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

The following list of categories suggests topics of information which are important to know in order to be a successful and proficient Grade 4 Wastewater 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**

Collection Systems
- Types
- Inflow, Infiltration, Exfiltration
- Pre-treatment
- Sources of wastewater
- Pump stations

Flow
- Measurement
- Flow equalization

Screening
- Bar screens (hand-cleaned)
- Bar screens (mechanically cleaned)
- Static screen
- Microscreen

Grinding
- Grinders
- Comminutors
- Barminutors

Grit Removal
- Hand-cleaned grit chambers
- Mechanically-cleaned grit chambers
- Aerated grit chambers
- Vortex

Clarification
- Primary (Rectangular; Circular)
- Secondary
- SBR Clarification

Attached Growth/Fixed Film
- Trickling Filters
  - Standard Rate
  - High Rate
  - Roughing
- Rotating Biological Contactor (RBC)
- Activated Biofilter (ABF)

Lagoons
- Aerobic
- Facultative
- Anaerobic
- Aerated
- Discharging

Activated Sludge
- Conventional
- Step Feed
- Contact Stabilization
- Extended aeration
- Tapered aeration
- Complete mix
- Pure oxygen
- Oxidation ditch
- Types of aeration
- Sequencing Batch Reactor (SBR)
- Membrane Biological Reactor (MBR)

Solids handling
- Sludge conditioning
- Sludge thickening
- Anaerobic digesters
- Aerobic digesters
- Dewatering
- Incineration
- Drying beds
- Land application
- Composting
- 503 Regulations

Disinfection/Use of Chlorine
- Chlorination
- Dechlorination
- UV
- Other methods

Advanced Treatment
- Filtration
- Nitrogen removal
- Phosphorus removal
- Biological

Effluent Disposal
- Discharge
- Direct Use
- Irrigation
- Underground Disposal
- NPDES Permit

Cross-Connection
- Prevention
Types of devices

Category of Information: Support Systems

**Motors**
- Single Phase
- Poly Phase
- Variable Speed

**Drives**
- Coupled
- Direct (Shaft; Gear)
- Speed Reducer (Fixed; Variable)
- Right Angle

**Pumps**
- Air Lift
- Centrifugal
- Positive Displacement
  - Piston Plunger
  - Progressive Cavity
  - Diaphragm
- Screw
- Turbine
- Metering
- Ejector

**Blowers and Compressors**
- Centrifugal
- Positive Displacement (Rotary; Piston)

**Generators – AC & DC**

**Engines – Gasoline, Diesel & Gas**

**Joints**
- Flanged
- Compression
- Dresser
- Victualic
- Fused
- Threaded

**Valves**
- Ball
- Check
- Globe
- Gate
- Plug
- Petcock
- Pressure Control
- Vacuum Relief
- Mud
- Butterfly
- Multiport
- Telescoping
- Sluice Gate
- Air Release
- Foot

**Fittings**
- Coupling
- Union
- Plug/Caps
- Corporation (Ferrell; Cock)
- Curb Stop
- Special

**Cathodic Protection Devices**
- Anode Rod/Bags
- Cathode Rod/Bags
- Rectifiers
- Potentiometers

**Measuring/Control**
- Signal Generators
  - Kennison Nozzle
  - 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
  - Combination Recorders
- Meters
  - Hydraulic – Rotameter
  - Electrical – Amp
  - Electrical – Watt
  - Electrical – Watt – Hour
  - Electrical – Multi.
  - Electrical – VOM
  - Electrical – Megger
  - Mechanical – RPM
- Alarms
- Controls
  - Pneumatic
  - Float
  - Hydraulic
  - Electrical
  - Telemetry
  - Timers
Category of Information: Support Systems (continued)

- Chemical Feeders
  - Solids
  - Liquids
  - Evaporators
  - Gas
  - Slurry

- Odor Control
  - Biofilters
  - Chemical Additives
  - Scrubbers

- Rolling Stock
  - Service Vehicles
  - Fork Lifts
  - Trucks
  - Tractors
  - Trailers
  - Lawn Mowers
  - Loaders
  - Portable Pumps

Category of Information: Lab Tests

- Routine Tests
  - B.O.D.
  - Ammonia
  - Chlorine Residual
  - Coliform (Fecal)
  - E. coli
  - Dissolved oxygen
  - Total Kjedahl nitrogen
  - pH

- Control Tests
  - Centrifuge
  - Alkalinity
  - C.O.D.
  - Color
  - Conductance
  - Nutrients
  - Micro exam
  - Nitrate - nitrite

- Special Tests:
  - Metals
  - Chlorinated organics
  - Cyanide

- Generators

- HVAC
  - Heat Exchangers
  - Dehumidifiers
  - Fans
  - Compressors
  - Condensers
  - Boilers

- Safety Equipment
  - Personal Protection Gear
  - Traffic Control (Warning Devices; Barricades)
  - Hazard Detectors
  - First Aid/Hygiene

- Phosphorus
- Solids
  - Settleable
  - Suspended
  - Total dissolved
  - Total
  - Volatile

- Oil and Grease
- Surfactants
- Temperature
- Total organic carbon
- Turbidity
- Volatile acids
- Settleability
- Specific Oxygen Uptake Rate (SOUR)

- Phenol
- Sulfate - sulfide
- Biomonitoring
Category of Information: General Information

Units of expression
- Define units
- Convert units

Electrical (Basic)

Hydraulics (Basic)

Sources and characteristics
- Characterize
- Quality/quantity
- Physical/chemical/biological
- Effects
- Pre-aeration
- Chemical pre-treatment
- Grease control

Maps/plans – Interpretation and use

WWT Processes
- Sketch sequence
- Describe processes
- Explain why treated
- Goals of WWT (protect public; protect environment)