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Standard Guide for Safety, Access Rights, Construction, Liability, and Risk Management for Optical Fiber Networks in Existing Sewers[1]

This standard is issued under the fixed designation F2233; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide addresses only primary safety concerns, easements, constructability, liability of the various parties, and risk management related to constructing, installing, maintaining, or changing an optical fiber network in an existing sewer.

1.2 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory requirements prior to use.* See 4.1 and 5.1 – 5.1.7 for specific safety information.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *OSHA Document:*

OSHA 29 CFR Part 1926 Occupational Safety and Health Standards for the Construction Industry[2]

2.2 *Other Document:*

U.S. DOT MUTCD Part VI Manual on Uniform Traffic Control Devices[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *access rights*—agreements between various parties to obtain temporary and permanent access to property for the purpose of constructing, maintaining, or changing optical fiber networks.

3.1.2 *competent person*—a person properly trained in the safety aspects of an activity.

3.1.3 *confined space*—man entry area that has restricted access and egress.

3.1.4 *constructability*—the term used to denote the condition of a completed set of plans and specifications for a optical fiber network and its impact to the host utility, which have been prepared with an analysis of practical, feasible methods of construction.

3.1.5 *liability*—the exposure to claims for damage to another party's health, well-being, or property; in the event that a "bond" is considered from a liability perspective, furnishing a bond will guarantee performance or payment of all bills, or both.

3.1.6 *optical fiber network*—telecommunications cable from central office to user.

3.1.7 *partnering*—in construction, teaming between the owner, engineer, contractor, and other involved parties.

3.1.8 *risk management*—the process of identifying the risks on a construction project, and assigning the risks to the parties most capable of controlling the risks.

3.1.9 *safety*—physical and mental activities that protect the health, well-being, and life of workers and third-party people, and activities that protect the property of all parties.

4. Significance and Use

4.1 Safety factors must be addressed and incorporated into the work to protect the workers and the public, and construction activities may need to be altered accordingly. Engineering and construction costs are a part of the analysis.

4.2 Access rights to the work should be considered in the design of the project.

4.3 A construction professional, who has field experience in construction activities similar to the scope of work anticipated, should review the plans for constructability prior to starting the project.

[1] This guide is under the jurisdiction of ASTM Committee F36 on Technology and Underground Utilities and is the direct responsibility of Subcommittee F36.10 on Optical Fiber Systems within Existing Infrastructure.

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[2] Available from Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., NW, Washington, DC 20210, http://www.osha.gov.

[3] Available from American Traffic Safety Services Association (ATSSA), 15 Riverside Parkway, Fredericksburg, VA 22406-1077, http://www.atssa.com.

4.4 Proper insurance and surety bonding to protect the interests of all parties to the agreement or contract should be considered.

4.5 Risk management assessment will identify the parties that are in the best position to control and be responsible for the different risks.

5. Performance Requirements

5.1 *Safety Practices*—Safety practices should follow the guidelines of OSHA 29 CFR Part 1926 and other state and local regulations. The installer should refer to OSHA, state, and local regulations before work begins. These guidelines will address confined spaces, a competent person, safety training, structural hazards, trench safety, manhole safety, traffic safety, and equipment safety.

5.1.1 *Confined Spaces*—Perhaps the most dangerous element of safety risk is exposure to underground confined spaces. In the United States, OSHA requires that confined space entrants, attendant, entry supervisor, and rescue team be trained, provide special equipment, and follow certain procedures when entering a manhole or underground sewer. The attendant must be equipped to test the atmosphere, monitor the atmosphere and the crew, control the activities in the confined space, and call an emergency response team for any accident. Besides the air atmosphere, the confined space crew must recognize and protect members from sewage or water in the sewers, which can injure or drown a crew member.

5.1.2 *Structural Hazards*—When cleaning, inspecting, repairing the sewer, or installing and maintaining and changing the fiber and conduit, the crew should inspect entry structures and large diameter sewers for structural deficiencies, and consider possible point collapses, which could flood the pipe with sudden infiltration, or subject the crew to other hazards. Therefore, appropriate judgment and other precautions should be considered.

5.1.3 *Trench Safety*—Some open trench work or directional drilling is required for interconnections and for final connections to users and other telecommunication companies. A competent person trained to recognize dangerous conditions and to protect the crew must be on site. The most common safety concerns in open trench work are cave-ins and other utility hits. Therefore, shoring, trench boxes, manhole boxes, ladders, locating equipment, and air atmosphere monitoring devices are needed to perform these activities. All OSHA construction standards must be followed.

5.1.4 *Traffic Safety*—Crews cleaning, inspecting, repairing, installing optical fiber and conduit, repairing sewers and manholes, and installing new conduit in open trench may be exposed to traffic. U.S. DOT MUTCD Part VI requires that traffic control devices and flaggers must be in place to protect the crew and the public, if there is exposure to traffic. A competent person should be in charge of these activities.

NOTE 1—The AGC[4] offers information on Safety, Constructability, Liability and Risk Management, and Partnering through its website. Additional information about constructability issues is available at the website https://www.engr.wisc.edu/cee/, which is the "Constructability Analysis" course at the College of Engineering, University of Wisconsin-Madison.

5.1.5 *Equipment Safety*—All construction equipment and personal protective gear must meet OSHA regulations, and be in good repair. Crew members should receive proper training in safety for all exposures, and weekly (more frequent if warranted) safety meetings should be conducted to identify anticipated hazards, and plan appropriate processes to protect the crew and public from injury or death. Prior to starting a project, a safety plan should be prepared by the installer or owner's designated representative. This plan should be implemented and followed during the construction.

NOTE 2—Safety videos are available from various vendors, including a variety from the AGC.

5.1.6 *Manhole Safety*—Whenever optical fiber devices are installed in manholes, certain procedures are used to protect people entering the confined space in the future. Cable bend guards are to be closed to avoid a tripping and entanglement hazard. Where practical, splice enclosures are to be installed next to the manhole steps or ladder so that workers or rescue workers can get into the manholes with self-contained breathing apparatuses without hindrance or risk of entrapment.

5.1.7 *Installation Safety*—Certain electrically powered devices for cable installation, such as robots, can have an electrical potential difference from the pipeline. An electrical failure in the robot and certain conduit attachment methods may create sparks. Engineering and construction professionals should assess the conditions and methods, and use appropriate safety measures to guard against any potential explosion or electrical shock hazard.

5.2 *Access Rights*—As in any construction project, access rights are extremely important for constructability, timely execution of the project, legal risk management, and public relations. It is recognized that for a project to be constructable, the installer must have access to sewers, manholes, streets, public and private property, and be able to execute the work without interfering with other public or private activities.

NOTE 3—The APWA[5] has manuals covering procedures for street access management.

5.2.1 In the initial stages of the project the telecommunications company (or equivalent) will contract with the sewer utility for the use of its facilities. Consideration should be given to all needed access to sanitary and storm sewers, manholes, streets, and temporary street or "parking" access for all construction activities, including temporary pumping discharge piping and storage of job materials.

5.2.2 If street closures or partial closures are needed, the street utility director needs to be contacted and necessary permission acquired prior to construction. Barricading of streets, lane closures, and other traffic rerouting should be carefully planned and the designated authority should give permission to perform such activities.

[4] Available from Associated General Contractors (AGC) of America, 2300 Wilson Blvd., Suite 300, Arlington, VA 22201, http://www.agc.org.

[5] Available from American Public Works Association (APWA), 1200 Main Street, Suite 1400, Kansas City, MO 64105-2100, http://www.apwa.net.

5.2.3 Construction equipment needs should be planned, including enough room for maneuvering equipment and construction materials. For instance, sewer cleaning, pumping equipment, generators, directional boring machines, and open trenching equipment all require enough real estate to perform the various operations efficiently and safely. If private property is needed for equipment operating processes, agreements should be obtained prior to construction.

5.2.4 Certain interconnecting lines, open trench conduit installation, and underground cable plowing will be required on public and private property. The procedures in this guide should be implemented to obtain access and to maintain open communications among installers, property owners and the public. After open trench conduit installation or plowing, restoration work should be completed as soon as practical in accordance with local regulations, so that public access and good public relations are maintained.

5.3 *Constructability*—A project is considered constructable whenever the contracting parties and design professionals have taken into consideration the various challenges that the contractor or installer will face when performing the construction. Constructability issues such as ample room in work areas, isolation from traffic or the public, existing conditions, time constraints, weather conditions, safety exposures, complete plans, permits from other utilities, teamwork, flexible contracts, involvement of all parties affected, and good engineering practices, all contribute to how a job is accomplished. These factors also make the project more suitable for bidding. During the constructability review, the parties may emphasize value engineering to provide the most cost effective project.

5.3.1 When access routes are obtained, a holistic approach should be considered in the plan. The access must consider the needs for the facility to be built, the size of construction equipment, the need to maneuver machines and materials, access to the site for equipment and materials, temporary storage of materials and equipment, traffic, emergency vehicle access, and adequate room for the safety of the crew, including any safety equipment required. This planning should be conducted by seasoned and experienced construction professionals.

5.3.2 Existing conditions should be part of the engineering. For instance, when working underground, existing utilities must be located to protect workers and the infrastructure. Allow enough room for workers and safety devices. The topography plays a role too. In a low area, possible flooding of the construction activities should be anticipated. If traffic affects construction and cannot be rerouted or controlled, another plan should be adopted. The condition of the existing sewers and manholes must be known, so that during the construction, adequate restoration work can be budgeted.

5.3.3 The construction time and schedule should be based on sound construction and site condition factors. During project conception or engineering activities, or both, a preliminary construction schedule should be prepared and approved by all of the parties. Construction activities should be broken down into elements and sequenced chronologically. Climate, weather conditions and holidays should be considered in the construction schedule. Adequate time must be added for safety activities. If construction activities are constrained by certain restrictions, such as work only at night or during off peak traffic conditions, time should be adjusted for labor efficiency. Experienced managers should be involved in the scheduling activities, using critical path scheduling software.

5.3.4 It is good practice to assemble a comprehensive team to plan the project. Team input from engineering and construction professionals, public and private utility staff, telecommunications staff, and legal entities throughout the conceptual, design and construction phases will provide the best project. A team approach brings in more expertise, and creates "buy-in" by the various team members.

NOTE 4—The AGC has a video and pamphlet on partnering which can help guide the team through this process.

5.4 *Liability and Risk Management*—The responsibilities and authorities of the parties involved in the planning, engineering, construction, operation and maintenance of the project should be identified.

5.4.1 Risk should be assigned to the party who has control over the particular risk. Liability should be considered by the team for such things as underground conditions, controlling sewage spills or blockages, illegal discharges into the sewers by third parties, easements, professional design insurance, builder's risk insurance, contractor's insurance (liability and property), and liability for existing utility relocation. When the project is in its infancy, a team should have a brainstorming session to identify all perceived risks for the project. Individual risks are assigned to the party that has control over the identified risk. When this process is completed, all parties should have a number of risks assigned to them.

NOTE 5—The AGC has a risk allocation video and pamphlet to assist the team.

5.4.2 Should blockages or spills occur during construction, maintenance, or operation, certain regulatory agencies will become involved. The parties should anticipate these risks and assign responsibility to the appropriate party. Certain indemnification agreements should be considered for equity. The operator of the sewerline may desire indemnification should damage to the optical fiber system occur during routine or emergency maintenance or operation.

5.4.3 The party that is primarily responsible for a certain risk should provide the appropriate insurance protection for the project. Bonding should also be considered for performance and payment, and bonding limits should be set. The costs for such insurance should be included in the project costs. An insurance and bonding professional should be consulted to assist the team with these decisions, and to help ascertain bonding and insurance limits.

5.4.4 A contingency plan should be developed. This plan should list the contact people, phone numbers, emergency numbers, and sources of specialized equipment rentals needed in the event that the sewer becomes blocked during inspection, construction, operation or maintenance. It should also list local business and residential numbers to contact to prevent further release of sewage into the blocked sewer during such an emergency.

6. Keywords

6.1 access rights; competent person; confined spaces; constructability; liability; optical fiber networks; partnering; risk management; safety; telecommunications; trench safety