



**Bismarck State College
National Energy Center of Excellence
Mechanical Maintenance Technician
Apprenticeship Program**

TPC 111 – How Power Plants Work

Covers the basic steam generation system, how thermal energy is converted into electrical energy, components of the system, and design features for gaining thermal efficiency. Includes handling of water, fuel, and wastes, and the operating features of a power plant

TPC 112 – Generating Steam in the Power Plant

Covers energy principles and boiler maintenance. Explains coal, oil, and natural gas combustion, and how to conserve energy through improved combustion control.

TPC 113 – Using Steam in the Power Plant

Covers how to conserve energy in turbines, auxiliaries, electric power generation, and air conditioning systems

TPC 107 - Hand Tools

Covers the most important hand tools used on the job. Begins with measuring tools, including a discussion of units of measurement. Examines the various kinds of wrenches and screwdrivers, their uses and handling techniques. Explains other hand tools by specialty: pipefitting tools, plumbing tools, electrician's tools, sheet metalworking tools, machinists' metal-working tools. Ends with hoisting and pulling tools.

TPC 108 – Portable Hand Tools

Explains the uses, selection, safety, and care of industrial power tools: electric drills, electric hammers, pneumatic drills and hammers, screwdrivers, nutrunners, wrenches, linear-motion and circular saws, routers and planes, electric sanders, grinders, and shears. Covers tool sharpening techniques for selected tools.

TPC 109 - Safety and Health

Explains government involvement in ensuring a safe workplace. Discusses safety in various situations. Discusses personal protective equipment and fire safety. Includes expanded coverage of many health hazards. Covers ergonomics, environmental responsibility and importance of maintaining a safe work environment.

TPC 101 – Blue Prints

Covers all types of blueprints used in industrial plants. Discusses machine parts and machine drawings. Features drawings of a compound rest and a clutch-brake control. Examines hydraulic, pneumatic, piping, plumbing, electrical, air-conditioning, and refrigeration drawings. Introduces sketching used in industrial plants.

TPC 102 - Schematics and Symbols

Covers all types of schematics and symbols used in commercial and industrial settings. Examines symbols on schematics, electrical symbols and diagrams, piping symbols and diagrams, hydraulic and pneumatic diagrams and symbols. Discusses air conditioning and refrigeration systems, including explanations of electrical/electronic control schematics. Covers welding and joining symbols.

TPC 104 – Measurements

Covers units of measurement used in commercial and industrial applications. Examines all aspects of basic measurement concepts and procedures, including accuracy and tolerance. Discusses techniques and devices for comparison measurements (dial indicators and gauge blocks). Shows common methods for measuring volume, motion, force, temperature, fluid flow, and electricity. Explains how to use scales and rules, combination calipers, and micrometers.

TPC 318 – Industrial Rigging

Covers techniques and safeguards in the use of rope, chain, hoists, and scaffolding when moving heavy plant equipment and maintaining plant utilities.

TPC 319 – Equipment Installation

Covers installation procedures for large plant equipment. Considers factors affecting proper installation in detail, from preparatory relocation of underground piping and wiring, through equipment anchoring, aligning, and test running.

TPC 341 – Maintenance of Mechanical Drives

Covers alignment, particularly coupling alignment. Includes installation and maintenance of mechanical drives, from chain drives to enclosed gear drives.

TPC 342 – Mechanical and Fluid Drive Systems

Covers further details of drive maintenance, including brakes, clutches, and adjustable-speed drives. Also covers maintenance and troubleshooting of fluid drives and package drive systems.

TPC 105 - Metals

Introduces metals, metallurgy, and metalworking. Discusses the properties of metals, including their mechanical properties. Examines several industrial manufacturing processes. Covers iron and standard steels. Explains the different kinds of heat treatment and their usage. Discusses some techniques of working with copper, aluminum, magnesium, titanium, lead, nickel, tin, and zinc.

TPC 106 – Non-Metals

Introduces major nonmetal materials and how they are most frequently used. Describes properties, characteristics, and classifications of each material. Covers synthetic and natural materials. Examines various paints and coatings, their proper use, preparation, and application. Surveys industrial chemicals. Chemical safety precautions are covered, along with the proper use of protective equipment.

TPC 417 – Welding Principles

Covers fundamentals of welding, Discusses welding safety considerations and precautions. Covers both oxyfuel and arc welding equipment. Describes welding techniques and symbols. Discusses ways to avoid weld faults.

TPC 418 – Oxyfuel Operations

Covers the welding of ferrous and nonferrous metals. Describes oxygen cutting as well as brazing and soldering. Discusses surfacing techniques.

TPC 419 – Arc Welding Operations and Practices

Covers shielded metal arc welding, selecting electrodes for SMAW, gas metal and tungsten arc welding, preheating, reheating, welding ferrous and nonferrous metals, pipe welding, hard facing, and rebuilding.

TPC 110 – Developing Troubleshooting Skills

Explores the subject of troubleshooting and the importance of proper maintenance procedures. Covers working with others, aids in communication, and trade responsibilities. Outlines troubleshooting techniques and aids, using schematics and symbols. Focuses on specific maintenance tasks, breakdown maintenance, and planned maintenance.

TPC 302 – Lubrication

Covers a complete lubrication training program, including functions and characteristics of lubricants, factors in selection of lubricants, and effects of additives. Oils, greases, and other compounds used for lubrication are described, as well as their applications. Lubrication methods and recommended storage and handling procedures are included.

TPC 303 – Drive Components

Covers belt drives, chain drives, gears and gear drives, adjustable-speed drives, shaft alignment, shaft coupling devices, and clutches and brakes.

TPC 304 - Bearings

Covers principles and applications of various types of bearings, including plain journal, ball, and roller bearings. Explains installation, inspection and repair of bearings. Deals with specialized bearings, including powdered-metal, nonmetallic, and hydrostatic bearings. Covers bearing seals, lubrication, and maintenance practices.

TPC 331 - Bulk-Handling Conveyors

Covers belt conveyors that carry coal, sand, gravel, grain and other loose materials. Acquaints the trainee with the terminology, basic structure, and operation of these systems. Includes detailed coverage of belts, belt cleaners, idlers, and feed/discharge devices, as well as an explanation of how to install, maintain, replace, and troubleshoot these components.

TPC 343 - Installation and Replacing Bearings

Covers plain bearings, their parts, dimensions, functions, and relining techniques. Continues with installation and replacement of antifriction bearings. Also covers linear motion bearings and shaft seals.

TPC 305 – Pumps

Covers typical applications of various types of pumps. Describes factors affecting pump selection. Explains operating principles of centrifugal, propeller, and turbine, rotary, reciprocating, and metering pumps. Includes special-purpose pumps, diaphragm pumps, and others designed to handle corrosive and abrasive substances. Covers pump maintenance, packing gland, seal, and bearing replacement.

TPC 306 – Piping System

Covers piping and tubing systems used for fluid transport in the plant: hydraulic fluids, steam, liquefied product, refrigerant, and water. Shows typical metallic and nonmetallic piping systems, pipe-joining methods, and how tubing and hoses differ from piping. Covers valves, pipe fittings, hangers, supports, and insulation, and shows how tubing is sized, fitted, bent, and joined. Explains uses of traps, filters, and strainers.

TPC 344 – Pump Installation and Maintenance

Covers basic pumping concepts. Describes required maintenance of packing and seals. Covers maintenance and overhaul of centrifugal pumps. Concludes with maintenance of rotary pumps.

TPC 345 – Maintenance Pipe Fittings

Covers components and terminology used in piping systems. Also covers terminology, measurement, and maintenance of threaded, welded, and plastic piping systems. Explains the use of pipefitting accessories-supports, traps, filters and strainers, and expansion joints.

TPC 346 – Tubing and Hose Systems

Covers tubing specifications, materials, and fittings. Explains procedures used for handling, bending, cutting, and installing tubing. Gives basics of tubing in a hydraulic system. Describes hose systems and their functions. Concludes with gaskets, sealants, and adhesives.

TPC 347 – Installing and Maintaining Valves

Covers maintenance and operation of gate, globe, ball, plug, check, and special-purpose valves. Details actuators and various accessories. Explains valve selection based on application. Describes methods of protecting piping systems.

TPC 307 – Basic Hydraulics

Covers hydraulic principles, types of hydraulic fluids and their characteristics. Describes components of the hydraulic system and their functions, including filters and strainers, reservoirs and accumulators, pumps, piping, tubing and hoses, control valves, relief valves, and actuating devices. Covers a variety of cylinders and hydraulic motors.

TPC 308 – Hydraulic Troubleshooting

Covers understanding the systems, using schematic diagrams, installation procedures, cleanliness and safety. Includes tubing cutting, bending, and flaring, identification and selection of proper fluid, and charging the system. Discusses planned maintenance, specific repair/replacement recommendations, system diagnosis, and troubleshooting.

TPC 309 – Basic Pneumatics

Covers how work, force, and energy are applied to principles of pneumatics. Shows operating principles of reciprocating, positive displacement, rotary, and dynamic air compressors. Covers primary and secondary air treatment. Includes valves, logic devices, cylinders, and air motors.

TPC 310 – Pneumatic Troubleshooting

Covers pneumatic systems, schematic symbols and diagrams, installing system components, planned maintenance, system diagnosis, and troubleshooting. Includes maintenance of air compressors, control valves, air motors, electrical components, and hybrid systems.