PURPOSE IF MEN EXPOSE THEMSELVES TO HAZARD WHILE INSTALLING IT. MOST OF THE INSTALLATION WORK SHOULD BE CARRIED ON FROM A SAFE POSITION OUTSIDE OF THE TRENCH.
- PROTECT ALL MEN IN TRENCHES. IF A MAN IS NEEDED AT THE BOTTOM OF THE TRENCH NEAR THE BOOM-END OF A BOOM-TYPE TRENCHING MACHINE, HE SHOULD BE PROTECTED BY METAL SHIELDS ATTACHED TO THE BOOM-END. THIS SHIELDS SHOULD BE OF ADEQUATE STRENGTH AND DESIGN TO SERVE AS SUBSTITUTE FOR SHORING AND BRACING.

TRENCH SHORING SPECIFICATIONS

SOIL TYPE	DEPTH	UPRIGHTS		BRACES		STRINGERS	
	METERS (FEET)	SIZE mm (IN)	HOR. SPACING m (FT)	SIZE mm (IN)	HOR. SPACING m (FT)	SIZE mm (IN)	VERT. SPACING m (FT)
HARD	1.5-4.5 (5-15)	50x200 (2x8)	2.4 (8)	100x100 (4x4)	2.4 (8)	WHERE INDICATED	
	OVER 4.5 (15)	75x200 (3x8)	1.8 (6)	100x150 (4x6)	1.8 (6)	WHERE INDICATED	
SATURATED	1.5-4.5 (5-15)	50x200 (2x8)	1.2 (4)	100x100 (4x4)	1.2 (4)	WHERE INDICATED	
	OVER 4.5 (15)	75x200 (3x8)	SOLID	100x150 (4x6)	1.8 (6)	100x100 (4x4)	1.2 (4)
UNSTABLE	1.5-3.0 (5-10)	50x200 (2x8)	1.2 (4)	100x100 (4x4)	1.2 (4)	WHERE INDICATED	
	3.0-4.5 (10-15)	50x200 (2x8)	0.6 (2)	100x100 (4x4)	0.6 (2)	WHERE INDICATED	
	OVER 4.5 (15)	75(200 (3x8)	SOLID	100x150 (4x6)	1.8 (6)	100x150 (4x6)	1.2 (4)
RUNNING	1.2-2.4 (4-8)	50x200 (2x8)	SOLID	100x100 (4x4)	1.8 (6)	100x150 (4x6)	1.2 (4)
	OVER 2.4 (8)	75x200 (3x8)	SOLID	150x150 (6x6)	1.8 (6)	150x150 (6x6)	1.2 (4)

MANDATORY DRAWING

05	OCT'94	ESSD RLO	REVISED DIMENSION ON "HARD COMPACT GRND. DET.			
04	MAY94	ESSD CAC	ADDED MANDATORY DWG. NOTE PER CSD-ESD-L774/94			
03	JUN92	ESSD FDR	DRAWING DIGITIZED INTO CADD DATABASE WITOUT CHANGES			
REV. NO.	DATE	BY	JO/EWO	DESCRIPTION	CHKD. CERT.	APPD.

SAUDI ARABIAN OIL COMPANY

DRAWN BY	JASSIM	CHECKED BY	RDG	SCALE	NONE
DATE STARTED		DATE COMPLETED			01-30-66
OPR'G. DEPT.		ORIGINAL SIGNED		ENG. DEPT.	ORIGINAL SIGNED
APPD' FOR CONSTR.		02-02-66		02-01-66	

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION OR FOR ORDERING MATERIAL UNTIL CERTIFIED AND DATED	CERTIFIED BY	DATE
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STANDARD SPECIFICATIONS FOR SHORING TRENCHES

STD. DWG. SAUDI ARABIA

PLANT NO.	INDEX	DRAWING NUMBER	SHT. NO.	REV. NO.
990	S	AB-036899	001	05