ASCE STANDARD

ASCE/UESI/CI

38-22

Standard Guideline for Investigating and Documenting Existing Utilities

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AMERICAN SOCIETY OF CIVIL ENGINEERS

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PREFACE

The provisions of this document are written in permissive language and, as such, offer to the user a series of options or instructions but do not prescribe a specific course of action. Significant judgment is left to the user of this document.

ASCE 38 is a combination of a prescriptive standard and a performance standard. As a prescriptive standard, it sets forth a series of minimum actions necessary to achieve Utility Quality Level Documentation. As a performance standard, it describes the significant professional judgment exercised by the professional to determine the appropriate timing, sequencing, location, and scope of a Utility investigative effort to achieve the goal of reduced Utility issues during Project Delivery.

This engineering standard is developed to safeguard the public welfare by providing guidance on performing Utility Investigations and documenting results in a standardized fashion, which in turn empowers the design engineer to address two objectives: (1) Design so as to have minimal Utility related issues; and (2) protect engineers, project owners, Utility owners, and the public against Utility related claims that might arise during Project Delivery. ASCE 38 minimizes issues that might otherwise arise from using incorrect and incomplete Utility data. Moreover, ASCE 38 compliant data clearly conveys, through graphical and written documents, the relative, non-quantifiable uncertainty associated with the Utility's existence and location. Throughout Project Development, understanding the uncertainty assigned to a documented Utility allows engineers to make better risk-based decisions regarding placement of design elements, protecting or relocating utilities, and public safety issues.

Subsurface Utility Engineering (SUE) has emerged in the last three decades as a professional effort and best practice for performing and documenting the results of Utility Investigations. Subsurface Utility Engineers acquire, process, characterize, assess quality, and present Utility information for Project Development. This iterative documentation facilitates effective management of the risks associated with Project Development and construction that may affect, or be affected by, existing utilities. SUE combines traditional and emerging civil engineering practices of Utility data collection and documentation with advances in geophysical investigation and data management technologies, design and construction knowledge of past and current Utility systems, and scientific concepts for assessing and defining the quality and relative uncertainty of Utility information. The practice of SUE leads to Deliverables sealed by responsible professionals who directly oversee and execute the Utility Investigation and develop the resulting Documentation of existing subsurface utilities at their achieved Utility Quality Levels. When part of the scope, SUE professionals also document certain aspects of aerial utilities that are necessary for Utility conflict analysis and relocation design. The processes leading to SUE Deliverables are executed by professional(s) proficient in engineering, surveying, and geological and geophysical sciences. Moreover, these efforts are typically led by a professional engineer in responsible charge who is subject to relevant liabilities and statutes regulating professional engineering.

Historically, SUE was initially defined as "designating, locating, and data management." SUE developed over time to include the concept of Utility Quality Levels that defined the level of uncertainty of a utility's location and existence. ASCE 38-02 standardized the practice of assigning a Utility Quality Level to a Utility Segment. SUE is predicated on the application of appropriate techniques and methods to obtain important information on the existence and location of utilities even if existing records are incomplete or unavailable. The basis of this standard is predicated on the original SUE practice that most projects will benefit from the concurrent and integrated use of geophysics, records research, and a Utility Feature survey as early as possible in Project Development.

This edition of ASCE 38 adds guidance on collecting and recording Depths of Utility Features and Utility Segments. It recommends that a Utility Report that has been authored by a qualified professional incorporate any Utility Drawing Deliverables. The Utility Report is particularly important when notes and/or Metadata are not embedded within the Utility Drawing itself. A new section on Utility Attributes has been added. In addition, clarifications and enhancements have been added to common definitions used in this document. Commentary previously embedded throughout the standard language in the previous edition is now in a separate section.

The commentary and appendixes in this document provide supplemental guidance for interpretation and use. For example, the appendix on geophysical techniques provides a compilation of shallow geophysical techniques and instruments that are functional for detecting, tracing, and imaging existing underground utilities. These tools provide evidence leading toward the judgment of the utilities' most probable location based on measurable characteristics. This is a highly specialized discipline that is undergoing continuous technologic advancement. Users of this standard must remain current with equipment principles, capabilities, operating parameters, and limitations. This edition includes an appendix that reflects academic and organizational studies on costs and benefits of projects that have used Utility Quality Levels. An appendix provides guidance on the development of three-dimensional Utility models, a relatively new practice.

The title of this standard has changed from its previous edition to (1) more succinctly convey its purpose, and (2) better differentiate it from ASCE 75-22, *Standard Guideline for Recording and Exchanging Utility Infrastructure Data*, which focuses on documenting newly installed infrastructure. Both underground and aboveground Utility networks need to be considered during Project Delivery. Resolutions of conflicts at one part of the network often affect other parts, whether they are subsurface or aerial. Sufficient Attributes of aerial networks and structures are often missing from topographical surveys, resulting in surprises of cost and time during Project Delivery. Therefore, a section on aerial Utility documentation is included.

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ACKNOWLEDGMENTS

ASCE acknowledges the work of this standard committee of the Utility Engineering and Surveying Institute and the Construction Institute. This balanced group comprises individuals with varied backgrounds, including professionals experienced in subsurface Utility Engineering; Utility infrastructure documentation; geology; geophysics; surveying; computer-aided design and drafting; geographic information systems; highway and other infrastructure design; right-of-way; geotechnical engineering; and Utility design.

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CHAPTER 1
INTRODUCTION

The world population is growing. As population grows, so does the demand for basic resources including housing, transportation, access to potable drinking water, means for sanitary sewer collection and removal, means to provide heat and power, and additional communication such as WiFi and vehicle automation networks. Around the world, these demands consequently result in significant new and upgraded underground and aboveground Utility infrastructure.

Much of our existing infrastructure including roads and bridges, buildings, railroads, airports and seaports, and Utility systems are in use beyond their intended design life and are in the process of replacement, expansion, and rehabilitation. At the same time, new technologies in Utility materials and construction are proliferating. Fiber-optic lines are replacing copper communication cables. Micro cell towers are being installed rapidly. Horizontal directional drilling and a multitude of other trenchless methods and techniques are quickly replacing or complementing open trench methods. Available right-of-way is increasingly more restricted and congested, especially in urban and suburban areas, which challenges new construction, maintenance, or replacement activities and requires efforts to identify and remediate conflicts with existing underground and aboveground Utility infrastructure. Our existing underground space is becoming a scrapyard of abandoned utilities and structures.

Improved Utility Investigation practices, equipment, and data-processing technologies increase the effectiveness in enabling collection, documentation, exchange, and use of existing Utility infrastructure data. The systematic and professional investigation of aerial and subsurface Utility infrastructure comprise central aspects of what is commonly known as Subsurface Utility Engineering (SUE). Organizations such as ASCE, the US Department of Transportation's Federal Highway Administration (FHWA), Transportation Association of Canada (TAC), National Transportation Safety Board (NTSB), US Department of Energy (USDOE), Associated General Contractors of America, Inc. (AGC), American Association of State Highway and Transportation Officials (AASHTO), American Council of Engineering Companies (ACEC), National Academy of Sciences (NAS), Engineers Joint Contract Documents Committee (EJCDC), American Public Works Association (APWA), Common Ground Alliance [CGA, including Canadian Common Ground Alliance (CCGA)], universities, and others endorse the practice of SUE as an effective risk management solution.

ASCE recognizes that Utility Investigations are part of a larger necessary civil engineering task discipline called Utility Engineering. The importance of Utility Engineering is illustrated by the commissioning of ASCE's ninth Institute, the Utility Engineering and Surveying Institute (UESI), in 2017. Utility Engineering incorporates the elements affecting civil engineering projects of any kind as they relate to utilities:

- Utility Investigations: technologies to detect, identify, and map existing utilities effectively and the integration of quality, standards-based Utility information, including 3D modeling and building information modeling (BIM), in all phases of Project Delivery;
- Utility conflict management: techniques, protocols, and systems that identify and resolve conflicts systematically between infrastructure project features or phases and existing or proposed Utility facilities;
- Utility design: pipeline, cable, and conduit project planning, design, and construction; and Utility relocations and protect-in-place measures for existing facilities that remain in place during Project Delivery (including preparations of plans, specifications, schedules, and cost estimates);
- Construction management (utilities): techniques and procedures for building, monitoring, inspecting, and surveying Utility installations at the job site, as well as mapping and production of quality, standards-based Utility as-builts;
- Utility asset management: techniques and procedures for accommodating, permitting, managing, documenting, and assessing conditions of Utility facilities within the right-of-way (including fee simple property and easements) over their entire life cycle; and
- Utility process and program management: techniques and procedures that enable a more effective management of the Utility process during all phases of Project Delivery as well as a more effective coordination of contractual relationship between project owners and Utility stakeholders.

Utility Engineering uses these elements to optimize planning, design, and construction activities to control costs and mitigate risks to the project and to the public. The advent of Utility Engineering as a more comprehensive task discipline that addresses engineering aspects of utilities affected a change to the definition of SUE, and that change is reflected within this document.

Collecting and depicting Utility information is complicated by the limited availability and unknown reliability of the Utility owners' record data. Utility owners rarely possess comprehensive, current, and spatially accurate (e.g., survey-grade) coordinate data of their existing and planned infrastructure that are of sufficient certainty for the specific needs of the project. Because of security concerns, many Utility owners of sensitive facilities, such as gas, petroleum or fiber optics, have internal policies that do not allow or provide only limited distribution of as-builts and/or system documentation. Engineers are too often unable to obtain from Utility owners in a timely fashion the necessary Utility information required for making critical design and planning decisions early in the project. Furthermore, Utility owners are typically not under any obligation to provide the