

STEAMFITTER / PIPEFITTER

PROGRAM OBJECTIVES

The Steamfitter/Pipefitter program at Eastern College, is designed to provide students with the high quality training necessary to start their career in the Steamfitter/Pipefitter trade. Students will have the opportunity to combine classroom learning with the application of the skills in a shop setting.

The objective of this program is to prepare students with the skills necessary to gain employment in their trade. Instruction is provided by industry experts in a balance of classroom theory and practical application. This means you will read and study how to do a job and then actually apply the skills in a shop setting.

Students will develop skills in hand and power tools, oxyfuel brazing and cutting, pipe and tubing fundamentals, piping valves, piping varieties, trades math, shielded metal arc welding (SMAW), hydronic heating, rigging and blueprint reading.

Students will complete an industry work term of four weeks as part of their program and will be evaluated by the journeyman/mentor during the work term.

CAREER OPPORTUNITIES

Graduates of the Steamfitter - Pipefitter program are entering the field at a time when industry demand is very high and Atlantic Canada is experiencing strong growth. Graduates will have opportunities for employment in industrial and commercial construction, generating plants, pulp mills, manufacturing and oil refineries.

Following graduation from the program, those who complete apprenticeship and obtain a Certificate of Qualification with Red Seal will have opportunities for project supervision and/or management and even self-employment.

PREREQUISITES

- High school diploma or
- Mature student status or
- Adult High school Diploma or
- High School equivalency (GED)

GRADUATION REQUIREMENTS

A student must obtain an overall grade, in each module of at least 70% in order to graduate and receive a diploma. A student must complete all requirements of the Student Success Strategies and Career Planning and Preparation modules as well as the field placement requirements.

APPRENTICESHIP AND OCCUPATIONAL CERTIFICATION

Steamfitter - Pipefitter is an apprenticeship trade in New Brunswick and graduates working in the trade with a journeyman should apply to become registered apprentices as soon as they start work.

Graduates of this program may qualify for credit toward their apprenticeship upon registering as an apprentice with their trade employer and Apprenticeship and Occupational Certification, Government of NB. Graduates may also be eligible to challenge the apprenticeship level one exam and upon successful completion of that exam and meeting the on the job requirements for their trade will become second year apprentices.

Please visit the Federal Government web-site at: www.servicecanada.gc.ca/en/gov/apprenticeship.htm for information on how to receive a Government of Canada *Apprentice Incentive Grant* of \$1000.00 for completion of level one of apprenticeship (includes both exam and work term requirements), and for information on how to receive another \$1000.00 grant for completion of level two of apprenticeship.

PROGRAM MODULES

Student Success Strategies*	SMAW Equipment
Career Planning and Preparation I*	Shop / Lab Practices: SMAW Welds on Mild Steel
Career Planning and Preparation II for Trades	Weld Faults
Software Lab: Computer Fundamentals*	Plastic Pipe
Mathematics	Drawing Tools
Safety Guidelines	Introduction to Drawing
Safe Work Practices	Introduction to Pressure Testing
Steamfitter / Pipefitter Apprenticeship Program	Hydronic Heating Boilers
Orientation	Hydronic Heating Systems
Glossary of Terms and Definitions	Isometric and Oblique Drawings
Safe Use of Hand Tools	Piping Isometrics
Safe Use of Power Tools	Fibre Rope, Wire Rope and Hand Rigging Equipment
Threaded Pipe	Perimeters, Areas, Percentage and Grade
Welded Pipe and Fittings	Temperature and Heat Calculations
Ductile Iron, Glass and Fibreglass Pipe	Properties of Matter
Tube and Tubing	Pressure and Atmosphere
Applied Mathematics	Temperature and Heat Science
Oxyfuel Equipment	Work Placement
Brazing and Soldering	
Oxyfuel Cutting	
Valves	
Hangers and Supports	
Mild Steel Electrodes	
Basic Joints and Weld Types	

Theory	560 hours
Practical	480 hours
Work Term	160 hours
Total Hours	1200 hours
Total Weeks	32 weeks

*4 hours/day, all other classes are full days.

MODULE DESCRIPTIONS

Student Success Strategies

In this orientation module, emphasis is placed on thinking about achieving success from Day One. This module stresses the importance of developing non-technical skills to enhance personal, academic, and career success. This includes understanding learning styles and honing practical study skills, such as memory, reading, writing, note-and test-taking techniques. Personal exercises will focus on teamwork, decision making and problem solving skills, setting SMART goals and maintaining a positive attitude; techniques for managing change, money, stress and conflict will also be explored.

Career Planning and Preparation Level I

This module introduces tools for planning and preparing for a successful job search, so that students can maintain a career-focused approach throughout their education program. Students will learn about the "Hidden" Job Market and ways to access it in their upcoming job search, how to research opportunities and network for industry contacts, and use appropriate etiquette when communicating with prospective employers. Students will identify their personal skills, values and preferences for the workplace, begin preparation of a professional resume and references, and organize proof documents for their career portfolio. Class discussions on various self-management topics introduced in Student Success Strategies will round out this module, which is a pre-requisite for Career Planning and Preparation - Level II.

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Career Planning and Preparation Level II for Trades

This module continues to build on the concepts and skills introduced in Career Planning and Preparation - Level I. Students will identify and practice the different types and forms of interviews, practice responding to typical questions, and practice follow-up, evaluation and negotiation techniques they can use to ensure success. Students also practice the customer service and interpersonal skills necessary for success in today's business environment, with focus on oral and written techniques that ensure effective business communication.

Software Lab: Computer Fundamentals

Through a combination of theory and hands-on-practice, this module examines the role and use of the computer in today's workplace. Emphasis is placed on those computers outfitted with the Microsoft Windows operating system. Students will review basic computer concepts, Windows OS usage, and complete hands-on training exercises in business-standard software applications, including Microsoft Outlook and Microsoft Word. Keyboarding skills are also honed via daily keyboarding exercises and drills.

Mathematics

In this module, you will review several areas of math including: basic math, fractions, perimeters, areas, percentage, grade, and the application of these calculations. These skills are important to ensure accuracy and efficiency in the workplace. You will review your mathematical skills using practical, trade-related questions. This module will enable you to solve trade-related problems arising in the Steamfitter/Pipefitter trade.

Safety Guidelines

This module teaches you how to locate and interpret section of the *New Brunswick OH & S Act, Regulation and Code, and the Workplace Hazardous Materials Information System (WHMIS)*. This module also contains procedures to follow when you have to enter, work, weld or cut in a confined space that has the potential to become a dangerous environment. This module will enable you to follow WCB, OH&S and WHMIS guidelines.

Safe Work Practices

As an apprentice and tradesperson, you must constantly be on the alert for possible injury situations. **Statistics show that over 50% of the accidents involving young workers occur during the first six months on the job.** The purpose of this module is to alert you to some of the hazards found around steamfitting, pipefitting, welding, and cutting operations.

Steamfitter/Pipefitter Apprenticeship Program Orientation

The purpose of this module is to familiarize you with the New Brunswick Apprenticeship training program for the steamfitter–pipefitter trade and helps you to work through it successfully. This module will enable you to describe the responsibilities and opportunities in the steamfitter – pipefitter trade.

Glossary of Terms and Definitions

The terms from the first period ILM modules are primarily aimed at identification of the various devices and equipment encountered in the trade. The succeeding periods further amplify and define the requirements for fabrication and/or installation of each of these components. This module will enable you to identify the terms of the steamfitter – pipefitter program.

Safe Use of Hand Tools

Hand tools used in the steamfitter – pipefitter trade range from measuring and layout tools used in preparation work to the tools used for fit-up and fabrication work. This module provides information on the selection, safe and proper use and care of the more common hand tools used in the steamfitter – pipefitter trade.

Safe Use of Power Tools

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This module describes the operating characteristics, physical hazards and safe operating guidelines and procedures for:

- Grinders, both portable and stationary
- Drills and drill presses
- Forming tools including rolls, benders, and brakes
- Cutting tools including shears, punches and saws
- Pneumatic tools and components

Threaded Pipe

Iron/ferrous pipe and fitting used in the piping trade range from small sized threaded iron pipe and fitting installations to large, exotic, welded alloy pipe systems. This module discusses the selection, safe and proper use and care of the most common iron/ferrous pipe and fittings used in the piping trade. Upon completion of this module you will be able to describe, install and service ferrous pipe and fittings.

Welded Pipe and Fittings

Welded pipe and fittings used in the piping trade range from small size socket weld iron pipe and fitting installations to larger welded exotic alloy pipe systems to plastic piping systems. Plastic pipe, fittings and flanges may be jointed using fusion welding and solvent welding and are covered. This module discusses the selection, safe and proper use and care of the most common welded pipe and fittings used with iron pipe in the piping trade. This module describes the fabrication process, installation and service of welded pipe and fittings.

Ductile Iron, Glass and Fibreglass Pipe

Knowledge of cast iron, fibreglass and glass pipe and fittings is required to make your job easier and enable you to work more efficiently. This module provides information on the selection, safe and proper use of cast iron, fibreglass and glass pipe and fittings used in the steamfitter – pipefitter trade. Upon completion of this module you will be able to describe, install and service cast iron, fibreglasses and glass piping materials.

Tube and Tubing

Copper tube, tubing and fittings used in the piping trade range from small size copper tubing and fitting installations to large copper tube soldered systems. This module discusses the selection, safe and proper use and care of the more common copper tube, tubing and fittings used in the piping trades. This module will enable you to describe, install and service non-ferrous metal pipe and fittings.

Applied Mathematics

This module may seem very easy for you as it encompasses basic skills previously acquired, but it is essential that you complete the samples and the self-test as a review and a diagnostic tool to determine any weaknesses you have. In addition, these skills form the building blocks for more advanced mathematics that you will encounter as you progress through your training. This module will enable you to implement basic mathematical skills relevant to the trade, utilizing metric and imperial measurements.

Oxyfuel Equipment

In order for you to assemble and safely use oxyfuel equipment, this module includes topics on:

- Gas used
- Equipment components
- Set-up procedures
- Using the equipment
- Shut-down procedures

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- Flame types and their uses

Upon completion of this module, you will be able to assemble oxyfuel equipment.

Brazing and Soldering

The theory sections and practical exercises contained within this module are designed to help you acquire the skills you need to completely execute acceptable quality oxyfuel fusion welds, braze and brazing operations. This module will enable you to perform oxyfuel welding, braze welding, and brazing.

Oxyfuel Cutting

This module on *Oxyfuel Cutting* includes the following:

- The theory of the oxyfuel cutting operation
- Descriptions of manual, semi-automatic, machine and fully automatic oxyfuel cutting equipment
- Practical exercises for developing good oxyfuel cutting skills

Valves

Every piping installation should have a valve installed to control flow or pressure in the system. The valve is a key component for safety, serviceability and efficiency in a pipeline system. You must be able to visually identify a valve and determine if the valve is suited for the particular piping application in which it is installed. This module will enable you to install and service valves.

Hangers and Supports

Supporting and anchoring piping systems manufactured from various piping materials is a critical aspect of the piping trades. Piping must be securely anchored in order to provide support for not only the pipe and fittings, but also the contents of the piping system. Hangers are used to keep piping level or to provide the required grade on the piping system. This module will enable you to support pipe and fittings above ground.

Mild Steel Electrodes

This module is designed to help you understand the terminology associated with the mechanical properties of carbon steel electrodes. The module also contains information about the American Welding Society and Canadian Standards Association carbon steel electrodes specifications and classification systems. This module will enable you to select mild steel electrodes for SMAW.

Basic Joints and Weld Types

This module deals with basic joints and weld types with particular reference to variations, terminology, dimensioning, advantages and limitations. The module then offers guidelines for making an informed decision on the selection of a joint and weld type for a given job. Upon completion of this module you will be able to identify basic joints and weld types.

SMAW Equipment

This module is designed to introduce you to some of the SMAW related terms as they apply to electricity and welding machines. The module concludes with a discussion on arc length and its effects on welding. This module will enable you to identify SMAW equipment.

Shop/Lab Practices: SMAW Welds on Mild Steel

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This module is designed to increase your knowledge of SMAW and to develop your hand skills with this process. The module outlines procedures that are applicable to performing surfacing, fillet and groove welds on mild steel using the (SMAW) process. The procedures prescribed in this module have historically proven successful in the production of sound welds. The techniques that you develop can be applied to many other processes and material types. Recommended progression is to perform, in order, the following projects for the development of your skills to an acceptable level of competency:

- Surfacing beads in the flat position
- Fillet weld in the flat (1F) position
- Fillet weld in the horizontal (2F) position
- Fillet weld in the (3F) position
- Groove weld in the flat (1G) position
- Groove weld in the flat (1G) position using a (1 GF) test assembly

This module will enable you to perform surface welds in the flat position and 1F, 2F, 3F, 1G and 1GF welds using SMAW.

Weld Faults

You must always strive to achieve a high standard of quality in your work. This applies not only to your welding, but also to the selection and preparation of materials and to finishing work as well, such as removal of welding spurs and spatter. Weld faults occur whenever this standard is not met. This module will enable you to identify weld faults, know their causes and determine how to avoid and correct the weld faults.

Plastic Pipe

Many piping materials, such as steel and copper, have been developed over a great number of years. Consequently, many of their characteristics are widely known and there is much experience in their application. This module provides information about the selection, safe and proper use and care of the most common thermoplastic and thermosetting plastic pipe and fittings used in the piping trade. This module enables you to describe, install and service non-metallic pipe and fittings.

Drawing Tools

This module introduces practical applications of drafting and layout equipment to construct geometric shapes and patterns. Upon completion of this module you will be able to perform basic geometric construction.

Introduction to Drawing

This module is designed to introduce you to some basic shop drawing techniques and to apply this knowledge in layout and fabrication work for welded structures.

Introduction to Pressure Testing

To prevent catastrophic failure of piping, companies have developed testing procedures that enable them to thoroughly test plan piping and to document these tests for future reference. This module deals with test equipment, installation procedures for test equipment and some general testing procedures used in industry. Upon completion of this module you will be able to identify pressure-testing methods used in the steamfitter – pipefitter trade and state application, installation requirements and test procedures.

Hydronic Heating Boilers

Boilers are manufactured from a variety of material and in various patterns. The use of any particular type of boiler is dependent upon the application of the heating system. This module provides information on basic boiler

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construction and trim components. This module will enable you to list and describe types of hydronic heating boilers, ratings and trim.

Hydronic Heating Systems

As the use of hot water or hydronic systems becomes more popular, installers must be able to recognize the proper application of various types of heating systems. Upon completion of this module you will be able to install and service hot water heating for a commercial building, including boilers, trim (hot water and low pressure steam), two-pipe supply systems and terminal heating systems in accordance with applicable codes and manufactures' specifications.

Isometric and Oblique Drawings

This module provides information and exercises for making isometric and oblique drawings. Upon completion of this module you will be able to develop basic isometric and oblique drawings.

Piping Isometrics

You will often sketch or draw a three-dimensional image of an object in order to get a better sense of what it actually looks like. The image can be an isometric drawing. The image may also be drawn from scratch simply to put one's ideas on paper to see what an object will look like once it has been built. This module provides information and exercises for making isometric drawings. Upon completion of this module, you will be able to draw single line piping isometrics using 90-degree elbows.

Fibre Rope, Wire Rope and Hand Rigging Equipment

Rigging is the bringing together of various lifting devices to raise or lower a work piece or equipment. These lifting devices can vary from a large crane to an eyebolt. All lifting devices rely on some form of connecting material between the device and the equipment to be lifted. Upon completion of this module, you will be able to describe types of rigging and hoisting materials and equipment.

Perimeters, Areas, Percentage and Grade

This module gives you information and practice in utilizing basic mathematical skills. The formulas, examples, and practice questions included in the module will enable you to calculate perimeters and areas of rectangles, triangles, and circles. Manipulation of these basic formulas will allow for calculating the surface areas of various tanks and vessels. This module discusses how to calculate percentages and how to convert decimals or fractions to percentages. This module will enable you to solve mathematical problems involving perimeters, areas, percentage, and grade.

Temperature and Heat Calculations

The use and transfer of heat energy forms one of the major components of the steamfitter – pipefitter trade. Whether you are installing a radiant heating system or troubleshooting a hot water tank, a basic understanding of heat and temperature is essential in becoming a competent steamfitter – pipefitter. Upon completion of this module you will be able to implement basic heat calculations relevant to the trade, utilizing both metric and imperial values.

Properties of Matter

This module is designed to give you information on matter, density, and relative density as related to the pipe trades. These basic concepts form the foundation for understanding the concepts of pressure, buoyancy, and electricity. This module will enable you to define terminology related to matter and define and calculate densities and relative densities.

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Pressure and Atmosphere

This module provides you with the skills necessary to apply the principles of force and pressure. After completing this module, you will be able to define and calculate force and pressure in imperial and metric units. In addition, you will be able to define atmospheric pressures and convert atmospheric pressure readings from one type of unit to another. This module will enable you to utilize standard science fundamentals that are relevant to the steamfitter – pipefitter trade, applying both metric and imperial values.

Temperature and Heat Science

This module is designed to give you information on the methods of heat transfer and how they affect the steamfitter – pipefitter trade. It also explains expansion and contraction and how to calculate the expansion or contraction of different materials. The effects of expansion and contraction are discussed and how these effects can be used or controlled.

Work Placement

Experience on the job is where it all comes together. Students will have the opportunity to work on the job with a certified industry expert who can provide advice and guidance as you start your new career in the Steamfitter - Pipefitter trade. The expert will evaluate your knowledge and abilities as part of this work term.