# *Facilities Maintenance*

The Facilities Maintenance Apprenticeship at TOCC is based on a curriculum developed by the National Center for Construction Education & Research (NCCER), whose website is www.nccer.org. The following tables show the content of classroom instruction and the number of hours of instruction for each module. Following the tables are descriptions of the modules. Classroom instruction is complemented by on-the-job training, which is customized for each student. Facilities Maintenance is a two-year program, requiring 4,000 hours of investment by the student.

| FIRST SEMESTER (Core) | Hours | SECOND SEMESTER | Hours |
|---|---|---|---|
| Basic Safety | 15 | Welding Safety | 2.5 |
| Introduction to Construction Math | 15 | Oxyfuel Cutting | 17.5 |
| Introduction to Hand Tools | 10 | Base Metal Preparation | 12.5 |
| Introduction to Power Tools | 5 | Weld Quality | 10 |
| Introduction to Blueprints | 7.5 | Equipment and Setup | 5 |
| Basic Rigging | 20 | Electrodes and Selection | 2.5 |
| Basic Communication Skills | 5 | Beads and Fillet Welds | 120 |
| Basic Employability Skills | 15 | Groove Welds with Backing | 10 |
| | | Joint Fit-Up and Alignment | 5 |
| Total Semester Hours | **92.5** | Total Semester Hours | **185** |

***First Year (277.5 hours)***

## *Second Year (200 hours)*

| FIRST SEMESTER | Hours | SECOND SEMESTER | Hours |
|---|---|---|---|
| Introduction to the Plumbing Profession | 5 | Electrical Safety | 12.5 |
| Plumbing Safety | 20 | Hand Bending | 7.5 |
| Plumbing Tools | 7.5 | Electrical Theory I | 7.5 |
| Introduction to Plumbing Math | 7.5 | Electrical Test Equipment | 7.5 |
| Introduction to Plumbing Drawings | 12.5 | Introduction to the National Electrical Code® | 2.5 |
| Plastic Pipe and Fittings | 10 | Introduction to Electrical Blueprints | 7.5 |
| Copper Pipe and Fittings | 10 | Wiring: Commercial and Industrial | 7.5 |
| Cast-Iron Pipe and Fittings | 12.5 | Orientation to the Trade | 2.5 |
| Carbon Steel Pipe and Fittings | 10 | Building Materials, Fasteners, and Adhesives | 7.5 |
| | | Hand and Power Tools | 10 |
| | | Reading Plans and Elevations | 20 |
| | | Basic Stair Layout | 12.5 |
| Total Semester Hours | **95** | Total Semester Hours | **105** |

***Total Apprenticeship-Related Training (Classroom Instruction) = 477.5 hours***

# *Facilities Maintenance Modules*

## *First Year (277.5 hours)*

### *First Semester (92.5 hours)*

**Basic Safety (15 hours)** Explains the safety obligations of workers, supervisors, and managers to ensure a safe workplace. Discusses the causes and results of accidents and the dangers of rationalizing risk. Reviews the role of company policies and OSHA regulations in maintaining a safe workplace. Introduces common job-site hazards and protections such as lockout/tagout, personal protective equipment (PPE) and HazCom.

**Introduction to Construction Math (15 hours)** Reviews basic mathematical functions such as adding, subtracting, dividing, and multiplying whole numbers, fractions, and decimals. Also reviews basic geometry as applied to common shapes and forms.

**Introduction to Hand Tools (10 hours)** Introduces trainees to hand tools that are widely used in the construction industry, such as hammers, saws, levels, pullers, vises, and clamps. Also safety and maintenance issues related to hand tools.

**Introduction to Power Tools (5 hours)** Provides detailed descriptions of commonly used power tools such as drills, saws, grinders, and sanders.

**Introduction to Blueprints (7.5 hours)** Familiarizes trainees with basic blueprint terms, components, and symbols. Explains the different types of blueprint drawings (civil, architectural, structural, mechanical, plumbing/piping, and electrical.

**Basic Rigging (20 hours)** Explains how ropes, chains, hoists, loaders, and cranes are used to move material and equipment from one location to another on a jobsite. Also hand signals.

**Basic Communication Skills (5 hours)** Provides trainees with techniques for communicating effectively with co-workers and supervisors. Includes practical examples that emphasize importance of verbal and written information and instructions on the job.

**Basic Employability Skills (15 hours)** Identifies the roles of individuals and companies in the construction industry. Introduces trainees to critical thinking and problem solving skills and computer systems and their industry applications.

### *Second Semester (185 hours)*

**Welding Safety (2.5 hours)** Covers safety equipment, protective clothing, and procedures applicable to the cutting and welding of metals.

**Oxyfuel Cutting (17.5 hours)** Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust and shut down oxyfuel equipment.

**Base Metal Preparation (12.5 hours)** Describes how to clean and prepare all types of base metal for cutting or welding. Identifies and explains joint design and base metal preparation for all welding tasks.

**Weld Quality (10 hours)** Identifies the codes that govern welding. Identifies and explains weld imperfections and causes. Describes non-destructive examination practices, welder qualification tests, and the importance of quality workmanship.

**Equipment and Setup (5 hours)** Describes SMAW and welding safety. Explains how to connect welding current and set up arc welding equipment. Identifies and explains using tools for cleaning welds.

**Electrodes and Selection (2.5 hours)** Explains electrode characteristics and different types of filler metals. Describes the role of the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME). Explains proper storage and control of filler metals and identifies the use of codes.

**Beads and Fillet Welds (120 hours)** Describes the preparation and setup of arc welding equipment and the process of striking an arc. Explains how to detect and correct arc blow. Describes how to make stringer, weave, overlapping beads, and fillet welds.

**Groove Welds with Backing (10 hours)** Explains groove welds and how to set up welding equipment for making groove welds. Describes how to make groove welds with backing. Provides procedures for making flat, horizontal, vertical, and overhead groove welds.

**Joint Fit-Up and Alignment (5 hours)** Identifies and explains job code specifications. Describes the use of fit-up gauges and measuring devices to check fit-up and alignment and the use of plate and pipe fit-up and alignment tools to properly prepare joists. Explains how to check for joint misalignment and poor fit.

## *Second Year (200 hours)*

### ***First Semester (95 hours)***

**Introduction to the Plumbing Profession (5 hours)** Introduces trainees to the many career options available in today's plumbing profession. Provides a history of plumbing and also discusses the current technology, industries, and associations that make up the modern plumbing profession. Also reviews human relations and safety skills.

**Plumbing Safety (20 hours)** Discusses the causes of accidents and their consequences and repercussions in terms of delays, increased expenses, injury, and loss of life. Reviews the types and proper use of personal protective equipment (PPE). Instructs trainees in the use of critical safety information conveyed in hazard communication (HazCom), safety signs, signals, lockout/tagout, and emergency response. Covers confined space safety, and reviews safety issues related to hand and power tools.

**Plumbing Tools (7.5 hours)** Instructs trainees in the care and use of the different types of hand and power tools they will use on the job. Gives trainees the information they need to select the appropriate tools for different tasks, and reviews tool maintenance and safety issues.

**Introduction to Plumbing Math (7.5 hours)** Reviews basic math concepts, such as whole numbers, fractions, decimals, and squares, and demonstrates how they apply to on-the-job situations. Teaches trainees how to measure pipe using fitting tables and framing squares and how to calculate 45-degree offsets.

**Introduction to Plumbing Drawings (12.5 hours)** Introduces trainees to the different types of plumbing drawings they will encounter on the job, and discusses how to interpret and apply them when laying out and installing plumbing systems. Discusses the symbols used in plumbing and mechanical drawings, and reviews isometric, oblique, orthographic, as well as schematic drawings. Requires trainees to render plumbing drawings and to recognize how code requirements apply to plumbing drawings.

**Plastic Pipe and Fittings (10 hours)** Introduces trainees to the different types of plastic pipe and fittings used in plumbing applications, including ABS, PVC, CPVC, PE, PEX, and PB. Describes how to measure, cut, join, and support plastic pipe according to manufacturer's instructions and applicable codes. Also discusses pressure testing of plastic pipe once installed.

**Copper Pipe and Fittings (10 hours)** Discusses sizing, labeling, and applications of copper pipe and fittings, and reviews the types of valves that can be used on copper pipe systems. Explains proper methods for cutting, joining, and installing copper pipe. Also addresses insulation, pressure testing, seismic codes, and handling and storage requirements.

**Cast-Iron Pipe and Fittings (12.5 hours)** Introduces trainees to hub-and-spigot and no-hub cast-iron pipe and fittings and their applications in DWV systems. Reviews material properties, storage and handling requirements, and fittings and valves. Covers joining methods, installation, and testing.

**Carbon Steel Pipe and Fittings (10 hours)** Discusses threading, labeling, and sizing of carbon steel pipe, and reviews the differences between domestic and imported pipe. Also covers the proper techniques for measuring, cutting, threading, joining, and hanging carbon steel pipe.

***Second Semester (105 hours)***

**Electrical Safety (12.5 hours)** Covers safety rules and regulations for electricians. Trainees learn the necessary precautions to take for various electrical hazards found on the job. Also teaches the OSHA-mandated lockout/tagout procedure.

**Hand Bending (7.5 hours)** Provides an introduction to conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

**Electrical Theory One (7.5 hours)** Offers a general introduction to the electrical concepts used in Ohm's law applied to DC series circuits. Includes atomic theory, electromotive force, resistance, and electric power equations.

**Electrical Test Equipment (7.5 hours)** Focuses on proper selection, inspection, use, and maintenance of common electrical test equipment. Trainees get to practice using many of the instruments while learning the appropriate test procedures and safety rules.

**Introduction to the National Electrical Code® (2.5 hours)** Provides a navigational road map for using the NEC®. Trainees are introduced to the layout of the NEC® and the types of information found within the code book. Trainees are able to practice finding information using an easy-to-follow procedure.

**Introduction to Electrical Blueprints (7.5 hours)** Focuses on electrical prints, drawings, and symbols. Trainees learn the types of information they can find on schematics, one-lines, and wiring diagrams.

**Wiring: Commercial and Industrial (7.5 hours)** Covers the electrical devices and wiring techniques common to commercial and industrial construction and maintenance. The appropriate NEC® requirements are stressed.

**Orientation to the Trade (2.5 hours)** Reviews the history of the trade, describes the apprentice program, identifies career opportunity for carpentry and construction workers, and lists the responsibilities and characteristics a worker should possess.

**Building Materials, Fasteners, & Adhesives (7.5 hours)** Provides an overview of the building materials used in construction work, including lumber, sheet materials, engineered wood products, structural concrete, and structural steel. Also describes the various fasteners and adhesives used in construction work.

**Hand & Power Tools (10 hours)** Provides detailed descriptions of the hand tools and portable power tools used by carpenters. Emphasis is on safe and proper operation of tools, as well as care and maintenance.

**Reading Plans & Elevations (20 hours)** Builds upon the basic information presented in the *Introduction to Blueprints* module studied in the *Core Curriculum*. Trainees will learn the techniques for reading and using blueprints and specifications with an emphasis placed on those drawings and types of information that are relevant to the carpentry trade. Introduces the subject of quantity takeoffs.

**Basic Stair Layout (12.5 hours)** Introduces the trainee to the various types of stairs and the common building code requirements related to stairs. The module focuses on the techniques for measuring and calculating rise, run, and stairwell openings, laying out stringers, and fabricating basic stairways.