

The background is a grayscale photograph of a classroom or workshop. An instructor on the left is pointing at a whiteboard. Several students are seated at long wooden tables, some looking towards the instructor. The room has a high ceiling with exposed beams and fluorescent lights. A semi-transparent dark gray overlay covers the right side of the image, where the text is placed.

# INSTRUCTOR LED TRAINING

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## CATALOG

**Face-To-Face Instruction  
With Industry Experts**

Hands-on Exercises

Interactive

Peer-to-Peer

eLearning

Skill Building



# FACE-TO-FACE TRAINING BROUGHT TO YOUR FACILITY

## Boost your training program by offering interaction with real-world experts.

With more than 90 years of manufacturing expertise and with the thousands of companies we work with annually, Tooling U-SME has an extraordinarily large network of top-tier manufacturing educators and trainers. Our instructors bring deep industry knowledge and experience as well as a passion for what they teach.

Tooling U-SME instructors provide a dynamic, engaging classroom experience that may be extended out into the work environment. Training is highly interactive, hands-on, and personalized to your business needs.

## Our Instructor-Led Training classes:

- Are immediately applicable to real-world scenarios
- Utilize hands-on exercises
- Are dynamic, with instructor and participant interactivity
- Engage peer-to-peer learning
- Complement eLearning to improve comprehension and skill building

## We bring the training to you.

You choose the location that's most convenient for you – your facility, hotel.

## Constantly updated, customizable content.

We are always updating our content to ensure we deliver up-to-date, relevant material. The class outlines on the following pages can be customized to meet your needs during the planning stage of our engagement with you.

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# ENHANCE INSTRUCTOR-LED TRAINING WITH TURNKEY TRAINING

Offer robust, comprehensive training when you support Instructor-Led Training with Turnkey Training.

Turnkey Training from Tooling U-SME is a series of predefined online curriculum packages for core manufacturing job roles. Each curriculum comprises the most effective combination of our classes for targeted learning. When combined with

your on-the-job training (OJT), Turnkey Training quickly creates a learning roadmap and career path for everyone from new hires to tenured employees. Most job roles can be completed in one year with less than four hours a month spent online.

Tooling U-SME's industry-leading online classes and assessments are developed

with input from manufacturers and employ the latest methods in instructional design. Turnkey Training is ready for immediate use and delivers instruction in the areas needed most by today's manufacturers. Unlike many other training programs, Turnkey Training requires minimal preparation. It is efficient, effective training that will deliver ROI quickly.

## Instructor-led classes mapped to Turnkey Training

INSTRUCTOR-LED TRAINING SERIES	TURNKEY TRAINING	
<b>Electrical Series</b> <b>Instrumentation &amp; Control Series</b> <b>Mechanical Series</b>	<b>Maintenance</b> Maintenance Fundamental Electrical Production Maintenance Production Automation Technician	Electrical Technician Fluid Systems Technician
<b>Welding Series</b>	<b>Welding</b> Welding Welding Fundamentals GMAW FCAW Sub Arc Welding GTAW Welding	SMAW Welding Fabrication and Repair
<b>Foundational Series</b> <b>Safety Series</b>	<b>Manufacturing Awareness</b> Composites Machining Maintenance	Stamping Forming Fabricating Welding
<b>Multi-Craft Series</b>	<b>Assembly</b> Assembler Painter	Mechanic
<b>Operations Series</b> Reliability Series	<b>Quality</b> Quality Technician	
<b>Power Generation Series</b>	<b>Engineering</b> Engineering Fundamentals	Engineering Technician
<b>Professional Development Series</b>	<b>Leadership Essentials</b>	
<b>Smart Manufacturing</b>	<b>Additive Manufacturing</b>	

# INDUSTRIAL-LEVEL EQUIPMENT

Tooling U-SME is proud to offer a full line of industrial-level training equipment to support instructor-led, hands-on training as part of a blended learning solution.

These training units offer a real-world learning experience for the following classes:

Classes that incorporate a training unit are indicated throughout the catalog with this symbol.



## GP TROUBLESHOOTING TRAINER

- Basic PLCs (Studio-500)
- Motor Controls and Troubleshooting
- Introduction to Drives
- Variable Frequency Drives



## COMBUSTION TRAINER

- Combustion Basics



## MOTOR CONTROLS TRAINER

- Introduction to Drives
- Variable Frequency Drives



## FACET TRAINER

- Basic Electrical Concepts
- Industrial Electronics
- Digital Circuits



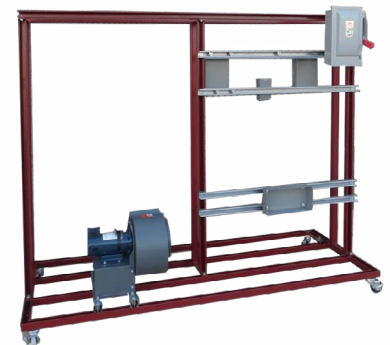
## LUBRICATION TRAINER

- Lubrication Fundamentals



## HYDRAULIC TRAINER

- Hydraulics and Pneumatics
- Hydraulic Applications



## LAB-VOLT WIRING/CONDUIT BENDING TRAINER

- Conduit Bending and Wiring



### MOTOR THEORY TRAINER

- Motor Theory
- Generator Theory
- Power Transformers



### POWER TRANSMISSION TRAINER

- Bearing Fundamentals
- Belt Drives
- Chain Drives
- Gears
- Shaft and Coupling Alignment
- Precision Measuring Instruments



### PUMP TRAINER

- Centrifugal Pumps



### PLC-5 TRAINER

- Basic PLCs (PLC-5)



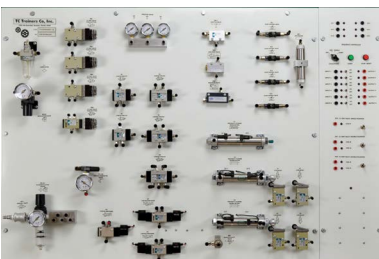
### PROCESS CONTROLS TRAINER

- Instrumentation Overview
- Introduction to HART Communications
- Process Controls Fundamentals
- Introduction to Proportional-Integral-Derivative (PID) Systems
- Introduction to Proportional-Integral-Derivative (PID) Tuning
- Differential Pressure Cells
- Level Detection
- Flow Detection
- Final Control Elements



### SLC-500 TRAINER

- Basic PLCs (SLC-500)



### PNEUMATIC TRAINER

- Diesel Engine Fundamentals
- Pneumatic Applications



### VALVE TRAINER

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# 1

## FUNDAMENTALS

### BASIC ELECTRICAL CONCEPTS

**40 HOURS**

#### **EM-100: Basic Electrical Concepts**

- Identify the types of electrical energy.
- Discuss the composition of the atom and its relation to electrical charge.
- Explain the characteristics of current, voltage, and resistance.
- Explain Kirchhoff's Current Law and Kirchhoff's Voltage Law
- Calculate equivalent resistance of series and parallel resistive circuits.
- Calculate DC circuit parameters using Ohm's Law, Kirchhoff's Current Law, and Kirchhoff's Voltage Law.
- Describe the characteristics of capacitors and capacitance.
- Describe the characteristics of inductors and inductance.
- Describe the construction and operation of a simple AC generator.
- Define inductive reactance.
- Calculate the inductive reactance of a simple AC circuit.
- Define capacitive reactance.
- Calculate the capacitive reactance of a simple AC circuit.
- Define impedance.
- Describe the relationship between apparent, true, and reactive power.
- Define power factor as it relates to true power and apparent power.

### MOTOR THEORY

**24 HOURS**

#### **EM-105: Motor Theory**

- Describe the general characteristics of electric motors.
- Describe the construction and operation of DC motors.
- Identify the types of DC motors.
- Describe how DC motors are controlled.
- Describe the construction and operation of AC motors.
- Identify the types of AC motors.
- Describe how AC motors are controlled.
- Identify the information on a motor nameplate.
- Describe DC and AC motor maintenance activities.
- Describe the International Electrical Testing Association guidelines for testing motors.

### GENERATOR THEORY

**16 HOURS**

#### **EM-110: Generator Theory**

- Identify the terminology associated with AC and DC generators.
- List and describe the major components of an AC generator.
- Describe AC power generation theory.
- Explain the operation of AC generators.
- List and describe the major components of a DC generator.
- Describe DC power generation theory.
- Explain the operation of DC generators.

## ELECTRICAL TEST EQUIPMENT

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### 16 HOURS

#### EM-115: Electrical Test Equipment

- Describe the operation of an analog meter.
- Describe the operation of a clamp-on ammeter.
- Describe the operation of a digital meter.
- Describe the operation of a voltage detector.
- Describe the operation of the basic oscilloscope.
- Calculate amplitude, frequency, period, phase difference, and duty cycle.
- Describe the operation of a megohmmeter (megger).
- Explain the purpose of thermography.

## NATIONAL ELECTRICAL CODE OVERVIEW

---

### 16 HOURS

#### EM-120: National Electrical Code (NEC) Overview

- Identify the origin and purpose of the NEC.
- Describe the requirements of Article 90.
- Describe the general requirements for electrical installations (Chapter 1).
- Describe wiring and protection requirements (Chapter 2).
- Describe proper wiring methods and materials (Chapter 3).
- Describe the requirements for general use equipment (Chapter 4).
- Demonstrate the proper table usage found in Chapter 9.
- Demonstrate proper methods to calculate ampacity.
- Demonstrate proper methods to calculate conduit fill and size.

## CONDUIT BENDING AND WIRING

---



### 40 HOURS

#### EM-125: Conduit Bending and Wiring

- Identify and describe the purpose for the various types of conduit used for electrical runs.
- Interpret rigid metal conduit data.
- Explain conduit fill and spacing requirements.
- Explain and demonstrate proper methods to cutting, reaming, bending, and installing conduit.
- Identify the difference between conductors, insulators, and semiconductors and describe the key characteristics of each.
- Describe cable construction and characteristics of the different components used in construction of cables.
- Discuss the operating characteristics of electrical cables.
- Describe the different methods of cable installation and their advantages and disadvantages over other methods of installations.
- Demonstrate proper techniques to pull wire or cable.
- Describe the precautions that must be observed when splicing wires, and demonstrate how wire and cable are spliced.
- Describe the precautions and tools used to terminate wiring, and demonstrate proper wire termination methods.
- Demonstrate the proper techniques for connecting wiring to terminal boards.

# 2

## APPLIED FUNDAMENTALS

### POWER TRANSFORMERS

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**24 HOURS**

**EM-200: Power Transformers**

- Identify and discuss safety issues relating to transformers.
- Explain the theory of transformer operations.
- List and describe the types of transformers.
- Describe the construction and nameplate information of a transformer.
- Demonstrate different types of transformer tap connections.
- Demonstrate proper inspection techniques for transformers.
- Demonstrate proper maintenance techniques for transformers.

### LOW VOLTAGE SWITCHGEAR

---

**40 HOURS**

**EM-205: Low Voltage Switchgear**

- List and explain the voltage level conventions used in electrical equipment.
- List and describe the components that make up electrical switchgear.
- Identify and explain the four general classifications of circuit breakers.
- List and explain the major ratings of circuit breakers.
- Discuss the major components associated with a power system.
- Demonstrate inspection methods of low voltage circuit breakers.

### MEDIUM VOLTAGE SWITCHGEAR

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**40 HOURS**

**EM-210: Medium Voltage Switchgear**

- Demonstrate inspection methods of medium voltage circuit breakers.

### HIGH VOLTAGE SWITCHGEAR

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**40 HOURS**

**EM-215: High Voltage Switchgear**

- Demonstrate inspection methods of high voltage circuit breakers.



## PROTECTIVE RELAYS

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### 32 HOURS

#### EM-220: Protective Relays

- Identify the purpose and types of protective relays.
- List and describe the components found in protective relays.
- Describe the functions of protective relays.
- Discuss methods for protective relay testing.
- List and demonstrate protective relay function tests.
- Identify and demonstrate common maintenance tasks associated with protective relays.

## BATTERIES AND UNINTERRUPTABLE POWER SUPPLIES

---

### 8 HOURS

#### EM-225: Batteries and Uninterruptable Power Supplies (UPS)

- Identify the types of batteries.
- Describe the construction and operation of various batteries.
- Identify industry and government standards for maintenance, testing, replacement, sizing, and installation of lead-acid batteries.
- Identify federal regulations governing lead-acid battery disposal.
- Describe the construction and operation of a UPS.
- Describe the function and operation of a transfer switch.
- Inspect a UPS system.
- Analyze battery charge and discharge rate to determine if replacement is needed.

## MOTOR CONTROL AND TROUBLESHOOTING

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### 40 HOURS

#### EM-230: Motor Control and Troubleshooting

- List and explain a systematic approach to troubleshooting electrical circuits.
- List and describe the purpose and application of various motor control components.
- Explain methods for inspecting electrical contacts.
- Describe three basic methods of starting a three-phase AC motor using full or reduced voltage.
- Describe the basic operation of a three-phase AC motor.
- Describe methods for troubleshooting AC motors.
- Apply a systematic approach to troubleshooting motor control circuits.
- Design and construct motor control circuits.
- Implement proper motor control troubleshooting techniques.
- Analyze and evaluate faults to determine motor control components.

## 3

## SITE SPECIFIC

### BASIC PROGRAMMABLE LOGIC CONTROLLERS (PLC-5)

**40 HOURS**

#### EM-300: Basic Programmable Logic Controllers (PLC-5)

- Identify general PLC circuit and logic contact symbology.
- Describe the purpose of the address in memory.
- Identify contact symbols.
- Use the programming software to configure a PLC.
- Use the programming software to create and edit ladder logic programs.
- Create a ladder logic motor controller.
- Use the programming software to force bit state.
- Create a timer-based program.
- Create a counter-based program.

### ANALOG INPUT/OUTPUTS (PLC-5)

**24 HOURS**

#### EM-310: Analog Input/Outputs (PLC-5)

- List and describe the components of a PLC-5 and their function.
- Describe the function of an analog input and output card.
- Demonstrate proper setup of an analog input and output card.
- Demonstrate proper programming of analog cards.
- Demonstrate proper configuration of analog cards.
- Analyze system requirements and create a program using analog inputs and outputs.

### DEVICENET FOR SLC-500

**40 HOURS**

#### EM-315: DeviceNet for SLC-500

- Configure a DeviceNet network using RSNetWorx.
- Install and configure a VFD to operate via DeviceNet from a SLC-500.

### INTRODUCTION TO DRIVES

**24 HOURS**

#### EM-320: Introduction to Drives

- Describe the operation of diodes, SCRs, and transistors.
- Match the proper motor, gearing drive, and electrical power to a load.
- Describe the basic functions of AC drive hardware.
- Identify the characteristics of shunt and series wound motors.
- Differentiate between field control and armature control of a DC motor.
- Describe the operation of various types of AC drives.
- Describe the operation of various types of DC drives.
- Use the parameters associated with a drive to control motor operation.

### VARIABLE FREQUENCY DRIVES

**16 HOURS**

#### EM-325: Variable Frequency Drives

- List and describe the operation of components found in a PowerFlex 70.
- List and explain the parameters found in a PowerFlex 70.
- Demonstrate proper installation and setup of a PowerFlex 70.
- Demonstrate proper troubleshooting techniques on a PowerFlex 70.

0

FOUNDATIONAL

**INTRODUCTION TO INDUSTRIAL MATH**

**8 TO 16 HOURS**

**FND-000: Introduction to Industrial Math**

- Calculate the sum, difference, product, and quotient of whole numbers.
- Solve problems using fractions.
- Solve problems using decimals.
- Calculate a percentage using fractions and decimals.
- Calculate measurements using fractions and decimals.
- Calculate the sum, difference, product, and quotient of signed numbers.
- Solve problems using powers and roots.
- Apply mathematical principles to evaluate algebraic expressions.

**ADVANCED INDUSTRIAL MATH**

**8 TO 16 HOURS**

**FND-005: Advanced Industrial Math**

- Measure and calculate angles.
- Identify the types of triangles.
- Calculate the side of a right triangle using Pythagorean Theorem.
- Identify and calculate the parameters of polygons.
- Calculate the parameters of a solid figure.
- Apply geometric principles to solve problems.
- Solve problems using basic trigonometric functions.

**MATH USING THE METRIC SYSTEM**

**8 HOURS**

**FND-010: Math Using the Metric System**

- Identify common metric units for mass, length, volume, temperature, force, and pressure.
- Identify the symbols used for common metric units.
- Identify metric unit prefixes and symbols.
- Complete metric-to-metric conversions.
- Complete English-to-metric and metric-to-English conversions.
- State the common rules for writing in metric.

**MECHANICAL PRINT READING**

**16 HOURS**

**FND-015: Mechanical Print Reading**

- List and explain the types of mechanical drawings.
- Explain and describe the purpose of the title block, legend, revisions, and material list in terms of location and content.
- Describe and identify the meaning of each of the six types of lines used in drawings.
- Identify and define the types of views used in drawings.
- Given a drawing, identify its construction, size, and location dimensions.
- Locate and identify tolerances on machine drawings.
- Measure and identify screw threads.
- Identify and discuss the different types of dimensions found in drawings.
- Identify and discuss the different elements of a P&ID.
- Draw schematics of simple mechanical systems.

## 0

## FOUNDATIONAL

### MECHANICAL SAFETY AND LOCKOUT/TAGOUT

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#### **8 HOURS**

#### **FND-020: Mechanical Safety and Lockout/Tagout**

- Identify and discuss electrical safety hazards.
- Discuss the hazards of stored energy in hydraulic and pneumatic systems.
- Given a scenario, discuss the proper use of personal protective equipment.
- Given a scenario, discuss the hazards particular to mechanical work and the precautions/countermeasures for each hazard.
- Describe mechanical system lockout/tagout requirements.

### ELECTRICAL SAFETY FOR NON-QUALIFIED PERSONNEL

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#### **4 HOURS**

#### **FND-025: Electrical Safety for Non-Qualified Personnel**

- Review applicable OSHA 1910 regulations and NFPA 70E standards regarding arc flash protection.
- Review applicable OSHA 1910 regulations and NFPA 70E standards regarding lockout/tagout.
- Review applicable OSHA 1910 regulations and NFPA 70E standards regarding personal protective equipment.

### ELECTRICAL PRINT READING

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#### **16 HOURS**

#### **FND-030: Electrical Print Reading**

- Describe the organization of an electrical print.
- Identify common electrical schematic symbols.
- Interpret an electrical block diagram and a one-line diagram.
- Interpret an electrical three-line diagram.
- Interpret a P&ID.
- Analyze a basic logic circuit.
- Interpret basic ladder logic.

### ELECTRICAL SAFETY FOR QUALIFIED PERSONNEL

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#### **8 HOURS**

#### **FND-035: Electrical Safety for Qualified Personnel**

- Describe general safety hazards and precautions associated with electrical systems.
- Describe electrical tool and equipment safety.
- Define voltage level conventions for electrical systems.
- Describe electrical lockout/tagout requirements.
- Identify the requirements for working on energized equipment.
- Given a scenario, describe the requirements associated with arc flash protection.
- Explain the requirements for protective grounding.
- Describe the electrical safety requirements associated with fuses.
- Describe the electrical safety requirements associated with switchgear and circuit breakers.
- Describe the electrical safety requirements for batteries and DC systems.

### HAND AND POWER TOOLS

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#### **8 HOURS**

#### **FND-040: Hand and Power Tools**

- Describe the safe use and operation of measuring tools.
- Describe the safe use and operation of hand tools.
- Describe the safe use and operation of power tools.

# 1

## FUNDAMENTALS

### STAMPING DIE WORKSHOP

**32 HOURS**

#### TU-010

- Provide the skills necessary to properly design, build, maintain, and trouble shoot dies and sheet metal stamping operations.
- Teach the user to approach processes and problems with a data based systematic method.
- Provide the knowledge necessary to make effective data based decisions regarding the maintenance and trouble-shooting methods utilized to keep tooling proper world class working order.
- Provide a comprehensive understanding of the physics of forming and cutting metal.

### HEAT TREAT WORKSHOP

**32 HOURS**

#### TU-011

- Understand failure in materials
- Find strength, modulus and ductility from a plot of stress and strain
- Understand the effects of defects on mechanical properties
- Calculate critical flaw size for a material at a given applied stress

### METALLURGY WORKSHOP

**24 HOURS**

#### TU-012

- Fundamental aspects of metallic properties
- Failure modes in terms of causes and characteristics
- Manufacturing techniques for alloys

### INDUSTRIAL ELECTRONICS

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**24 HOURS**

#### I&C-100: Industrial Electronics

- Discuss the characteristics and uses of semiconductor devices.
- Discuss the characteristics and uses of bipolar transistors.
- Describe the operation of diodes.
- Describe the operation of transistors.
- Describe the operation of amplifiers.

### DIGITAL CIRCUITS

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**24 HOURS**

#### I&C-105: Digital Circuits

- Convert a number between binary and decimal.
- Describe the difference between analog and digital circuits.
- Describe the gates found in digital logic.
- Simplify expressions using Boolean algebra.
- Describe how to combine logic gates.
- Describe the circuit found in sequential logic.

### INSTRUMENTATION OVERVIEW

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**8 HOURS**

#### I&C-110: Instrumentation Overview

- Identify the different types of instruments used in an instrumentation loop.
- Describe and explain the function of components that are used for an instrumentation loop.
- Demonstrate how to build a basic instrumentation loop.

# 1

## FUNDAMENTALS

### INTRODUCTION TO HART COMMUNICATIONS



**8 HOURS**

**I&C-115: Introduction to HART Communications**

- Identify and discuss the components of a HART communicator.
- Demonstrate connection methods to field devices.
- Demonstrate how to properly set up and calibrate field devices.

### COMBUSTION BASICS



**16 HOURS**

**I&C-120: Combustion Basics**

- Explain the flame triangle.
- Describe the relationship between heat, temperature, and specific heat.
- List and discuss the different methods of heat transfer.
- Identify and discuss the by-products of combustion.
- Identify and describe the importance of stoichiometric conditions.
- Describe the construction of basic combustion systems.
- Describe the safety equipment associated with a combustion system.
- Design a basic fuel train for a combustion system.

### INTRODUCTION TO DISTRIBUTED CONTROL SYSTEMS (DCS)

**8 HOURS**

**I&C-125: Introduction to Distributed Control Systems (DCS)**

- List and explain the concepts of computer networking and communications.
- Describe the components of a DCS and their functions.
- Describe communications in a DCS.

# 2

## APPLIED FUNDAMENTALS

### PROCESS CONTROLS FUNDAMENTALS



**8 HOURS**

**I&C-200: Process Controls Fundamentals**

- List and explain process control terms.
- Describe how a single or multiple capacity process responds to change.
- Demonstrate proper two-position control loop installation.
- Demonstrate basic proportional control loop installation.

### INTRODUCTION TO PROPORTIONAL-INTEGRAL-DERIVATIVE (PID) SYSTEMS



**24 HOURS**

**I&C-205: Introduction to Proportional-Integral-Derivative (PID) Systems**

- Identify and explain the different control methods used in PID systems.
- Describe how changing control parameters affects system response.
- Demonstrate proper installation of PID systems.
- Demonstrate proper troubleshooting of PID systems.

### INTRODUCTION TO PROPORTIONAL-INTEGRAL-DERIVATIVE (PID) TUNING



**8 HOURS**

**I&C-210: Introduction to Proportional-Integral-Derivative (PID) Tuning**

- List and describe the factors that affect system stability.
- Demonstrate closed loop tuning methods.
- Demonstrate open loop tuning methods.

## 3

SITE  
SPECIFIC**DIFFERENTIAL PRESSURE CELLS****8 HOURS****I&C-300: Differential Pressure Cells**

- Identify and describe the components of a differential pressure cell.
- Describe how a differential pressure cell operates.
- Demonstrate different connection methods and uses of a differential pressure cell.
- Demonstrate proper setup and calibration of a differential pressure cell.

**TEMPERATURE DETECTION****8 HOURS****I&C-315: Temperature Detection**

- Identify and describe the components of different temperature measurement devices.
- Describe how temperature measurement devices operate.
- Demonstrate different connection methods and uses of temperature measurement devices.
- Demonstrate proper setup and calibration of temperature measurement devices.

**LEVEL DETECTION****8 HOURS****I&C-305: Level Detection**

- Identify and describe the components of different level detection devices.
- Describe how level detection devices operate.
- Demonstrate different connection methods and uses of level detection devices.
- Demonstrate proper setup and calibration of level detection devices.

**FINAL CONTROL ELEMENTS****8 HOURS****I&C-320: Final Control Elements**

- Identify and describe the components that are used in pneumatically controlled actuators.
- Demonstrate proper setup and calibration of a pneumatically controlled actuator.
- Identify and describe the types of electrically controlled final elements.
- Demonstrate proper setup and calibration of electrically controlled final elements.

**FLOW DETECTION****8 HOURS****I&C-310: Flow Detection**

- Identify and describe the components of different flow measurement devices.
- Describe how flow measurement devices operate.
- Demonstrate different connection methods and uses of flow measurement devices.
- Demonstrate proper setup and calibration of flow measurement devices.

# 1

## FUNDAMENTALS

### HEAT EXCHANGER FUNDAMENTALS

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**8 HOURS**

#### **MM-100: Heat Exchanger Fundamentals**

- Identify and explain heat transfer within heat exchangers.
- Discuss safety precautions associated with heat exchangers.
- List and identify different types of heat exchangers and their major components.
- Identify maintenance and inspection activities associated with heat exchangers.

### VALVE FUNDAMENTALS

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**16 HOURS**

#### **MM-105: Valve Fundamentals**

- Identify the types of valves used in industrial applications.
- Describe the construction and operation of valves used in industrial applications.
- Identify the types of valve operators.
- List and explain valve markings.

### SEALS AND PACKING FUNDAMENTALS

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**8 HOURS**

#### **MM-110: Seals and Packing Fundamentals**

- Identify the different types of compression packing, and explain when each is used.
- Identify the different types of molded packing, and explain when each is used.
- List the advantages and disadvantages of pump mechanical seals.

### BEARING FUNDAMENTALS

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**16 TO 24 HOURS**

#### **MM-115: Bearing Fundamentals**

- Identify and explain the purpose for bearings.
- Discuss the basic terms associated with bearing design and construction.
- Identify and recognize the major components of various bearings.
- Demonstrate proper bearing maintenance and lubrication techniques.
- Demonstrate the proper installation and removal of bearings.
- Examine a bearing and analyze it to determine cause of failure.

### BOILER FUNDAMENTALS

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**8 HOURS**

#### **MM-120: Boiler Fundamentals**

- Explain the fundamentals of steam production.
- List and describe the major components in a boiler.
- Explain the basic operation of a boiler system.

### HYDRAULICS AND PNEUMATICS FUNDAMENTALS

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**24 HOURS**

#### **MM-125: Hydraulics and Pneumatics Fundamentals**

- Describe the basic principles of fluid dynamics.
- State the relationship between force, pressure, and area.
- List and describe the major components of a hydraulic system.
- Identify the symbols used to identify hydraulic components in a schematic.
- List and describe the major components of a pneumatic system.
- Identify the symbols used to identify pneumatic components in a schematic.



## DIESEL ENGINES FUNDAMENTALS



### 24 HOURS

#### MM-135: Diesel Engines Fundamentals

- Describe the function of a diesel engine.
- List and describe the major components of a diesel engine.
- Describe the basic operation of a diesel engine.
- Discuss factors that affect engine operation.
- Discuss maintenance activities associated with a diesel engine.
- Troubleshoot common engine problems.

## RECIPROCATING COMPRESSORS FUNDAMENTALS

### 24 HOURS

#### MM-140: Reciprocating Compressors Fundamentals

- Describe the function of a reciprocating compressor.
- List and describe the major components of a reciprocating compressor.
- Describe the basic operation of a reciprocating compressor.
- Discuss factors that affect compressor operation.
- Discuss maintenance activities associated with a reciprocating compressor.
- Troubleshoot common compressor problems.

## AXIAL FLOW COMPRESSORS FUNDAMENTALS

### 24 HOURS

#### MM-145: Axial Flow Compressors Fundamentals

- Describe the function of an axial flow compressor.
- List and describe the major components of an axial flow compressor.
- Describe the basic operation of an axial flow compressor.
- Discuss maintenance activities associated with an axial flow compressor.

## RADIAL FLOW COMPRESSORS FUNDAMENTALS

### 24 HOURS

#### MM-150: Radial Flow Compressors Fundamentals

- Describe the function of a centrifugal compressor.
- List and describe the major components of a centrifugal compressor.
- Describe the basic operation of a centrifugal compressor.
- Discuss factors that affect compressor operation.
- Discuss maintenance activities associated with a centrifugal compressor.

## 2

APPLIED  
FUNDAMENTALS**CENTRIFUGAL PUMPS****24 HOURS****MM-200: Centrifugal Pumps**

- Discuss centrifugal pump laws.
- List and describe terminology associated with centrifugal pumps.
- Identify the major components of a centrifugal pump and describe its function.
- Discuss factors affecting pump performance.
- Demonstrate proper techniques for disassembly, maintenance, and assembly of a centrifugal pump.

**POSITIVE DISPLACEMENT PUMPS****16 HOURS****MM-205: Positive Displacement Pumps**

- Discuss positive displacement pump laws.
- List and describe terminology associated with positive displacement pumps.
- Identify the major components of a positive displacement pump and describe its function.
- Demonstrate proper techniques for disassembly, maintenance, and assembly of a positive displacement pump.

**VALVE REPAIR****40 HOURS****MM-210: Valve Repair**

- Demonstrate proper valve disassembly and inspection.
- Demonstrate how to properly repair a valve seat.
- Identify and replace worn valve components.
- Demonstrate how to properly repack a valve.

**CLUTCHES****8 HOURS****MM-220: Clutches**

- Identify the various methods of clutch engagement.
- Identify the various types of clutches.
- Describe how to properly install a clutch and perform maintenance.

**BELT DRIVES****8 HOURS****MM-225: Belt Drives**

- List and describe the principles of operation of belt drives.
- Identify the types of belts and their uses.
- Demonstrate proper installation, alignment, and tensioning of belt drives.
- Discuss common drive failures.

**CHAIN DRIVES****8 HOURS****MM-230: Chain Drives**

- List and describe the principles of operation of chain drives.
- Identify the types of chains and their uses.
- Demonstrate the proper installation, alignment, and tensioning of chain drives.

## GEARS



### 8 HOURS

#### MM-235: Gears

- State the purpose of gears.
- Define the terminology associated with gears.
- Identify the following types of gear arrangements: spur gear, helical gear, herringbone gear, bevel gear, worm gear, and planetary gear.
- Demonstrate how to measure backlash in a gearing arrangement.

## COUPLING

### 8 HOURS

#### MM-240: Coupling

- Explain the purpose of a coupling.
- Explain the difference between a rigid and flexible coupling.
- Explain the following terms as they relate to a coupling: hub, shaft, key, match marks, bore, and gap.

## SHAFT AND COUPLING ALIGNMENT



### 40 HOURS

#### MM-245: Shaft and Coupling Alignment

- Identify the fundamental principles of shaft alignment.
- List and identify the tools used in the alignment process.
- Identify the phases of the alignment process.
- Demonstrate proper alignment methods.
- Discuss the factors that may affect alignment.
- Discuss the importance of alignment tolerances.
- Discuss the importance of using a pre-alignment checklist.
- Identify soft foot and discuss methods to correct it.
- Discuss methods used for non-standard alignments.
- Identify the coupling used to connect shafts.

## PIPEFITTING

### 40 HOURS

#### MM-250: Pipefitting

- List and discuss codes and standards associated with pipe and tubing.
- Identify and discuss types of metal piping and their uses.
- Identify and discuss types of non-metallic piping and their uses.
- Identify and discuss types of tubing, including their installation and use.
- Describe the methods used for connecting pipes.
- Describe the components found in a piping system.
- Identify and discuss the types of pipe hangers and their applications.

## 3

## SITE SPECIFIC

### HYDRAULICS APPLICATIONS



**16 HOURS**

#### **MM-300: Hydraulics Applications**

- Describe hydraulic power and the components used in the design of hydraulic systems.
- Identify and explain common hydraulic components.
- Describe basic hydraulic theory.
- Replace hoses, seals, and fittings according to the guidelines identified in this training course.
- Explain common circuit applications.
- Describe preventive maintenance actions such as removing, replacing, and cleaning common hydraulic components.
- Interpret ANSI symbols and drawings to explain the functions of specific hydraulic systems.
- Troubleshoot common hydraulic components.

### PNEUMATICS APPLICATIONS



**16 HOURS**

#### **MM-305: Pneumatics Applications**

- Describe pneumatic power and the components used in the design of pneumatic systems.
- Identify and explain common pneumatic components.
- Describe basic pneumatic theory.
- Replace hoses, seals, and fitting according to the guidelines identified in this training course.
- Describe preventive maintenance actions such as removing, replacing, and cleaning common pneumatic components.
- Interpret ANSI symbols and drawings to explain the functions of specific pneumatic systems.
- Troubleshoot common pneumatic components.

## 1

## FUNDAMENTALS

**BOLTS AND FASTENERS****8 HOURS****MUL-100: Bolts and Fasteners**

- Identify the standards associated with bolts and fasteners.
- Describe the different types of basic fasteners and their applications.
- Discuss the appropriate specification and selection criteria for fasteners.
- Describe the various types of locking devices in common use.
- Select the proper fastener for a given application.
- Demonstrate the proper torquing techniques for various mechanical fasteners.

**PRECISION MEASURING INSTRUMENTS****16 HOURS****MUL-105: Precision Measuring Instruments**

- Explain the purpose of precision measurement.
- List and discuss the terminology as it applies to precision measurement.
- Discuss the factors that affect measurement.
- Identify and demonstrate the proper use and application of precision measuring instruments.
- Apply and measure torque to fasteners.

**LUBRICATION FUNDAMENTALS****8 HOURS****MUL-110: Lubrication Fundamentals**

- Identify and explain lubrication maintenance strategies.
- Discuss the fundamentals and theory of lubrication.
- Describe the selection criteria for lubrication.

**LUBRICANT APPLICATION AND ANALYSIS****16 HOURS****MUL-115: Lubricant Application and Analysis**

- Discuss proper lubricant application and maintenance on lubricating systems.
- Explain the requirements for proper lubrication storage and management.
- Describe lubrication system filtering methods.
- List and explain lube oil sampling requirements.
- Identify and explain the factors affecting lubrication health.
- Describe common wear mechanisms associated with machines.

## 1

### FUNDAMENTALS

#### PIPING CORROSION PROTECTION

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**8 HOURS**

**MUL-120: Piping Corrosion Protection**

- Identify the different types of piping coating and their purpose.
- Describe galvanic corrosion and how to reduce or prevent deterioration of the pipe.
- Describe the application, inspection, and repair process for piping coatings.
- Describe the tape coating and heat shrink coating systems.

#### INTRODUCTION TO STEAM TURBINES

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**24 HOURS**

**MUL-125: Introduction to Steam Turbines**

- Describe the function of a steam turbine.
- List and describe the major components of a steam turbine.
- Describe the basic operation of a steam turbine.
- Discuss factors that affect turbine operation.
- Discuss maintenance activities associated with a steam turbine.
- Troubleshoot common turbine problems.

#### INTRODUCTION TO GAS TURBINES

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**24 HOURS**

**MUL-130: Introduction to Gas Turbines**

- Describe the function of a gas turbine.
- List and describe the major components of a gas turbine.
- Describe the basic operation of a gas turbine.
- Discuss maintenance associated with a gas turbine.

## 2

### APPLIED FUNDAMENTALS

#### SCAFFOLDING

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**16 TO 24 HOURS**

**MUL-200: Scaffolding**

- Explain the requirements set forth by OSHA part 1910 and part 1926 regulations.
- Identify safety hazards associated with scaffolding.
- Identify the types and uses of scaffolding.
- Discuss procedures, precautions, limitations, and practices surrounding the aspects of erecting, using, and dismantling fabricated frame scaffolding.
- Discuss case reports from OSHA files.
- Safely erect and dismantle a two-tier scaffold following OSHA regulations.

#### RIGGING

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**16 HOURS**

**MUL-205: Rigging**

- Identify the safety hazards associated with rigging.
- Identify and describe rigging gear.
- Discuss the fundamentals of rigging.
- Discuss methods used to determine the weight of a load.
- Demonstrate methods used for moving and manipulating loads.

## 3

SITE  
SPECIFIC**ELECTRIC OVERHEAD TRAVELING (EOT)  
CRANE INSPECTION****16 HOURS****MUL-300: Electric Overhead Traveling (EOT)  
Crane Inspection**

- Identify and discuss the major assemblies of EOT cranes.
- List the inspection points on an EOT crane.
- Locate the inspection points on an EOT crane.
- Discuss the criteria for the inspection points.

**DIRECT CURRENT (DC)  
CRANE CONTROLS****24 HOURS****MUL-305: Direct Current (DC) Crane Controls**

- Identify and explain component layout of a crane.
- Describe the function and operation of electrical components associated with DC cranes.
- List and describe the purpose of components located in a DC power control system.
- Describe the operation of DC motors.
- Analyze a DC schematic to determine failed component.
- Demonstrate proper troubleshooting techniques.
- Demonstrate proper maintenance associated with cranes.

**CRANE BRAKES****16 TO 24 HOURS****MUL-310: Crane Brakes**

- Explain the operation of overhead crane brakes.
- Describe maintenance activities associated with overhead crane brakes.
- Implement proper troubleshooting techniques associated with overhead crane brakes.

# 1

## FUNDAMENTALS

### ARTICULATED DUMP TRUCK OPERATION

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**40 HOURS**

#### HEO-100: Articulated Dump Truck Operation

- Describe the safety rules associated with articulated dump truck operation.
- Identify the controls and functions on the articulated dump truck control panels.
- Perform a vehicle inspection.
- Describe basic techniques for using the articulated dump truck.

### TRACTOR DOZER OPERATION AND TECHNIQUES

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**40 HOURS**

#### HEO-105: Tractor Dozer Operation and Techniques

- Locate and identify the safety warning labels on the dozer.
- Describe the safety rules associated with the dozer operation.
- Perform a Visual Walk-around using the Dozer Inspection sheet.
- Complete the Mobile Equipment Pre-Shift Inspection sheet.
- Identify all console equipment.
- Identify all control equipment.
- Perform a pre-start check of the dozer.
- Perform an engine start-up.
- Perform an engine and machine warm-up.
- Drive the dozer.
- Operate the blade in all directions.
- Plow with a straight blade.
- Plow with a tilt right blade.
- Plow with a tilt left blade.
- Stop and park the machine.
- Stop the engine.
- Leave the machine.
- Perform operator maintenance tasks.

### FLATBED TRUCK OPERATION

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**40 HOURS**

#### HEO-110: Flatbed Truck Operation

- Describe the safety rules associated with flatbed truck operation.
- Identify the controls and functions on the flatbed truck control panels.
- Perform a vehicle inspection.
- Describe basic techniques for using the flatbed truck.
- Perform basic operations with the flatbed truck.

### PAYLOADER OPERATION

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**40 HOURS**

#### HEO-115: Payloader Operation

- Describe the safety rules associated with payloader operation.
- Identify the controls and functions on the payloader control panels.
- Perform a vehicle inspection.
- Describe basic techniques for using the payloader.

### TRACTOR TRAILER OPERATION

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**40 HOURS**

#### HEO-120: Tractor Trailer Operation

- Describe the safety rules associated with tractor trailer operation.
- Identify the controls and functions on the tractor trailer control panels.
- Perform a vehicle inspection.
- Describe basic techniques for using the tractor trailer.





## TRACTOR/LOADER/ BACKHOE OPERATION

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### **40 HOURS**

#### **HEO-125: Tractor/Loader/Backhoe Operation**

- Describe the safety rules associated with the Tractor/Loader/Backhoe (TLB) operation.
- Identify the controls and functions on the TLB control panels.
- Perform a vehicle inspection.
- Describe basic techniques for using the TLB.

## TRAIN-THE-TRAINER

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### **40 HOURS**

#### **TTT-100: Train-the-Trainer**

- Analyze key factors for planning and preparing training delivery.
- Select and utilize effective motivational techniques.
- Use appropriate introductory techniques for opening a lesson.
- Practice effective presentation and facilitation skills.
- Select and use effective strategies for summarizing and evaluating a lesson or a course.

0

FOUNDATIONAL

**WRITING PLANT  
OPERATING PROCEDURES**

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**3 DAYS**

**WPOP-000: Writing Plant Operating Procedures**

- Describe the two criteria that determine a procedure's effectiveness.
- List the three stages of the procedure development process.
- State the roles and responsibilities of the writer, users, and reviewer in the procedure development process.
- Describe the four elements of the communication cycle.
- Describe how the medium affects the readability of a procedure.
- Explain the three stages of the procedure writing process.

## 1

## FUNDAMENTALS

**NUCLEAR ACAD – MATHEMATICS**

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**HOURS VARY****ACAD-101: Nuclear ACAD – Mathematics**

- Basic math
- Algebraic operations, equations, and word problems
- Systems of equations and quadratic equations
- Scientific notation and logarithms
- Graphing
- Plane and solid geometry
- Trigonometry
- Scalar and vector quantities

**NUCLEAR ACAD – CLASSICAL PHYSICS**

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**HOURS VARY****ACAD-102: Nuclear ACAD – Classical Physics**

- Units and measurements
- Velocity and acceleration
- Gravity and Newton's law
- Momentum
- Work
- Energy and conservation of energy power

**NUCLEAR ACAD – HEAT TRANSFER**

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**VARIES****ACAD-103: Nuclear ACAD – Heat Transfer**

- Thermodynamic units and properties
- Heat and heat transfer
- Steam
- Fluid flow
- Heat exchangers

**NUCLEAR ACAD – MECHANICAL SCIENCE**

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**HOURS VARY****ACAD-104: Nuclear ACAD – Mechanical Science**

- Valves
- Pumps
- Heat exchangers
- Steam traps
- Filters and strainers
- Air compressors
- Refrigeration machines
- Heating, ventilation, and air conditioning (HVAC)
- Lubrication principles
- Steam turbines
- Diesel engines
- Hangers and snubbers

**NUCLEAR ACAD – ELECTRICAL SCIENCE**

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**HOURS VARY****ACAD-105: Nuclear ACAD – Electrical Science**

- Basic electrical theory
- Voltage production
- Basic DC theory and circuits
- DC circuit inductance and capacitance
- DC generators
- DC motors
- Batteries
- Basic AC theory
- Basic AC reactive components
- Three phase power
- AC generators and transformers
- AC motors
- Electrical test instruments and measuring devices
- System components and protection devices
- Basic electronics

1

FUNDAMENTALS

**NUCLEAR ACAD –  
INSTRUMENTATION & CONTROL**

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*HOURS VARY*

**ACAD-106: Nuclear ACAD – Instrumentation & Control**

- Instrumentation and control concepts
- Temperature sensors and detectors
- Pressure sensors and detectors
- Level sensors and detectors
- Flow sensors and detectors
- Valve actuators and position indicators
- Miscellaneous sensors and detectors
- Chemistry instrumentation
- Radiation detectors

**NUCLEAR ACAD – CHEMISTRY**

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*HOURS VARY*

**ACAD-107: Nuclear ACAD – Chemistry**

- Chemistry principles I
- Chemistry principles II
- Acids and bases
- Demineralizers and ion exchangers
- Primary coolant chemistry
- Corrosion
- Chemistry hazards

**NUCLEAR ACAD – MATERIAL SCIENCE**

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*HOURS VARY*

**ACAD-108: Nuclear ACAD – Material Science**

- Structures of metals
- Properties of metals
- Plant materials
- Brittle fracture
- Thermal shock

**NUCLEAR ACAD – NUCLEAR SCIENCE**

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*HOURS VARY*

**ACAD-109: Nuclear ACAD – Nuclear Science**

- Components, structure, and identification of the atom
- Mass defect and binding energy
- Radioactive decay and neutron interactions
- Nuclear cross-section, fission, and neutron classification
- Neutron life cycle
- Delayed neutrons and reactor kinetics
- Coefficients
- Plant operations

**NUCLEAR GENERAL FUNDAMENTALS –  
PLANT COMPONENTS**

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*HOURS VARY*

**GENFN-101: Nuclear General Fundamentals –  
Plant Components**

- Valves
- Pumps
- Heat exchangers and condensers
- Ion exchangers and demineralizers
- Motors and generators
- Breakers, relays, and disconnects
- Sensors and detectors
- Controllers and positioners

**NUCLEAR GENERAL FUNDAMENTALS –  
REACTOR THEORY**

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*HOURS VARY*

**GENFN-102: Nuclear General Fundamentals –  
Reactor Theory**

- Neutrons
- Neutron life cycle
- Reactor kinetics
- Reactivity coefficients
- Control rods

## NUCLEAR GENERAL FUNDAMENTALS – REACTOR THEORY (CONTINUED)

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- Neutrons
- Neutron life cycle
- Reactor kinetics
- Reactivity coefficients

## NUCLEAR GENERAL FUNDAMENTALS – THERMODYNAMICS

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### *HOURS VARY*

#### **GENFN-103: Nuclear General Fundamentals – Thermodynamics**

- Thermodynamic properties and units
- Basic energy concepts
- Steam
- Thermodynamic process
- Thermodynamic cycle
- Fluid statics and dynamics
- Heat transfer and heat exchangers
- Thermal hydraulics
- Core thermal limits
- Brittle fracture and core vessel stresses

## CHEMISTRY FOR OPERATORS

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### *3 DAYS*

#### **CFO-100: Chemistry for Operators**

- Describe basic concepts of plant water chemistry.
- Describe the causes and effects of corrosion.
- Describe the methods used to control and prevent corrosion.
- Describe types of water treatment technologies and their applications.
- Explain plant chemistry control methods and their applications.
- Relate typical plant chemistry transients to probable causes and corrective actions.
- Identify basic types and uses of in-line instruments.

## COMBINED CYCLE FUNDAMENTALS

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### *4.5 DAYS*

#### **CCF-100: Combined Cycle Fundamentals**

- Discuss the laws of thermodynamics and energy conversion.
- Use a steam table to look up the properties of steam and water.
- Explain the primary flow paths for fuel, air, steam cooling water, and power.
- Discuss the general purpose and basic operation of various plant systems.
- Describe the purpose and primary function of each major component.
- Discuss the sequence of events for a plant start-up and shutdown.
- Discuss the current trends in combined cycle generation.

## INDUSTRIAL BOILERS

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### *3 DAYS*

#### **IB-100: Industrial Boilers**

- Discuss steam and water properties.
- Discuss basic concepts of heat transfer and metallurgy.
- Explain boiler and steam water circuits, boiler components, and flue gas flow paths.
- Describe the purpose and basic operation of boiler support equipment.
- Describe the control process, measurements, and burner management control systems.
- Describe plant start-ups, shutdowns, and abnormal operations.
- Describe the operation and safety considerations of a steam distribution system.

# 1

## FUNDAMENTALS

### INTRODUCTION TO SCRUBBER OPERATION

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#### 2 DAYS

#### ISO-100: Introduction to Scrubber Operation

- Identify provisions of the Clean Air Act Amendments of 1980.
- Identify FGD Systems designed to reduce SO<sub>2</sub> emissions.
- Identify properties and production processes of lime and limestone.
- Identify the different types of scrubbers to include design considerations.
- Recall operating characteristics of Lime and Limestone Handling and Preparation Systems.
- Identify operating characteristics of Absorber Systems (liquid side).
- Identify operating characteristics of Waste Removal and Dewatering Systems.
- Identify operating characteristics of Sludge Disposal Systems.
- Identify operating characteristics of flue gas reheaters.
- Identify operating characteristics of Particulate Removal Systems.
- Identify control, operation, and maintenance methods for scrubbers.

### POWER PLANT FUNDAMENTALS

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#### 4 DAYS

#### PPF-100: Power Plant Fundamentals

- Restate the laws of thermodynamics and energy conversion.
- Recognize process and instrument diagrams.
- Use a steam table to look up the properties of steam and water.
- Describe the purpose and primary function of each major component.
- Discuss the general purpose and basic operation of a boiler, steam turbine, and generator.

### RELAY PROTECTION FOR OPERATORS

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#### 1 DAY

#### RPO-100: Relay Protection for Operators

- Describe the role protective relays play in an electrical power system.
- Describe the construction and operation of electromechanical and solid state relays.
- Identify National Electrical Manufacturers Association (NEMA) protective relay device numbers.
- Explain relay coordination, including zones of protection.
- List and categorize the general types of protective relay devices.
- Describe how fuses and overcurrent relays operate and identify typical applications.
- Describe how frequency relays operate and identify applications.

### LARGE STEAM TURBINE-GENERATOR OPERATIONS

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#### 4.5 DAYS

#### STG-100: Large Steam Turbine-Generator Operations

- Describe the steam flow path through a large steam turbine.
- Discuss the major turbine components.
- Describe the function of the major valves for the steam turbine.
- List and describe the operation of the support systems associated with the steam turbine.
- Discuss the importance of turbine supervisory instrumentation and list the major components monitored.
- Explain the construction and operation of a generator.

### UTILITY BOILER OPERATIONS

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#### 4.5 DAYS

#### UBO-100: Utility Boiler Operations

- Discuss steam and water fundamentals, heat transfer concepts, and basic metallurgy.
- Describe factors affecting plant efficiency.
- Discuss the operation of boiler auxiliary equipment.
- Describe different types of process controls for boilers and turbines.

## 2

APPLIED  
FUNDAMENTALS**COMBINED CYCLE  
ABNORMAL CONDITIONS****3 DAYS****CCAC-200: Combined Cycle Abnormal Conditions**

- Identify the possible causes for typical casualties.
- Explain the potential consequences.
- Describe the most effective immediate operator responses.
- Discuss the probable follow-up operator responses.

**CLASSROOM INSTRUCTOR TRAINING****2.5 DAYS****CIT-200: Classroom Instructor Training**

- Recognize and deal with individual differences.
- Provide effective presentations.
- Establish direction and purpose for training.
- Identify, select, and apply various instructional methods and support materials.
- Explain the steps for performing a training needs analysis and task analysis.
- Explain the steps for developing training program objectives and lessons.
- Validate training program materials.
- Implement training programs.

**EFFECTIVE SIMULATOR INSTRUCTION****2.5 DAYS****ESI-200: Effective Simulator Instruction**

- Identify the different approaches for dealing with individual differences relating to teaching adults.
- Identify how to work with each student to clearly define the objectives and expectations, including the students' own objectives and expectations.
- Identify the attributes of an instructor and evaluator and how they relate to effective completion of simulator activities.
- Identify the process and attributes of creating realistic simulator scenarios that effectively engage the students to accomplish specific goals.

**OPERATIONAL LEADERSHIP  
AND MANAGEMENT SKILLS****3 DAYS****OLMS-200: Operational Leadership and  
Management Skills**

- Describe effective techniques for assembling a team.
- Explain how a team leader should be selected.
- Describe effective team communication techniques.
- Describe basic techniques for managing conflict.
- Discuss ways to optimize team performance.

**PLANT ABNORMAL CONDITIONS****3 DAYS****PAC-200: Plant Abnormal Conditions**

- Identify the possible causes for typical casualties.
- Explain the potential consequences.
- Describe the most effective immediate operator response.
- Discuss the probable follow-up operator responses.

# 3

## SITE SPECIFIC

### ADVANCED PERFORMANCE ANALYSIS AND TROUBLESHOOTING FOR POWER PLANTS

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**4.5 DAYS**

**APA-300: Advanced Performance Analysis and Troubleshooting for Power Plants**

- Recognize the principles of thermodynamics and heat transfer.
- Identify where thermal losses occur.
- Determine if problems are due to equipment or operations difficulties
- Act to effectively control heat rate
- Monitor improvements and continually reassess strategies for optimum performance.

### COMBINED CYCLE POWER PLANT PERFORMANCE

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**2.5 DAYS**

**CCPPP-300: Combined Cycle Power Plant Performance**

- Identify and diagnose root causes of capacity and efficiency degradation.
- Quantify the benefits of performance recovery.

### FUNDAMENTALS OF POWER PLANT PERFORMANCE FOR UTILITY ENGINEERS

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**4.5 DAYS**

**FPPP-300: Fundamentals of Power Plant Performance for Utility Engineers**

- Recognize and use standard testing methods.
- Determine the performance levels of major plant equipment.
- Test performance accurately and interpret results.
- Improve the efficiency of plant operations.

### HEAT RATE AWARENESS

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**2.5 DAYS**

**HRA-300: Heat Rate Awareness**

- Discuss the details of heat rate concepts.
- Explain controllable and non-controllable losses.
- Explain the effects of component performance on operating costs.
- Discuss how heat rate affects operating practices, unit optimization, and environmental compliance.

### SIMULATOR-BASED COMBINED CYCLE PLANT OPERATIONS

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**4.5 DAYS**

**SBCC-300: Simulator-Based Combined Cycle Plant Operations**

- Prepare the combined cycle unit for start-up.
- Start up the unit following normal operating practices.
- Change from simple cycle to combined cycle configuration and back.
- Properly operate the unit under routine conditions and load changes.
- Prepare the combined cycle for shutdown.
- Shut down the unit following normal operating practices.
- Interpret alarms and their relationships quickly.
- Effectively respond to abnormal operating conditions, including GT flame out, HRSG tube leaks, unit runbacks, etc.



## SIMULATOR-BASED COAL-FIRED PLANT OPERATIONS

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**5 DAYS**

### **SBCF-300: Simulator-Based Coal-Fired Plant Operations**

- Explain the characteristics and flow paths of a coal-fired plant.
- Describe all major plant systems.
- Identify the sequence of major events during plant startup and shutdown.
- Discuss current coal-fired plant activities, trends, and technologies.
- Use the high-fidelity coal-fired simulator to start the plant from cold conditions, operate the plant over various load conditions, and shut down the plant.
- Determine if a tube leak exists.
- Identify where the leak is most likely to be located.
- Estimate the extend of the leakage.
- Determine factors for subsequent actions

## SIMULATOR-BASED GAS-FIRED BOILER PLANT OPERATIONS

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**9.5 DAYS**

### **SBGF-300: Simulator-Based Gas-Fired Boiler Plant Operations**

- Preparing the gas-fired unit for startup.
- Starting up the unit following normal operating practices.
- Properly operating the unit under routine conditions and load changes.
- Preparing the unit for shutdown.
- Responding to boiler/turbine trip and performing recovery.
- Interpreting alarms and their relationships quickly.
- Effectively responding to abnormal operating conditions, including a loss of condensate pumps, boiler feed pumps, boiler fans, air heater drives, boiler tube leaks, unit runbacks, etc.

## SMART MANUFACTURING | ADDITIVE MANUFACTURING

### ADOPTING AND OPTIMIZING ADDITIVE MANUFACTURING

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**4 HOURS**

#### **TU-013**

- Define Additive Manufacturing
- Compare AM with other processes
- Describe the equipment requirements for AM
- Describe a business case and write an action plan regarding AM specific to their organization

# 0

## FOUNDATIONAL

### ACCOUNTABILITY

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#### 4 HOURS

##### **PDS-001: Accountability**

- Define accountability, responsibility, and empowerment.
- Rate yourself and your team on the PowerMeter.
- Discuss the Account-Able Choice.
- Identify obstacles to being accountable.
- Speak the language of empowerment and accountability.
- Apply a five-step model to create accountability in others.

### COMMUNICATE WITH CLARITY

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#### 8 HOURS

##### **PDS-002: Communicate With Clarity**

- Describe the five steps to creating open communication.
- Assess communication skills and identify areas of strength and development.
- Determine the most appropriate method for sharing messages.
- Demonstrate the appropriate nonverbal skills to enhance communication with others.
- Create assertive statements.
- Apply open-ended questioning techniques to increase two-way communication.
- Use active listening skills to improve rapport and productivity in the working environment.
- Respond effectively when receiving feedback.

### DELEGATION

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#### 4 HOURS

##### **PDS-003: Delegation**

- Define delegation.
- Break your personal barriers to delegation.
- Apply situational leadership to delegation.
- Decide the tasks to delegate and the tasks to keep.
- Determine the right person to whom to delegate the task.
- Plan and conduct a four-step delegation meeting.
- Follow up on a delegated task.
- Obtain the results you expect from a delegated task.

### EMOTIONAL INTELLIGENCE

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#### 8 HOURS

##### **PDS-004: Emotional Intelligence**

- Define emotional intelligence and how it relates to personal and organizational success.
- Apply tools to increase personal skills: self-awareness and self-management of personal emotions.
- Analyze and interpret online assessment results from the EQ-I Inventory.
- Apply tools to increase social skills: recognizing the emotions in others and responding to those emotions.

### FACILITATING EFFECTIVE MEETINGS

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#### 4 HOURS OR 8 HOURS

##### **PDS-005: Facilitating Effective Meetings**

- Apply four steps to successfully facilitate meetings.
- Create an effective purpose statement.
- Identify intended outcomes to achieve the purpose.
- Develop an agenda that is focused on achieving intended outcomes.
- Understand the logistics of setting up a meeting.
- Apply three tools that keep a meeting on track.
- Resolve challenging attendee behaviors.
- Utilize a method for reviewing a meeting that achieves results on action items.

### GIVING AND RECEIVING FEEDBACK

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#### 4 HOURS

##### **PDS-006: Giving and Receiving Feedback**

- Define feedback.
- Understand the importance of the approach to giving feedback.
- Identify guidelines for giving feedback.
- Demonstrate the ability to use observation versus judgment.
- Apply steps to giving constructive feedback.
- Apply steps to giving positive feedback
- Apply guidelines for receiving feedback.

## MANAGING CONFLICT

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### 4 HOURS OR 8 HOURS

#### PDS-007: Managing Conflict

- Recognize the five styles of conflict resolution and how to best adapt your style and approach to a conflict situation.
- Understand your preferred style of conflict resolution.
- Apply the Stop, Yield, Go Model to collaborative conflict resolution.
- Apply techniques to managing emotions during conflict.
- Explain assumptions and their effect on conflict.
- Use active listening skills to improve the working environment.
- Apply assertive language techniques to express your needs and respect the needs of others.

## HIRING TALENT: RIGHT PERSON, RIGHT JOB

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### 8 HOURS

#### PDS-008: Hiring Talent: Right Person, Right Job

- Recognize the importance of selecting the right candidate.
- Calculate the cost of turnover.
- Explain the organization's hiring process.
- Apply a four-step interviewing process.
- Identify job competencies and value behaviors for an open position.
- Create behavior-based interview questions.
- Conduct an effective selection interview.
- Decide on the best candidate.

## LEADING CHANGE

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### 4 HOURS

#### PDS-009: Leading Change

- Understand the three stages of change that people and organizations go through.
- Identify what stage of change people are in by their words or actions.
- Discuss personal reactions to change and rethink the more self-defeating aspects of their reactions to change.
- Identify actions to lead and communicate organizational change through each stage.
- Identify five areas of the organization that leaders can change.

## MENTORING

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### 4 HOURS

#### PDS-010: Mentoring

- Define your role and responsibilities as a mentor or protégé in the mentoring process.
- Understand the phases of mentoring and the activities in each phase.
- Understand your mentor's or protégé's interaction style.
- Set and manage expectations for the mentoring relationship.
- Listen with openness and understanding.
- Provide supportive feedback.
- Coach mistakes without commanding or criticizing.

## PARTNERING FOR PERFORMANCE

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### 8 HOURS

#### PDS-011: Partnering for Performance

- Use a three-phase process to effectively manage performance.
- Assess employee strengths and development opportunities.
- Apply the SMART goal-setting formula.
- Help employees prepare for the goal-setting discussions.
- Apply follow-up techniques to ensure commitments, goals, and standards are being met.
- Apply a structured approach to conducting the performance review.
- Use language that focuses on development versus criticism.
- Establish a safe climate for collaborative performance discussions.
- Apply collaborative techniques to create a two-way dialogue.
- Handle difficult performance discussions.



## FOUNDATIONAL

### PRESENTATION SKILLS

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**8 HOURS**

**PDS-012: Presentation Skills**

- Identify the benefits of a powerful presentation.
- Create an opening that will capture audience attention.
- Apply a five-step process for preparing a powerful presentation.
- Utilize techniques to add variety, interest, and emphasis.
- Manage nervousness.
- Discuss the power of visual, verbal, and vocal skills.
- Use visual aids effectively (handouts, charts, PowerPoint slides).
- Encourage audience participation.
- Manage difficult questions and audience members.

### PROVIDE POWERFUL SERVICE

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**4 HOURS**

**PDS-013: Provide Powerful Service**

- Recognize and understand the perspectives of both internal and external customers and appreciate the impact made on the ability to get their needs met.
- Use a consultative and partner-based approach to facilitate solutions for internal and external customers.
- Apply personal expertise in ways that provide value.
- Provide positive feedback to colleagues on the use of partnership behaviors; ask for and accept feedback from colleagues.

### PROBLEM SOLVING AND DECISION MAKING

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**8 HOURS**

**PDS-014: Problem Solving and Decision Making**

- Define your role in problem solving.
- Identify barriers to effective problem solving.
- Apply a six-step problem-solving process.
- Select appropriate tools to effectively problem solve.

### STRESS MANAGEMENT

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**4 HOURS**

**PDS-015: Stress Management**

- Define stress.
- Discuss how stress works.
- Identify personal sources of stress.
- Apply a three-step process to manage your stress.
- Apply effective strategies to increase resilience.
- Implement an action plan to reduce stress and improve personal productivity.

### TEAMWORK

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**4 HOURS**

**PDS-016: Teamwork**

- Identify telltale signs that the teamwork within your team needs attention.
- Apply techniques to translate goals to individual team members.
- Apply techniques to empower all team members to participate.
- Apply techniques to encourage collaboration among all team members.
- Discuss techniques to track the team's environment and to make adjustments.
- Recognize how teamwork is often more beneficial than individual performance.

### TIME MANAGEMENT

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**4 HOURS**

**PDS-017: Time Management**

- Define time management.
- Develop an effective planning process.
- Identify time wasters and what to do about them.
- Create an action plan for future development.

## 1

## FUNDAMENTALS

**INTRODUCTION TO LEAN**

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**2 DAYS****REL-100: Introduction to Lean**

- Describe the concept of each of the Lean tools.
- Describe how Lean can improve the performance of an enterprise.
- Understand the rollout process.
- Define the tools supporting the Lean Temple.
- Explain how Lean tools work together to create a Lean environment.
- Recognize areas of improvement within a facility, and identify the correct tool to use.
- Understand how Lean needs to be launched / implemented in an enterprise and why “cherry picking” often fails.

**DAILY MANAGEMENT OVERVIEW**

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**0.5 TO 1 DAY****REL-105: Daily Management Overview**

- Explain the reason two-thirds of Continuous Improvement initiatives fail.
- Explain how Daily Management and Goal Deployment combine to form Lean Management.
- List and explain the elements of Daily Management.
- Identify ways to apply Daily Management at your organization.
- List and explain the elements of Goal Deployment.

**ADDITIVE MANUFACTURING  
(3D PRINTING) OVERVIEW**

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**16 HOURS****TU-001: Additive Manufacturing (3D Printing) Overview**

- Identify current additive manufacturing technologies and primary applications.
- Identify additive manufacturing processes and available material choices.
- Understand the landscape of the industry and describe the business and economics of adopting these technologies.

# 2

## APPLIED FUNDAMENTALS

### VALUE STREAM MAPPING

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#### 1 DAY

##### REL-200: Value Stream Mapping

- Create a value stream map for both current and future states.
- Collect and collate data.
- Devise an action plan.
- Set measurables and objectives.
- Devise spaghetti diagrams.

### BLUE SKY AND MASTER SCHEDULE

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#### 3 DAYS

##### REL-205: Blue Sky and Master Schedule

- Understand the prerequisites for Blue Sky.
- Create a Blue Sky common measurable vision.
- Create a Master Schedule.
- Align divisions and departments to Blue Sky.
- Measure and monitor the implementation of Blue Sky.

### SIX SIGMA GREEN BELT

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#### TWO 4.5 DAY BLOCKS

##### REL-210: Six Sigma Green Belt

- Explain how Six Sigma improves business performance.
- Describe the Six Sigma approach.
- Describe sources of variability and process sigma level.
- Describe the DMAIC improvement methodology, and use it to perform Green Belt-level projects.
- Use Six Sigma tools, including Voice of Customer,  $Y=f(x)$ , basic QC tools, process mapping, measurement systems analysis, use of statistics, sampling, confidence intervals, ANOVA, process capability, graphical analysis, correlation and regression, cost-benefit analysis, error proofing, and standards.
- Use project plans and issues lists to manage Six Sigma projects.
- Report on project progress during toll gate reviews.

### SIX SIGMA BLACK BELT UPGRADE

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#### TWO 4.5 DAY BLOCKS

##### REL-215: Six Sigma Black Belt Upgrade

- Be an articulate proponent of how Six Sigma improves business performance.
- Perform Green Belt and Black Belt-level projects.
- Use advanced Six Sigma tools, including customer surveys, QFD, DOE, analysis of paired and two-sided t-tests, non-normal data, multiple regression, and advanced control charts.
- Use project plans, work breakdown structure, project reviews, and issues lists to manage Six Sigma projects crossing multiple departments.
- Facilitate project teams.
- Coach process owners after project hand-off.

### STANDARD WORK PROCESS: THE FOUNDATION TO IMPROVE

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#### 1 DAY

##### REL-220: Standard Work Process: The Foundation to Improve

- Describe the Standard Work Process.
- Identify critical processes in order to focus resources.
- Identify different types of standards and where and when to use each.
- Create a sample standard.
- Conduct training on a standard.
- Use a standard audit practice to assess understanding and identify opportunities for improvement.
- Address failures.

## PROCESS PROBLEM SOLVING

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### 1 DAY

#### REL-225: Process Problem Solving

- Understand different levels of problem solving.
- Define the Process Problem Solving methodology.
- Apply, in a practical environment, the Process Problem Solving methodology.
- State the reasons and benefits for implementing Process Problem Solving.
- Identify barriers to implementing Process Problem Solving and develop ways to remove them.

## QUICK CHANGEOVER

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### 1 DAY

#### REL-230: Quick Changeover

- Define Quick Changeover.
- Describe the steps to reducing changeover time.
- Identify and implement improvements in changeover activity.
- Determine how changeover time impacts key operating system principles.
- Understand the importance of teamwork.
- Understand parallel processing.
- Identify the seven wastes.
- Recognize the benefits gained from reduced changeover time.

## KANBAN

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### 1 DAY

#### REL-235: Kanban

- Describe how Kanban supports JIT in a lean system.
- Explain how a Kanban system works.
- Identify the different types of Kanban and flows for each.
- Describe five rules and four types of Kanban.
- List the preconditions required for Kanban implementation.
- Describe how Kanban controls production and material flow.
- Identify the factors to consider when calculating Kanban.

## OPERATOR ASSET CARE (OAC) WORKSHOP

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### 2-4 DAYS

#### REL-240: Operator Asset Care (OAC) Workshop

- Identify the benefits of improving equipment cleanliness and reliability.
- Define the term “abnormality” as it applies to your equipment.
- Describe the effects that equipment abnormalities have on safety, production capability, and product quality.
- Describe the P-F curve and where abnormalities fit on the curve.
- List common abnormalities and the use of 5 Senses to identify them.
- Describe the roles and responsibilities of the various personnel who participate in the OAC program.
- Develop and use a standard OAC inspection form.
- Fill out an abnormality tag and register it properly at the OAC board.
- Describe the types of information available on the OAC board.
- Apply visual controls to the equipment in assigned work areas.
- Describe the purpose of and use a one point lesson.
- Explain the concept of continuous improvement as it applies to the OAC process.
- Read, evaluate, and apply the standard OAC audit form.
- Monitor the progress of an OAC area through key performance indicators and audit forms.

# 2

## APPLIED FUNDAMENTALS

### PROCESS FAILURE MODE EFFECTS ANALYSIS (PFMEA) AND PROCESS CONTROL

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**5 DAYS**

**REL-245: Process Failure Mode Effects Analysis (PFMEA) and Process Control**

- Analyze a process to identify and prioritize failure modes.
- Identify and implement corrective and preventive actions for failure modes.
- Identify opportunities for error-proofing.
- Design and implement an effective process measurement system.
- Establish methods to control process performance.
- Address failures and solve problems to improve process performance.

### MAINTENANCE PLANNING AND SCHEDULING – COMPREHENSIVE

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**4 DAYS**

**REL-250: Maintenance Planning and Scheduling – Comprehensive**

- Describe the role of planning and scheduling in asset management.
- Understand the concepts of maintenance waste and its effect on wrench time.
- Discuss work management techniques and their overall impact to the asset management strategy.
- Explain the work management cycle and the specific application of each phase of the cycle to include:
  - Work identification
  - Work control
  - Planning
  - Scheduling
  - Work execution
  - Failure Reporting and Corrective Action System (FRACAS)

- Understand the importance of clearly defining roles and responsibilities within the organization.
- Explain the need for standardized planning and scheduling meetings.
- Develop and apply a system for prioritizing work.
- Understand how to calculate the work backlog.
- List the minimum acceptable elements of a good job plan.
- Understand the value and difference between subjective and quantitative task descriptions.
- Develop effective work procedures within the good job plan.
- Describe and apply the necessary elements to support a weekly scheduling process.
- Apply the special techniques required to plan for and execute effective outages.
- Measure the performance of specific elements of the work execution management process.

### MAINTENANCE PLANNING AND SCHEDULING – FOR MANAGERS

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**1 DAY OR 2 DAYS  
2 DAY INCLUDES GAME**

**REL-255: Maintenance Planning and Scheduling – For Managers**

- Two-day training option includes Planning & Scheduling Game.
- Discuss management’s role in planning and scheduling.
- Describe the elements of planning and scheduling.
- Define compelling reasons for improving planning and scheduling.
- Understand the path to world-class maintenance.
- Explain the need for standardized planning and scheduling meetings.
- Describe the concepts of hidden capacity.
- Understand the value of planned work.
- Determine the value of maintenance effort.
- Understand the anatomy of a planned job vs. an unplanned job.
- Understand the maintenance planner’s role.
- Describe planning and scheduling’s role in improving reliability and operational excellence.
- Determine how to measure success and explain KPIs.



## MAINTENANCE PLANNING AND SCHEDULING – DAILY MAINTENANCE

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**1 DAY OR 2 DAYS**  
**2 DAY INCLUDES GAME**

### REL-260: Maintenance Planning and Scheduling – Daily Maintenance

- Two-day training option includes Planning & Scheduling Game.
- Define the maintenance technician's role in the planning and scheduling cycle.
- Explain the need for standardized planning and scheduling meetings.
- Understand the importance of effective work procedures.
- Describe how early work identification improves planning and scheduling.
- Explain the sources of maintenance wastes and their impact on planning and scheduling.
- Discuss best-in-class wrench time models and how to improve wrench time.
- Understand work priorities and the importance of recording the correct work codes in the CMMS.
- Understand the difference between reactive and proactive work.
- Discuss work execution and feedback.

## MAINTENANCE PLANNING AND SCHEDULING – DOWNDAYS AND OUTAGES

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**1 DAY OR 2 DAYS**  
**2 DAY INCLUDES GAME**

### REL-265: Maintenance Planning and Scheduling – Downtime and Outages

- Two-day training option includes OUTAGE! Game.
- Understand the difference between outage work and routine work.
- Describe planning requirements for outage work.
- Describe scheduling requirements for outage work.
- Explain the need for standardizing requirements for outage work.
- Determine what makes an outage successful; overcome the challenges.
- Understand effective shutdown management and improvement techniques.
- Describe how to apply critical path management for outage duration.
- Explain how to perform risk assessments for outages.
- Explain the need for an outage war room; communicate obsessively.
- Measure outage success; explain KPIs.

## ROOT CAUSE FAILURE ANALYSIS (RCFA)

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**2 DAYS**

### REL-270: Root Cause Failure Analysis (RCFA)

- Discuss the nature of problems and understand the difference between common problems and special problems.
- Describe the SDCA/PDCA cycle and how it applies to the process of eliminating problems.
- Describe the Five Whys technique for root cause determination.
- Explain the use of a cause and effect (fishbone) diagram in the determination of a root cause.
- Describe the Situation Target Proposal methodology for problem resolution.
- Describe the Quality Improvement Story methodology for problem resolution.
- Implement a RCFA management system.

# 2

## APPLIED FUNDAMENTALS

### STREAMLINED RELIABILITY CENTERED MAINTENANCE (SRCM)

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**4 DAYS**

#### **REL-275: Streamlined Reliability Centered Maintenance (SRCM)**

- Define the purpose of SRCM.
- Understand SRCM vs RCM.
- Describe SRCM benefits.
- Understand FMEA and its role in SRCM.
- Plan and conduct an FMEA.
- Understand the Mean Time Between Failure (MTBF).
- Review classical failure modes.
- Understand the P-F Curve.
- Describe the select maintenance strategies.
- Establish SRCM teams.
- List the seven essentials of SRCM.
- Define the SRCM process.
- Plan and conduct FMEAs.
- Describe FMEA action plans and their implementation.
- Understand Preventive Maintenance Optimization.
- Measure success throughout the SRCM process.

### CENTER LINING FUNDAMENTALS

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**2 DAYS**

#### **REL-280: Center Lining Fundamentals**

- Describe the center lining methodology.
- Identify and document product transformations in detail.
- Develop documentation to support center lining.
- Implement a sustainable center lining process that will keep the equipment operating to center lines.

### GEOMETRIC DIMENSIONING & TOLERANCING (GD&T)

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**24 HOURS**

#### **TU-002: Geometric Dimensioning & Tolerancing (GD&T)**

- Describe the benefits of using geometric dimensioning and tolerancing.
- Explain how Rule #1 imposes certain geometric controls automatically.
- Identify whether a given feature is considered a surface or a feature of size.
- Interpret feature control frames and identify correct/incorrect syntax in a given feature control frame.
- Calculate virtual condition and describe why it is important.
- Define a basic dimension and explain how it relates to GD&T.
- Recognize the MMC modifier and calculate the appropriate bonus tolerance.
- Describe the tolerance zone for each of the 14 GD&T symbols.
- Correctly identify datum features and determine their order of precedence.
- Determine proper inspection methods for a given GD&T callout.

### FAILURE MODE AND EFFECTS ANALYSIS (FMEA) FUNDAMENTALS

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**16 HOURS**

#### **TU-003: Failure Mode and Effects Analysis (FMEA) Fundamentals**

- Explore key assumptions required for different types of FMEAs.
- Study severity, occurrence, and detection, ranking interpretation and application.
- Consider the differences among requirements, failures, effects, causes, and controls.
- Learn how to avoid the common pitfalls.
- Understand links between FMEAs and other key documents.
- Use step-by-step procedures for completing FMEAs.

## DESIGN FOR MANUFACTURING AND DESIGN FOR ASSEMBLY (DFM/DFA)

### 24 HOURS

#### TU-004: Design for Manufacturing and Design for Assembly (DFM/DFA)

- Understand key DfX concepts including Design for Manufacturing, Design for Assembly, Design for Lean, and Design for Six Sigma.
- Identify key elements of any component or assembly design that must be considered during DFM/DFA analysis and application.
- Learn how to involve key stakeholders, including vendors and suppliers, to ensure they have input to DFM/DFA activities.
- Understand how to structure the DFM/DFA process to facilitate the engineering team through the process for both new products and/or redesigned products/processes.
- Use step-by-step guidelines for analyzing DFA including design for handling, presentation, orientation, insertion, fastening, plus error-proofing, mistake-proofing, and Poka Yoke applications for design and process elements.
- Understand DFM guidelines and general tolerancing recommendations for the most popular manufacturing processes, including injection molding, machining, metal forming, casting, etc.
- Conduct a variety of capability studies including Cp, Cpk, Pp, and Ppk.
- Calculate and assign appropriate tolerances for new designs.
- Take away 15 key Geometric Dimensioning and Tolerancing (GD&T) strategies for increasing tolerances and reducing cost without compromising product function.
- Learn to take advantage of GD&T principles without adding GD&T to the drawings.
- Use step-by-step guidelines for dimensioning, tolerancing, and optimization using both coordinate and geometric tolerancing.

## VALUE STREAM MAPPING

### 16 HOURS

#### TU-005: Value Stream Mapping

- Define Value Stream and how it relates to material and information flow.
- Explain how the Value Stream Map is used to encourage improvement.
- Draw a Value Stream Map using a standard set of symbols.
- Determine key opportunities for improvement from the current-state Value Stream Map.
- Develop current, ideal, and future state Value Stream Maps.
- Create an improvement plan to move from the current to the future condition.

## 2

## APPLIED FUNDAMENTALS

### BLOODBORNE PATHOGEN TRAINING

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**2 HOURS**

#### **SAF-200: Bloodborne Pathogen Training**

- Describe incident and exposure protocols, as well as post-exposure medical follow-up procedures.
- Understand work practices geared to reduce exposure risks.
- Understand engineering controls and how they are used and maintained.
- Know the purpose of personal protective equipment (PPE), where it is kept, and when it must be used and how.
- Describe procedures for handling and disposing of wastes.
- Describe procedures for handling contaminated laundry and personal clothing.

### CONFINED SPACE ENTRY (ENTRANT, ATTENDANT, SUPERVISOR) TRAINING

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**8 HOURS**

#### **SAF-205: Confined Space Entry (Entrant, Attendant, Supervisor) Training**

- Know the hazards that may be encountered during entry and the signs, symptoms, and consequences of exposure.
- Know about the equipment necessary for safe confined space entry.
- Understand communication procedures and the importance of exiting the space when conditions warrant or an alarm sounds.
- Understand the entry permit and the information that must be listed or added as needed.
- Know about self-rescue and attendant rescue techniques.
- Understand the basis and basics of OSHA standard 29 CFR 1910.146.

### CONFINED SPACE RESCUE TECHNICIAN TRAINING

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**40 HOURS**

#### **SAF-210: Confined Space Rescue Technician Training**

- Understand the construction, usages, and limitations of various types of hardware and software such as ropes, webbing, carabiners and pulleys.
- Demonstrate proficiency in tying and utilizing knots as appropriate.
- Demonstrate proficiency in configuring acceptable anchor points.
- Understand the dynamics of critical angles and forces involved.
- Demonstrate proficiency in constructing lowering systems.
- Demonstrate proficiency in constructing mechanical advantage systems for hauling, raising, and moving loads.
- Demonstrate proficiency in patient packaging and handling techniques.
- Be able to use and establish common communication procedures, team roles, and responsibilities, including an incident command system.
- Display teamwork developed during group scenarios.

## CONFINED SPACE RESCUE REFRESHER TRAINING

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### **8 HOURS**

#### **SAF-215: Confined Space Rescue Refresher Training**

- Understand the construction, usages, and limitations of various types of hardware and software such as ropes, webbing, carabiners, and pulleys.
- Demonstrate proficiency in tying and utilizing knots as appropriate.
- Demonstrate proficiency in configuring acceptable anchor points.
- Understand the dynamics of critical angles and forces involved.
- Demonstrate proficiency in constructing lowering systems.
- Demonstrate proficiency in constructing mechanical advantage systems for hauling, raising, and moving loads.
- Demonstrate proficiency in patient packaging and handling techniques.
- Be able to use and establish common communication procedures, team roles, and responsibilities, including an incident command system.
- Display teamwork developed during group scenarios.

## FIRST AID/CPR/AED TRAINING

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### **7 HOURS**

#### **SAF-220: First Aid/CPR/AED Training**

- Understand how to use the EMS system.
- Describe how to identify and care for breathing emergencies.
- Describe how to identify and care for heart attack and cardiac arrest in adults.
- Describe how to reduce the risk of heart attack.
- Describe how to identify and care for life-threatening bleeding.
- Identify how to provide care for different sudden illnesses and injuries.
- Identify how to provide care for different types of wounds.
- Describe how to splint dislocations, strains, sprains, and fractures.

# 2

## APPLIED FUNDAMENTALS

### FALL PROTECTION AWARENESS TRAINING

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**4 HOURS**

**SAF-225: Fall Protection Awareness Training**

- Have an introduction to working at heights.
- Understand the OSHA Regulations Concerning Working at Heights.
- Describe hazards of working at heights.
- Describe ladder safety.
- Introduce roof, scaffold, and work platform safety.
- Explain fall protection systems.
- Explain fall protection equipment and proper use.

### FIRE EXTINGUISHER TRAINING

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**4 HOURS**

**SAF-235: Fire Extinguisher Training**

- Demonstrate the appropriate use of equipment to employees who have been designated to use firefighting equipment as part of the company's emergency action plan.

### FIREFIGHTER SURVIVAL/MAYDAY TRAINING

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**10 HOURS**

**SAF-240: Firefighter Survival/Mayday Training**

- Understand that the second leading cause of firefighter line-of-duty fatalities is becoming lost, caught, or trapped on the fireground.
- Illustrate how the disorientation sequence plays a role in firefighter fatalities.
- Illustrate the importance of fireground accountability.
- Understand the Mayday Protocol and the parameters for declaring a Mayday.
- Understand basic survival awareness by discussing fire dynamics, building types, the warning signs of collapse, and the types of collapse.
- Understand sound search and rescue techniques.
- Understand size-up and search techniques for rapid intervention.
- Understand tactical considerations when switching from suppression strategy to a high-priority rescue.
- Understand the importance of a strong command presence and managing resources when a Mayday is called.
- Discuss considerations for developing standard operating procedures.

## HAZARD COMMUNICATION TRAINING

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### 4 HOURS

#### SAF-245: Hazard Communication Training

- Know the hazardous chemicals that workers are exposed to, by means of a hazard communication program, labels, and other forms of warning, SDS, and information and training.
- Know the operations in the work area where hazardous chemicals are present.
- Know the location and availability of the written hazard communication.
- Understand the Global Harmonizing System (GHS).

## HAZARDOUS CHEMICAL TRANSPORTATION (FORMERLY DOT HM-126F) TRAINING

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### 4 HOURS

#### SAF-250: Hazardous Chemical Transportation (Formerly DOT HM-126F) Training

- Understand the principles of HM-172.704.
- Explain the hazardous materials table.
- Explain shipping papers.
- Explain labeling of hazardous materials.
- Demonstrate packaging and marking.
- Demonstrate loading and segregating materials.
- Explain placard requirements.
- Introduce safety training overview.
- Explain DOT Emergency Response Guide.
- Explain the properties of hazardous material.
- Explain DOT classifications of hazardous materials.
- Demonstrate basic emergency response actions.

## HAZWOPER/HAZMAT AWARENESS TRAINING

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### 4 TO 8 HOURS

#### SAF-255: HAZWOPER/HAZMAT Awareness Training

- Understand what hazardous substances are, and their associated risks in an incident.
- Know the potential outcomes associated with an emergency created when hazardous substances are present.
- Have the ability to recognize the presence of hazardous substances in an emergency.
- Understand the role that the first responder plays in the employer's emergency response plan, including site security and control, and the U.S. Department of Transportation's Emergency Response Guidebook.
- Have the ability to identify the hazardous substances, if possible.
- Have the ability to realize the need for additional resources, and to make the appropriate notification to the communication center.

## HAZWOPER/HAZMAT OPERATIONS TRAINING

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### 24 HOURS

#### SAF-256: HAZWOPER/HAZMAT Operations Training

- Know basic hazard and risk assessment techniques.
- Know how to select and use proper personal protective equipment provided to the first responder at the operations level.
- Understand basic hazardous material terms.
- Know how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available.
- Know how to implement basic decontamination procedures.
- Understand the relevant standard operating procedures and termination procedures.

# 2

## APPLIED FUNDAMENTALS

### HAZWOPER/HAZMAT TECHNICIAN TRAINING

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**40 HOURS**

**SAF-257: HAZWOPER/HAZMAT Technician Training**

- Safety Training Services, Inc. offers a comprehensive training program that encompasses all aspects of hazardous waste operations for technicians.

### HAZWOPER/HAZMAT TECHNICIAN REFRESHER TRAINING

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**8 HOURS**

**SAF-258: HAZWOPER/HAZMAT Technician Refresher Training**

- Safety Training Services, Inc. offers a refresher course in hazardous waste operations and emergency response for technicians.

### MANAGEMENT & SUPERVISOR HAZMAT TRAINING

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**8 HOURS**

**SAF-260: Management & Supervisor HAZMAT Training**

- Have the ability to coordinate a site-specific health and safety program.
- Have the ability to design a site-specific safety and health plan.
- Define employee training programs and requirements.
- Have the ability to coordinate a PPE program.
- Have the ability to coordinate a spill containment program.
- Define health hazard procedures and recovery techniques.

### NFPA 70E ARC FLASH TRAINING

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**8 HOURS**

**SAF-265: NFPA 70E Arc Flash Training**

- Identify electrical hazards in the workplace.
- Determine the personal protective equipment required based on the task to be performed.
- Identify safer alternatives to existing procedures.
- Establish an electrically safe work environment.



## OCCUPATIONAL NOISE EXPOSURE TRAINING

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### **2 HOURS**

#### **SAF-270: Occupational Noise Exposure Training**

- Recognize applicable hazardous noise sources, the type and magnitude of noise reduction devices available in the workplace, and the methods and means necessary to protect an employee's hearing.
- Understand the purpose and use of noise and hearing conservation equipment.

## ON-SCENE INCIDENT COMMANDER

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### **8 HOURS**

#### **SAF-275: On-Scene Incident Commander**

- Know how to implement the employer's incident command system.
- Know how to implement the employer's emergency response plan.
- Know and understand the hazards and risks experienced by employees working in chemical protective clothing.
- Know how to implement the local emergency response plan.
- Be familiar with the state emergency response plan and the federal Regional Response Team.
- Know and understand the importance of decontamination procedures.

## OSHA 10-HOUR GENERAL INDUSTRY TRAINING

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### **10 HOURS**

#### **SAF-280: OSHA 10-Hour General Industry Training**

- Have an introduction to OSHA.
- Identify hazards related to walking and working surfaces.
- Know and understand the importance of exit routes, emergency action plans, fire prevention, and protection plans.
- Understand electrical hazards.
- Have an understanding of PPE and when it is required.
- Understand hazard communication.

# 2

## APPLIED FUNDAMENTALS

### OSHA 30-HOUR GENERAL INDUSTRY TRAINING

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#### 30 HOURS

##### SAF-281: OSHA 30-Hour General Industry Training

- Have an introduction to OSHA.
- Identify hazards related to walking and working surfaces.
- Know and understand the importance of exit routes, emergency action plans, fire prevention, and protection plans.
- Understand electrical hazards.
- Have an understanding of PPE and when it is required.
- Understand hazard communication.
- Understand materials handling.

### OSHA 10-HOUR CONSTRUCTION INDUSTRY TRAINING

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#### 10 HOURS

##### SAF-282: OSHA 10-Hour Construction Industry Training

- Have an introduction to OSHA.
- Know the Focus Four Hazards, including fall protection, electrical, struck by, and caught in/between.
- Have an understanding of PPE and LSE and when it is required.
- Know the health hazards in construction, including hazard communication and silica.

### PERSONAL PROTECTIVE EQUIPMENT (PPE) TRAINING

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#### 2 HOURS

##### SAF-285: Personal Protective Equipment (PPE) Training

- Determine when personal protective equipment is necessary.
- Determine what personal protective equipment is necessary.
- Know the limitations of personal protective equipment.
- Know how to properly don, doff, adjust, and wear personal protective equipment.
- Know the proper care, maintenance, useful life and disposal of the personal protective equipment.

### RESPIRATORY PROTECTION TRAINING

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#### 4 HOURS

##### SAF-290: Respiratory Protection Training

- Safety Training Services, Inc. will provide training according to the Respiratory Protection Standard (29 CFR 1910.134).

## 2

APPLIED  
FUNDAMENTALS**OXYGEN/ACETYLENE  
(OXY/ACT) CUTTING****40 HOURS****WE-200: Oxygen/Acetylene (OXY/ACT) Cutting**

- Describe equipment and gases used in oxy-acetylene cutting.
- Identify oxy-fuel equipment and its uses.
- Discuss the hose and hose fittings used in oxy-acetylene cutting.
- Identify safety and health hazards in oxy-fuel applications.
- Identify and describe the safety equipment associated with oxy-acetylene cutting.
- Demonstrate proper setup for safe operation of oxy-acetylene equipment.
- Operate an oxy-acetylene torch and perform manual flame cutting.

**PIPE WELDING****200 HOURS****WE-210: Pipe Welding**

- Discuss uphill shielded metal arc welding and its applications.
- Identify and discuss proper pipe welding procedures.

**SHIELDED METAL ARC WELDING (SMAW)****200 HOURS****WE-205: Shielded Metal Arc Welding (SMAW)**

- Discuss SMAW and its applications.
- Identify and discuss proper SMAW welding procedures.
- Prepare and assemble a pipe joint without backing.
- Discuss criteria to identify the quality of a weld.
- Demonstrate proper application of a root pass.
- Demonstrate proper application of hot pass and stringers.
- Demonstrate the correct use of preheat and interpass temperatures.
- Prepare and assemble a pipe joint with a backing rig.



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