

Oxygen (Dissolved), SM 4500-O G, 22nd edition (2011) – Membrane Electrode Method

Initial Demonstration of Capability (DOC)

- Documentation (signed form) that analyst has read and understands all appropriate SOPs and Methods.
- Calibrate daily according to manufacturer's instructions
- Follow Hach Method 10360 9.2.1 – Prepare and measure four samples of air-saturated water according to section 7.2.
 - 7.2.1 – Add approximately 1500 mL of organic-free water or BOD dilution water to a 2-L beaker or PET bottle
 - 7.2.2 – Allow the water to equilibrate to room temperature. Room temperature should be approximately $20 \pm 3^{\circ}\text{C}$.
 - 7.2.3 – With a steady gentle stream of filtered air ($\approx 10\text{-}40$ mL per minute), aerate the water for a minimum of 30 minutes. Alternatively, vigorously shake the reagent water or BOD dilution water for several minutes.
 - 7.2.4 – At the completion of aeration, let water re-equilibrate to room temperature ($20 \pm 3^{\circ}\text{C}$) for 30 minutes and note the barometric pressure of the laboratory during preparation. The barometric pressure reading is used in the calculation and determination of the theoretical DO concentration for the preparation of air-saturated water.
 - 7.2.5 – Transfer the aerated water to a BOD bottle until overflowing and stopper.
 - 7.2.6 – Calculate the theoretical dissolved oxygen concentration using a dissolved oxygen table such as Hitchman...
- **Real people language – each analyst should calibrate the probe, prepare dilution water that is air-saturated and analyze four bottles and compare to the theoretical dissolved oxygen concentration (± 0.2 mg/L).**
 - **Theoretical dissolved oxygen can be found at USGS's website at <http://water.usgs.gov/software/DOTABLES/> or by using a DO Saturation Table.**
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Method Detection Limit (MDL)

- None

Initial Calibration Verification (ICV)

- 1020 B.11.b. – Perform initial calibration using at least three concentrations of standards for linear curves.
- **Real people language – calibrate daily by following manufacturer's instructions.**

Method Blank

- NONE

Laboratory Fortified Blank (LFB)

- NONE

Duplicate

- 1020 B.12.f. – Calculate RPD (relative percent difference)

- 4020 B.2.f. – Randomly select routine samples to be analyzed twice.
 - Process duplicate sample independently through the entire sample preparation and analysis.
 - Include at least one duplicate for each matrix type daily or with each batch of 20 or fewer samples.
- **Real people language – on a 5% basis (1 for every 20 samples or once per month, whichever is more frequent) analyze 2 samples for DO.**
 - **First sample is result, second sample is duplicate**
 - **Target value is to get close to the first value and have a small RPD (less than 20%)**

Laboratory Fortified Matrix (LFM)/Laboratory Fortified Matrix Duplicate (LFMD)

- NONE

Continuing Calibration Verification (CCV)

- Follow Hach Method 7.2.1 – Add approximately 1500 mL of organic-free water or BOD dilution water to a 2-L beaker or PET bottle
- 7.2.2 – Allow the water to equilibrate to room temperature. Room temperature should be approximately $20 \pm 3^{\circ}\text{C}$.
- 7.2.3 – With a steady gentle stream of filtered air ($\approx 10\text{-}40$ mL per minute), aerate the water for a minimum of 30 minutes. Alternatively, vigorously shake the reagent water or BOD dilution water for several minutes.
- 7.2.4 – At the completion of aeration, let water re-equilibrate to room temperature ($20 \pm 3^{\circ}\text{C}$) for 30 minutes and note the barometric pressure of the laboratory during preparation. The barometric pressure reading is used in the calculation and determination of the theoretical DO concentration for the preparation of air-saturated water.
- 7.2.5 – Transfer the aerated water to a BOD bottle until overflowing and stopper.
- 7.2.6 – Calculate the theoretical dissolved oxygen concentration using a dissolved oxygen table such as Hitchman...
- 9.3.1 – Upon air calibration, prepare a calibration verification standard with each analytical batch of 20 samples or less in an 8 hour period.
- 9.4.3 – Initially and at the end of each analytical batch of samples, analyze a dilution water sample that is air-saturated
- **Real people language – prepare dilution water that is air-saturated and analyze bottles and compare to the theoretical dissolved oxygen concentration (± 0.2 mg/L).**
 - **Theoretical dissolved oxygen can be found at USGS’s website at <http://water.usgs.gov/software/DOTABLES/> or by using a DO Saturation Table.**

Control Charts

- NONE

Corrective Action - 1020 B.5., B.8., & B.15.

Batch Size

- For samples that need to be analyzed on a 5% basis (1 for every 20 samples or once per month, whichever is more frequent) follow these criteria:
 - If a permit stated that 3 analyses per week, we would allow for a duplicate to be analyzed at least once per month.
 - Pick a date and be consistent, the 1st of every month or the 1st Thursday of every month. Mark your calendar!!
 - If a permit stated 5 analyses per week, we would suggest twice a month.
 - Pick a date and be consistent, the 1st and 15th of every month or the 1st and 3rd Thursday of every month. Mark your calendar!!