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Tab 10 - The NESCC and Underground Applications

The National Electric Safety Code (NESC)

The NESC provides guidelines for the design of underground systems

- Section 9 – Grounding Methods
- Part 3 – Safety Rules for the Installation and Maintenance of Underground Electric Supply and Communications Lines and Equipment
- Part 4 – Rules for Operation of Electric Supply and Communications Lines and Equipment

NESC 320 – Location

The underground system should only occupy one lane of travel when installed in a highway or street

Special construction required of bridges and railroad tracks

Adverse soil conditions can cause movement or corrosion

NESC 320B – Separation Distances

Separation between Supply and Communication Conduit systems

- 3” of Concrete or
- 4” of masonry or
- 12” of well tamped earth
 - However, lesser distance can be agreed upon

Section 320B-4

- Water pipes can burst and undermine the supply conduit which in turn can collapse

NESC 321 – Excavation and Backfill

The backfill should have nothing larger than 4” within 6” of the duct system with the remaining trench having nothing larger than 8”

- Other construction standards may establish a more stringent requirement

The soil conditions may require a protective layer of fill

- The fill may be required to encompass the duct bank

The bottom of the trench should be undisturbed earth or well tamped to avoid settling

NESC 322 – Ducts

Most utilities have ‘standard’ stock that is used

- The duct material must be corrosion resistant

The duct system must be designed in a manner that prevents a cable fault in one duct from damaging the cables in an adjacent duct

Inside the duct must be free from sharp edges

NESC 323 – Manholes

The location of the manholes is determined by the location of the opening to the manhole

Rule 323A - The duct bank must be able to withstand external loads

The manhole must be designed and installed in a manner that will allow it to withstand the external pressures applied

- Vehicular load is 300 lbs per ft²
- Requires a 30% increase for live impact

Pulling eyes aid the installation of the cable

- Must be able to withstand 2 times the expected pulling tension

NESC 323 – Manholes (continued)

Working Space

- Horizontal spacing is 3 feet minimum
- Vertical spacing is 6 feet minimum
 - Most new manholes typically have 7 feet of head room

Access

- Round openings have to be 26” or more in diameter to allow for ladder and person (A 32” to 36” diameter is typical for transmission cable because of the large components that must be lowered into the manhole. Two openings are standard)
 - This can be reduced to 24” with fixed ladder
- Rectangular openings are to be no less than 26” x 22”

NESC 323 – Manholes (continued)

Covers

- No real specification is provided by the NESC other than the covers must be secure and not easily removed without tools (Note that a couple of utilities have tethers on their transmission cable manhole covers.)

Drainage

- Be aware of any sewers or storm drains that may allow sewer gas to enter the manhole

Ventilation

- Also covered in Section 4.

Mechanical protection of cables

NESC 340 – Cable

Installation

- The bending radius is not established in the Code.
 - The Code only states that the radius must be large enough so as not to damage the cable
 - Refer to manufacturer's recommendations
- Sidewall pressure limit
 - The cable will have a force applied while installing
- The effects of gravity must be taken into account

Supports

- The cable must be supported in the manhole
 - Called 'racking the cable'
- The cables must be 3" above the floor or protected
- The cables will move and the supports and restraint system must be designed to allow this

NESC Section 35 – Direct Buried Cable

Direct buried cable is any cable not placed in a duct or raceway

These rules outline the requirements for any supply or communication cable that is direct buried

There is a specific identifier that the cable must display

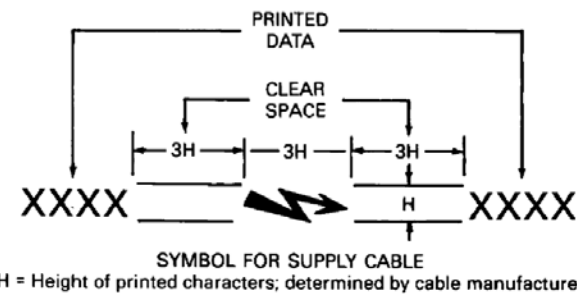
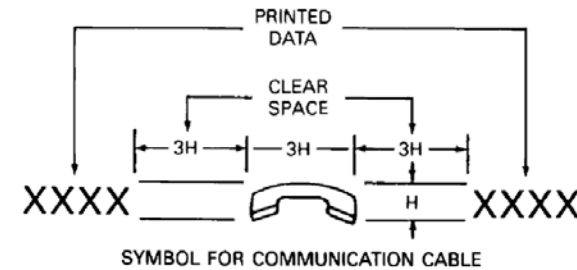


Figure 350-1—Symbols for identification of buried cables

NESC Section 35 – Direct Buried Cable (continued)

Installation depth is established in Section 353D

- This is the minimum depth without mechanical protection; please be aware of the exceptions
- The trench must be suitable including the backfill
 - No machine tamping within 6” of the cable
- Care must be taken to not damage the cable during installation
 - Seems like a ‘no brainer’ but many cables fail due to improper installation

NEESC 423 – Operating Procedures

The requirements of this section include

- Guarding
- Testing for Gas
- Flames
- Excavation
- Identification

Rules concerning confined space

- Refer to the OSHA Standards and your Company procedures

NESC Section 44

Understand the rules for working around live or energized equipment will aid in the decision-making process for construction

The design and construction of the manhole/duct system is only part of the picture

- The rest of the picture will be the operation and maintenance of the system for the next 50+ years

Summary

The NESC provides the general design and operation guidelines for Underground Electric Supply Lines and Equipment

Most Electric Utilities have more stringent requirements

- NESC are minimums and your Company can establish additional rules