



# Nonmetals in the Plant

## Course 106: Nonmetals in the Plant

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 Training is accredited by IACET to offer **1.0 CEU** for this program.



### Lesson 1: Introduction to Nonmetals

#### Topics

Classifying Materials; Properties of Solids; Properties of Liquids; Behavior of Liquids at Rest; Properties of Gases; Behavior of Gases; Fluids in Motion; Mixed States of Matter

#### Objectives

- State the definition of a solid, a liquid, and a gas.
- Demonstrate how to change a liquid to a solid.
- Demonstrate buoyancy.
- Identify an object less dense than water, and an object more dense than water.
- List six possible combinations of matter.

### Lesson 2: Plastics

#### Topics

Characteristics of Plastics; Processing Plastics; Molding; Casting and Foaming; Extruding; Reinforcing; Machining; Assembly; Welding; Patching

#### Objectives

- State the definition of a thermoplastic and a thermoset.
- Describe injection molding, foam molding, and extrusion.
- Select the best bonding agent for joining polyethylene parts.
- Describe the steps in patching a damaged area with glass-plastic material.

### Lesson 3: Rubber

#### Topics

Nature of Rubber; Processing Rubber; Kinds of Rubber; Properties of Rubber; Vulcanizing Rubber; Uses of Rubber; Foam Rubber; Hose and Tubing; Tank Linings; Other Uses of Rubber; Reclaiming Rubber

#### Objectives

- Name four properties of rubber.
- Explain the vulcanizing process.
- Select the best hose for handling oils or gasoline.
- Describe how to use a pinhole locator.
- List the kinds of sheet rubber that should be kept on hand in the storeroom of an industrial maintenance department.

### Lesson 4: Wood

#### Topics

Lumber; Properties of Wood; Wood Grades; Wood Defects; Measuring Lumber; Plywood; Plywood Grades; Choosing Wood; Wood Frame Construction; Wood Joints; Wood Preservation; Industrial Uses; Fasteners

#### Objectives

- State the definition of hardwood and softwood.
- Name the grades of softwoods and hardwoods.
- Describe a radial cut, a crosscut, and a tangential cut.
- Demonstrate how to calculate the number of board feet in a piece of 2 x 8 lumber 10 ft long.

### Lesson 5: Construction Materials

#### Topics

Concrete; Mixing Concrete; Concrete Defects; Removing Stains; Masonry Units; Brick; Mortar; Patching and Repairing Masonry; Wallboard; Repairing Wallboard; Plaster; Glass

#### Objectives

- List the ingredients in concrete.
- State the definition of spalling, crazing, and dusting.
- Explain how to remove an oil stain from concrete.
- Demonstrate how to mix a small batch of mortar.
- List the steps in repairing a hole in wallboard.

### Lesson 6: Insulating Materials

#### Topics

Heat Flow; Thermal Insulation; Loose-Fill Insulation; Blanket Insulation; Low-Density Insulation; Special Thermal Insulation; Acoustic Insulation; Vapor Barriers; Electrical Insulation; Fire Prevention

#### Objectives

- Name the ways by which heat can be transferred.
- State the formula for determining the thermal conductivity coefficient (k value) of a thermal insulator.
- Demonstrate how to install blanket insulation.
- Select the best materials for use an electrical insulation where resistance to flame and high temperature is important.
- List the safety rules that should be followed when working with insulating materials.

### Lesson 7: Paints and Coatings

#### Topics

Protective Materials; Substrates; Paint; Primer; Choosing a Coating; Surface Preparation; Methods of Application; Using Colors; Special Coatings

#### Objectives

- List the factors to consider in selecting a protective coating.
- Name the qualities and characteristics of pigments and vehicles.
- List the safety precautions to follow when using paints containing solvent thinners.
- State the definition of primer.
- Demonstrate how to prepare a metal substrate for coating.

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### Lesson 8: Industrial Chemicals

#### Topics

Chemical Safety; Soaps and Detergents; Solvents; Acids; Packaged Chemicals; Aerosols; Oils; Refrigerants; Water-Treatment Chemicals; Welding and Plating Chemicals; Fuels; Fire-Fighting Chemicals; Protective Equipment

#### Objectives

- List the safety precautions to follow when working with liquid and solid chemicals.
- Name the general classifications of cleaning agents.
- Select the best acid for cleaning stainless steel and aluminum.
- State the reasons why aerosol spray cans are potentially dangerous.
- List considerations in selecting an oil for a particular use.

### Lesson 9: Adhesives

#### Topics

Adhesive Terms; Kinds of Adhesives; Animal Glues; Casein Glues; Vegetable Glues; Synthetic-Resin Glues; Plastic Welding; Acrylic-Based Adhesives; Special Adhesives; Strength of Adhesives; Tapes; Special Tapes

#### Objectives

- State the definitions of adhesiveness, curing, drying, joint, pot, life, and tack.
- List the characteristics of thermosetting and thermoplastic adhesives.
- Demonstrate the plastic-welding process.
- Select the best tapes for insulating and protecting electrical connections and wires.

### Lesson 10: Carbon

#### Topics

Forms of Carbon; Properties of Carbon; Carbon Electrodes and Resistors; Carbon in Furnaces; Carbon Brushes; Kinds of Carbon Brushes; Industrial Diamonds; Fabricated Carbon Products; Chemical Uses of Carbon

#### Objectives

- List four uses of carbon and fabricated carbon products in industry.
- List three properties of carbon that make it useful in electrical and mechanical applications.
- Describe the carbon-arc welding process.
- List the most common causes of brush noise.
- Demonstrate the correct method of cutting individual rings from a continuous length of braided packing.