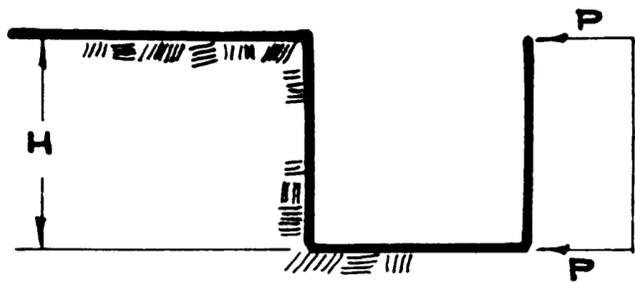


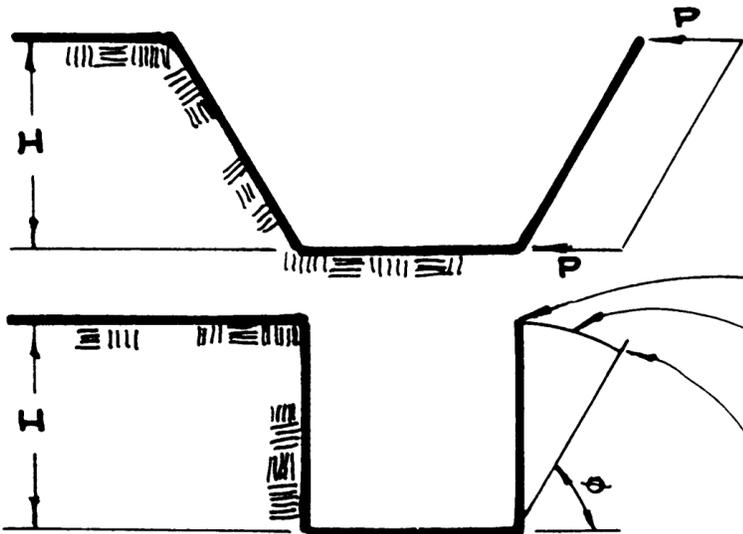
CASE I - SHORING FOR VERTICAL EXCAVATIONS



* $P = .8Kw \cdot H$ = Unit pressure in p.s.f.
 K = Coefficient of active earth pressure
 w = Unit weight of soil in p.c.f.
 H = Depth of excavation in feet

Use following values of Kw in design of shoring
 $Kw = 25$ p.c.f. for all soils except wet sand, saturated soil or soft plastic clay
 $Kw = 50$ p.c.f. for wet sand
 $Kw = 100$ p.c.f. for saturated soil and for soft plastic clay

CASE II - SHORING FOR SLOPING EXCAVATIONS



* $P = .8KwH$ = Unit pressure in p.s.f.
 K = Coefficient of active earth pressure
 w = Unit weight of soil in p.c.f.
 H = Depth of excavation in feet.

Use following values of Kw in design of shoring
 Kw varies with slope of side of excavation in accordance with Figure 1, below.

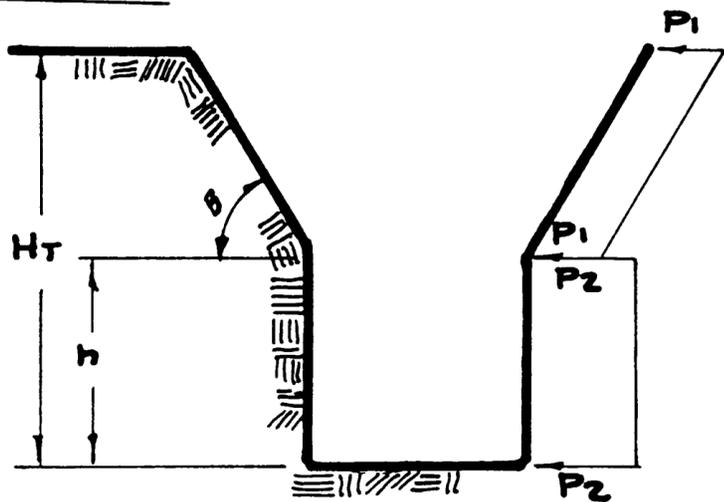
$Kw = 25$ p.c.f. for all soils except wet sand, saturated soil, or soft plastic clay.
 $Kw = 50$ p.c.f. for wet sand
 $Kw = 100$ p.c.f. for saturated soil and for soft plastic clay.

Kw decreases uniformly from maximum value for a vertical excavation to zero for a slope whose angle of inclination equals θ (See General Note No. 3)

$Kw = 3$ zero

FIGURE 1

CASE III - SHORING FOR COMBINED VERTICAL AND SLOPING EXCAVATIONS



* $P_1 = .8Kw \cdot HT$ = Unit pressure in p.s.f. (use Kw value per Figure 1, Case II.)

* P_2 = Unit pressure in p.s.f. (vertical portion) Varies uniformly from a value equal to $.8Kw \cdot HT$ when $\beta = 90^\circ$ to a value equal to $.8Kw \cdot (h + .25h \cdot \tan \beta)$ when $\beta = \theta$. When β is less than θ , $P_2 = .8Kw \cdot (h + .25h \cdot \tan \theta)$.

K = Coefficient of active earth pressure.
 w = Unit weight of soil in p.c.f.
 HT = Depth of excavation in feet.
 h = Depth of vertical portion of excavation in feet.

Use following values of Kw in design of shoring
 $Kw = 25$ p.c.f. for all soils except wet sand, saturated soil, or soft plastic clay.
 $Kw = 50$ p.c.f. for wet sand.
 $Kw = 100$ p.c.f. for saturated soil and for soft plastic clay.

* See General Note 4

GENERAL NOTES

1. MATERIALS:

All materials used for shoring, sheeting and lagging in complying with the provisions of this standard may be new or used but shall be free from defects and damage that might in any way impair their protective function. The grade or structural properties of such materials, used for shoring, shall correspond to that specified in the uniform building code or current standard grading and dressing rules of the west coast Lumbermen's Assn. as applicable, for the stresses used.

2. SHORING FOR EXCAVATIONS:

- Shoring for excavations shall consist of main horizontal and vertical spacing, wood shoring members in contact with the ground shall be not less than 2 inches thick and 8 inches wide, spaced every 8 feet, extending from top to bottom of excavation. Excavation braces shall be not less than 4 inches wide and 4 inches thick.
 - Shoring for excavations shall be designed by a Civil or Structural Engineer Registered in the State of Calif. shoring for excavations shall be designed to withstand not less than the loads indicated for the case involved and in no case providing less strength than a system complying to the State of California, Department of Industrial Relations Construction Safety orders.
 - Allowable design stresses for lumber used for shoring for excavations shall be per the current edition of Standard grading and dressing rules of the west coast Lumbermen's Assn., except they may be increased by 33%. Allowable design stresses for steel members used in shoring for excavations shall be per the latest edition of the Uniform Building Code except that they may be increased by 33%.
 - The contractor shall obtain approval from the State Division of Industrial Safety of shoring to be used and shall then furnish details of said shoring to the City for use in the inspection of the project.
- Angle θ is the anticipated angle at which the soil involved will safely stand without shoring, but in no case shall it be greater than 53° (i.e. A slope of three quarters horizontal to one vertical.)
 - Non-Stress grade lumber for sheeting and lagging may be used providing the following thickness and spacing requirements are observed:

Minimum rough thickness of sheeting or lagging	Minimum spacing of shoring
2 inches	4 feet
3 inches	7 feet

However, the minimum rough thicknesses and maximum spacings tabulated above for non-stress grade lumber may be disregarded provided stress grade lumber or steel is used for sheeting or lagging. Said sheeting or lagging for excavations shall be designed using the same criteria as that shown for shoring for excavations except that the coefficient of .8 (eight tenths) may be reduced to .6 (six tenths).

The loading criteria shown herein are minimum for the cases shown. Minor changes in these design criteria may be permitted by the State of California, Division of Industrial Safety. Values of Kw shown herein may be modified provided such modifications are recommended by a Registered Civil Eng. and can be fully substantiated to the satisfaction of the Div. of Industrial Safety by supporting technical soils data based upon the soils and other subsurface conditions existing in the areas of excavation. Such modified Kw values must include an allowance for surcharge loads created by traffic conditions and by loads caused by the contractor's equipment and method of operation.

CITY OF SAN BERNARDINO - PUBLIC WORKS DEPT.

CRITERIA FOR THE DESIGN OF SHORING FOR EXCAVATION

APPROVED

12-7, 1973

P. Z. Huber
 CITY ENGINEER

STANDARD PLAN

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