Modernizing Utility Infrastructure Management

Report Number: SPR-RE22(013)-8H-00

Early Identification and Location of Utility Facilities within Iowa DOT Project Footprints

Research Team

Report Number: SPR-RE22(013)-8H-00

Principal Investigator
Philip J. Meis, M.S., P.E., M. ASCE
President and Principal Engineer
Utility Mapping Services, P.C.
Governor
ASCE Utility Engineering and Surveying Institute
Chair: ASCE/CI/UESI 75-22 Standard Committee
E-mail: pjmeis@umsi.us

Co-Principal Investigator
Roy E. Sturgill, Jr., Ph.D., P.E., M. ASCE
Assistant Professor
Civil, Construction and Environmental Engineering Department
Iowa State University
Chair: TRB Utilities Committee (AKD60)
E-mail: sturgill@iastate.edu

Technology Landscape Lead
Daniel Colby, M. ASCE, M. OGC
Senior Vice President of Technology
Utility Mapping Services, P.C.
Chair: ASCE UESI URMD Utility Infrastructure Data Exchange and Security Committee
Email: dcolby@umsi.us

Legal and Policy Analysis Lead
Jesse R Cooper, RPLS, M. ASCE
Senior Utility Manager
HDR, Inc.
Email: jesse.cooper@hdrinc.com

Utility Permitting Lead
Eric Berkowitz, EIT, M. ASCE
Project Manager
Utility Mapping Services, P.C.
Email: eberkowitz@umsi.us

Research Coordinator
Misha Anderson, CSM, CTCM
Program Director
Utility Mapping Services, P.C.
Email: manderson@umsi.us

Iowa State University Research Assistants
Parshva Patel
Shani Montes Victorio

Report Number: SPR-RE22(013)-8H-00

Acknowledgements

This research was made possible through the constructive participation, interviews, and support provided by a technical advisory committee (TAC) composed of representatives from:

1) The Iowa Department of Transportation (IADOT) includes officials from Research, Right-of-Way, Utilities, Design, and Construction divisions.

2) Private and public utility infrastructure owners that operate systems residing within IADOT public right of way.

3) Contractors that perform construction work for IADOT.

Special recognition is extended to Project Champion ***Deanne Popp, CPM Utility Program Administrator Transportation Development Division***, who recognized this effort as a priority and drove the initiative to get this project sponsored and funded.

Technical Advisory Committee (TAC)

Iowa DOT

- Deanne Popp, CPM
- Khyle Clute, P.E.
- Adam Shell
- Matthew Buttz
- Gregory Cagle
- Brad Hofer
- Eric Wright
- Jon Rees
- Nicole Cuva
- Wes Musgrove
- Thomas Samson
- Kyle Perkins
- Daniel Brown

Utility Companies

Des Moines Water Works
- *Carla Schumacher*
- *Jonathan Mouw*

Council Bluffs Water Works
- *Adam Wiegman*

Buckeye Partners
- Wesley D. Pekarek

MidAmerican Energy
- *Gregory Wildebour*
- *Paul Swanson*

OneOK, Inc.
- *Fallon Sanford*
- *Susan Bergman*
- *Timothy Mikles*

Alliant Energy Corp.
- *Jon Katzenmeier*
- *Mary Montgomery*
- *Bob Meis*

Verizon Wireless
- *Ryan Schaffer*
- *Thanh Nguyen*
- *Grace Gilborn*

Contractors

Peterson Contractors, Inc.
- *Matt Bohlen*
- *Jordan Muller*
- *Doug Clark*

Cramer & Associates, Inc.
- *Dan Cramer*
- *Robert Cramer*

C.J. Moyna & Sons, LLC.
- *Ryan Kipp*

Hawkins Construction Company
- *Nick Gaebel*

Design Consultants

Snyder & Associates
- *Gabriel A. Nelson, P.E.*

Report Number: SPR-RE22(013)-8H-00

Executive Summary & Overview

Principal Investigator
Philip J. Meis, M.S., P.E., M. ASCE
President and Principal Engineer
Utility Mapping Services, P.C.
Governor ASCE Utility Engineering and Surveying Institute
Chair: ASCE/CI/UESI 75-22 Standard Committee
E-mail: pjmeis@umsi.us

IOWA DOT

Report Number: SPR-RE22(013)-8H-00

Executive Summary Highlight

This Iowa Department of Transportation (IADOT) funded research focused on policies and processes necessary to get reliable information on utility infrastructure residing within a project footprint early in the design development stage. IADOT right-of-way (ROW) managers, design engineers, utility agents, construction engineers, geographic information system (GIS) and internet technology leads, design consultants, construction contractors, and private and public utility infrastructure representatives were among those interviewed to understand existing practices, issues, and perspectives. A Technical Advisory Committee (TAC) composed of representatives from utility owners, contractors, consultants, and IADOT participated in regular progress meetings and provided feedback on research findings.

The research encompassed relevant best practices, policies, and standards employed by local governments and state transportation agencies within the United States and by government agencies in Canada and promoted by entities including, but not limited to, the U.S. Department of Transportation Federal Highways Administration (FHWA), the Transportation Research Board (TRB) Utilities Committee (AKD60) of the Academy of Sciences, and the American Society of Civil Engineers (ASCE) Construction Institute (CI) and Utility Engineering and Surveying Institute (UESI). In addition, emerging technologies, and newly published standards for acquiring, managing, leveraging, and securely sharing utility infrastructure data were evaluated for IADOT needs.

Report Number: SPR-RE22(013)-8H-00

A Fundamental Factor

A fundamental factor behind the need for this research effort is the simple fact that a “utility as-built” record standard specification has never-before existed in the U.S.; that changed in July 2022 when ASCE published **ASCE/CI/UESI 75-22** . This new “utility as-built” standard can be utilized within regular IADOT business activities to record utility data, including positional coordinates, dimensions and geometry, and feature attributes, on utility infrastructure during road design and road construction efforts, and whenever new utility infrastructure is permitted and installed within IADOT ROW.

Report Number: SPR-RE22(013)-8H-00

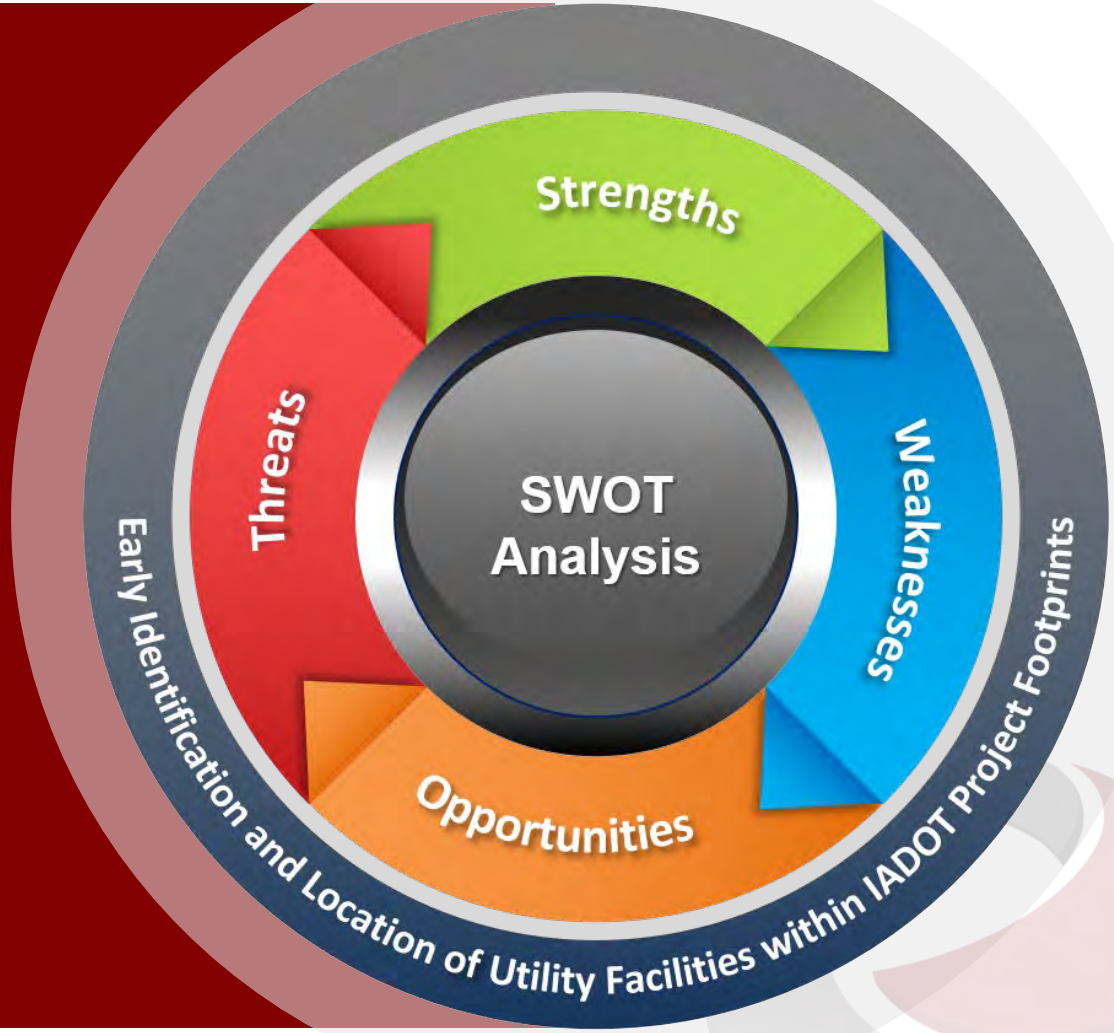
The Roadmap

The research effort produced a “road map” for modernizing IADOT business practices and corresponding technology landscape to acquire and manage data on utility infrastructure residing within IADOT ROW. A staged implementation strategy is recommended. The research did not develop a new utility accommodation manual for IADOT nor recommend utility coordination practices for projects; these are being addressed through two other concurrent IADOT research efforts (SPR-3052 Best Practices for Utility Management in the Public Right of Way, and SPR-3081 Project Development and Utility Coordination as a Partnership). However, the recommendations herein directly correlate and are in harmony with the recommendations from those projects.

Report Number: SPR-RE22(013)-8H-00

The Strategy

- Streamline utility information exchange and reduce data handling requirements;
- Shift responsibility to the “systems of source” (i.e., utility facility owners) to acquire, manage, and securely share data as required; and
- Effectively decrease IADOT resources required to pursue and reckon with utility infrastructure data deficiencies while enabling utility engineering best practices that expedite project delivery, decrease costs, improve ROW management, and enhance the public welfare. Existing FHWA policy and IADOT statutes support the recommended practices and implementations.



SWOT Analysis

Working with Iowa DOT, through a series of breakouts, the research team performed multiple SWOT analyses. A SWOT analysis is a strategic planning and strategic management technique used to help organizations identify Strengths, Weaknesses, Opportunities, and Threats related to business or project planning.

Public Demand

Swelling public demand to utilize public ROW to accommodate utility infrastructure has escalated Iowa DOT ROW corridor congestion. Projects and utility systems are much more complex today.

Feasibility

Moving utilities out of the way for Iowa DOT projects is often no longer a simple matter and often not the best option (regarding project schedule, project cost, public disruption, societal cost, public interest).

Policy Revisions

Iowa DOT policies, procedures, and technologies for Managing Utilities in Iowa DOT ROW need updating.

Looking Back

Numerous IADOT right-of-way (ROW) management policies and procedures were established during an earlier era when:

- Roadway systems were simpler and less congested.
- Utility systems were much less complex (e.g., overhead) and there were only a few service providers.
- ROW and easements were less expensive and easier to obtain.
- Utility materials (pipes, valves, transformers, switch boxes, poles, and cables) were primarily manufactured in the U.S. and supplies were relatively abundant.
- Implications of utility conflicts discovered before and during construction were relatively easy to identify and manage.

Increased Demand

Since that time, however, utility related issues on IADOT projects have become increasingly problematic due to evolutions that improve infrastructure resilience and environmental, public safety, social and business conditions, while increasing demand for and congestion of public ROW.

The Impacts

Not only is it more challenging to design a relocation, but the relocation process is greatly complicated and delayed by limited easement availability, labor and material shortages, skyrocketing costs, and efforts which require multiple years of advanced planning and scheduling. Accordingly, utilities will increasingly impact the critical path for project schedules.

These trends are expected to continue and corresponding ramifications for error are expected to become further problematic. This situation is not unique for Iowa, but true for all state and local roadway corridors nationwide.

Constant Change

- Population growth and urbanization, triggering new facilities and added capacity.
- Public preferences for buried cables and pole removal.
- Utility deregulation leading to multiple and rival service providers (yielding greater services at competitive pricing, while creating fiercely competitive business environments and leaner operating margins).
- Aging infrastructure that are decommissioned, abandoned-in-place, bypassed and/or replaced with new installations in the same vicinity (which confuses the subgrade environment

The Future is Here

- Arising renewable energy sources (e.g., wind farms, solar parks) and corresponding infrastructure to gather, transform and transmit electric power.
- Mandates to make our utility infrastructure more resilient and secure.
- Arising electric vehicle usage requiring high voltage transmission and charging stations.
- Equity and inclusion directives to install broadband to reach underserved communities.
- Ubiquitous skyrocketing rise in internet and 5G cellular usage and dependence.

A Digital Society

- E-commerce industry and telecommuter boom along with corresponding internet demand.
- Migration from internal network server systems to commercial data centers and cloud hosting.
- Migration to offshore manufacturing and international trade agreements (which has resulted in a reduction of U.S. built utility infrastructure equipment and supplies).
- Increasing complexity and specialized nature of utility control equipment (which now require microchip processors and internet service to operate – valves, switches, sensors require specialized parts and manufacturing skills not prevalent anywhere, let alone within the U.S.).

Time to Standardize

Identification of utilities within IADOT project footprints requires **proactive** documentation of utility infrastructure within IADOT right-of-way (ROW) based on:

- A standard for documenting utility infrastructure, such as the new ASCE/CI/UESI 75-22 “Standard Guideline for Recording and Exchanging Utility Infrastructure Data”

Lifecycle Management

Lifecycle asset management practices for all facilities installed within IADOT ROW including:

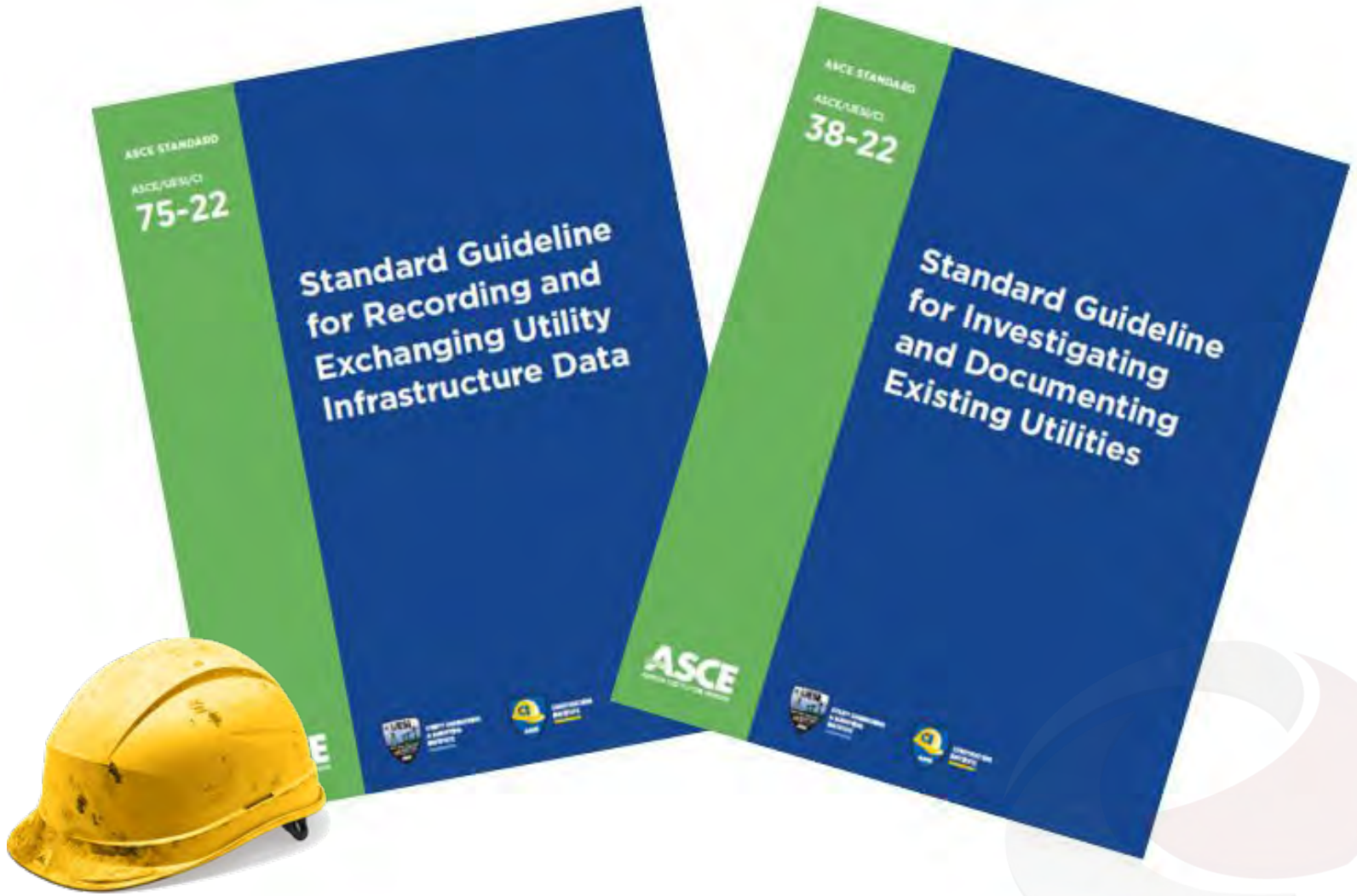
- Systematic permitting to regulate and monitor all changes and construction activities affecting utility infrastructure; and
- A federated utility data GIS collaboration portal that functions like a secure repository, built around ASCE/CI/UESI 75-22, and based on shared standardized data from systems of record.

Systematic Data Capture

Systematic capture and management of standardized data when installations are newly installed, exposed for construction or maintenance purposes, investigated for project development needs (such as by subsurface utility engineering methods in accordance with ASCE/CI/UESI 38-22 “Standard Guideline for Investigating and Documenting Existing Utilities”), or proposed for permitting approval.

Report Number: SPR-RE22(013)-8H-00

- ASCE 38 - 22
- ASCE 75 - 22
- Utility Engineering



A New As-Built Standard is Born

Compliance with ASCE/CI/UESI 75-22 is necessary:

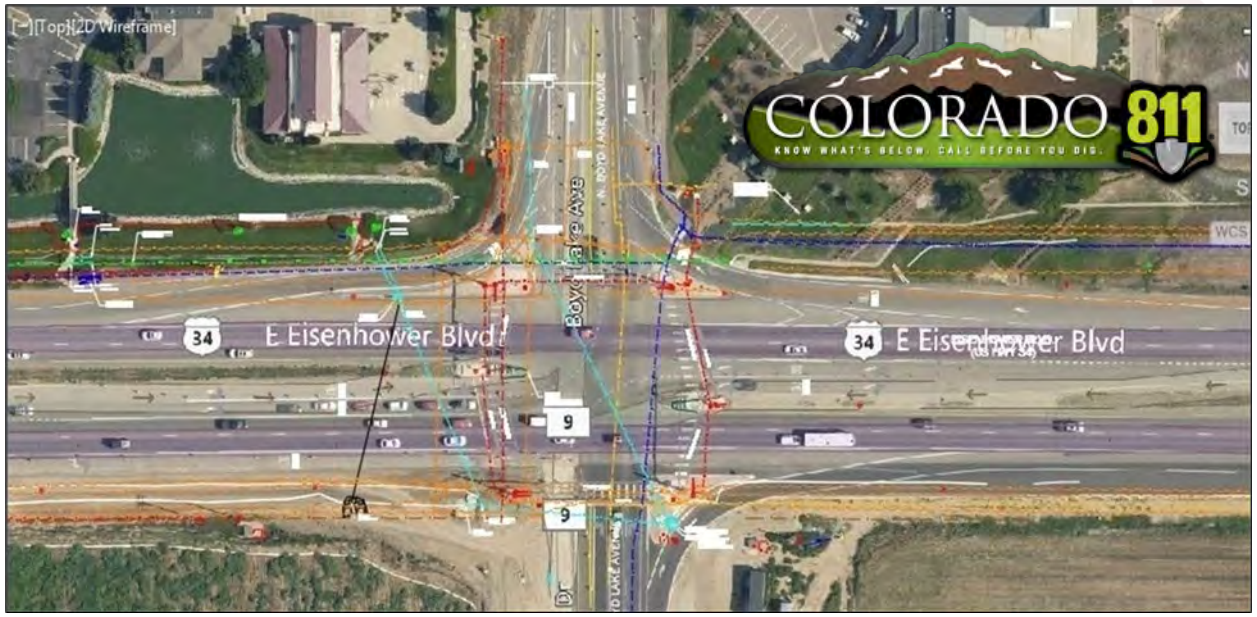
1) ASCE/CI/UESI 75-22 has been designed for capturing sufficient spatial and attribute data on utilities to enable creation of an accurate 3D digital twin; and
2) The Open Geospatial Consortium (OGC) has adopted ASCE/CI/UESI 75-22 as key input to their Modeling Underground Data Definition and Integration (MUDDI) standard, which means emerging software applications will be able to accept, visualize, and share digital 3D models of utilities seamlessly. ASCE/CI/UESI 75-22 is designed to manage ASCE/CI/UESI 38-22 data in digital format and is scalable to accommodate the most primitive record data.
3) Concurrently, IADOT to implement ASCE Utility Engineering best practices to leverage utility data in manner that mitigates project risk, optimizes project delivery, and upholds public interest and welfare from a holistic stance. IADOT project return on investment factor is estimated to be from 10–20M.

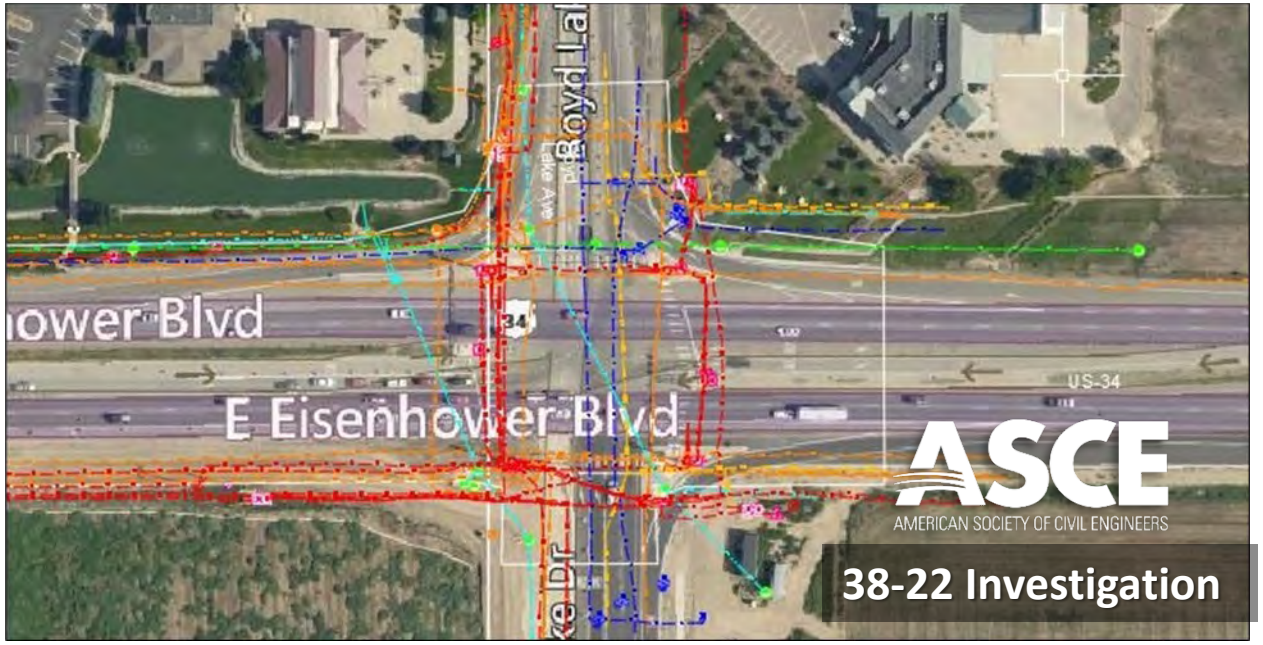
A SUE Case Study

A typical example comparing a depiction based on historic utility record data and Call 811 markings verses an ASCE 38 investigation. Note differences in alignments and quantity of utilities. Use of ASCE 38 often produces much more linear feet of depicted utility infrastructure than achieved through historical utility record transcription and survey of Call 811 field markings.

Utility Types	One- Call record (ft)	SUE record (ft)	% Difference
Over-head power cable	7602	32690	330%
Power cable	10756	14577	36%
Telecommunications	6920	40003	478%
Gas	4802	6164	28%
Water	8653	9680	12%

The findings underscore the importance of incorporating SUE practices early in the project development stages to ensure reliable utility data for design decisions.





Collaboration

Utility owners are rarely contractual parties to the infrastructure project development process, yet their existing pipes, cables, and support structures have significant effects on project risk, schedules, and budget

CAD Standardization

Finalizing designs with non-standardized, unreliable utility data and addressing utility issues with belated, reactive measures during construction is more disruptive and costly, and less efficient than leveraging proactive, predictive, and sophisticated analytical and problem-solving strategies developed by professionals with reliably qualified utility data during design development.

Managing Risk

ASCE has developed two data standards, to assist engineers in managing risk associated with utility infrastructure. Utility Engineering is the process of integrating utility infrastructure with project development.

Design Issues

Utility related problems in design and construction are nearly always the result of:

1) Not having adequate (i.e., readily accessible, reliable, complete, current and standardized) information (e.g., spatial, pedigree, ownership, operational, and regulatory data) on existing infrastructure; and

2) Treating utility issues largely as an administrative activity as opposed to a specialized multi-discipline engineering function that is based on systematic data acquisition, conflict and critical path analytics, and effective risk mitigation and project delivery optimization (i.e., Utility Engineering).

Utility Collaboration

Utility owners are rarely contractual parties to the infrastructure project development process, yet their existing pipes, cables, and support structures have significant effects on project risk, schedules, and budget. Reliance upon utility owner records for design base conditions has proven insufficient as these are often inadequate or incompatible with designer needs, especially within congested urban corridors.

Responsibility

This is the primary reason why attempts to make utilities responsible for providing accurate, design grade data on their installations, along with using threats and lawsuits to force compliance repeatedly fail to resolve the problem.

This legalized “big stick approach” needlessly strains tenuous, and often creates adversarial, relations between utility infrastructure owners and DOT management; moreover, the results yielded come at a cost that is often not in the public’s best interest as ratepayers and taxpayers, commonly the same entity, end up footing the bill.

Compliance is Essential

Without exception, finalizing designs with non-standardized, unreliable utility data and addressing utility issues with belated, reactive measures during construction is more disruptive and costly, and less efficient than leveraging proactive, predictive, and sophisticated analytical and problem-solving strategies developed by professionals with reliably qualified utility data during design development.

Administrative Process

The Point 25 process provides administrative steps and timelines for managing utility infrastructure during Iowa DOT project development; however, the process lacks critical engineering activities.

Utility Engineering

The concept of Utility Engineering (UE) in which utility infrastructure is fully integrated within the project design effort, has developed since Point 25 was put into action. With some minor amendment, Point 25 fits well within the UE Utility Coordination function (next section).

Project Development

Iowa DOT project development activities need revising to include Utility Engineering (UE). UE requires cross discipline expertise

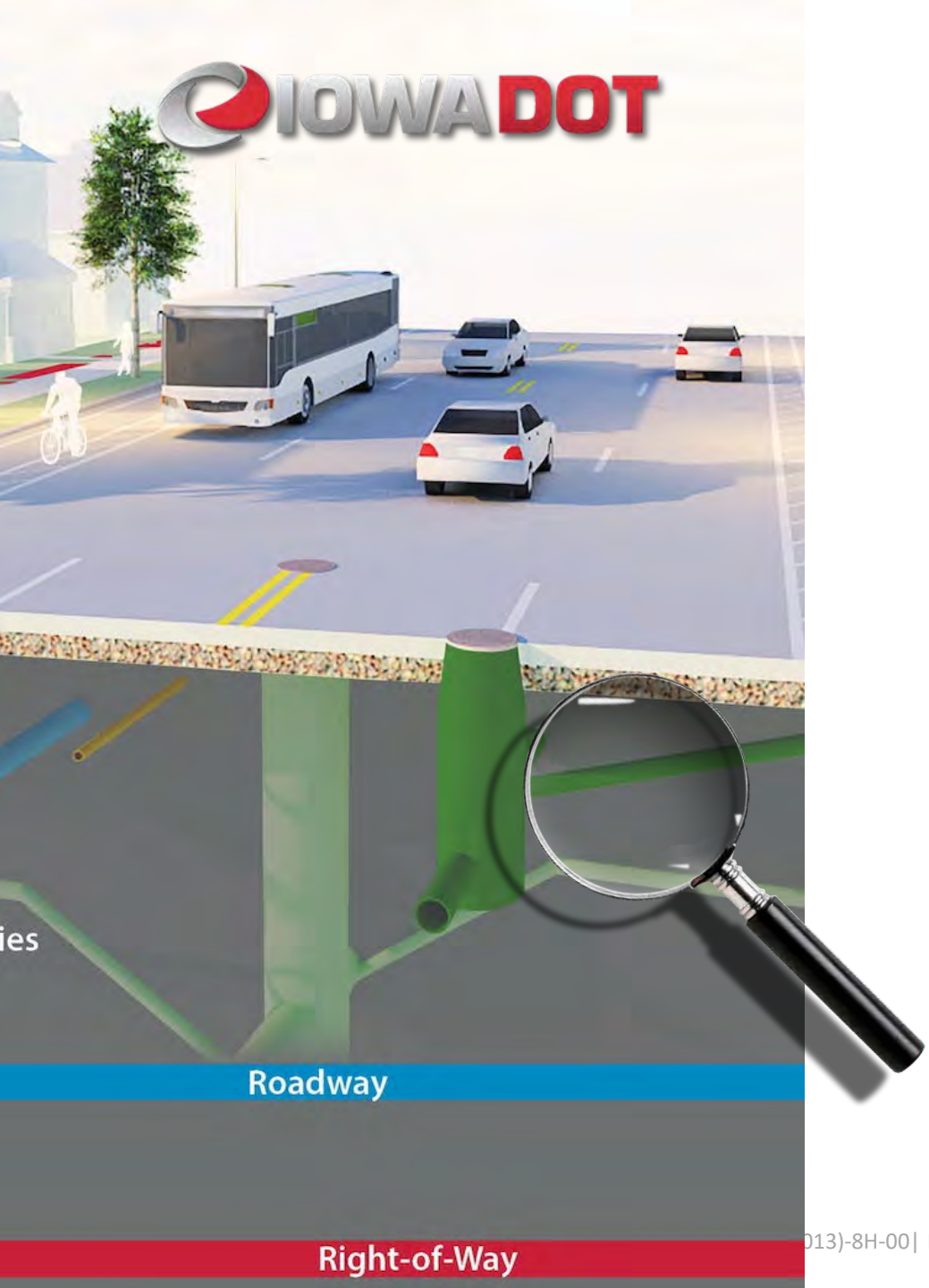
A Good Start

Iowa DOT reviewed and rewrote its administrative rules regarding the accommodation of utilities on highway right-of-way. A new policy was developed for the adjustment of utilities on construction projects. This **“Point 25”** policy and process is outlined in **Iowa Administrative Code 761--Chapter 115.25.** The policy allows for a window of time, where possible, for the adjustment of utilities in the Project Development Process.

The Point 25 process was originally pushed out in 2003 with the code section 306A.3 and then IA Administrative Code Chapter 761.115.25 through 761.115.30. The policy was revised in 2005 to incorporate the Point 25 through Point 30 IAC sections, but it took five years, until after 2010, for Iowa DOT to really begin using the Point 25 process.

Hindsight is 20/20

However, while Point 25 (Iowa Administrative Code 761 Chapter 115) addressed utility coordination administrative activities and corresponding timelines for the utility relocation process in a comprehensive manner**, it lacked specifications for critical engineering activities**; this in turn led to inconsistent results and often missed opportunities to optimize project delivery..



Point 25 Stipulations

For project development the Code simply stipulates the following key items along with related notification, procedural and timeline criteria:

115.25(3) Adjustment of a facility occupying highway right-of-way. If adjustment of an existing utility facility occupying the right-of-way is required due to highway construction, the utility owner shall adjust the facility without cost to the state and, whenever possible, in advance of the highway work.

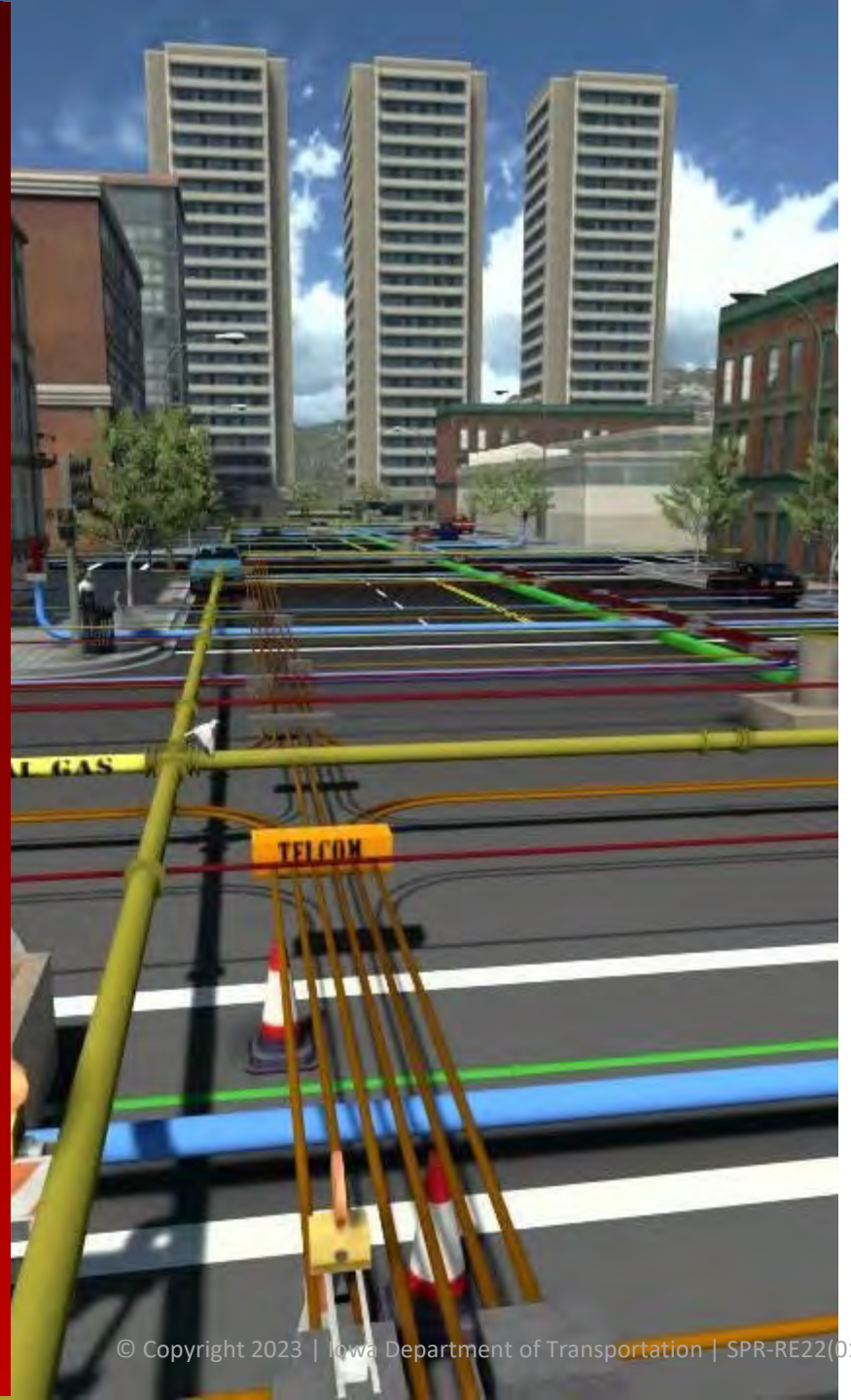
761--115.26(306A) Notice of project.

115.26(1) Determining affected utilities. The department shall make a reasonable effort to determine what utility facilities are located within the project limits of a state highway improvement project by researching permit files, through field investigations or contacts with one-call locating services, and through contacts with local government units.

Defining the Gaps

Missing are specifications for essential engineering efforts required in order to:

- Fully investigate and reliably depict utilities in accordance with a published professional standard;
- Systematically Identify and assess design impacts to utilities and utility impacts to design;
- Rigorously analyze resolutions; and
- Develop and execute a utility plan that mitigates risk and optimizes project delivery while holding public interest paramount.



Removing the GAP

To address this cross discipline “gap” in civil engineering practices, ASCE launched their ninth institute in 2015 , the **Utility Engineering and Surveying Institute (UESI)**. UESI is supporting appropriate research and guidance for UE and has formed committees for developing corresponding manuals of practices, certifications for engineers and technologists, and supporting standards. UESI’s Utility Risk Management Division (URMD) is currently focused on establishing UE standards of practice with committees for utility investigations and subsurface utility engineering, conflict analytics and utility coordination, and standardized utility “as-built” documentation, data exchange, security and management. UESI has helped to develop Utility Investigation Schools which provide training for utility investigations performed in accordance with the ASCE/CI/UESI 38-22 standard and is developing a certification program to qualify individuals conducting the various specialized UE activities.

Report Number: SPR-RE22(013)-8H-00

Utility Engineering

"Utility Engineering is a branch of Civil Engineering that focuses on the planning, position, design, construction, operation, maintenance, and asset management of any and all utility systems, as well as the interaction between utility infrastructure and other civil infrastructure."

Engineering surveying are those activities involved in the planning and execution of surveys for the development, design, construction, operation and maintenance of civil and other engineered projects. Engineering surveying may be regarded as a specialty within the broader professional practice of engineering and includes all surveying activities required to support the conception, planning, design, construction, maintenance, and operation of engineered projects.

Lifecycle Management

Iowa DOT Project Development activities and procedures currently result with inconsistent efforts to identify and address utility infrastructure issues. Iowa DOT ROW management practices do not adequately consider lifecycle management of utility assets located within Iowa DOT ROW

Reliable Standards

Newly defined Utility Engineering (UE) activities encompass both project development and asset management efforts that effectively eliminate utility related issues and better serve public interests. Required, however, is reliable, standardized utility data.

Utility Asset Management

UE Utility Investigations for project development will produce reliably qualified utility data through ASCE 38 standardized process for investigating and documenting previously installed existing infrastructure. This enables risk mitigation and optimize project delivery. UE Utility Asset Management will ensure utilities are accurately recorded at the time of installation or when exposed. The ASCE 75 standard is used push all utility data into a common digital format.

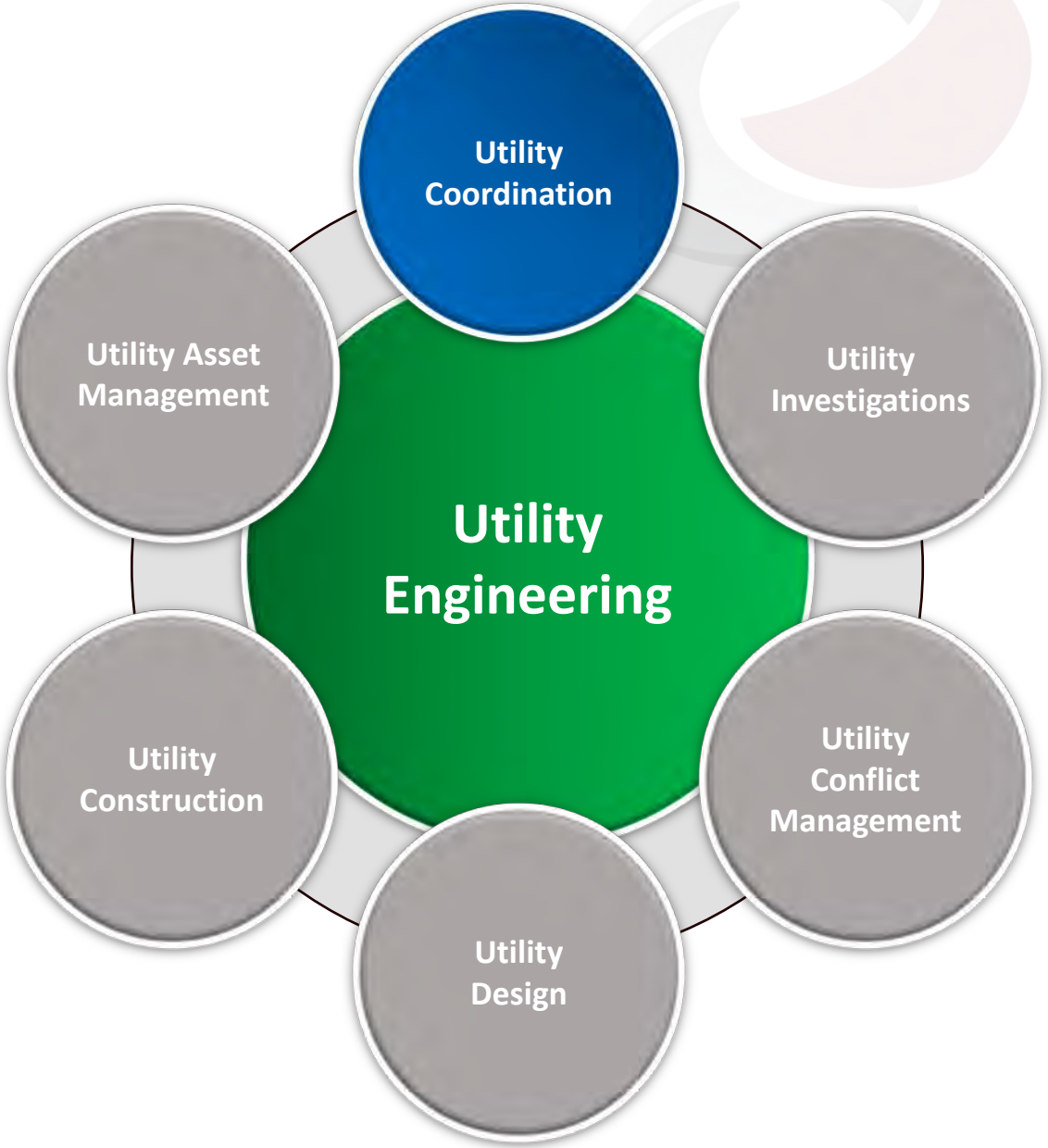
Six Pillars of Utility Engineering

Cesar Quiroga, Ph.D., P.E., F. ASCE, Senior Research Engineer for Texas A&M Transportation Institute is currently the Manager for the Utility Engineering Program at Texas A&M University.

While Chair for the TRB Utilities Committee (AKD60) and serving on the ASCE UESI Utility Risk Management Division Executive Committee (URMD), Dr. Quiroga formulated the definition of Utility Engineering as based upon the following “Six Pillars”.

Utility Coordination

Techniques and procedures to provide effective coordination between project owners and utility stakeholders (including preparation, execution, and management of utility agreements, as well as management of utility-related documents in bid packages)



Utility Investigations

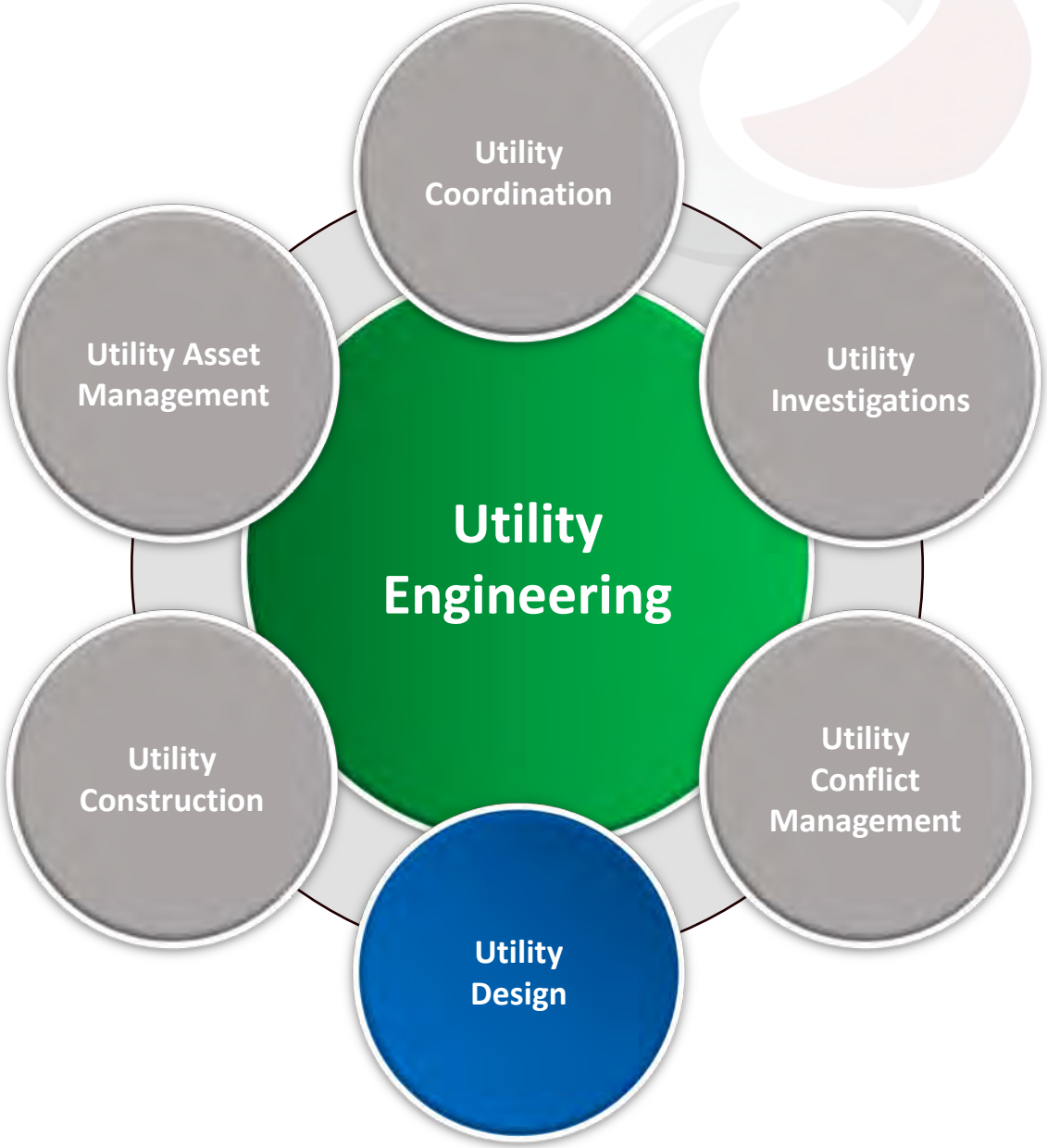
Professionally investigated and documented utility data in accordance with ASCE/CI/UESI 38-22 . This is a prescriptive standard for investigating existing utilities using a variety of sophisticated geophysical and engineering methods by competent professionals to establish and depict the presence of existing utilities. ASCE 38 data can be pushed into digital format (per ASCE/CI/UESI 75-22) to enable a myriad of virtual design and construction (VDC) and digital project delivery methods.

Utility Conflict Management

Professional, multilateral assessment of conflicts and best solutions consistent with SHRP2 R15B recommended practices and processes, including project schedule critical path analytics.

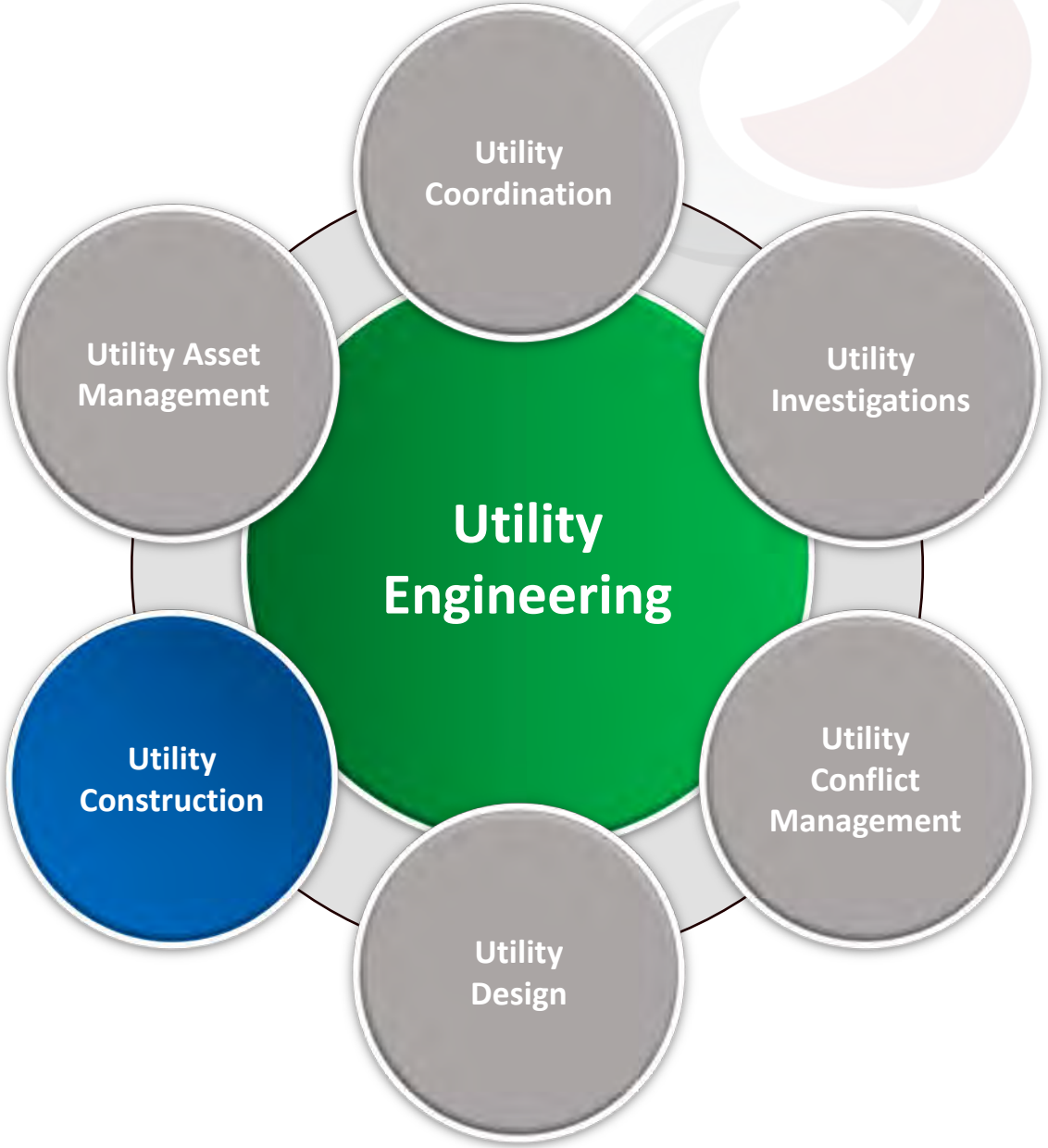
Utility Design

Design (including preparation of plans, specifications, schedule, and cost estimate) by a P.E. of utility relocations and protect-in-place measures (for existing facilities that remain in place) with attention toward integrating utility infrastructure adjustments with mainline project work. The design goal is to specify strategies that optimize the project delivery with minimal disruption to the project, utility services, commerce, and the public. Proposed utility designs and relocations are included within the utility design effort.



Utility Construction

Techniques and procedures for monitoring, inspecting, and surveying utility installations at the job site, as well as recording and production of quality, utility digital as-built data in accordance with ASCE/CI/UESI 75-22.



Utility Asset Management

Techniques and procedures for accommodating, permitting, managing, documenting, and assessing utility facilities within the right of way over their entire lifecycle. Utility Asset Management includes recording and managing digital utility as-built data on proposed and newly installed utility infrastructure in accordance with ASCE/CI/UESI 75-22.

The Research Focus

Each of these UE “pillars” or activities require and/or generate utility data. This project research focuses on achieving standardized utility data for Iowa DOT projects and identifying opportunities within routine project development and daily ROW management business activities for collecting and sharing utility data. To that end, adoption of UE recommended practices for acquiring, sharing, and leveraging standardized utility infrastructure data within Iowa DOT workflows is a logical and beneficial evolution that will resolve the challenges with attaining reliable utility data early in a project while proactively addressing complications associated with hosting utility infrastructure within Iowa DOT ROW.

For this research project, the UE Utility Asset Management pillar is of particular interest for supporting the acquisition, management, and sharing of standardized digital utility infrastructure as-built data.

Utility Asset Management

Utility asset management is the process of the public ROW owner **supporting** the utility owner's efforts, and utility owners' supporting the public ROW owner.

T]he goal is to ensure utility assets are efficiently:

1) positioned, protected, operated, maintained, and replaced over their lifecycle to provide reliable services to customers and ensure regulatory compliance; and
2) accommodated and managed during public ROW project development, construction, and maintenance activities. It's a symbiotic relationship (as opposed to a setting that is too often adversarial) in which ROW owners and utility infrastructure owners work proactively to take care of each other's interests and needs.

Data Management

Utility data is readily available through project development, project construction, and ROW management activities, but Iowa DOT lacks procedures to ensure data is collected, managed and subsequently made accessible.

Best Practices

Implementing UE Utility Asset Management system and practices will enable data to be collected through a variety of existing Iowa DOT business practices (e.g., design, construction, permitting). New technologies make collection, management and sharing of standardized digital utility data a simple process.

Data Collaboration

Interest. Existing software technologies, web services, published standards, and GIS protocols make establishing a Utility Asset Management system relatively easy for both Iowa DOT and utility owners.

A Modified Approach

For this specific Iowa DOT research effort, Utility Asset Management is of primary interest. Though with a slight twist, the concepts for conventional asset management readily represent and support a modified approach in which an agency managing public ROW, such as Iowa DOT, extends consideration toward utility assets owned by 3rd parties which are occupying public ROW. The fact that these assets are owned by others is academic, for, no matter how the cards are cut, in the end utility infrastructure serves the public interest. Moreover, through proper utility asset management practices Iowa DOT can begin to achieve better usage of public ROW (e.g., move more goods and services while decreasing vehicle traffic , decrease individual carbon footprints and other environmental impacts, decrease pavement wear, improve social equity, and bolster infrastructure resilience) while greatly enhancing Iowa DOT planning, design, and project delivery. In short, utility asset management will enable Iowa DOT to better serve their clients – i.e., the citizens of Iowa.

Data Collaboration

Utility asset management is the process of the public ROW owner supporting the utility owner's efforts, and utility owners' supporting the public ROW owner. The goal is to ensure utility assets are efficiently:

- Positioned, protected, operated, maintained, and replaced over their lifecycle to provide reliable services to customers and ensure regulatory compliance; and
- Accommodated and managed during public ROW project development, construction, and maintenance activities. It's a symbiotic relationship (as opposed to a setting that is too often adversarial) in which ROW owners and utility infrastructure owners work proactively to take care of each other's interests and needs.

Federated GIS Collaboration

Technology Landscape Lead
Daniel Colby, M. ASCE, M. OGC
Senior Vice President of Technology
Utility Mapping Services, P.C.
Chair: ASCE UESI URMD Utility Infrastructure Data Exchange and Security Committee
Email: dcolby@umsi.us

Data Maintenance

Iowa DOT does not need to create a massive hosting service nor maintain the mass of utility infrastructure asset data for all the facilities located within Iowa DOT ROW.

Open Standards

Nearly all utility owners currently operate OGC compliant GIS inventories for asset management. A Federated Geographic Information System Collaboration Portal will enable Iowa DOT to securely access utility owner data hosted on the utility owner GIS

Data Governance

Just need to implement existing protocols and data exchange standards. Utilities manage their own data and are the source of record. Eliminates versioning errors, security issues; expedites data access and usage.

Federated GIS Explained

A **Federated Geographic Information System (GIS)** refers to a distributed network of GIS resources or services that are connected and interoperable, allowing for data sharing, analysis, and visualization across different organizations or entities. In a Federated GIS, multiple GIS systems, databases, or services from different organizations or jurisdictions are linked together, allowing users to access and utilize geospatial data and services seamlessly. A federated GIS provides a framework for **collaborative geospatial data sharing** and analysis across different organizations or entities, while allowing them to retain autonomy over their own GIS security, resources, and services.

Key Characteristics

A **Federated GIS** typically includes:

- **Distributed architecture:** A Federated GIS consists of multiple GIS resources or services that are distributed across different organizations or entities, rather than being centralized in a single location.
- **Interoperability:** The GIS resources or services in a federated system are designed to be interoperable, meaning they can communicate and exchange data with each other using standardized protocols and interfaces.
- **Data sharing**: A Federated GIS enables sharing of geospatial data across different organizations or entities, allowing for collaborative data management and analysis.

.

Federated GIS Integrates

- **Heterogeneity:** The GIS resources or services in a federated system may have different hardware, software, and data configurations, allowing for diverse data sources and technologies to be integrated into a unified system.
- **Autonomy:** Each organization or entity participating in a Federated GIS retains control over its own GIS resources or services, including data ownership, access rights, and functionality, while enabling collaborative data sharing and analysis.

It’s Scalable & Secure

- **Scalability:** A Federated GIS is designed to be secure and scalable, allowing for the inclusion of additional GIS resources or services as needed to accommodate changing requirements or data sources.
- **Security and privacy:** Federated GIS typically incorporates security measures to protect data integrity, confidentiality, and privacy, including authentication, authorization, and encryption mechanisms.

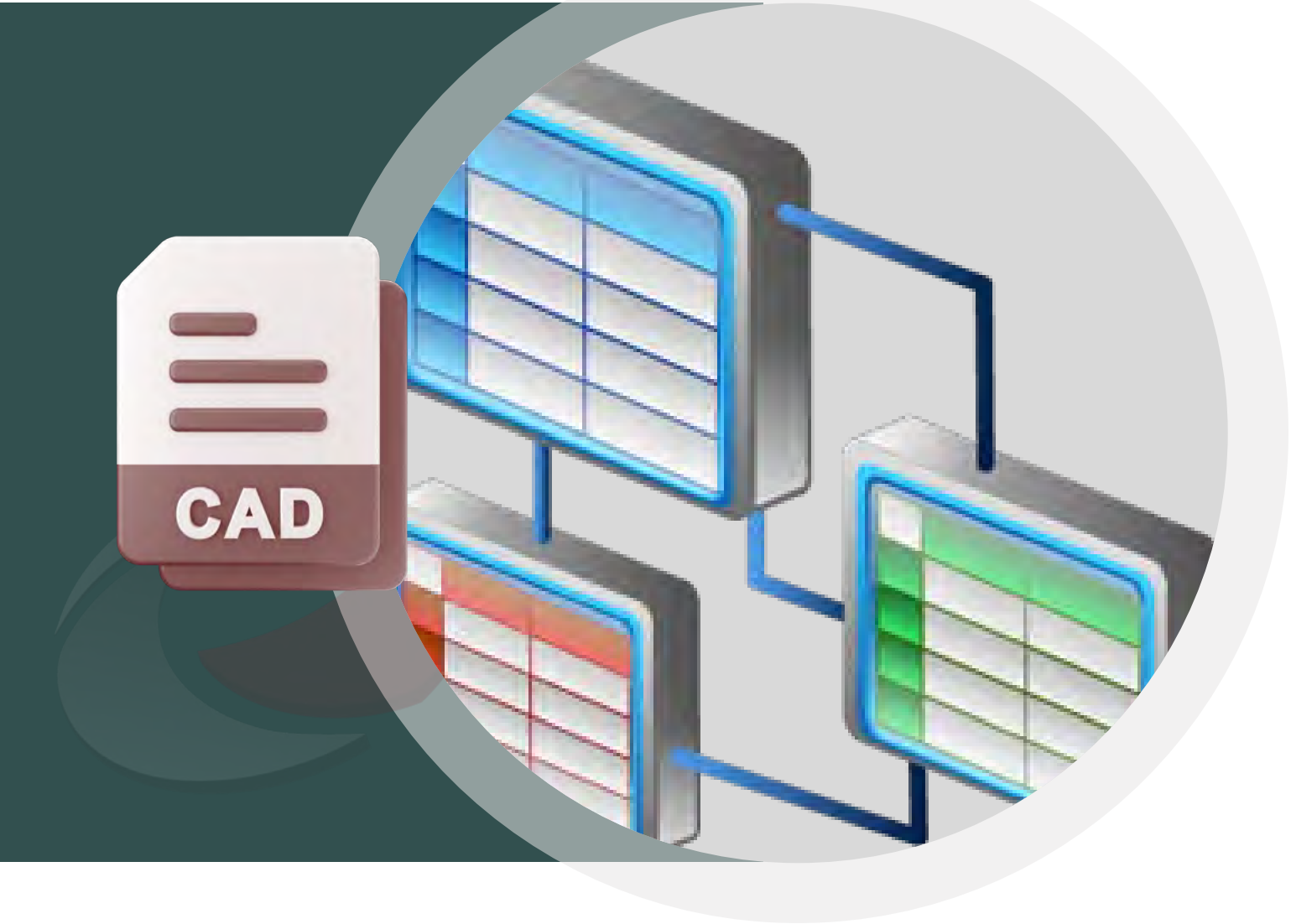
Advantages of GIS Federation

The benefits of a Federated Geographic Information System Collaboration Portal include the following:

- Iowa DOT does not need to increase staff for managing the utility data repository. Automated processes and data standards relieve Iowa DOT GIS staff from onerous data gatekeeper duties.
- The onus for managing utility data is placed on the utility owner or operator.
- Utility owners can effectively manage the “what, who, when, and for how long” regarding viewing and data access.
- Eliminates versioning issues – there is only one source of utility information.
- Eliminates data transfer; information from the source of record is accessed and viewed in real-time using established OGC compliant web services and protocols.
- Data is standardized, and in a digital format appropriate for design and viewing consumption by OGC compliant software applications (such as ESRI, QGIS, Autodesk, Bentley).

CADD Attribution

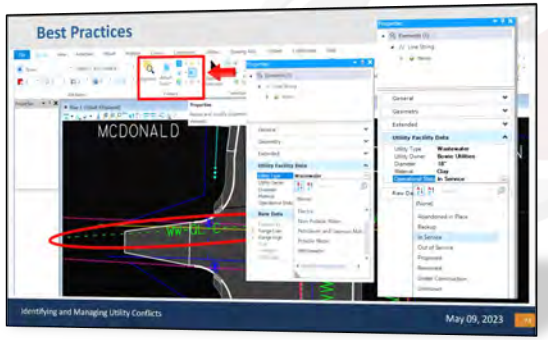
The research team strongly advises moving to an attributed feature CAD model. In Bentley MicroStation, you can add attributes to objects using the "Element Information" tool. This is a powerful feature of Bentley MicroStation that allows you to view and manage important attribute information about the elements in your design and SUE data. Adding standard attributions based on ASCE 38 and 75 to elements in Bentley MicroStation provides several advantages.



Dynamic Labeling

Dynamic labeling refers to the process of assigning properties or characteristics to CAD objects or entities where the annotation labels are dynamic and populated by the data attributed in each element, whereas simple annotation involves adding just text on the drawing using leaders. Attributes can be customized to fit your specific needs. You can define your own attribute types and values and attach them to elements in your design and SUE data as needed. This allows you to tailor your data management and communication processes to fit your unique requirements and to standardize them to adhere to both ASCE 38 and 75.

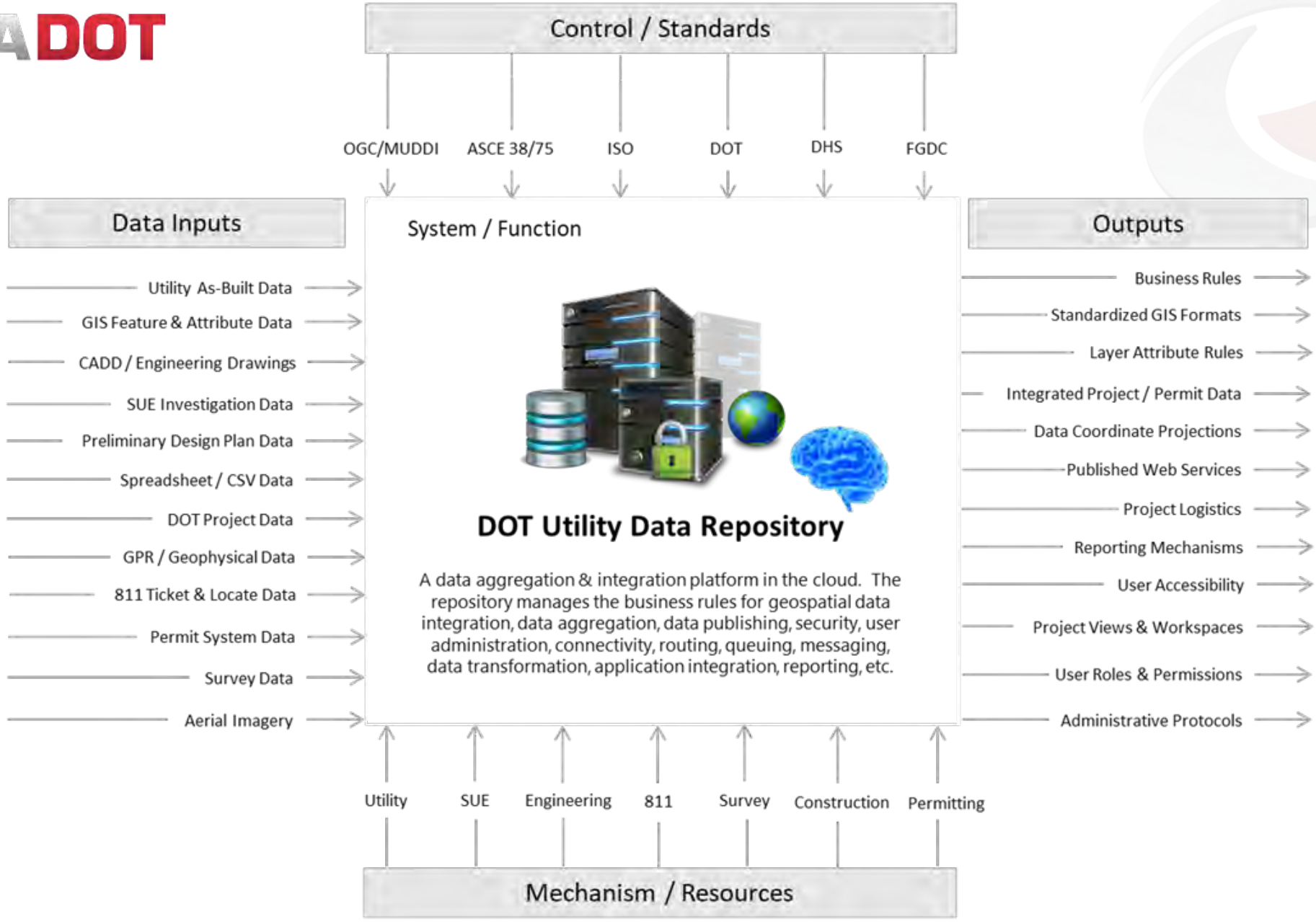
Attribution vs. Simple Annotation

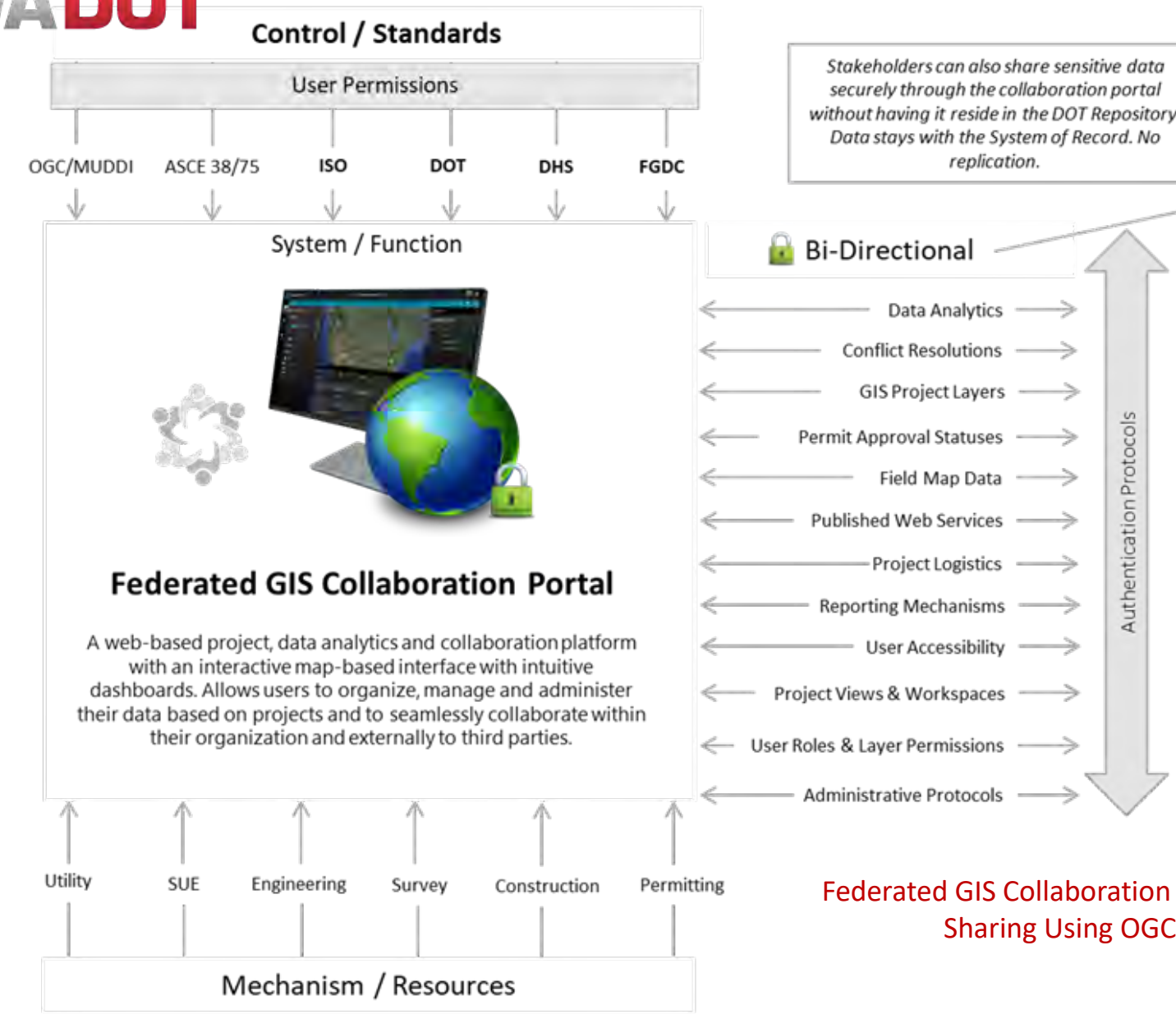


It is important to start using attribution in CAD instead of simple annotations. Using attribution in CAD provides several advantages over simple annotations, including improved data management, increased efficiency, consistency, customization, interoperability, and improved analysis. By using attribution, you can more effectively manage and utilize the data within your CAD drawings, improving the quality and accuracy.

Overall, adding attributes to elements in Bentley MicroStation can help you to work more efficiently, manage your design and utility data more effectively, and improve communication with others involved in the design, SUE, utility conflict management and construction processes. Here are some advantages of using attribute labeling over simple annotation in CAD.

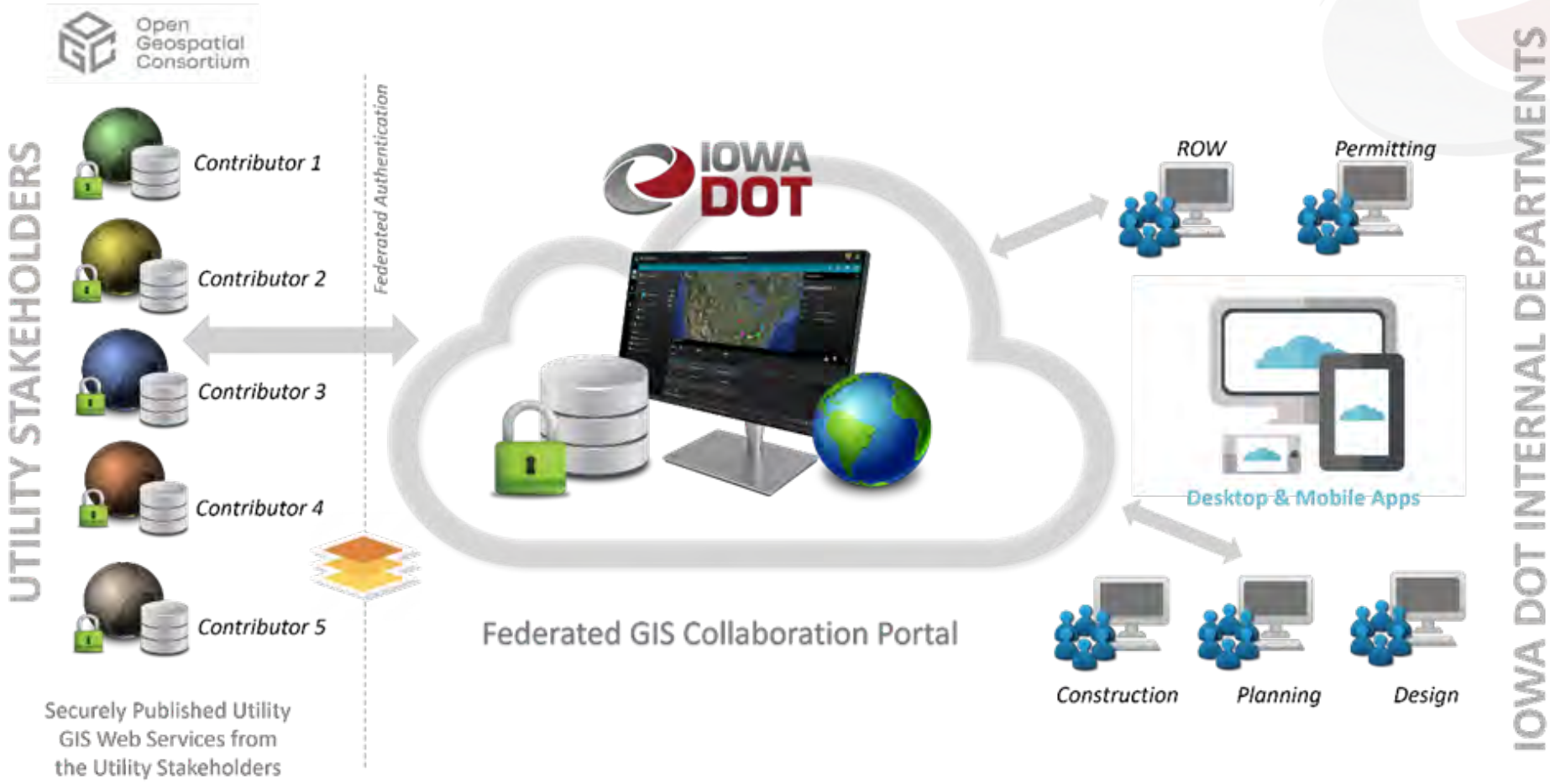
Leveraging CAD (Computer-Aided Design) feature attribution within Bentley MicroStation allows for a more seamless experience for sharing data with Geographic Information Systems





Federated GIS Collaboration Enables Bi-Directional Secure Data Sharing Using OGC Protocols and Standards

Interim Solution



In this scenario, Iowa DOT would leverage ESRI's ArcGIS Enterprise portal to administer a federated server. With this configuration, the utility stakeholders manage their published services from their respective GIS server and share web services directly with Iowa DOT. Instead of acquiring and replicating the utility GIS data and managing it in a separate Iowa DOT GIS repository, a federated approach allows utility stakeholders to share, publish and consume data securely directly from the utility GIS system of record. The GIS data is maintained at the system of record, ensuring the data stays current is not out of date. No replication.

Research Recommendation

Because of the statewide need for a utility Federated Geographic Information System Collaboration Portal, it is recommended Iowa DOT initially establish a system that demonstrates the concept, but then allow the Iowa Office of Chief Information Officer (OCIO) to take over and expand the system for statewide use for which Iowa DOT then becomes one of the users.

Among its many powers and duties, the OCIO has the authority to establish standards for information technology used by state agencies, direct the work of agency information technology staff, review and recommend approval of information technology staff employment decisions in coordination with the Department of Management and enter contracts for the receipt and provision of information technology services.

Ideal Scenario

This diagram illustrates a state managed federated GIS solution administered by the Iowa Department of Management's Office of the Chief Information Officer (OCIO). The research team highly recommends this approach as the OCIO is best positioned to federate and secure these services across all public stakeholders, such as state, county, and local municipality agencies that need access to utility data for numerous reasons, including disaster preparedness and emergency response activities.

Why OCIO?

Traditionally when entities and agencies need to acquire utility data, they reach out to each respective utility member individually. This is not only a time-consuming process for the requestors, but also for the data grantors as well. Through research breakouts with various utility stakeholders, this approach is well received as it allows utility stakeholders to securely publish their data to a single federated portal where it can be securely accessed by all of those who need it. This eliminates the need for utility stakeholders to respond to multiple data sharing requests, especially in emergency response situations.

The Office of the Chief Information Officer was created as an independent agency for the purpose of leading, directing, managing, coordinating, and providing accountability for the information technology resources of state government. The mission of the office is to provide information technology and business solutions to government and citizens through guidance, service delivery and partnerships. Their vision is to enable the digital transformation of government through collaboration and innovation, to deliver citizen-centric solutions. Among its many powers and duties, the OCIO has the authority to establish standards for information technology used by state agencies, direct the work of agency information technology staff, review and recommend approval of information technology staff employment decisions in coordination with the Department of Management, and enter contracts for the receipt and provision of information technology services.

Modernization Goal

As the utility industry moves toward significant technology and digital transformation, the overarching DOT and other agency strategies should embrace modernization as well. The goal is to unite systems to communicate spatial asset data from the various systems of records responsible for managing stakeholder assets, not by replicating them. By strengthening work and utility asset management collaboration, it allows the DOT (and other agencies) the ability to monitor the ever-changing status of utility networks, identify issues that may affect projects in a proactive verses' reactive manner.

Stay Postured

Overall, modernizing the technology landscape is critical for organizations to stay relevant, efficient, and secure in the fast-paced digital world.

Modernizing and building upon the current technology landscape with enterprise GIS federation coupled with workflows & asynchronous data transformations will allow Iowa DOT to not only scale but to stay postured today and well into the future.

Report Number: SPR-RE22(013)-8H-00

Construction and Utility Involvement

Co-Principal Investigator
Roy E. Sturgill, Jr., Ph.D., P.E., M. ASCE
Assistant Professor
Civil, Construction and Environmental Engineering Department
Iowa State University
Chair: TRB Utilities Committee (AKD60)
E-mail: sturgill@iastate.edu

Background of Construction Projects and Utilities

The POINT 25 Process, as previously summarized, concludes with the collection of a detailed plan regarding utility relocation efforts and communicates this plan into the construction phase of the project by way of the Utility Bid Attachment. Again, the Utility Bid Attachment indicates if a project was coordinate using the POINT 25 Process or not, indicates what utilities are within the project footprint, which utilities were relocated prior to construction, which utilities were not relocated based on not being impacted, and utilities to be relocated during construction with the details and dependencies of those relocations. The information is communicated within the bid documents and would be a point of discussion during any preconstruction meeting. While the POINT 25 Process details procedures that some consider effective practice, the Iowa DOT construction environment is experiencing significant delays and disruptions due to utility-related impacts. Like many other state DOTs, as pointed out in previous research, Iowa DOT recognized utility-related impacts as one of their more significant sources of construction delays. This was the impetus for undertaking research to find improvements in this area.

Likewise, many Iowa highway construction contractors also noted negative impacts and delays to their projects as the result of utility issues. This point became emphasized in October 2022 when Olson Construction Law issued, A Roadmap: How to Minimize Unmarked/Mismarked Utilities and Late Utility Relocation (Iowa). This white paper resulted from the Iowa Associated General Contractors (AGC), who represent the majority of large highway contractors in Iowa, noting that change was needed regarding utility impacts.

Stakeholder Dialog

To collect details regarding challenges and potential solutions regarding utility-related delays during construction, an online exchange was held with members of the Iowa AGC, Iowa DOT construction and utility coordination representatives, and members of the research team. The Iowa AGC members were in consensus belief that the POINT 25 Process can be effective. However, they believe that there is a lack of compliance in following the POINT 25 Process among right of way owners and the utilities companies.

It was noted that there are fewer issues experienced on Iowa DOT projects when compared to local agencies, but that the issues experienced are still significant. Additionally, even when relocation needs are known, they are experiencing a lack of, or delayed, response by utility companies to meet their relocation timelines. **The Iowa contracting community interviewed believes there is a need for potential penalties to hold the utility companies accountable..**

Utility Locations Lacking

Contractors often find that the utility location information provided within Iowa DOT plans is inaccurate or not detailed; especially with excavation contractors required depths or elevations (even better). Typically, utility information is provided with horizontal locations only. Additionally, the data provided is often inaccurate, incorrect, or missing. Iowa contractors employ the services of One Call and additionally investigate utilities with exposures or potholing at their cost.

Lack of Records

Contractors and court cases have found that utility companies often completely lack records of location data of their facilities, and certainly do not have records of a quality or accuracy for the support of designing or constructing roadways. Even though permitted accommodations and relocations require current and planned locations, these are not collected or provided to a usable accuracy from the utility companies.

Associated General Contractors of Iowa

Utility Frustration

The Iowa highway contractors noted that utility companies often do not comply with the relocation schedules provided within the Utility Bid Attachment of projects, and in many cases are completely non-responsive to the contractor for relocation efforts. Contractors also note that utility companies often to not attend project preconstruction meetings and there is little communication regarding relocation efforts. This leave contractors with delays or less than optimal progress in working around utilities and their relocation efforts. Contractors note that penalties should be available to hold utility companies liable for these delays.

Contractor Risks

Contractors carry significant risk in utility coordination during construction. Contractors noted that they feel they **carry the burden of risk** as it relates to utility delays. It was noted that the issues arise during the design of the highway projects, and there seems to be little effort toward resolution before the responsibility for managing the issues are passed to the contractors.

After a discussion of the challenges faces, the exchange turned to potential paths for solutions.

Improved adherence to the POINT 25 Process

The construction community noted that POINT 25 projects entail much better information and results than most non-POINT 25 projects. They would like to see all projects be considered POINT 25 projects, and they believe, for Iowa DOT projects, this falls in line with the administrative rule. They believe education may be needed on the POINT 25 process internally to the Iowa DOT, to local agencies and to the utility companies to see improved adherence to this process. Related to the POINT 25 process, the contracting community believes that projects should not reach the construction letting when utility relocations have not been completed. They understand that instances exist where utilities cannot be relocated without some portion of the construction being completed, but more often projects are let where at least a portion of the utilities yet to relocate could have relocated prior to the letting. Additionally, when utilities do necessitate being relocated during construction, there should be considerations of the probable delays applied to the project scheduling requirements so as to provide the contractor additional time for those projects. While the Iowa DOT will often pay for accelerations of work for public convenience accelerations, this is not the correct solution. The contractors believe in the PONIT 25 process and believe if it is followed, utility issues will be minimized.

Improved Collection and Accuracy of Utility As-Built Data within Permitting

The construction community is requesting that more effort be put into utility investigations and standardized as-built data acquisition as part of the permitting process. The location of the existing utilities should be known and necessary information during the right of way and design stages, as much as the construction stage. The construction community notes that accurate locations of utilities with elevations or at least depths should be collected during original permitting of the utilities in the right of way. If not available from the utility as-builts, it should still be collected by investigations, exposures, and pot holing during design. This solution may entail needed changes to permitting process and required documentation, and the approach may take time to build a comprehensive as-built database, but the exchange parties agreed that is a worthwhile effort to assist in resolving utility-related delays. The discussion of this solution expanded into prescribing an accuracy and format within the permitting process and the potential application of the ASCE 75 standard for as-builts of utilities.

In discussion of improved investigations during design efforts, the exchange discussed applying a decision framework to projects to determine the level of utility investigation a project may warrant. Iowa DOT already selectively uses consultants to expand beyond historic Call 811 markings and contractor potholing methods for achieving better utility position information, but the discussion expanded into the application of the ASCE 38 standard to achieve subsurface utility engineering and professionally judged quality levels of utility location data.

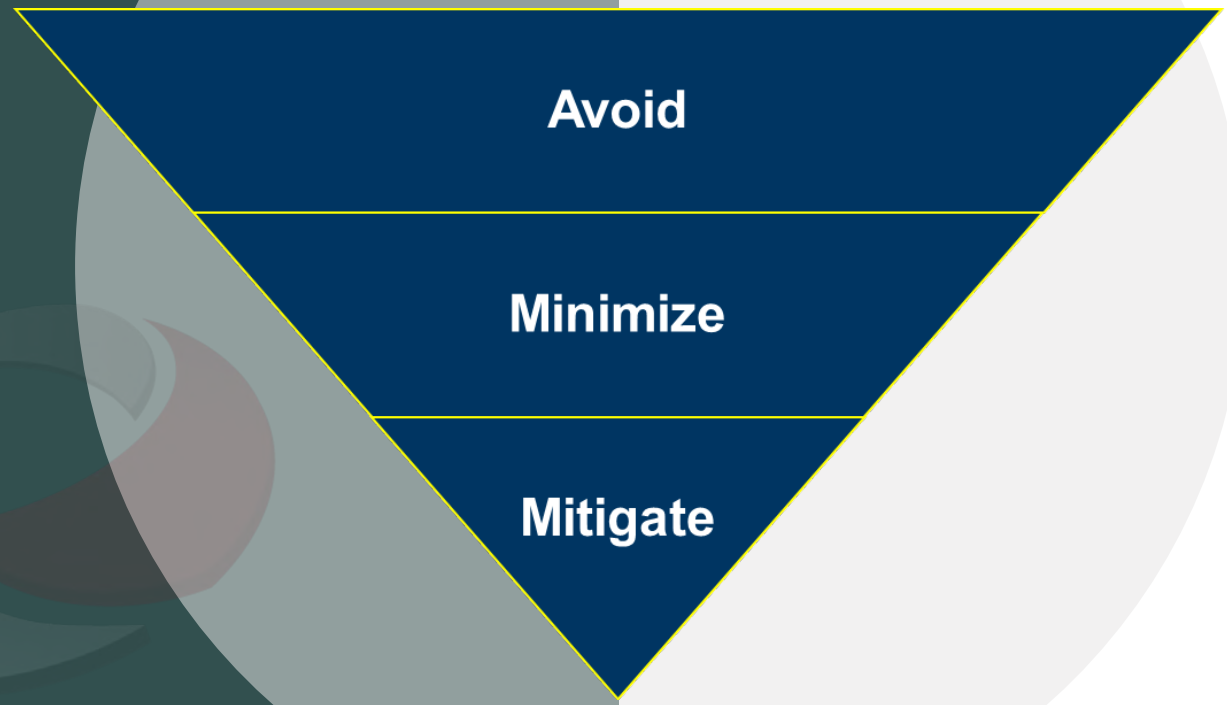
Enforcement

It was noted that the Iowa AGC would support any needed regulatory changes to help reduce utility company related delays.

The POINT 25 process was also reiterated and that there should be penalties for non-compliance; especially non-compliance with work plans and schedules. While not discussed, it should be noted that the POINT 25 process does entail a discussion of penalties in delay damages and withholding future permits from non-compliant utility companies. This may be a point for considering enforcement of these conditions, though these would be recommended as a last-resort approach.

Cultural Shift Needed

Likely, a more popular solution among all parties, including utility companies, would be an approach of partnership. This approach entails a cultural shift of the project development process and has been effective when put in place in other states, such as Indiana. The approach is for the project design team to have available thorough and accurate utility location data. This data may be collected through the performance of an ASCE 38 utility investigations or lesser investigations as deemed appropriate by an early assessment of the project in the planning stage to determine the utility investigation needs.

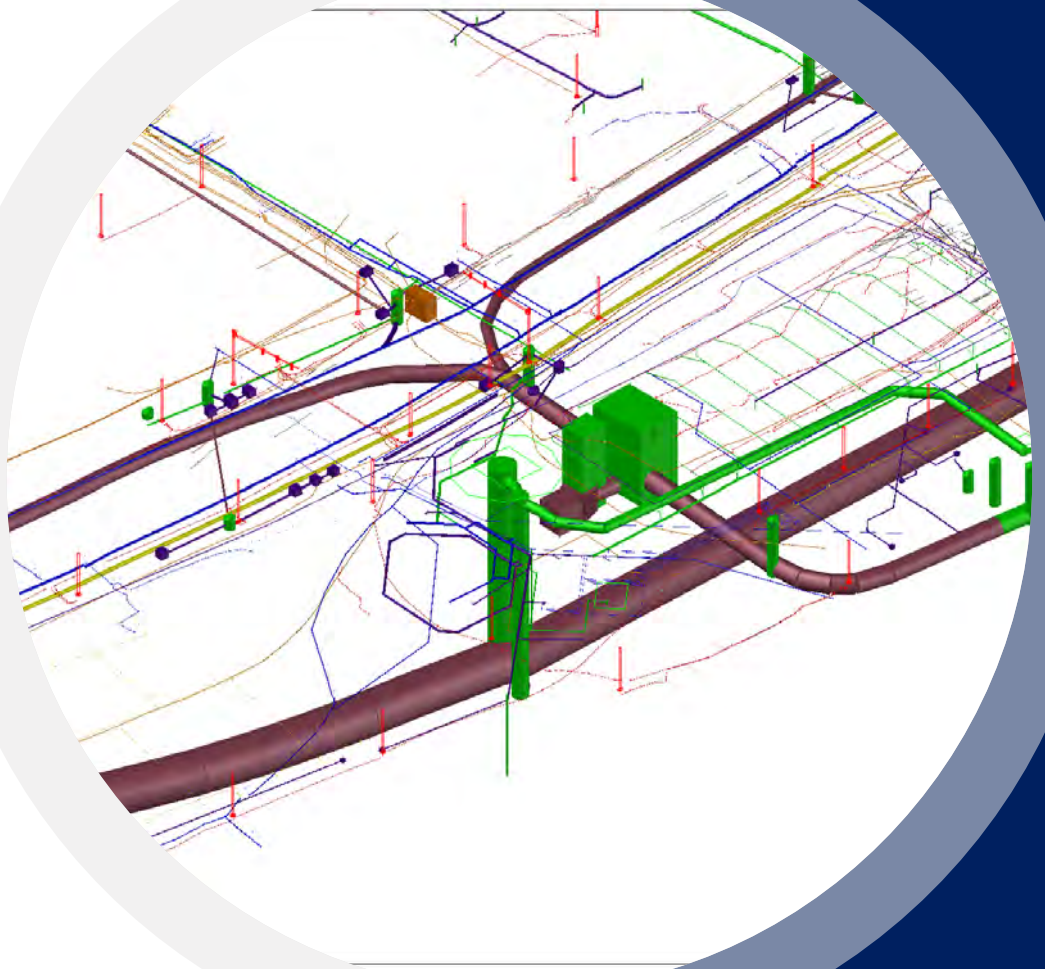


Avoid When Feasible

The design team needs this level and quality of information to know where utilities are and where the roadway project and associated relocations may go. The mentality in this approach is to avoid utility facilities during design as a first approach; at least where feasible. Further, the design team should understand design impacts to utilities, timelines, and treat utilities as a partner in the right-of-way. This will entail the Iowa DOT educating designers on utility avoidance and understanding the impacts and how those vary by utility type and utility attributes.

A Collaborative Approach

This approach would establish a more collaborative manner for relationships with the utility companies. Along with establishing the partnership, avoiding utility relocations when feasible and otherwise minimizing impacts to utilities provides an incentive to the utility companies to participate in the project process and the building of relationships that will likely lead to high instances of response. Along with the improved utility investigations, the data collected can then be provided back to the utility companies as as-builts to assist in building the repository of as-built information. .



Construction Community Exchange Summary

There are noted issues regarding utility impacts to Iowa DOT construction projects. The consensus solution involved several components but can be summarized as a multifaceted approach inclusive of shift the relocation culture. There is a desire to collect better utility as-built data in the permitting process, conduct more informed utility investigations in planning and design, and the Iowa DOT should be open to paying for this higher quality information so that improved design decisions can be made. This is in the same approach as conducting geotechnical investigations. Further, a focus on avoiding utilities and building partnerships with utility companies may lead to better response and participation by utility companies overall.

As a last resort, the community feels penalties need to be considered. Doing so may result in better compliance to permitting and the POINT 25 process. The community felt these things could be impactful and could be done right away.

Legal & Policy Analysis

Legal and Policy Analysis Lead
Jesse R Cooper, RPLS, M. ASCE
Senior Utility Manager
HDR, Inc.
Email: jesse.cooper@hdrinc.com

Accommodation Policies

The importance of developing and adhering to policies for the accommodation of utilities in Iowa DOT rights of way is paramount because

Today's permit may create the design conflict of tomorrow. All proposed permit accommodations should consider the following:

- The proposed accommodation must not adversely affect the safety, design, construction, operation, maintenance, or stability of the highway.
- The proposed accommodation must not interfere with or impair the present use or future expansion of the highway.
- Any alternative location would be contrary to the public interest.

Although Iowa DOT strives to accommodate utility whenever possible, the authorized use and occupancy of Iowa DOT right of way for Utility Accommodation purposes is subordinate to the primary interests, safety of the traveling public, and protection of the transportation the facility. Additionally, we believe the Iowa DOT encourages collaboration, cooperation, and joint use among various utilities to be placed within Iowa DOT right of way. The end goal should be to support Utilities and the provide an Asset Management Policy for the Iowa DOT ROW.

Federal Codes

Iowa DOT uses the regulations of the Federal Highway Administration (FHWA) under 23 Code of Federal Regulations (CFR) 645, Subpart B for the basis of accommodation of utilities within Iowa DOT right of way. The CFR includes:

The State transportation department's standards for regulating the use and occupancy of highway right-of-way by utilities must include, but are not limited to, the following:

*(1) **The horizontal and vertical location requirements and clearances for the various types of utilities must be clearly stated.** These must be adequate to ensure compliance with the clear roadside policies for the particular highway involved.*

For the DOT, managing the ROW asset must be a top priority. While in the past the accuracy of utility locations was not as critical as in today's environment with limited ROW and increasing demands of utility companies to occupy the ROW. With advancing technologies, the quality of location data collected and available management systems this requirement can accomplished.

State Statue

306.46 Public utility facilities — Public Road Rights-of-Way.

1. A public utility may construct, operate, repair, or maintain its utility facilities within a public road right-of-way. The location of new utility facilities shall comply with section 318.9. ***A utility facility shall not be constructed or installed in a manner that causes interference with public use of the road.***

2. For purposes of this section, "public utility" means a public utility as defined in section 476.1, and shall also include waterworks, municipally owned waterworks, joint water utilities, rural water districts incorporated under chapter 357A or chapter 504, cooperative water associations, and electric transmission owners as defined in section 476.27 primarily providing service to public utilities as defined in section 476.1. For the purposes of this section, "utility facilities" means any cables, conduits, wire, pipe, casing pipe, supporting poles, guys, and other material and equipment utilized for the furnishing of electric, gas, communications, water, or sewer service.

Emerging ROW Demands

With the emerging new demands on ROW for Broadband and Electric Services the lines between Public and Private utilities are being blurred. New facilities such as electric lines from Solar Farms to the Electric Grid and dedicated communication lines for Broadband includes many Public /Private initiatives which may require a review of these definitions, rights, and methods of occupation of the ROW.

State Statue

306.47 Utility facilities relocation policy

1. It is the policy of the general assembly that a proactive, cooperative coordination between the department, local governments, private and public utility companies, and other affected parties is the most effective way to minimize costs, eliminate the need for utilities to relocate facilities, limit disruption of utility services related to federal, state, or local highway construction projects and limit the potential need for relocation of utility facilities.

2. All potentially affected parties shall be invited to participate in development meetings at the design phase of a highway construction project to review plans, understand goals and objectives of the proposed project, and discuss options that would limit the impact of the construction on utility facilities and thereby minimize or even eliminate costs associated with utility facility relocation. All jurisdictions and other Interested parties shall cooperate to discuss strategies and policies to utilize the Iowa one call system in the development of a highway construction project. Failure of the affected parties to respond or participate during the design phase shall not in any way affect the ability of the federal, state, or local agency to proceed with design and construction.

Utility ROW Occupation

Iowa DOT statutes and policies already promote and require cooperation for the occupation, relocation, and inclusion of utilities in ROW. This basis of cooperation is required to advance and accomplish ROW Asset management and should be utilized. Implementation of "Utility Engineering" practices as promoted by the ASCE Utility Engineering and Surveying Institute assures that Iowa DOT achieves cooperation with utility infrastructure owners in a systematic manner.

PUBLIC UTILITY REGULATION, §476.1 476.1 Applicability of authority.

1. The utilities board within the utilities division of the department of commerce shall regulate the rates and services of public utilities to the extent and in the manner hereinafter provided. 2. As used in this chapter, "board" or "utilities board" means the utilities board within the utilities division of the department of commerce. 3. As used in this chapter, "public utility" shall include any person, partnership, business association, or corporation, domestic or foreign, owning or operating any facilities for: a. Furnishing gas by piped distribution system or electricity to the public for compensation. b. Furnishing communications services to the public for compensation. c. Furnishing water by piped distribution system to the public for compensation. d. Furnishing sanitary sewage or storm water drainage disposal by piped collection system to the public for compensation. 4. This chapter does not apply to municipally owned waterworks, waterworks having less than two thousand customers, joint water utilities established pursuant to chapter 389, rural water districts incorporated and organized pursuant to chapters 357A and 504, cooperative water associations incorporated and organized pursuant to chapter 499, municipally owned sanitary sewage or storm water drainage systems, sanitary districts incorporated and organized pursuant to chapter 358, districts organized pursuant to chapter 468, or a person furnishing electricity to five or fewer customers either by secondary line or from an alternate energy production facility or small hydro facility, from electricity that is produced primarily for the person's own use.

Noteworthy Point

Since the previous section is under the Department of Commerce, any revisions to definition and policies for a Public Utility must be reviewed and coordinated with appropriate State Departments.

306.22
Sale of Unused Right of Way

306.22 Sale of unused right of way

If any tract of land is sold, the sale shall be subject to the right of a utility association, company, or corporation to continue in possession of a right-of-way in use at the time of the sale

Noteworthy Point: Implementation of an Asset Management Program in place will make it possible to identify and communicate the existence of occupying utilities when unused ROW is sold.

IOWA ADMINISTRATIVE CODE 761 CHAPTER 115.2 (306A)

POLICY FOR ACCOMMODATING AND ADJUSTMENT OF UTILITIES ON THE PRIMARY ROAD SYSTEM

"Utility". *A system for supplying water, gas, power, or communications; a storm sewer, sanitary sewer, drainage tile or other system for transmitting liquids; a pipeline system; or like service systems. The term "utility" includes traffic signal systems and street and intersection lighting systems.*

"Utility facility". Any pole, pipe, pipeline, pipeline company facility, sewer line, drainage tile, conduit, cable, aqueduct or other utility-related structure or appurtenance. However, the term does not include department facilities or the utility lines that service them.

Utility owner. The owner of a utility facility.

Noteworthy Point: It is noted DOT ITS lines are not included, and Traffic Signals are included. Since ITS and traffic signal operations are related it is recommended this Code be reviewed.

"Freeway". *means a fully controlled access primary highway. The rights of ingress and egress from abutting properties have been legally eliminated by the department. Permanent access to the highway is allowed only at interchange locations. A freeway is generally five or more miles in length.*

Noteworthy Point: The term "Interstate" is not included in the code and though out the code only the term freeway is used. Due to different funding sources and categories of highways it is recommended the definitions be reviewed and updated to adequately address the differences in Interstates, Freeways, and Toll Facilities.

115.4(1) Permit Required and Exceptions to Permit.

a. Permit required.

(1) A utility owner shall obtain permission from the department in the form of a utility accommodation permit before it places its utility facilities in, on, above or below the primary highway right-of-way; attaches its utility facilities to a primary highway structure; or adjusts existing utility facilities occupying the right-of-way.

(2) The purpose of the permit process is to ensure the safety of motorists, pedestrians, construction workers and other highway users; to ensure the integrity of the highway; and to document the location of utility facilities for use in managing the highway right-of-way and in locating the facilities in the future.

b. Exceptions to required permit.

(1) A permit is not required for storm sewers, subdrains, and lighting designed and constructed as part of a department highway construction project.

(2) A permit is not required for service connections within the corporate limits of a city. These connections require city approval rather than department approval; the utility owner shall apply to the city. However, service connections shall meet all other requirements of this chapter.

Noteworthy Points

The research team recommends as a condition of a permit, that utilities acknowledge the requirement to perform design locates for future highway projects. While the 811 requirements may give some assistance, we believe it would be good to require this in the permit to draw attention to Iowa DOT's design needs.

The Exceptions to a permit should be reviewed as several of these, such as services, may be required to be in the asset inventory.

115.4(2)
Agreement Required

For certain utility facility adjustments, the department may require an agreement between the department and the utility owner. However, the agreement by itself does not constitute a permit nor does it grant permission to occupy the primary highway right-of-way. The utility owner is responsible for obtaining a permit prior to commencing work within the right-of-way. The agreement shall then be attached to and become a part of the permit.

Noteworthy Point: We recommend an agreement be required for all adjustments or relocations to have an enforceable agreement for scope, cost, and schedule of the relocation. Even a minor relocation may cause a significant delay to a highway project.

115.4(11) Noncompliance

The department may take any or all of the following actions for noncompliance with any provision of this chapter or any term of a permit:

a. Halt utility construction or maintenance activities within the right-of-way.

b. Withhold an adjustment reimbursement until compliance is ensured.

c. Revoke the permit.

d. Remove the noncomplying construction or maintenance work, restore the area to its previous condition, and assess the removal and restoration costs to the utility owner.

e. Place all pending and future permits on hold until the issue is resolved.

Noteworthy Points:

This section of the Policy is very strong and supports the Iowa DOT Utility Program. We recommended this policy is verified as a tool to require design locates of utility facilities, As-built submissions, and Buy America Requirements. This section may be strengthened with a definition of an "Uncooperative Utility" and if this rule can be utilized when encountered.

Another action item which may be considered if there is a history of deficient plans or locating of existing utilities is to require a PE seal on plans to assure the conformance to the Accommodation Policy and maintain a safe ROW.

115.4(13)

Insufficient capacity of right-of-way

The department shall deny issuance of a permit if it determines there is insufficient room for additional utility facilities within the right-of-way.

Noteworthy Point: While this statement is strong, how is it determined when there is insufficient room. Should the Department deny the utility's proposed location but not occupancy as they may be able to go deeper or provide another alternative?

115.5(3) Number of Crossings

The number of utility facilities crossing the primary highway right-of-way shall be kept to a minimum. The department may require distribution facilities to be installed on each side of the highway to minimize the number of crossings and service connections. In individual cases, the department may require several facilities to cross in a single conduit or structure. Crossings should be as near to perpendicular to the highway alignment as practical.

Noteworthy Point: The DOT may consider allowing only one set of poles on each side of the road and require co-location on poles when space is available on the poles mirroring the concept of requiring joint occupancy on crossings. If possible, this should be also expanded for longitudinal telecommunications. Understanding multiple manholes may still be required for security.

115.8(3) Plan

Each permit application shall be accompanied by a plan showing the following:

a. Location of the utility facility by route, county, section, township, range, milepost and highway stationing, where these references exist.

b. Highway centerline and right-of-way limits.

c. Location of the utility facility by distance to the nearest foot at each point where the facility's location changes alignment, as measured from the:

i. Centerline of the highway on nonfreeway installations.

ii. Right-of-way fence on freeway installations.

d. All construction details including the:

i. Depth of burial.

ii. Types of materials to be used in the installation.

iii. Operating pressures and voltages.

iv. Vertical and horizontal clearances.

v. Traffic control plan prepared by a person knowledgeable in work zone traffic control, or a reference to a standard traffic control plan of the department.

Recommendations

Additions to this section of the policy should include:

- Requirement to tie utility plans and installation to the required DOT survey system. Including both Horizontal and Vertical.
- Requirement for Utility to hire a PLS to state ROW if DOT forces not available.
- Compliance of standards/accuracy levels of location delineated and in conformance with ASCE 75-22,
- Required Plan size and formats, file types and sizes, graphical formats, and structures.
- Traffic Control / Phasing sheets- for utility construction, this was a prior requirement of Iowa DOT but was discontinued. Including the Iowa 511, Notification of width or height restrictions included with Utility Permits.
- Designated boundary lines between city/county roads and the State Highway System

115.8(8) As-built Plans

a. Within 90 days after completion of construction, the utility owner shall submit to the district representative an as-built plan or a letter certifying that the actual placement of the utility facility is as described in the original permit.

b. If the utility owner fails to submit the as-built plan or letter within the time required, the department may hire an independent contractor to locate the utility facility and prepare an as-built drawing. All costs associated with this activity are the responsibility of the utility owner.

c. Any costs incurred by the department or its contractors due to incorrect as-built information supplied by the utility owner or deviations in actual placement from that described in the original permit are the responsibility of the utility owner.

Noteworthy Points:

- *It is recommended the location requirements, including vertical elevations, be in conformance with ASCE 75-22 and the citation be included in the Code if possible. A graphics file of the as-built should be required also, which can be uploaded into the Asset Management system for future use.*
- *If a utility does not comply, the code should give the DOT the option of withholding permits or other actions as noted in 115.4(11) and 115.30(6). All costs associated with the DOT actions to obtain As-Built information including ASCE 38-22 Levels B and A should be the responsibility of the Utility.*

115.8(9) Transfer of Permit

A new utility accommodation permit is not needed when a utility facility is transferred or leased in its entirety. The requirements of the permit and this chapter remain in force for as long as the utility facility continues to occupy the right-of-way and serve its intended purpose. The transferee or lessee shall submit the following information to the appropriate district representative:

a. The name and address of the transferee or lessee.

b. Geographical area involved in the transaction.

c. Designated telephone number for notification purposes.

Noteworthy Points:

- It is recommended this section be expanded to include a change of function or in use. This would include changing from public use to private use.
- Geographical information, if not already in the Iowa DOT system, should be required when updated in conformance with ASCE 75-22.

115.11(306A) Vertical Overhead Clearance Requirements

115.11(1) Conformance to standards. The vertical clearance for overhead utility facilities and the lateral and vertical clearances for bridges shall conform to accepted industry standards as well as applicable codes and regulations.

115.11(2) Minimum vertical clearance. In no event shall the vertical clearance be less than 20 feet above the roadway for all overhead utilities.

Noteworthy Point: It is recommended overhead electric lines are not allowed to cross within the approaches of a bridge to maintain OSHA clearances for equipment installing metal beam guard fence in the approach. Additionally, it is recommended to review longitudinal clearance requirements for equipment while performing maintenance to the bridge rail and appurtenances.

115.12(4) Engineering fee. When a primary highway bridge is in the planning stages and the department designs the bridge to accommodate a requested attachment, the department shall assess to the utility owner an engineering fee. The engineering fee shall reimburse the department for the department's increased costs of design, construction, and inspection due to the attachment. The department shall bill the fee to the utility owner when the department's work is complete.

Noteworthy Point: It is recommended the Utility be required to use a Profession Engineer and the plans be sealed on bridge attachments. This would be in addition to the Engineering Fee for the review of the attachment plan.

Legal & Policy Analysis

115.11(306A) Underground Utility Facilities

115.13(1) Depth requirements.

a. Minimum cover—roadway. The minimum required cover under a roadway is 48 inches.

b. Minimum cover—other portions of right-of-way. The minimum required cover under other portions of the right-of-way is:

i. 48 inches for electrical cable.

ii. 30 inches for communication cable except that 36 inches is required for longitudinal occupancy under freeway right-of-way.

iii. 36 inches for all other underground facilities.

Noteworthy Points:

- It is recommended that a review of the depth requirements of Utilities be completed as the Utility Industry and other states are currently moving to greater depths. Factors being considered are type of utility, need for access, risk of being impacted by other utilities or highway maintenance, and differing requirements for longitudinal or crossing occupation.
- Another consideration would be if a protection slab could be used if minimum depths cannot be achieved. Especially under ditches where it would provide protection form routine maintenance for drainage.

115.13(7) Multiduct Systems

The department may require installation of a multiduct system to be shared with others. Details of the installation are subject to department approval.

a. The department shall designate a "lead company" for the system. The lead company is generally the first utility owner requesting occupancy. The lead company is responsible for:

i. Design and construction of the multiduct system.

ii. Maintenance of the multiduct system.

iii. Providing all capital required to construct the multiduct system.

b. Once a multiduct system has been established, the department shall require future occupancies to be located within one of the unoccupied inner ducts of the system. If all inner ducts are occupied, the department may require the establishment of an additional multiduct system.

c. Each occupant of a multiduct system shall share equally in the entire capital costs of the facility. As each new occupant is added to an existing system, the department shall require the new occupant to pay its proportionate share based on the number of inner ducts it occupies.

Noteworthy Point: It is recommended to include or refence the requirement for each tenant in the multiduct to have an approved permit and provide As-Built information and plans that will be included in the asset management system in conformance with ASCE 75-22.

115.20(1) Notice to Department

Within 90 days after the abandonment or removal of all or a portion of an existing utility facility that occupies the primary highway right-of-way, the utility owner shall submit a written notice of abandonment or removal to the department.

The notice shall include:

a. Type of facility.

b. Location of the utility facility by route, county, section, township, range, milepost, and highway stationing, where these references exist.

c. Name of the original utility owner if different than the current owner.

d. Original utility permit number and date of approval, if known.

Noteworthy Point: It should be the Department's determination if a utility may abandon or remove all or a portion of the utility facility when it is retired or out of use. It is recommended to define the difference in abandoned and idled/in in use facilities. Abandoned normally indicates the utility relinquishes its ownership and responsibilities. This leaves the DOT dealing with the old lines in conflict with new projects and any environmental concerns that exist with the old utility lines. It is recommended to add policy for the DOT determining and approving if a facility can be abandoned or only partially approving if left in place and any related condition to abandonment.

115.25(306A)

Utility facility adjustments for highway improvement projects

Rules 761—115.26(306A) to 761—115.30(306A) establish administrative procedures for utility facility adjustments made necessary by state highway improvement projects. The purpose of these procedures is to adjust utility facilities with minimal delays or added expense.

Noteworthy Point: The addition of a requirement to **Buy America and Build America** should be included in this section conveying the consequences of non-compliance for both the DOT and the Utility.

115.27(5) Acceptance of Preliminary Work Plan.

The department shall notify the utility owner of the department's acceptance of the utility owner's preliminary work plan.

a. If the preliminary work plan is not acceptable to the department, the department shall notify the utility owner that the plan is not acceptable and provide a detailed explanation of the problem.

b. The utility owner shall submit a revised preliminary work plan to the department within 30 calendar days after its receipt of notice from the department that the plan was not acceptable.

c. The department shall review the revised preliminary work plan. If the work plan is acceptable, the department shall notify the utility owner of the department's acceptance of the plan.

d. If the work plan is still not acceptable, the process set out in 115.27(5) "a" to "c" shall be repeated.

Noteworthy Point: This section allows the possibility of an endless "do loop" if a Utility is uncooperative or is unresponsive to requests from Iowa DOT to make acceptable revisions to the work plan. A clear definition of an uncooperative utility should be referenced and actions to be taken per section 115.4(11).

115.28(4) Acceptance of Final Work Plan.

The department shall notify the utility owner of the department's acceptance of the utility owner's final work plan.

a. If the final work plan is not acceptable to the department, the department shall notify the utility owner that the plan is not acceptable and provide a detailed explanation of the problem.

b. The utility owner shall submit a revised final work plan to the department within 30 calendar days after its receipt of notice from the department that the plan was not acceptable.

c. The department shall review the revised final work plan. If the work plan is acceptable, the department shall notify the utility owner of the department's acceptance of the plan.

d. If the work plan is still not acceptable, the process set out in 115.28(4)"a" to "c" shall be repeated.

Noteworthy Point: This section allows the possibility of an endless "do loop" if a Utility is uncooperative or is unresponsive to requests from Iowa DOT to make acceptable revisions to the work plan. A clear definition of an uncooperative utility should be referenced and actions to be taken per section 115.4(11).

115.30(6) Failure to Provide a Work Plan or to Adjust Utility Facilities

If a utility owner fails to provide a work plan, fails to comply with the accepted work plan, or fails to complete the adjustment of its facilities, and its failure to perform results in a delay to the highway project or causes damages to be incurred by the department or the department's highway contractor, the utility owner is liable for all costs and damages incurred as a result of its failure to perform. The department may withhold approval of permits for failure to comply with the requirements of these rules.

Noteworthy Point: This section allows the possibility of an endless “do loop” if a Utility is uncooperative or is unresponsive to request from Iowa DOT to make acceptable revisions to the work plan or perform the relocation according to the Utility Relocation Plan. A clear definition of an uncooperative utility should be referenced, and all the alternatives of section 115.4(11) should be referenced, not just the withholding of permits.

Iowa Administrative Code

480 Underground Facilities Information

480.1 Applicability — prohibition.

This chapter applies to any excavation unless otherwise provided by law. A person shall not engage in any excavation unless the requirements of this chapter have been satisfied.

Noteworthy Point: It is recommended to amend this code to include a response from utilities for the design and planning of projects.

Recommendations

Other recommendations for additions to the Utility Accommodation Policy would include the following for:

Occupation of ROW

A Review of existing utility locations and designating more location assignments for different types of utilities on the ROW. Examples include which utility is preferred to be closest to the ROW and which may be closer to the roadway for Longitudinal occupations.

Requiring ownership markers with contact information at the ROW line for all utility crossings and designated intervals on longitudinal installations.

Highway Project Considerations and Coordination

- Develop a **Master Utility Agreement or Memorandum of Understanding** which encourages cooperation and collaboration in the DOT/Utility relationship and sets the expectation for responsibilities during a Highway Project.
- Providing a discussion of the various type of Projects and the impacts on the relocation of utilities in the policy.
- Consider setting a **Ready to Let Date (RTL)** for the utilities to be clear of proposed construction. Setting a date three to four months ahead of the Letting Date allows the highway contractor to bid on the job with minimum risk and save cost.
- Require **Subsurface Utility Engineering (SUE)** and Utility Investigations in accordance with the ASCE/CI/UESI 75 to identify conflicts including the use of a Utility Matrix to be provided to the Highway Contractor to minimize risks.
- Require the **Avoid, Minimize, and Accommodate (AMA)** approach in the highway project design phases.
- Requiring a Utility Management Plan for utilities not relocated early and required contractor phasing in specifications.
- A **Value Engineering approach to project design evaluating the Total Project Cost** including the relocation cost of utilities, regardless of DOT responsibility to reimburse or not.
- Utility Conflict Management **must include all disciplines**, such as Drainage, Traffic, ITS, Construction Phasing, Bridge, and Construction
- The possibility of including the utility relocations in the highway contract if design phases or schedule would realize a benefit.
- Capturing Utility Easement data encumbering the ROW and adjacent to the ROW for future projects and cost estimating.

Construction and Maintenance of the Utility Facility

- Provide the requirements for including a utility relocation in the highway contract.
- Providing names/signs for the utility owner on the utility project
- Contractors on the project should have Identification information on their trucks.
- Not allowing the cutting of pavement or riprap without an exception request and encouraging a bore in most cases.
- Addressing preservation of trees, vegetation, and cleanup
- Consequences of noncompliance
- Requiring the contractor/utility to have the approved permit and plans on site during all construction activities.
- Incentives, currently Iowa can only pay for 2nd relocates due to a redesign.
- Obtain the authority to acquire utility easements in the name of the state to assist in the relocation of utilities and establish a utility corridor.

Exceptions

It is recommended an **Exception Process** to the Utility Accommodation Rules be developed to clarify the recommendation and approval requirements of an exception to these rules. Normally exceptions are approved at a State Utilities Manager level if the proposed facilities or the work does not:

- Create a hazard or safety issue,
- Impact the roadway or traffic flow,
- Have the potential to damage adjacent facilities, or
- Impact future projects of the state.

Executive Action Summary

Executive Action Summary

Iowa DOT must implement design and construction practices (which include the **ASCE 38 *Standard Guideline for Investigating and Documenting Existing Utilities***) to address the fact that Iowa DOT ROW is predominantly occupied with poorly documented utilities. Standardized professional utility investigations will tackle the sins of the past. All future utility installations in Iowa DOT ROW must be documented through a permitting process that includes deriving standardized digital as-built data (in accordance with the **ASCE 75 *Standard Guideline for Recording and Exchanging Utility Infrastructure Data***) as utilities are designed and installed.

All utility data collected for design and during construction, and for new utility installations, should be managed within a Utility Federated GIS Collaboration Portal (utility asset management system), enabling individual utility owners to systematically improve their internal systems of record (GIS inventories), securely share data in real-time, and Iowa DOT to invoke Utility Engineering practices that eliminate risk and optimize project delivery while keeping the public welfare paramount over all other interests.

A Phased Approach

1. Adapt utility ROW occupation permitting process into a full utility infrastructure management system for controlling and capturing standardized data on all proposed and executed changes within IADOT ROW. (Commercial-off-the-shelf (COTS) applications are available for configuration and several other state agencies have already implemented similar solutions.)
2. Implement protocols and standards compliant with ASCE 75 for utility infrastructure owner data management and data sharing. (Iowa DOT has already built out an ASCE 75 compliant layer in their enterprise GIS and is developing data submittal language.)
3. Establish a Federated GIS Collaboration Portal at IADOT (later OCIO) for secure data sharing between authorized stakeholders. Many GIS applications have OGC compliant web service protocols, and enabled for broadcasting in a live, secure manner. (See Technology Modernization and Recommended Implementation section below.)
4. Implement guidelines for contractors to capture standardized utility infrastructure as-built data (compliant with ASCE 75) in the field during new installations or when exposed. (Iowa DOT has draft language under development.)

A Phased Approach

5. Implement guidelines for SUE providers to submit ASCE 38 data collected for project development. ASCE 38 data to be pushed into digital format compliant with ASCE 75.

    a. Establish plan for ASCE 38 compliance on projects – this may be addressed through: a) SPR-RE22(011)-8H-00 *Best Practices for Utility Management in the Public Right of Way*, and b) SPR-RE22(012)-8H-00 *Project Development and Utility Coordination as a Partnership*.

    b. Establish CADD attribution standards for utilities on all As-built, SUE and Design CADD submittals.

6. Adopt Recommended Legal and Policy Modifications (see following section)
7. Adopt Enforcement Policies (see Enforcement Policies section in Final Report)
8. Adopt Utility Engineering Practices (see Utility Engineering section in Final Report)

Modernizing Utility Infrastructure Management

Report Number: SPR-RE22(013)-8H-00