


UNDERGROUND CONSTRUCTION TECHNOLOGY
THE UNDERGROUND UTILITIES EVENT | JANUARY 25-27, 2022 | FORT WORTH, TEXAS








Key to Damage Prevention Starts with SUE


01/26/2022
Key to Damage Prevention Starts with SUE
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THE PROBLEM: Unreliable Utility Information

Change Orders

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 **Unreliable Utility Information Affects Project Planning / Design**



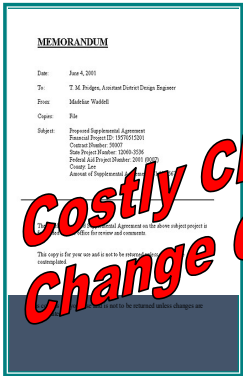




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 **Unreliable Utility Information Affects Project Funding and Construction Cost**









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Unreliable Utility Information Affects Right of Way Acquisition



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Unreliable Utility Information Affects Health & Safety Risks



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A Proven Solution: Subsurface Utility Engineering (SUE)



**Civil Engineering
Geophysics
Geotechnical
Survey
Data Management**

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SUE is important because it has been proven to:

Reduce damages

Resolve conflicts prior to construction

Avoid unnecessary utility relocations

Save Lives

Saves Money

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SUE: The Delivery Process

Currently, the project delivery of SUE includes three major phases:

- Designating
- Locating
- Survey & Deliverables

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• DESIGNATING

*The process of using “**all applicable**” surface geophysical methods to interpret the presence of a subsurface utility and to mark its **approximate** horizontal position (its designation) on the ground surface. (Note: Utility owners and contractors often call this process “locating.”)*



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• LOCATING

The process of exposing and recording the precise vertical and horizontal location of a utility, through the use of vacuum excavation. It is non-destructive and typically more time and cost efficient than other conventional digging methods.



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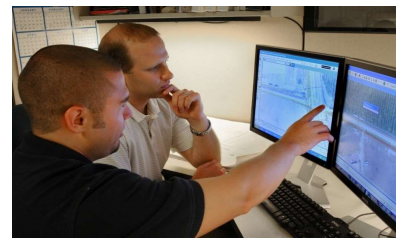


• SURVEY & DATA DELIVERABLES

Utility information obtained by designating and locating and typically that data is incorporated into survey and geospatial platform, such as CAD(2D/3D) and GIS

Activities include:

- updating existing utility drawings
- Depiction on owner's design plans
- Creation of "composite" utility maps
- Conflict analysis and resolution



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ASCE Standard - SUE Quality Levels D, C, B, A



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ASCE Quality Level D – “Records Research”

Information comes solely from:

- Existing utility records,
- Individual recollections
- 811
- Field review
- Public Service Commission



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ASCE Quality Level D – “Records Research”

Information comes solely from:

Governmental Permitting Agencies

Web-base geospatial search



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ASCE Quality Level C – Field Research”

Involves surveying visible above ground utility facilities, i.e. manholes, valve boxes, etc.

Correlates survey data with existing utility records plans



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ASCE Quality Level B – “Designating”

Assessing and using applicable surface geophysical technologies to determine the existence and approximate horizontal position of underground utilities



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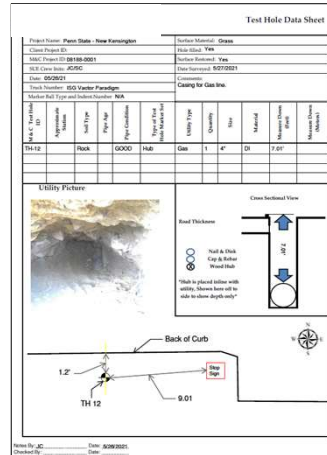


ASCE Quality Level A – “Locating”

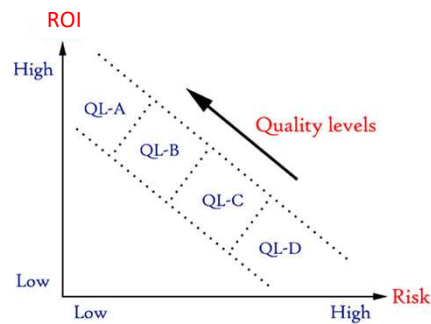
Using non-destructive excavating equipment at critical points to determine the precise horizontal and vertical position, type, size, condition, material and other characteristics of underground utilities



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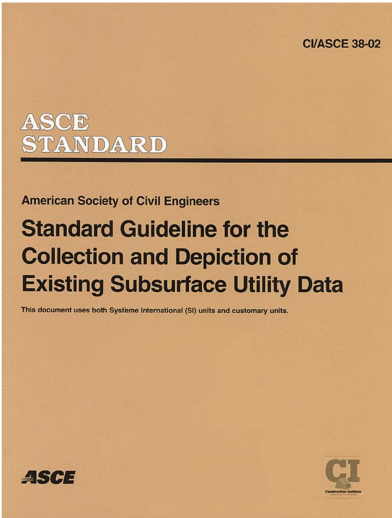


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CI/ASCE 38-02

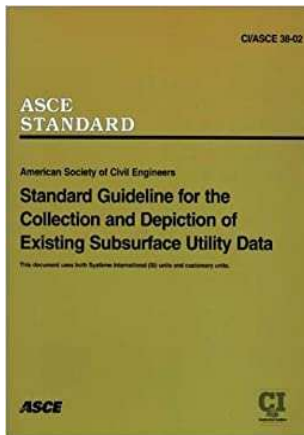
2022 Scheduled Update

Other SUE Standards

- Canada
- Australia
- United Kingdom
- China
- Malaysia
- Ecuador

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**How Standards Compliment
2002**

ASCE Standard Guidelines for the Depiction of Existing Subsurface Utilities

resolves issues with poor records on **existing** utilities.

(Resolves Symptoms)

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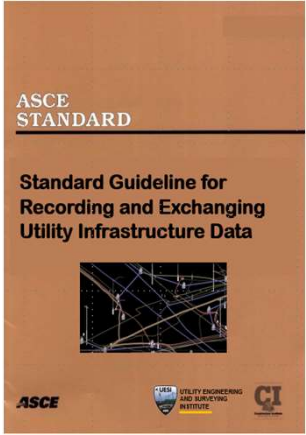

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How Standards Compliment

2022



ASCE *Standard Guideline for Recording and Exchanging Utility Infrastructure Data* resolves issues with poor as-built records on **new** or **exposed** utilities.

(Halts Cause)

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Industry Standards and Guidelines

Federal Highway Administration (FHWA)

American Association of State Highway and Transportation Officials (AASHTO)

American Society of Civil Engineers (ASCE)

Department of Defense(DOD)

Federal Aviation Authority (FAA)

American Public Works Association (APWA)

National Transportation Safety Board (NTSB)

State DOT's, Cities, Counties and Utility Owners

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SUE: Cost Benefit Study (2000)

**COST SAVINGS ON HIGHWAY PROJECTS
UTILIZING
SUBSURFACE UTILITY ENGINEERING**

Prepared by
Purdue University
Department of Building Construction Management

January 2000

Prepared for the
Federal Highway Administration
Office of Program Administration
Washington, D.C.

FHWA Contract Number DTFH61-96-C-00090

- **Purdue University**
- **Commissioned by Federal Highway Administration (FHWA)**
- **\$4.62 Return on \$1.00 Investment**

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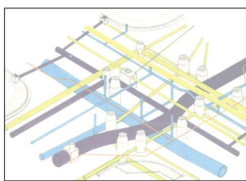



SUE: Cost Benefit Study (2005)

- **University of Toronto**
- **Commissioned by Ontario Sewer and Watermain Contractors Assoc.**
- **\$3.41 Return on \$1.00 Investment**

**SUBSURFACE UTILITY
ENGINEERING IN ONTARIO:
CHALLENGES & OPPORTUNITIES**
A SUMMARY OF MAIN FINDINGS

Centre for Information Systems
in Infrastructure & Construction (I2C)
Department of Civil Engineering,
University of Toronto




Hesham Othman, M.A.Sc.
Tamer E. El-Daraby, Ph.D.

October 2005

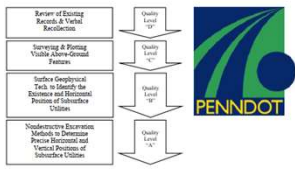
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SUE: Cost Benefit Study (2007)

- Penn State University
- Commissioned by PennDOT
- **\$22.20 Return on \$1.00 Investment**



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

PENNDOT RESEARCH

SUBSURFACE UTILITY ENGINEERING MANUAL
PennDOT/MAUTC Partnership, Work Order No. 8
Research Agreement No. 510401

FINAL REPORT
August 20, 2007
By S. K. Sinha, H. R. Thomas, M. C. Wang and Y. J. Jung

PENNSYLVANIA

Pennsylvania Transportation Institute The Pennsylvania State University
Transportation Research Building University Park, PA 16802-4718
(814) 865-1891 www.gti.psu.edu

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SUE: Industry Affiliation

- Subsurface Utility Engineering Association
- Utility Engineering Survey Institute




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Colorado Revised Statutes Title 9, Section 1.5

- Passed in 2018 as Senate Bill 18-167



COLORADO
Department of Transportation

- SUE required at the project owner's expense
- Defined SUE required project with certain criteria

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Colorado Revised Statutes Title 9, Section 1.5

The project involves a construction contract with a public entity, as that term is defined in section 24-91-102;

The project involves primarily horizontal construction and does not involve primarily the construction of buildings;

The project:

- A) has an anticipated excavation footprint that exceeds two feet in depth and that is a contiguous one thousand square feet; or
- (B) involves utility boring.

(For purposes of this subsection (6.8)(c), The term "two feet in depth" does not include rotomilling, and the contiguous one thousand square feet does not include fencing and signing projects.)

The project requires the design services of a licensed professional engineer

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Colorado Revised Statutes Title 9, Section 1.5

- Created SUE ticket in 811 system in addition to design ticket and excavation ticket
- Utility Owners have 10 business days to supply utility information for SUE ticket
- ASCE 38 must be followed for utility depiction
- Quality Level “B” shall be attempted for all utilities within the proposed minimum excavation or a reasonable rationale by a licensed PE must be given for not doing so

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Colorado Revised Statutes Title 9, Section 1.5



COLORADO
Department of Transportation

- Quality Level “A” must be performed at potential conflict points of the installation of gravity fed systems

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Pennsylvania Law on SUE

- PA - 1st state to add SUE language to One Call law (PA & CO only 2 States with SUE requirements)
- No PA enforcement prior to 2018 when enforcement moved to PUC
- Only Projects >\$400,000
- Includes both public and private work
- Vague language – “when practicable” and “sufficient quality level”
- Reference to ASCE 38 Standard is in the Definition Section

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Subsurface Utility Engineering and



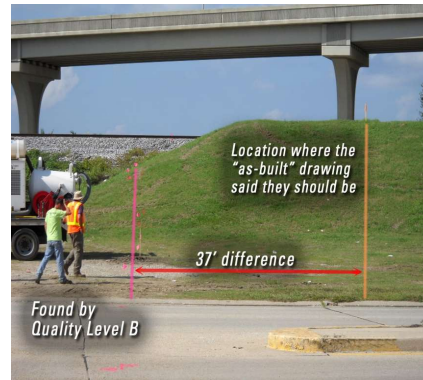
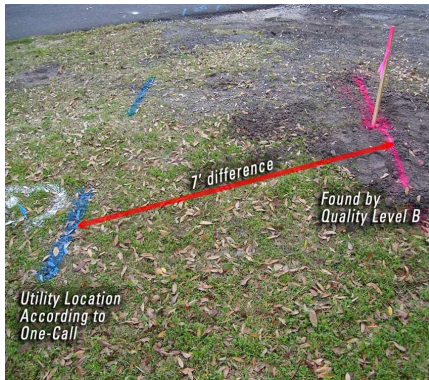
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SUE vs. 811



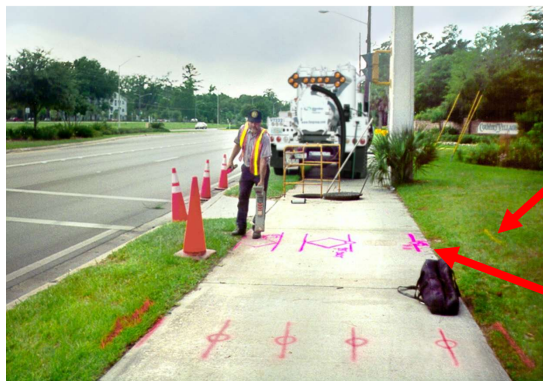
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SUE vs. 811



ONE-CALL MARK
INDICATING GAS
LINE

ASCE QUALITY LEVEL B
MARK INDICATING GAS
LINE

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Strategic Highway Research Project Study (excerpts)

Designator: Possesses all utility owner records.

Locator: Possesses only those records for the utility owner for which he/she is under contract.

Designator: Finds and marks all utilities.

Locator: Only marks some utilities – doesn't have advantage of seeing all parts of the puzzle. For instance, unrecorded utilities, outdated records, abandoned utilities, unknown utilities, multiple non-encased wires, etc. cause identification confusion.

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Strategic Highway Research Project Study (excerpts)

Designator: Has realistic time constraint for finding and marking utilities.

Locator: Is under severe time constraints for getting utilities marked.

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Strategic Highway Research Project Study (excerpts)

- Designator: Has many pieces of equipment on-site or readily available.
- Locator: Has limited equipment available.
- Designator: Maps large area, allowing better familiarization with utilities at site.
- Locator: Usually only responsible for a very small area, making it difficult to see the large picture.

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Strategic Highway Research Project Study (excerpts)

- Designator: Because of large area to be marked and reasonable time allowances, traffic control can be set up, allowing time and security for decision and precision.
- Locator: Usually no time for traffic control. Locator runs between vehicles when safe.

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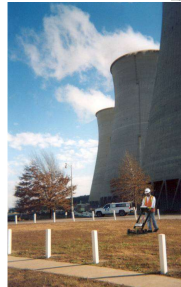
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Not Just for Highways!

- Public Works
- Power Plants
- Private Utility Infrastructure and Facilities
- Oil and Gas Transmission
- Airports
- Military bases
- Railroad / rapid transit
- Asset Management
- Seaports
- Other Industries: health, education, manufacturing, pharmaceutical, etc.

When & Where to Use SUE



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Professional excavator number would be lower if excluded violations for homeowners and facility owners' self-performing excavation work

Failed to Exercise due care to avoid lines 5.4

vs
Failed to Mark, Stake, Locate facilities 2.5 (i)

Failed to Exercise due care to avoid lines 5.4

vs
Failed to Mark, Stake, Locate facilities 2.5 (i)

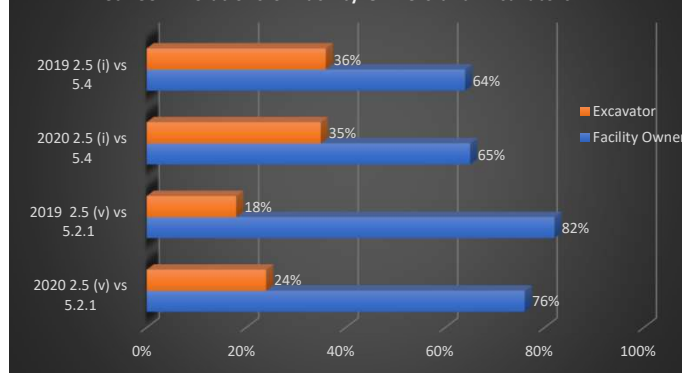
Failed to Exercise due care to avoid lines 5.2.1

vs
Failed to Mark, Stake, Locate facilities 2.5 (v)

Failed to Exercise due care to avoid lines 5.2.1

vs
Failed to Mark, Stake, Locate facilities 2.5 (v)

PA PUC 811 Violations – 2-Year Comparison
Between Violations of Facility Owners and Excavators



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Contractors' Perspective (Part I)

Mis-marks and no marks are increasing under the current 811 process (SEE PA PUC DPC Statistics)

Under PA One Call law the project owner is paying more to have the excavator hand-dig – “scratch and sniff” trying to locate utilities within the excavation zone from inaccurate or no locates

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Contractors' Perspective (Part I)

Contractors are bidding on projects with less design work, which leads to:

- Cutting, damaging, or discovering lines during construction
- Relocations
- Project Delays
- Differing Site Condition Claims
- More Change Orders
- Open cuts that stay open longer
- Reduction in production
- Disruption to businesses, homeowners, and the traveling public
- Environmental releases
- Increased 911 costs for emergency services required under One Call laws
- Property damage from water or gas leaks

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Contractors' Perspective (Part II)

DOES NOT ENCOURAGE SAFETY

Competitive bidding – large volume of bidders for each project

Economic Loss Doctrine prohibits downtime, which is increasing with the number of mis-marks or no marks – provides no right of recovery

- 2009 PA Supreme Court Case
Excavation Technology vs Columbia Gas

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Contractors' Perspective (Part III)

SUE is a proven **standard of care** that creates smarter engineering designs for contractors to bid from

SUE promotes quality level data that contractors can bid with less guess work

SUE **Geophysical and Geospatial** technologies leads to better mapping for future designs

SUE requires more accurate as-builds using GIS technology to within a more precise position than paper as-builds

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Contractors' Perspective (Part IV)

CLOSING:

NUCA National and the Pennsylvania Chapter members want to see the SUE standard of care used on public and private projects as an integral part of the project design phase

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NUCA SUE Effort Over the Past Year

NUCA Convention
 NUCA Texas Virtual Meeting with Contractors
 UESI- Pgh/NUCA/SUEA/ APWA/NULCA/AGC SUE Symposium
 Pittsburgh Water and Sewer Authority (PWSA) meeting
 Utility Technology Council Convention – Guest speaker
 PA Geospatial Board
 PMAA Trade Show
 Virtual Meeting on MUDDI and ASCE 75
 Minnesota 811 Geospatial
 NUCA PA Board of Directors
 ASCE Tech Talk – November 7 – Guest Speaker
 NUCA 811/One Call Forum November 18 & 19 – Coordinator for SUE
 2022 - UCT Convention Panelist on the Contractors' Perspective for SUE -
 January 25, 2022, Ft. Worth, TX

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SUE Future....Now?

ID	Name	Date	Other Attributes
142072173	444616.222	1/25/2021	Real Time Kinematic GPS Survey
142072173	444616.222	1/25/2021	Real Time Kinematic GPS Survey
142072173	444616.222	1/25/2021	Real Time Kinematic GPS Survey

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SUE Future....Now?

- Asset Management
- Geospatial Enhancement
- Augmented Reality (AR)
- Digital Twin

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What has to CHANGE?

- Educate project owners
- Educate, train NUCA members on the Standard of Care
- NUCA and SUEA to work and collaborate on this process for positive change

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What has to CHANGE? Cont'd

- Accountability – Inspect what you Expect
 - CGA – Dirt Report – voluntary reporting
 - PA – Mandatory reporting
- Change other State laws to adopt Colorado Model Legislation
 - Colorado 811 , NUCA & CODOT

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What Can NUCA Do For Its Members?

- NUCA National appoint a SUE Liaison**
- NUCA National hire a SUE consultant with Industry Expertise**
- Develop SUE “As-Build” Procedure and Training for contractors**
- Develop SUE legislative initiatives across the nation**

SUE PRESENTATION - Nick Zembillas 11/18/2021 53

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Case Study Videos

- 1) Pittsburgh Water & Sewer – Bates Street Project
- 2) Puget Sound Energy’s SR-510 Gas Pipeline Project

Roundtable Discussion

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Brenda Reigle
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717.903.2999

Thank you

QUESTIONS / DISCUSSIONS