Utility Location and Project Design

The Underground Utilities Event

You call for your 811 ticket

You wait the required mark-out time

You arrive at the job site to find no marks? Or you're excavating outside the tolerance zone and suddenly there's an unknown facility? Is it live or abandoned?

You call for remarks

Your crew and iron sits and waits

No facility owner responds to your re-mark call

On your second call, you call 811 again as well as the facility owner

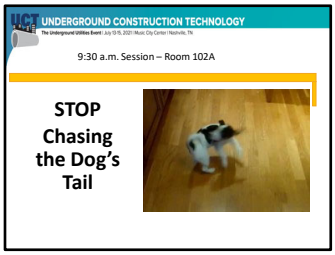
Finally, after a few hours you're back to digging

Iron and crew were on the clock not making money!

Little to no chance of recovery of downtime

I call this "Chasing the Dog's Tail"

Raise your hand if this scenario is too familiar to you?



Accurate utility information and timely relocation when required is essential to EVERY highway-heavy project.

Whether this occurs affects:
Cost;
Time to complete; and
And whether work can be safely performed.

So <u>how bad</u> is the current situation?

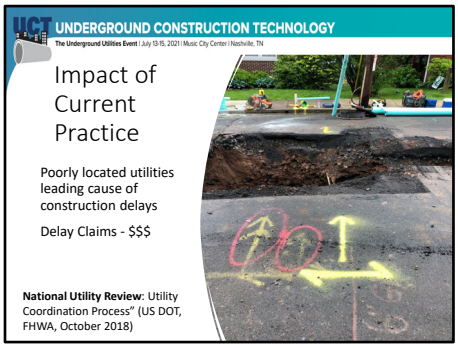
Impact of Current Standard Practice

"National Utility Review: Utility Coordination Process" (US DOT, FHWA, October 2018).

- 15% of federal aid projects report utility delays.
- Utilities repeatedly identified as one of top causes of cost increases and schedule delays.

"Avoiding Delays During the Construction Phase of Highway Projects" (NCHRP, October 2001)

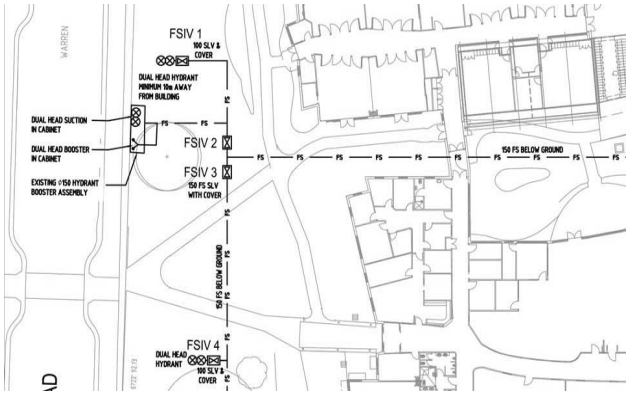
- Unforeseen and incorrectly located utilities were a leading cause of construction delays.



Utility Location and Project Design

Standard Practice

- Designer sends letter to utilities with project map
- Utility provides information including inaccurate horizontal location and no vertical location
- Owner/Designer does not obtain accurate utility location
- Owner/Designer cannot determine if there is a utility conflict and/or if utility conflict requires utility relocation or project redesign
- Project is improperly designed and bid without sufficient location and relocation schedule
- During construction phase, the Contractor potholes based on One Call markers to confirm utility locations
- Project is delayed due to late utility relocation/project redesign
- Project requires redesign due to utility conflicts
- Contractors incur extra costs to work around no-marked/mismarked utilities
- Safe workplace threatened



Utility Location and Project Design

PA Has Mandatory Reporting by all Stakeholders
Mandatory reporting paints a different picture than CGA voluntary reporting.

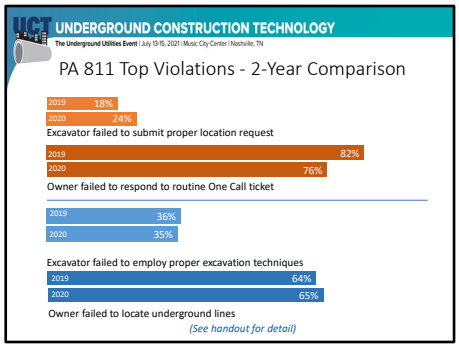
The 2020 PUC violations showed a similar facility owner vs excavator trend as 2019 figures.

Both years show facility owners are in violation of the 811 law at 3 to 1 on the first figures and 2 to 1 on the second set

NOTE:

Facility Owner numbers for “failed to respond to routine One Call ticket” was lower in 2020 because local govt pleaded for forgiveness and won.

The excavator numbers also include facility owners self-performing work and homeowner violations, which if you exclude these numbers drops the professional excavator numbers even lower.



Utility Location and Project Design

Three-Fold Focus

Ensure owners can better identify utilities at design phase
Provide for timely utility relocation when required
Help ensure contractors are paid extra when project or facility owners fail to properly perform this work

Examining improvement areas
Owner Obtains Accurate and Complete Utility Information
Owner Identifies Utility Conflicts
Owner Designs Project to Avoid Conflict or Determine Need for Relocation (i.e. Utility Relocation Plan)
Owner Timely Schedules Relocation (i.e. Utility Relocation Schedule)
Owner Utilizes Legal Tools to Obtain Timely Utility Relocation

Owners/Engineers cannot rely on utilities to provide accurate and complete information at Design Phase.
Many assume utility companies know the location of their underground utilities, BUT...

- The utility may have general (but imprecise) idea of x and y location, but little or no information on vertical ("z" plane).
- Many utilities on highway rights of way have been in place for many years (20 to 30+ years).
- Utilities did not and do not keep accurate records of the location of their utility lines.
- Accurate records have not been a requirement placed on utility companies.

One reason why utility conflicts are unknown, and thus increase project risk, is that few DOTs use subsurface utility engineering (SUE) as a common practice.
Contractors, utility owners, and DOT staff all indicated that as-built location data are unreliable and, at best, may provide a general indication of utility locations in the x any planes, with no z component or depth.

- One-Call services generally have a reliability of +/- 2 feet on either side of a paint line, but One-Call does not provide any depth data. This means designers are only provided an "indication" that a utility conflict may exist within the design plans. Per 23 CFR 645.113, on federally-assisted projects, State DOTs must prepare utility relocation plans when utilities conflict with highway project. To develop such a plan, the agency must locate potentially conflicting utilities.

The only way to know if there is a conflict is to know accurate location.

- Accurate means the utility information as surveyed includes the x-y-z horizontal or vertical coordinates.

Utility Location and Project Design

***ASCE Standard 38-02* defines quality of utility location efforts and prescribes practices to incorporate into plan documents.**

Grades information quality on an A to D scale.
Most current efforts would grade out at a "D" level.

Standard 38-02 provides a detailed description of the steps to improve SUE and how to incorporate this into project plans.R

Raise Level From "D" to "A"

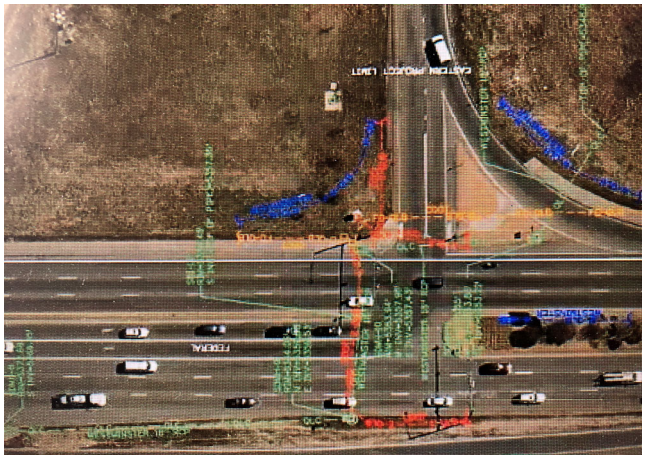
Quality Level D:
Review utility records (OneCall, Clerk's Office, Utility Owners)
Develop composite drawing of utilities

Quality Level C (all of the above, plus):
Compare utility records to surface utility features
Survey surface features and determine discrepancies in utility records and surface features

Quality Level B (all of the above, plus):
Use surface geophysical tools to locate facilities, mark for survey
Survey location of utilities and incorporate *surveyed* utilities into project plans
Geophysical tools include pip and cable locators, resistivity measures, metal detectors, ground penetrating radar, infrared, etc.

Quality Level A (all of the above, plus):
Locate utility facilities via survey and geophysical tools to within 15 mm vertical location and within horizontal needs of project
Excavate Test Holes
Determine x, y, and z location of utilities, elevation of existing grade over utilities, diameter of utilities, utility material composition

Notice QLs are depicted on mapping



Benefits of accurate utility information:

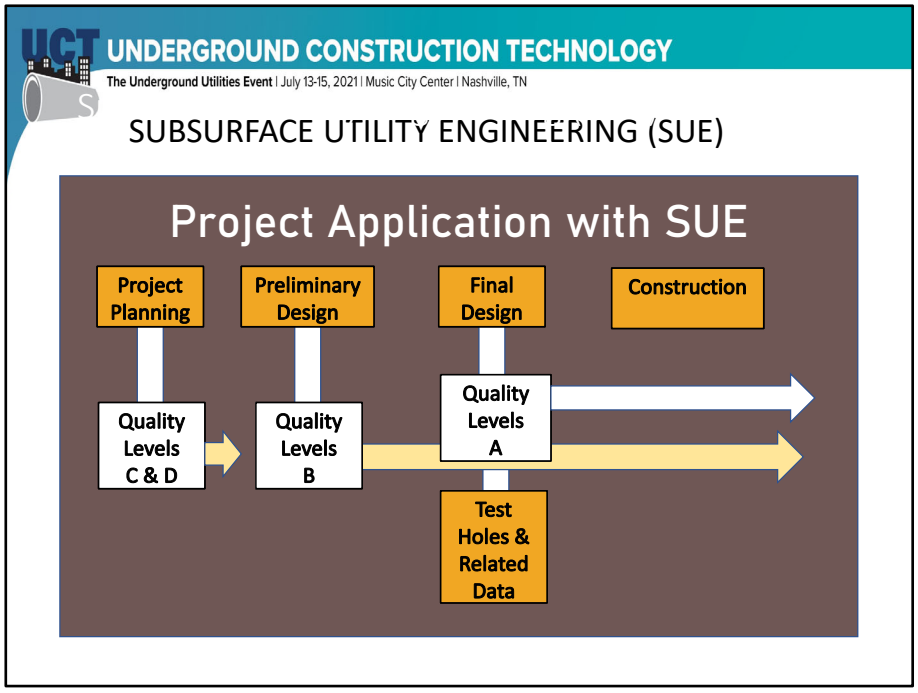
Avoid Contractor Claims for Additional Time and Compensation

Lower Bids

Limiting Impact of Delay on Local Businesses

Projects that are not federally-assisted DOT SHOULD conduct SUE at design phase.

Any public or private project that requires an Engineers stamp should use SUE



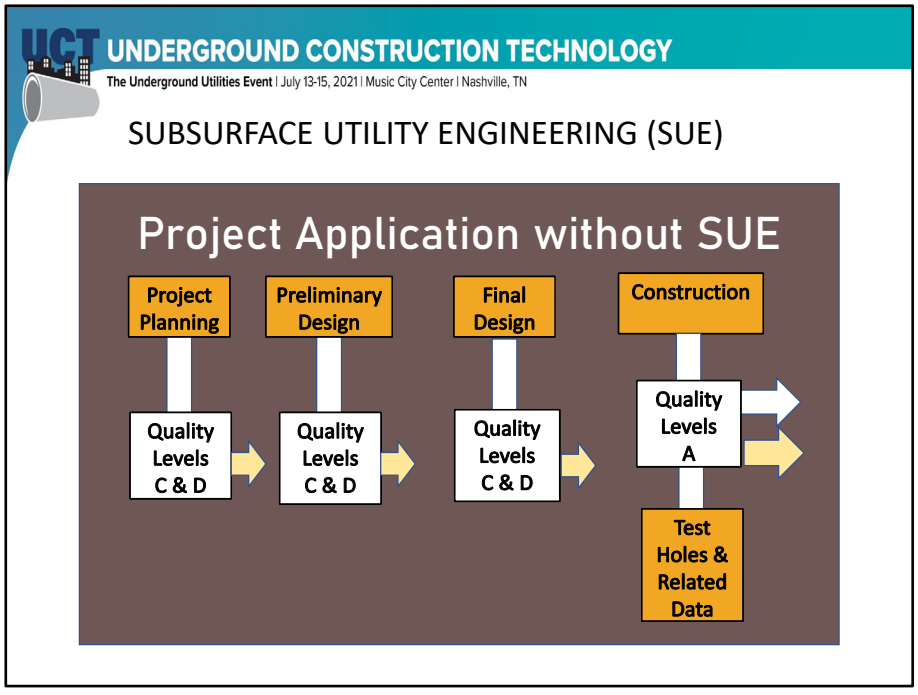
Benefits of accurate utility information:

Avoid Contractor Claims for Additional Time and Compensation

Lower Bids

Limiting Impact of Delay on Local Businesses

So even on projects that are not federally-assisted DOT, ALL project owners SHOULD conduct SUE at design phase.



Utility Location and Project Design

Improve the quality of designs in the design phase

Reliable and Comprehensive plans

Reliable and Comprehensive utility plans

Ensure timely utility relocations - specifications include utility relocation schedule

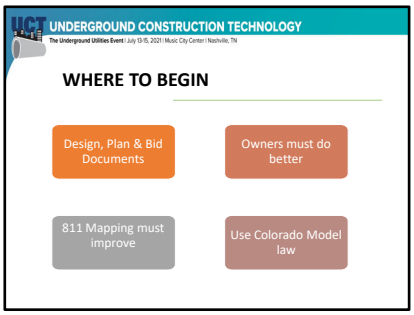
According to interviews with DOT officials, primary reason DOTs don't accurately locate utilities is increased time and costs during the design phase.

BUT… several studies have concluded that the cost of detailed utility investigations more than offset the impacts of inaccurate utility information.
Purdue University study found that construction projects saved $4.62 in expenditures for every $1.00 spent on SUE. (Penn State & Montreal studies show savings too)

Owners Must Do Better:

Evidence of negligence could include:

- Failure to use easement agreements
- Failure to follow DOT directives
- Failure to use regulatory, statutory and/or county ordinance authority



Use Colorado Model Law -<u>State Regulations / Statute</u>

An effective tool that may be pre-existing or could be created as a regulation or statute.

Some states have already enacted utility-related laws with SUE language.

811 Mapping Must Improve - Benefits of Potholing to Determine Exact Horizontal and Vertical Location of Existing Utilities
Satisfies a state or federal law
Allows project to be properly designed
Allows for timely completion
Cheaper to complete
Coordination of construction projects – PA Coordinate

Technology is Advancing – most 811 systems are behind in their technology

GIS

Live Satellite Imaginary rather than years old Google images or other outdated imaginary

Ground Penetrating Radar

3D Modeling

Future Autonomous Excavator Equipment

Utility Location and Project Design

Any public or private project that requires an Engineers stamp should use SUE

We simply cannot continue to push everything down the line to the last Stakeholder

To do the same practice over and over and expect a different outcome is the definition of insanity – Albert Einstein

We can do much better!

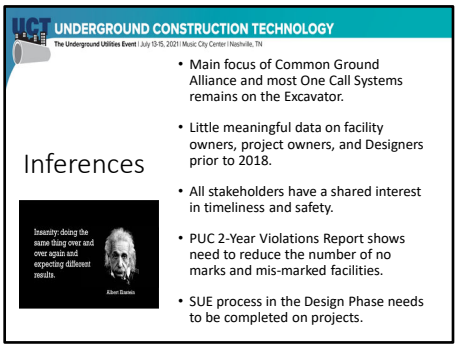
It's your turn to help bring about a cultural change to damage prevention through smarter utility designs

Attend events promoting SUE, like this event today

Talk to your colleagues, project owners, engineers and legislators about SUE in the design phase

Join an association that is promoting SUE – there are many – NUCA, UESI, ASCE, AGC, SUEA, APWA - the list is growing

The only way you will stop chasing the dog's tail is to change the direction of the dog's head – point it toward something better than the current 811 practices



Utility Location and Project Design

Time

Dollars –

Project impact

Economic impact to businesses and the community

Safety