Did you ever have one of those jobs that you absolutely hated to do? If you have ever had to deal with manholes it probably tops the list...

Manholes, besides the uncomfortable name, create a unique circumstance, both from an electrical standpoint as well as the confined space issues they create for the worker. Often times people will try to get some relief from an internal requirement to wear Level 4 PPE, as it creates additional safety concerns. But when an arcing fault occurs in a manhole, because of the limited entry space and because the flash/blast is essentially contained within a box, it creates additional hazardous conditions.

So when dealing with manhole safety, the basic issues are:

1. Having a qualified worker performing the tasks, and
2. Performing a hazard risk/assessment of the particular task to be performed in the manhole

The hazard is what the hazard is – and it really does not change. What *can* change is the risk involved in a specific task. That is why a hazard/risk analysis is always required, whether the tables in the NFPA 70E are used or the equipment has arc-flash labels on it. You have to completely and thoroughly perform an assessment of all the applicable risks, especially when entering a manhole space.

Ray Jones, former NFPA 70E Technical Committee Chairman, summarized the subject of arc-flash hazards in manholes in his book, *100 Questions and Answers on Electrical Safety*.

**Q58. Can an arc flash hazard exist in a manhole?**

Yes. Generally, cables and conductors in a manhole are high current or high voltage and serve several areas or devices. Although terminations normally do not exist in a manhole, splices are common, and terminations sometimes exist. The insulation on old cables can become brittle and subject to damage by moving the cable or conductor. The environment in the manhole is likely to be wet and congested. Any work in a manhole subjects existing cables and splices to physical damage. In some cases, physical damage is likely to generate an arcing fault. Failures inside a manhole are infrequent; however, when a failure occurs, the elevated temperature created in the arcing fault surrounds any worker in the manhole.

Speaking of the 70E, it addresses manholes in two places, Article 130.6(F) and in Table 130.7(C)(9) Hazard/Risk Category Classifications and Use of Rubber Insulating Gloves and Insulated and Insulating Hand Tools.

**130.6(F) Confined or Enclosed Work Spaces.**

*When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized electrical conductors or circuit parts operating at 50 volts or more or where an electrical hazard exists, the employer shall provide, and the employee shall use, protective shields, protective barriers, or insulating materials as necessary to avoid inadvertent contact with these parts and the effects of the electrical hazards. Doors, hinged panels, and the like shall be secured to prevent their swinging into an electrical hazard.*
employee and causing the employee to contact exposed energized electrical conductors or circuit parts rating at 50 volts or more or where an electrical hazard exists.

Table 130.7(C)(9)
Tasks Performed on Energized Equipment
Other Equipment 1 kV through 38 kV
Insulated cable examination, in manhole or other confined space Hazard/Risk Category 4; Rubber Insulating Gloves Required

Further information about dealing with manholes can be found in OSHA’s, Letter of Interpretation dated November 21, 2006. Excerpts from the letter are:

Question #1: Who is qualified to enter a manhole or vault?
Response: For the purposes of your inquiry, we will assume the entry into the space is to perform work covered by 29 CFR §1910.269. First, employees performing work covered by this standard must, at a minimum, have received the training required by 1910.269(a)(2). Second, if the vault or manhole meets the definition of an “enclosed space,” as found in 1910.269(x), then any entry into the space would be governed by the requirements found in 1910.269(e) and 1910.269(t). Any person entering an enclosed space or acting as an attendant to an enclosed space entry must, in accordance with 1910.269(e)(2), have been “trained in the hazards of enclosed space entry, in enclosed space entry procedures, and in enclosed space rescue procedures.” If the hazards associated with the space cannot be eliminated through the precautions in paragraphs (e) and (t) of 1910.269, then entry into the space must meet the requirements of paragraphs (d) through (k) of 29 CFR §1910.146, OSHA’s Permit–required confined spaces standard. The requirements of 1910.146 also apply when an employee enters a confined space to perform tasks not covered by 1910.269, OSHA’s Electric power generation, transmission, and distribution standard. Paragraph (g) of 1910.146 contains training requirements for permit required confined space entry.

Question #2: Who is qualified to enter and perform work in an underground manhole or vault with energized electrical conductors (12 kV and above)?
Response: Work with electrical conductors energized at 12 kV in a manhole or vault must be in compliance with 29 CFR §1910.269, OSHA’s Electric power generation, transmission, and distribution standard. As noted earlier, training requirements for employees engaged in these operations are found at 1910.269(a)(2) and 1910.269(c)(2). Additionally, if an employee is working on exposed energized parts or is near enough to them to be exposed to the hazards they present, the employee must be a “qualified person,” as required by 1910.269(l)(1), which includes having received additional training specified at 1910.269(a)(2)(ii).

Question #3: If a third party inspects the manhole or vault and the manhole or vault is deemed safe, what qualifications does it take to enter the confined space?
Response: Regardless of who performs the determination that the hazards within the space have been eliminated, the qualifications of the entrant do not change. If it is an enclosed space, as per 1910.269(x), then all of the requirements found in 1910.269(e) apply in full, including the training requirements for the entrant.

Question #4: If a third party inspects a manhole or vault that contains energized electrical conductors (12 kV and above) and the third party deems the space safe, what qualifications must the employee entering the space possess?
Response: As noted in the response to Question #3, regardless of who performs the determination that hazards do not exist, the entrant must possess the training required by 1910.269(a)(2)(ii) to enter the enclosed space. If the employee is working on or near exposed, energized parts, then the employee must be a “qualified person” as required by 1910.269(l)(1), which includes having received the training for “qualified persons” required by the standard at 1910.269(a)(2)(ii).

Question #5: Does it matter if the energized conductors (operating at 12 kV or above) are insulated?
Response: No.

Question #6: Would the individual entering the manhole or vault with the energized conductors (12 kV and above) need to know the minimum approach distances (MADs) to be compliant with the standard’s requirements?
Response: If the energized conductors are exposed and the employee is working on them or near enough to them to be exposed to the hazards they present, then 1910.269(a)(2)(ii)(C) requires that the employee, a “qualified person,” be trained in the MADs for the voltages involved.
**Question #7:** What qualifies an individual to work inside the MADs?

**Response:** An individual working inside the MADs must be a “qualified person,” as required by 1910.269(l)(1), and must have received the required training found at 1910.269(a)(2)(ii), but also must meet the requirements found at 1910.269(l)(2) (i.e., the employee must be insulated from the energized parts, such as through the use of rubber insulating gloves and sleeves where sleeves are required; or the part must be insulated from the employee and from any other conductive object at a different potential; or the employee must be insulated from any other exposed conductive object, such as during live-line bare-hand work).

OSHA Letter of Interpretation dated 11/21/06

Richard E. Fairfax
Directorate of Enforcement Programs

**Summary**

Manhole entry is to be performed by a qualified person. That person must wear PPE appropriate for the hazard, and also appropriate for the task to be performed. If the PPE creates a hazard, it might be appropriate to reduce the level of PPE, but be aware that although arc flashes inside occupied manholes are rare events, the consequences of such an event would be devastating to anyone inside. A thorough hazard/risk analysis must be conducted and documented to properly assess the hazards and risks involved for a specific task. If the decision is made to reduce the level of PPE and an accident occurs, there is a very good chance that OSHA will not agree with reducing PPE and you will be cited, even if a hazard/risk analysis has been performed and documented.

Because of the conditions presented by working in a manhole, frequent breaks, additional air conditioning, and possibly the use of rotating work crews wearing the appropriate PPE and equipment may be the best option for such hazardous work.

Or here’s an even better thought — how about turning it off?

Ron A. Widup and James R. White are NETA’s representatives to NFPA Technical Committee 70E (Electrical Safety Requirements for Employee Workplaces). James R. White is nationally recognized for technical skills and safety training in the electrical power systems industry. He is currently the Training Director for Shermco Industries, a NETA Full Member company. Jim has spent the last twenty years directly involved in technical skills and safety training for electrical power system technicians.