

EXCAVATION AND TRENCHING SAFETY REQUIREMENTS

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2.0 PURPOSE

The purpose of this standard is to outline OSHA requirements as they apply to excavations for NV Energy's (NVE) underground facilities.

3.0 GENERAL EXCAVATION REQUIREMENTS


- 3.1 Prior to opening an excavation, all other utility companies must be contacted, (**USA, Call Before You Dig, 811**) to determine if conflicting installations will be encountered, and if so, their location, depth, etc.
- 3.2 Surface encumbrances, such as trees, boulders or construction materials which may create a hazard to persons working on or in excavations, must be made safe before excavation is begun.
- 3.3 Excavated material, from excavations which persons are required to enter, must be stored at least 2 feet from the edge of the excavation or effectively retained by the use of barriers.
- 3.4 The walls and faces of all excavations in which persons are exposed to danger from moving ground shall be guarded by a shoring system, sloping off the ground, or some other equivalent means. Supporting systems shall be designed by a qualified person and meet accepted engineering requirements. Determination of the slope angle or design of the shoring system shall be based on such factors as excavation depth, anticipated changes of the material from exposure or surface loading due to equipment, traffic vibrations or excavated materials. (Refer to Page 4, Table I for minimum sloping requirements and Table II for minimum shoring requirements.)

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- 3.5 Materials used for shoring shall be in good serviceable condition, with timbers sound, and free from large or loose knots and of proper dimensions.
- 3.6 Excavations below the level of the base footing of any foundation or wall shall not be permitted, unless the wall is underpinned and other precautions are taken to insure the stability of adjacent walls.
- 3.7 Water shall not be allowed to accumulate in an excavation. Diversion ditches, dikes, etc., shall be used to prevent the entrance of surface water and to provide drainage of the adjacent area. See NVE standard, TE0001U, Section 6.0 for environmental requirements.
- 3.8 Dust conditions shall be kept to a minimum by the use of water or other means.
- 3.9 Ladders used in excavations shall be in accordance with the OSHA subpart concerning the subject. (Part 1926, Subpart “L”)

4.0 SPECIFIC TRENCHING REQUIREMENTS

- 4.1 When persons are required to enter trenches, 4 feet or more in depth, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than 25 feet of lateral travel.
- 4.2 Trenches in soft or unstable soil, 5 feet or more in depth, must be sloped, shored or otherwise supported by means of sufficient strength to protect persons working in them.
- 4.3 Trenches in hard or compact soil, 5 feet in depth and 8 feet or more in length, shall be shored or the trench sides above the 5 foot level sloped to be not steeper than 1 foot vertical to each 1/2 foot horizontal.
- 4.4 Trenches less than 5 feet deep shall also be protected when examination of the ground indicates hazardous ground movement may be expected.
- 4.5 Additional precautions, by way of shoring and bracing, shall be taken to prevent slides or cave-ins when trenches are dug in locations adjacent to backfilled areas or are subjected to vibration from railroad or highway traffic, the operation of machinery, or any other sources.
- 4.6 Bracing or shoring of trenches shall be carried along with the excavation (see Sections 4.1 & 4.2 for maximums without shoring).

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- 4.7 Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling or kickouts.
- 4.8 Portable trench boxes or sliding shields may be used, in lieu of a shoring system or sloping. The boxes or shields must be designed, constructed and maintained in a manner equal to or greater than the shoring system required for the trench.
- 4.9 Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces, from above, when all personnel have cleared the trench.

5.0 REFERENCES

Construction Safety and Health Regulations, Part 1926, Subpart “P”.

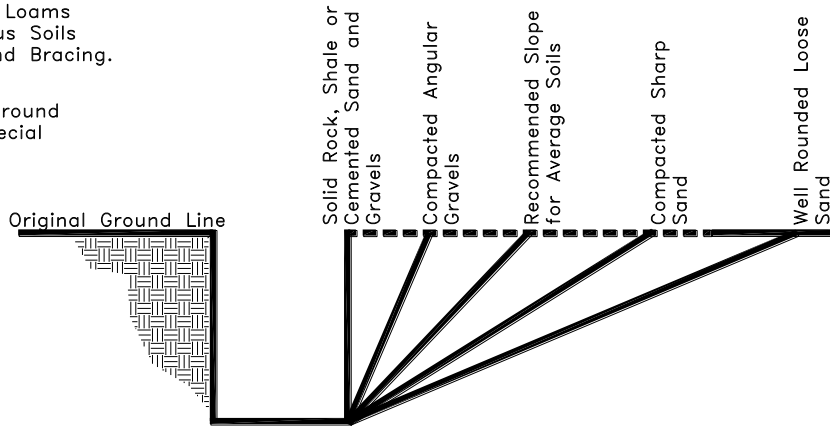
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**TABLE I
MINIMUM SLOPING REQUIREMENTS**

Slope Vertical (90°) Slope 1/2 to 1 (63° 26') Slope 1 to 1 (45°) Slope 1-1/2 to 1' (33° 41') Slope 2 to 1 (26° 34')

NOTE: Clays, Silts, Loams or non-Homogenous Soils Require Shoring and Bracing.

The Presence of Ground Water Requires Special Treatment.



**TABLE II
MINIMUM SHORING REQUIREMENTS**

Size and Spacing of Members

Depth of trench	Type of Earth	Minimum upright dimensions in inches	Maximum upright spacing in feet	Minimum stringer dimensions in inches	Maximum stringer spacing in feet	Width of trench (cross braces)					Vertical in feet	Horizontal in feet
						< 3'	3' to 6'	6' to 9'	9' to 12'	12' to 15'		
Five to Ten Feet	Hard, compact	4 x 4 or 2 x 6	6	----	----	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Likely to crack	4 x 4 or 2 x 6	close sheeting	4 x 6	4	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Soft, sandy or filled	4 x 4 or 2 x 6	close sheeting	6 x 8	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Hydro-static pressure	4 x 4 or 2 x 6	close sheeting	6 x 8	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
10 to 15 Feet	Hard, compact	4 x 4 or 2 x 6	4	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Likely to crack	4 x 4 or 2 x 6	2	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Soft, sandy or filled	4 x 4 or 2 x 6	close sheeting	6 x 8	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
	Hydro-static pressure	4 x 4	close sheeting	8 x 10	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6

Trench jacks may be used in lieu of, or in combination with, wood braces.
Shoring is not required in solid rock, hard shale or hard slag.
Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

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