SAFETY | ENVIRONMENTAL | QUALITY

Substation Safe Entry Training

PROFESSIONAL, FLEXIBLE,
EXPERT SOLUTIONS

Disclaimer

PLEASE NOTE THAT THIS CLASS WILL NOT MAKE YOU THE COMPETENT PERSON. ONLY YOUR COMPANY CAN MAKE THAT DETERMINATION.

Technical and Practical experience are required to become a competent person.

Agenda

- SMG Background and Experience
- Course Overview
- Practice and Feedback
- Closing

Introduction

It is a violation of OSHA rules and substation owner rules to allow an unqualified person to enter a substation. SMG associates who may have need to enter a substation for non-electrical work are required to participate in hazard awareness training to allow them to enter substations. If you do not know if you are authorized to enter a substation, you are not authorized.

General Policies and Procedures

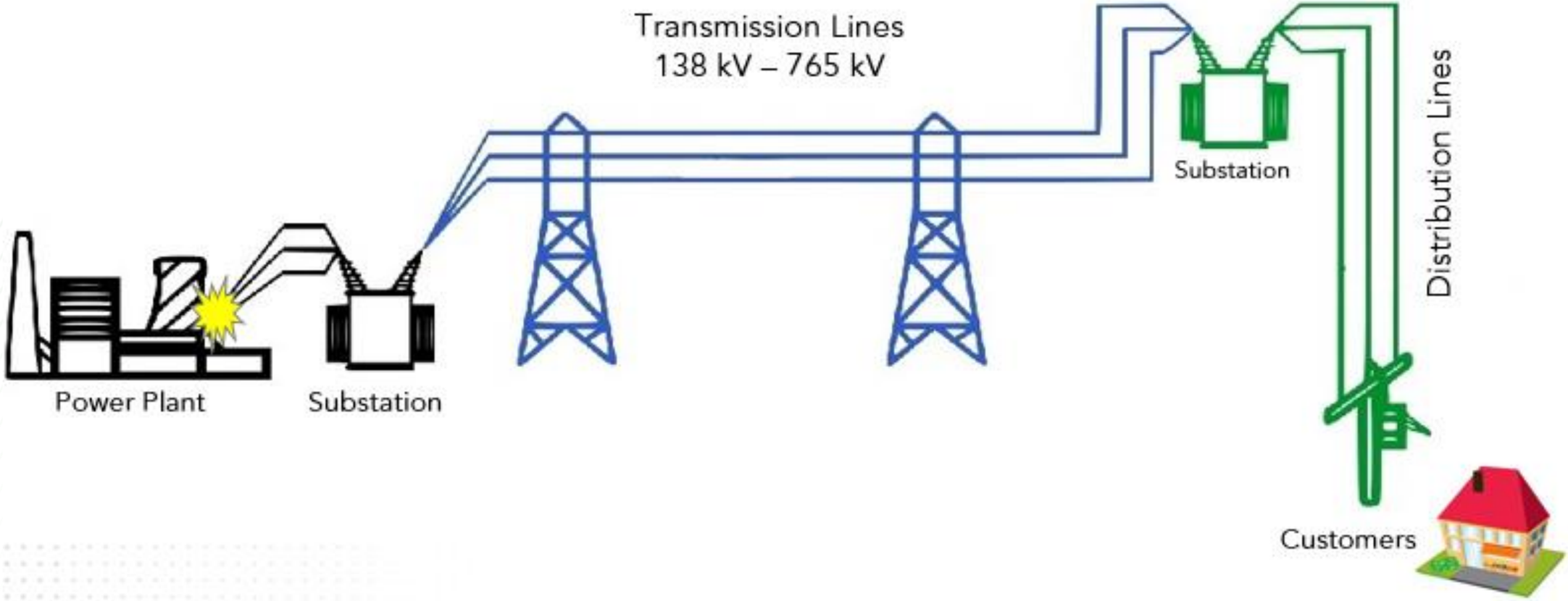
- SMG associates must complete and pass substation safe entry training prior to entering substations
- No associate shall enter a substation without the authorization of the owner
- SMG associates are prohibited with entering unoccupied substations

Learning Objectives

- **Explain** the basic functions of substations and switchyards
- **Recognize and identify** the major equipment used in substations and switchyards
- **Explain** the purpose of different types of substation and switchyard equipment and **describe** how this equipment works
- **Identify** the major parts of a transmission and distribution system
- **Recognize and describe** the function of a substation
- **Recognize and describe** the function of a switchyard

Substations And Switchyards

Simplified Power Systems



Personal Protective Equipment

SMG Hard Hat

Safety Glasses W/ Side Shields

FR HI-VIZ Vest

HRC 2 FR Shirt and Pants

Protective Toe Boots

Walking Into The Station – Access To Stations

- All access into a substation must be controlled, monitored and documented
- Upon arrival, contact the dispatch Authority or Center
- Provide your name, group size, entry date and time, reason for access and estimated work duration
- Call the dispatcher again when leaving to log out

Gate Properly Grounded

1926.966(d) Substation Fences

Conductive fences around substations shall be grounded. When a substation fence is expanded or a section is removed, fence sections shall be isolated, grounded, or bonded as necessary to protect employees from hazardous differences in electric potential.

Walking Into The Station – Structure/Equipment Grounds

- All station structures and equipment must bond to the grid for equipotential
- Work zone protects workers from electric shock
- Differences in potential can be caused by induced voltage, line re-energization, or lightning

Tower Properly Grounded

Keep The Gate Locked

- Ensure the gate is locked as you enter and as you leave
- Locking the gate limits access to qualified and approved personnel
- The lock may remain unlocked only if a designated gate attendant is always present and not performing any other task

Always Lock The Gate

Know How To Recognize Energized Components

Nominal Voltage

- The nominal voltage is the system voltage for which equipment is supposed to operate
- Nominal Voltage can be determined by reading the labels on cabinets, reading the One Line Diagrams, or by contacting the System Dispatcher
- Always verify to correctly reference the Minimum Approach Distance (MAD)

Referencing Voltage On The Cabinet

Minimum Approach Distance (MAD)

- Ensures workers avoid conductive objects near energized parts
- Distances vary based on electrical status
- Insulated tools like hot sticks or gloves protect against MAD violations

Employee Maintaining MAD With Insulated Hot Stick

Minimum Approach Distance (MAD)

NON-QUALIFIED ELECTRICAL WORKERS	
Voltage (kV) Phase to Phase	**Minimum Approach Distance (MAD)**
<50	10 ft.
69	11 ft.
138	13 ft.
230	16 ft.
345	20 ft.
500	25 ft.
765	35 ft.

Transformers

- Transformers change voltage levels between high transmission voltages and lower distribution voltages
- Cabinets contain electrical, mechanical and high-pressure gas
- Keep hands and tools outside of the fan guards
- Report equipment leaks to the system dispatcher immediately

Transformers (Cont.)

Bushings

Neutral

Control Cabinet

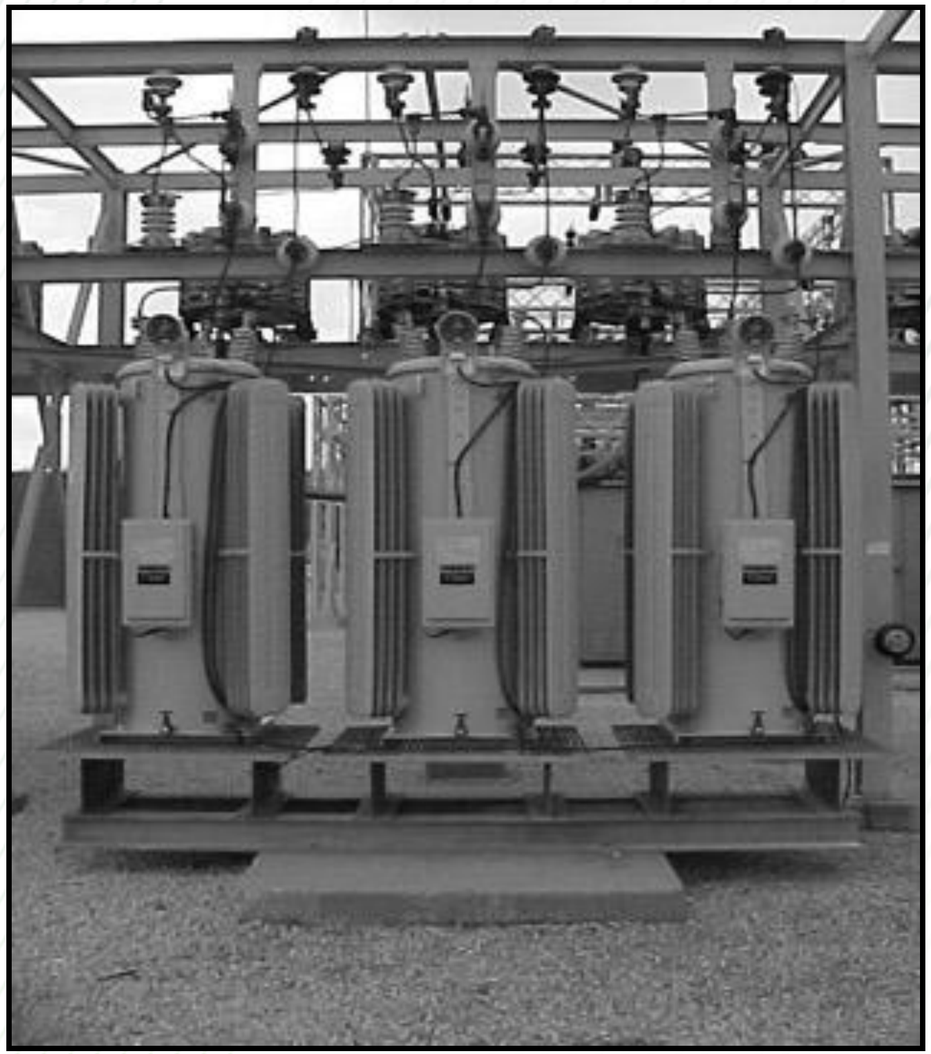
Oil Containment PIT

Circuit Breakers

- Breakers are used to interrupt any short circuits or overload currents that may occur on the network
- Control cabinets should only be opened by authorized personnel

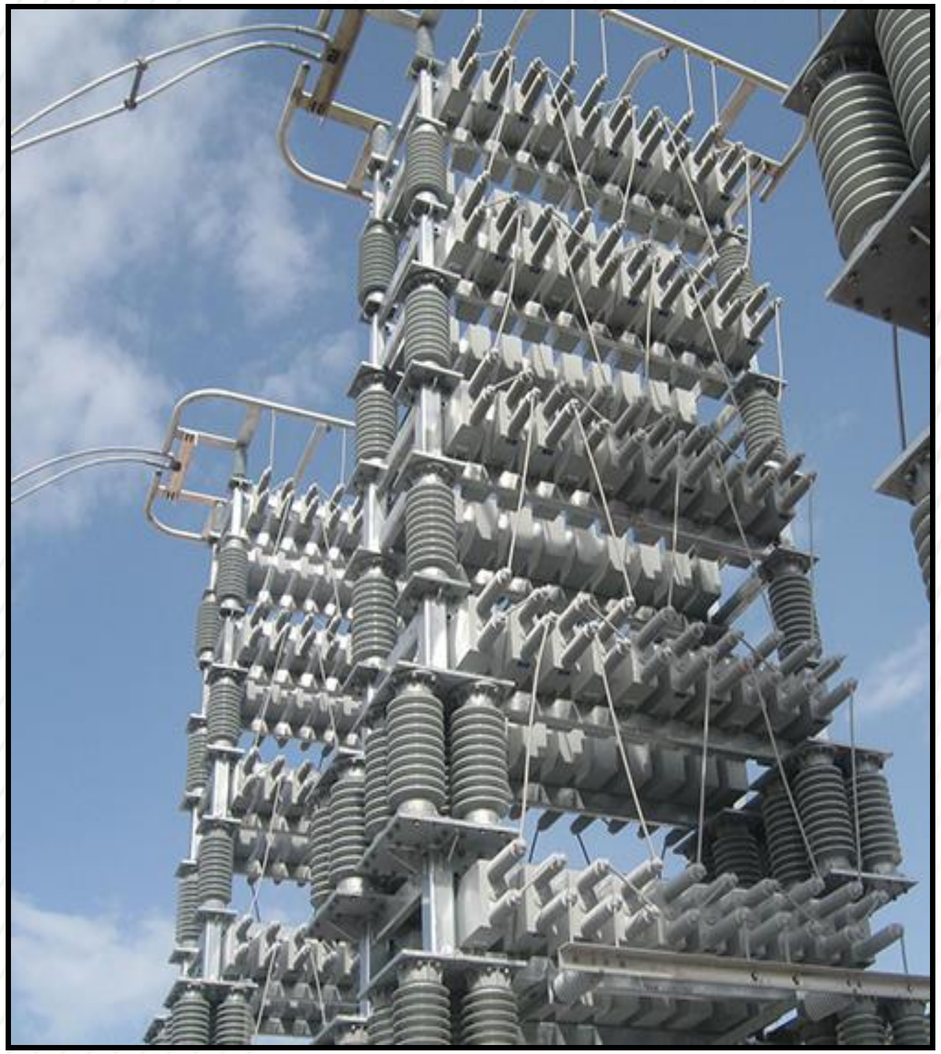
Regulators

- Regulators raise or lower the voltage on the distribution line to provide a more or less constant voltage as the amount of load on the line changes
- Low to ground
- Avoid contact



Capacitator Bank

- Capacitors are used to control the level of the voltage supplied to the customer by reducing or eliminating the voltage drop in the system
- Stored capacitors can contain an electrical charge if the circuit is not shorted



Electrified Fence

- Fence used to protect equipment from wildlife
- Only enter when accompanied by station personnel and verify the switch is in the ‘off’ position

Control Buildings - Inside

- The substation control house contains switchboard panels, batteries, battery chargers, supervisory control, power-line carrier, meters, and relays
- The control house provides all weather protection and security for the control equipment
- Walk with your hands in your pockets to prevent incidental contact

Control Buildings - Batteries

- The batteries are present for backup or uninterruptible power systems
- Keep your distance in the case of hydrogen gas fumes and sulfuric acid
- Ensure the caps are present along the top of the batteries to prevent shock

Vehicles In The Station

- Always park outside the station, if possible, and walk in to avoid hazards
- If parking in the station, abide by any delineated drive paths established by the utility or current contractor
- Remember SMG's **"Circle for Safety"** and utilize your cone

PLANNING

KEEP DISTANCE FROM EQUIPMENT

RECOGNIZE HAZARDS

Summary

Key Takeaways

You now know:

- Substations play a crucial role in the transmission and distribution of electrical power, ensuring efficient and reliable energy flow
- Having the proper training and being familiar with equipment such as transformers and circuit breakers is important for ensuring safe and efficient operations
- The purpose of each piece of equipment’s role, such as voltage regulation or fault protection, ensuring system stability
- Recognizing the key components of the transmission and distribution system helps connect substations to the larger electrical grid

Quiz Time!

Quiz

You have reached the end of the Materials Handling training.

You will now take a quiz to demonstrate your knowledge.

To pass, you must receive a **70%**. Good Luck!

Knowledge Check

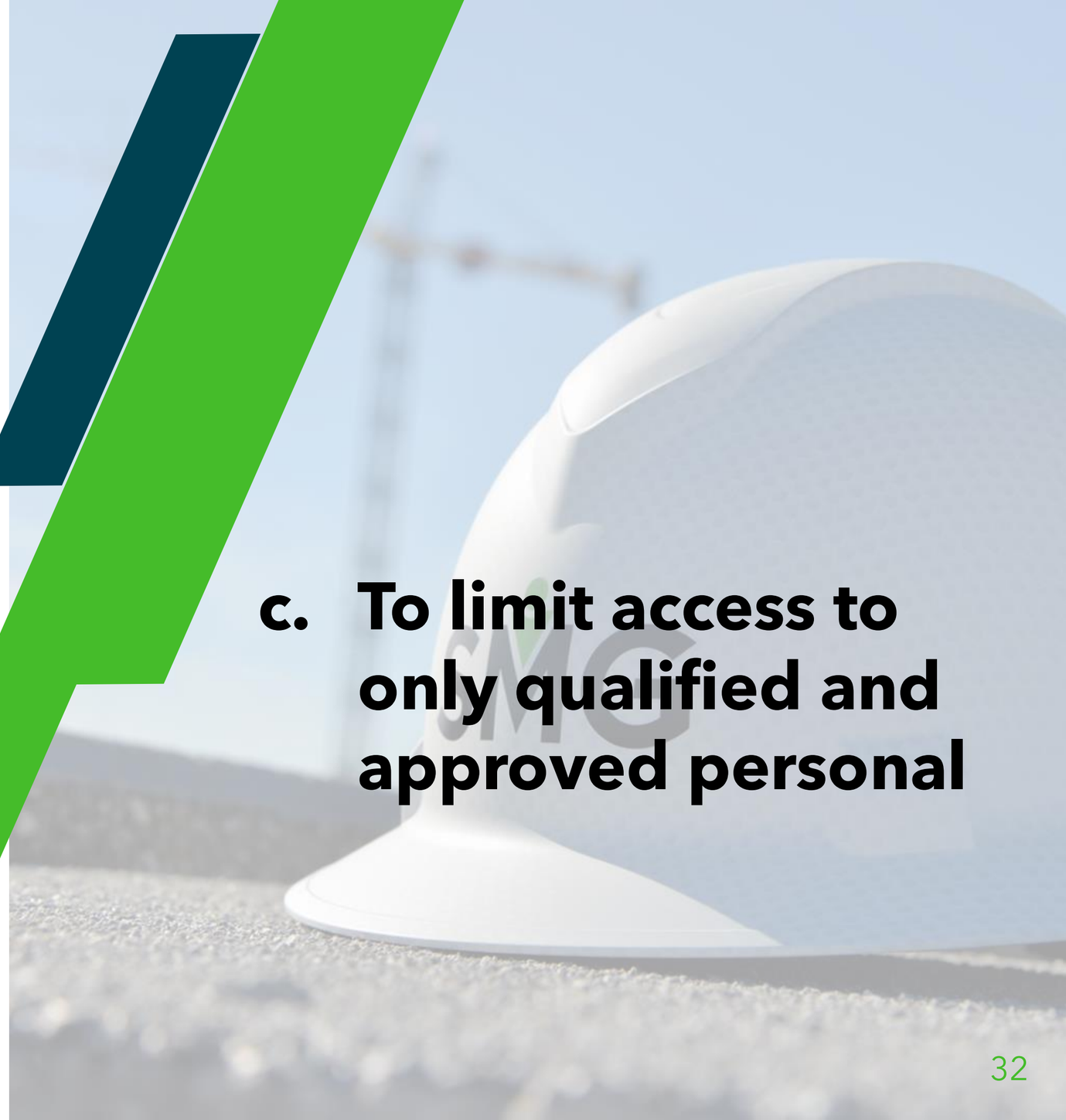
1. **What is the purpose of locking the gate substation when entering and leaving?**

   a. To bond all station structures and equipment to the grid

   b. To protect workers from differences in potential

   c. To limit access to only qualified and approval personal

   d. To prevent equipment from re-energization during a storm



c. To limit access to only qualified and approved personal

Knowledge Check

2. What is the one reason you should walk with your hands in your pockets inside a substation control house.

a. To avoid damaging the switchboard panels

b. To prevent incidental contact with control equipment

c. To protect batteries and chargers from your hands

d. To ensure the weather protection remains functional

b. To prevent incidental contact with control equipment

Knowledge Check

3. Nominal voltage can be determined by reading cabinet labels, reviewing One Line Diagrams, or contacting the System Dispatcher.

a. True

b. False

b. True

SMG

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Trainer Evaluation

PROFESSIONAL, FLEXIBLE,
EXPERT SOLUTIONS

SMG

Questions

Thank you for participating in the Substation Safe Entry Training.

Please visit us at : safetymanagementgroup.com/training to learn more about other training opportunities.