

## Grade 4 Water Treatment Operator Need-To-Know Criteria (Subject Areas)

The following list of categories suggests topics of information that are important to know in order to be a successful and proficient Grade 4 Water Treatment Operator. The list may not be all-inclusive, and knowledge of additional topics may be of benefit to the operator.

### *Category of Information: Processes*

#### Pre-Treatment

- Screens (Wells; Intake)
- Bar screens (Hand-cleaned; mechanically cleaned)

#### Aeration

- Slat tray
- Cascade
- Draft Aerators
  - Induced draft
  - Positive draft

#### Coagulation/Flocculation

- Mixers-in-line
- Mechanical
- Baffles
- Coagulants
  - Alum
  - Ferric Chloride and Sulfate
  - Polyaluminum Chloride
- Polymers

#### Clarification

- Pre-sedimentation
- Sedimentation Basins
- Upflow Solids Clarifiers
- Tube settlers

#### Filtration

- Rapid Sand
- Mixed Media
- Pressure
- Slow Sand
- Membrane
- Oxidation
  - Potassium Permanganate
  - Sodium Permanganate
- Point of entry cartridge filter
- Bag

#### Disinfection

- Gas Chlorinators
- Hypochlorinators
- Ozonators
- Chlorine Dioxide
- Mixed Oxidants
- Ultra-violet

#### Fluoridation

- Fluorosilicic Acid
- Sodium fluoride
- Sodium Fluorosilicate

#### Taste/Odor Control

- Aeration
- Powdered Activated Carbon
- GAC Contactors
- Oxidation
  - Potassium Permanganate
  - Sodium Permanganate
  - Chlorine
  - Peroxide

#### Softening

- Chemical Precipitation
- Ion Exchange

#### Corrosion Control

- Calcium Carbonate Equilibrium
- Corrosion Inhibitors
- Aeration

#### Iron/Manganese Removal

- Chemical Oxidation Precipitation
  - Potassium Permanganate
  - Sodium Permanganate
  - Chlorine Dioxide
- Aeration
- Filters
- Green Sand

#### Storage

- Ground Storage
- Elevated Tanks
- Standpipes
- Hydropneumatic Tanks

#### Recirculation

- Water Systems
- Sludge Systems

#### Sludge Disposal

- Drying Beds
- Filter Press
- Land Disposal
- Belt Press
- Landfill Solids
- Land Application of Solids

#### Cross Connections

- Air Gap
- Vacuum Breakers
- Backflow
- Backpressure
- Backsiphonage
- Cross Connection

## Category of Information: Support Systems

- Dissimilar metals – Galvanic Corrosion

### Motors

- Single Phase
- Three Phase
- Variable Speed

### Drives

- Coupled
- Direct

### Pumps

- Air Lift
- Centrifugal
- Positive Displacement (Piston Plunger; Cavity; Diaphragm)
- Turbine
- Metering

### Blowers and Compressors

- Centrifugal
- Positive Displacement

### Generators

- AC & DC

### Engines

- Gasoline & Diesel

### Pipes

- Ductile Iron
- PVC
- Asbestos Cement

### Joints

- Flanged
- Compression/Dresser
- Threaded

### Valves

- Ball
- Check
- Globe
- Gate
- Plug
- Pressure Control
- Vacuum Relief
- Mud
- Butterfly
- Multiport
- Telescoping
- Sluice Gate
- Air Release
- Foot
- Altitude
- RBPB
- Double Check

### Fittings

- Coupling
- Union
- Plug/Caps
- Corporation
- Curb Stop

### Cathodic Protection Devices

- Anode & Cathode Rod/Bags
- Rectifiers

### Measuring/Control

- Signal Generators
  - Magnetic Flowmeter
  - Parshall Flume
  - Proportional Weir
  - Rectangular Weir
  - Venturi
  - Propeller Meter
  - Ultrasonic
  - Pitot tube
- Signal Transmitters
  - Electric
  - Pneumatic
  - Hydraulic
  - Mechanical
  - Telemetry
- Signal Receivers
  - Counters
  - Indicators
  - Log Scale Indicators
  - Totalizers
  - Recorders
- Meters
  - Hydraulic/Rotameters
  - Electrical – Amp
  - Electrical – Watt
  - Electrical - Multi – VOM
  - Electrical - Multi - MA
- Alarms
- Controls
  - Pneumatic
  - Float
  - Hydraulic
  - Electrical
  - Telemetry
  - Timers

### Chemical Feeders

- Solids
- Liquids
- Evaporators
- Gas
- Slurry

### Rolling Stock

- Service Vehicles & Trucks
- Portable Pumps
- Generators

### Safety

- Personal Protection Equipment
- Self Contained Breathing Apparatus
- Confined Space
- MSDS Information
- Traffic Control (Warning Devices; Barricades)
- Hazard Detection
- First Aid/Hygiene

### Security

- Attack
  - Prevention
  - Detection
  - Recovery

## ***Category of Information: Lab Tests***

### Lab Tests

- Alkalinity
- Calcium
- Chloride
- Disinfectant residual
- Disinfectant demand
- Fluoride
- Iron
- Jar Test
  - Maximum Gradient
  - Velocity Gradient
  - Viscosity of Water
- Manganese
- Orthophosphate
- pH
- Specific Conductance
- Temperature
- Threshold Odor Number
- Total Coliform
- Total Hardness
- Turbidity (NTU)
- CO<sub>2</sub>
- Specific Gravity
- THM
- HAA5

## ***Category of Information: General Information***

### Units of Expression

- Definition
- Conversion

### Sources and Characteristics

- Characterization
- Quality/quantity
- Physical/chemical/biological characteristics

### Electrical Concepts (Basic)

- 

### Hydraulic Concepts (Basic)

- 

### Maps/Plans