CURRICULUM
Class III Maintenance Technologist

December 2010

CORE COMPETENCIES

• LEARNING OBJECTIVES
  o TASKS – Changes from Class II

23.00 Available hours for training with 3.0 hours for Exam

Advanced Maintenance Activities to include Inspect, Analyze, Perform Predictive Maintenance, Manage Duties, Tear Down, Perform Repairs, Install and reinstall

MATERIALS, TOOLS AND LUBRICATION (3.75 HOURS TRAINING)

• To provide an advanced overview of tools, materials and lubrication required for Class 2 plant maintenance technologist.
  o REQUIRED ADVANCED MATERIAL SELECTION - Adhesives, Anti-seize compounds, Coatings/Paints, Epoxy, Fastening Devices, Gaskets, Locking Compounds, Metals, O-rings, Plastics, Sealants, Shims, Solvents
  o REQUIRED ADVANCED KNOWLEDGE OF MATERIALS - Application Procedures, Corrosion Control, Material Compatibility, Material Safety Data Sheets, Storage Procedures
  o REQUIRED ADVANCED USE OF TOOLS - Calibration Equipment, Electrical instruments, Hand Tools, Hoists/Cranes, Ladders, Machining Equipment, Power Tools, Pressure/Hot Water Washer, Rigging, Scaffolds, Sand Blasters, Solvent Tanks
  o REQUIRED ADVANCED KNOWLEDGE OF ANCILLARY CRAFTS – Welding/Cutting Equipment
  o REQUIRED ADVANCED USE OF PRECISION TOOLS - Alignment, Caliper, Dial Indicator, Laser, Micrometer
  o REQUIRED ADVANCED KNOWLEDGE OF TOOLS - Accuracy, Non Sparking, Precision, Sharpening, Tool Storage
  o REQUIRED ADVANCED USE OF LUBRICANTS - Grease, Oil, Water
  o REQUIRED ADVANCED PREDICTIVE MAINTENANCE – Amperage, Efficiency Testing, Flow Monitoring, Hour Readings,
Megohm Meter Readings, Oil Analysis, Pressure Recording, Temperature Monitoring, Thermography, Ultrasonic’s, Vibration Analysis

**PUMPS (1.75 HOURS TRAINING)**

- To provide an advanced knowledge of pumps, types, operation and components.
  - **REQUIRED ADVANCED KNOWLEDGE OF PUMP OPERATIONS** – Air Binding, Cavitation, Operating Against A Closed Valve, Pump Curve, Pump Efficiency, Pump Head/Hydraulics, Reverse Rotation, Water Hammer (Surge)
  - **REQUIRED ADVANCED KNOWLEDGE OF PUMP COMPONENTS** – Impeller, Lantern Ring, Mechanical Seals, Packing, Packing Gland, Shaft Sleeve, Slinger Ring, Stuffing Box, Suction/Discharge Valves, Volute, Wear Plate, Wear Rings

**ROTATING COMPONENTS (1.25 HOURS TRAINING)**

- To provide an advanced knowledge of bearings, shafts and seals.
  - **REPLACE BEARINGS** - Ball, Needle, Radial, Roller, Spherical, Tapered, Thrust
  - **REPLACE BUSHINGS** - Babbitt, Sleeve
  - **REQUIRED ADVANCED KNOWLEDGE OF BEARINGS AND BUSHINGS** - Cleaning Procedures, Dismounting Procedures, Lubrication Methods, Mounting Procedures, Seals, Shields, Wear Pattern Analysis
  - **REPLACE SHAFTS**
  - **REQUIRED ADVANCED KNOWLEDGE OF SHAFTS** - Axial Alignment, Bearing Fit, Coupling Techniques, Dismounting Procedures, Endplay, Lubrication Methods, Mounting Procedures, Out-of-Roundness, Plumb, Run out, Storage, Vibration Analysis, Wear Pattern, Wear Sleeves

**MOTORS AND DRIVES (1.50 HOUR TRAINING)**

- To provide an advanced knowledge of electric, internal combustion engines and drives.
  - **REQUIRED ADVANCED KNOWLEDGE OF MOTORS** - Brake Horsepower, Capacitors, Enclosures, Hollow Shaft, Motor Brushes, Motor Efficiency, Motor Windings, Mounting, Rotation, Service factor
  - **REPLACE DRIVE EQUIPMENT** - Actuators, Belts, Brakes, Chains, Clutches, Drive Coupling, Drive Shafts, Gearbox, Gears, Universal Joints, Variable Speed Belt Drive
  - **REQUIRED ADVANCED KNOWLEDGE OF DRIVE EQUIPMENT** - Alignment, Anti-reverse Ratchets, Carrier Bearings, Gear Lash, Gear Ratios, Guards, Harmonic Imbalance, Lock Nuts, Shear Pin, Torque Overload

**PIPES AND VALVES (1.75 HOURS TRAINING)**

- To provide an advanced knowledge of valves, valve controls and hydraulics.
  - **REQUIRED ADVANCED KNOWLEDGE OF VALVE APPLICATION** - Actuators, Air release, Air Vacuum, Isolation, Level Control, Pressure Control, Throttling
REQUIRED ADVANCED KNOWLEDGE OF ANCILLARY CRAFTS – Backflow Prevention

MAINTAIN TANKS
REQUIRED ADVANCED KNOWLEDGE OF TANKS - Application, Cathodic Protection, Coatings, Materials, Overflow/Drain Lines, Tank Access, Ventilation, Wash Down Procedures

SAFETY PRACTICES (1.50 HOURS TRAINING)
- An advanced overview of industrial safety standards.
  REQUIRED ADVANCED KNOWLEDGE OF HEAVY EQUIPMENT - Commercial Driver License (CDL), Equipment Operator Certification, Safety Procedures
  REQUIRED TO FOLLOW ADVANCED SAFETY PROCEDURES - Chemical Handling, Confined Space Entry, Cross Connection Control, Electrical Hazards, Explosion Proof Lighting, Extension Cords, Fire Safety, Laboratory Safety, Lock-out/Tag-out, Traffic Control/Work Zone Safety, Trenching and Shoring Required

PRESSURE VESSELS AND BLOWERS (1.25 HOURS TRAINING)
- To provide an advanced knowledge of compressors, blowers, boilers and associated devices.
  REQUIRED ADVANCED KNOWLEDGE OF BOILERS - Air Release Valve, Chemical Feed, Corrosion Control, Low Water Cutoff, Pressure Relief Valve, Water Chemical Analysis
  REQUIRED ADVANCED KNOWLEDGE OF COMPRESSORS/BLOWERS - Air Dryers, Constant Speed Control Systems, Filters, Mufflers, On-Off Control Systems, Pressure Relief, Unloader Control Systems

ELECTRICAL DEVICES AND CONCEPTS (2.00 HOUR TRAINING)
• To provide an advanced knowledge of electrical theory, electrical apparatus types, devices and operation.
  o **REQUIRED ADVANCED KNOWLEDGE OF ELECTRICAL DEVICES** - Ammeter, Conduit, Ground Fault Circuit Interrupters (GFCI), Internal Motor Heating Coils, Leak Detection (Insulation), Magnetic Starters, Motor Control, Phase Protection Monitoring, Vibration Monitoring, Voltmeter, Watt Hour Meter
  o **IDENTIFY ELECTRICAL DEVICES** - Soft Start (reduced voltage starter), Variable Frequency Drives
  o **MAINTAIN ELECTRICAL DEVICES** – Capacitors, Circuit Breakers, Fuses, Heaters/Overload Protection, Knife Switches, Relays, Switch Gears, Transformers, WoundRotors
  o **REQUIRED ADVANCED KNOWLEDGE OF ELECTRICAL CONCEPTS** - Amperage, Grounding, Load Demand, Resistance, Voltage, Wattage, Wire Sizing, Electrical Line Diagrams, Electrical Math, Ladder Logic Diagrams
  o **REQUIRED ADVANCED KNOWLEDGE OF REGULATIONS / STANDARDS** - National Fire Protection, National Electrical Code

**INSTRUMENTATION (1.50 HOURS TRAINING)**
• To provide an advanced knowledge of process control instrumentation, electrical and electronic monitoring.
  o **INSTRUMENTATION CONTROL CALIBRATION** - Electronic Equipment, Instrumentation, Level / Flow Devices
  o **MAINTAIN/REPLACE INSTRUMENTS** - Air Velocity, Chart Recorder, Chlorine, Conductivity, Dissolved Oxygen (DO), Gas Monitors, Oxidation Reduction Potential (ORP), Particle Counters, pH, Power Supply, Recorders, Streaming Current, Temperature, Totalizer
  o **IDENTIFY ADVANCED ELECTRONIC EQUIPMENT** - Auto dialers, On/Off Control, Programmable Logic Controllers (PLC), Radio/SCADA Systems
  o **REQUIRED ADVANCED KNOWLEDGE OF INSTRUMENTATION AND ELECTRONIC EQUIPMENT** - Alarm Set-Points, Analog, Diaphragms, Digital, Oil Fill, Programming, Troubleshooting Techniques, Instrumentation, Systems and Automation,
  o **MAINTAIN / REPLACE ADVANCED LEVEL/FLOW DEVICES** - Bubblers, Conductivity, Doppler, Electrode, Float, Magnetic, Manometer, Palmer-Bowlus Flume, Parshall Flume, Pressure Differential (Venturi), Pressure Transducers, Propeller, Ultrasonic, V-notch Weir, Other Closed Pipe, Other Open-Channel
  o **REQUIRED ADVANCED KNOWLEDGE OF LEVEL/FLOW DEVICES** - Application Procedures, Methods of Measuring Drawdown, Troubleshooting Techniques

**MATH (3.50 HOURS TRAINING)**
• To provide an advanced knowledge of industrial and shop math.
REQUIRED TO PERFORM ADVANCED CALCULATIONS -
Addition and Subtraction, Division and Multiplication, Basic Algebra, 
Basic Geometry, Exponents, as used to solve practical Maintenance 
Applications

DRAWINGS (0.50 HOUR TRAINING)
• To provide an advanced understanding of maps, prints, drawings, illustrations and 
symbols.
  o INTERPRET ADVANCED DRAWINGS - As-Built Drawings / 
    Blueprints, Charts, Process and Instrumentation Diagrams, Schematics, 
    Operation and Maintenance Manuals, Standard Operation Procedures, 
    System Maps
  o REQUIRED ADVANCED KNOWLEDGE OF DRAWINGS - 
    Geographic Information System (GIS), Graphing, Sketching Techniques

MAINTENANCE MANAGEMENT (2.75 HOURS TRAINING)
• Advanced components of an infrastructure maintenance program.
  o REQUIRED ADVANCED ADMINISTRATIVE / MAINTENANCE 
    MANAGEMENT - Corrective Maintenance, Employee Training, Plan 
    Scheduling (prioritizing), Predictive Maintenance, Preventive 
    Maintenance, Record Keeping, Work Order, Writing Reports
  o REQUIRED ADVANCED KNOWLEDGE OF ADMINISTRATIVE / 
    MAINTENANCE MANAGEMENT - Computer Maintenance 
    Management Systems, Reporting Requirements, Spreadsheet Software, 
    Word Processing Software
  o REQUIRED ADVANCED KNOWLEDGE OF ANCILLARY 
    CRAFTS – Computers, Herbicides and Pesticides
  o MAINTAIN SYSTEM ADVANCED SECURITY - Fences, Lighting 
    and Locks, Chemical Delivery, Surveillance
  o PROTECT SYSTEM ADVANCED SECURITY - Data Security, 
    Vehicle Security
  o RESTRICT SYSTEM ADVANCED SECURITY - Computer Access, 
    System Access
  o VULNERABILITY ASSESSMENTS OF SYSTEM SECURITY – 
    Perform / Update
  o REQUIRED ADVANCED KNOWLEDGE OF SYSTEM SECURITY 
    - Communication Systems, Homeland Security, Security Awareness
  o REQUIRED ADVANCED REGULATIONS AND STANDARDS - 
    Comply with Requirements, Implement Requirements, Record 
    Requirements, Report Requirements
  o REQUIRED ADVANCED KNOWLEDGE OF REGULATIONS 
    AND STANDARDS - CHEMTREC, Department of Homeland Security, 
    Department of Transportation, Environmental Protection Agency 40 CFR, 
    National Incident Management System, National Sanitation Foundation, 
    Occupational Safety & Health Administration, Office of Hazardous 
    Materials Safety, State/Provincial Regulations