

NORTH CAROLINA WASTEWATER/GROUNDWATER LABORATORY CERTIFICATION BRANCH

APPROVED PROCEDURE FOR THE ANALYSIS OF TEMPERATURE

This document provides an Approved Procedure for the analysis of Temperature for compliance monitoring per 15A NCAC 02H .0805 (a) (7) and (g) (4).

Holding Time:

- Analyze within 15 minutes (40 CFR Part 136 Table II). It is recommended samples be analyzed immediately or *in situ*, if possible.

General Information:

- All compliance temperature measurements must be made with a National Institute of Standards and Technology (NIST) traceable temperature-measuring device that has a demonstrated accuracy of ± 0.5 °C and equilibrates rapidly. Acceptable temperature-measuring devices for compliance monitoring include liquid-in-glass or electronic thermometers and devices such as Conductivity, Dissolved Oxygen, pH or multi-parameter meters. Traceability to NIST may be established by comparison with a Reference Temperature-Measuring Device as described below.
- A Reference Temperature-Measuring Device is an NIST traceable temperature-measuring device used only to verify the calibration of other temperature-measuring devices. It must have a stated accuracy (or uncertainty) of ± 0.5 °C, be within expiration, able to distinguish temperature changes of 0.1 °C and equilibrate rapidly.
- Infrared (IR) devices are not acceptable for compliance monitoring.
- Liquid-in-glass thermometers must have at least 1-degree Celsius markings and be inspected each time of use to ensure there is no separation in the liquid column. It is recommended that all liquid-in-glass thermometers have a metal case to prevent breakage.
- All compliance temperature-measuring devices without an NIST traceable certificate, or with an expired NIST traceable certificate, must be verified against a Reference Temperature-Measuring Device and the process documented **initially and every 12 months.**
- When temperature-measuring devices with their own valid NIST traceable certificate are used to measure reported temperatures, initial verification is not required. However, they must be verified against a Reference Temperature-Measuring Device and the process documented every 12 months after the date of first use or certificate expiration, whichever comes first.
- To check a compliance temperature-measuring device, compare readings at two temperatures that bracket the range of compliance samples routinely analyzed against a Reference Temperature-Measuring Device and record all four readings. The difference between the readings from both devices **must be ≤ 0.5 °C.** If they are not, the device may not be used for temperature compliance monitoring.
- Verification documentation must include the serial number of the device being checked. The serial number, stated accuracy and expiration date of the Reference Temperature-Measuring Device used in the comparison must also be documented. Verification data must be kept on file and be available for inspection for 5 years. NOTE: International Organization for Standardization (ISO) 17025 compliant vendors or other Certified laboratories may provide assistance in meeting this requirement. When an ISO compliant vendor provides this assistance, they must provide the serial number, accuracy and calibration date for the Reference Temperature-Measuring Device used for the verification. When a Certified laboratory provides this service, they must provide a copy of the NIST traceable certificate of the Reference Temperature-Measuring Device used for the verification.
- All temperature-measuring devices must be immersed in the sample to the proper depth as specified by the manufacturer. Partial immersion thermometers are designed with scales calibrated to indicate the true temperature when the thermometers are immersed to specified depths. Total immersion thermometers are designed with the scales calibrated to indicate the true temperature when the bulb and the portion of liquid column, to just above the temperature being read, is exposed to the sample being measured. If a total immersion thermometer is used as a partial immersion thermometer, an emergent stem correction must be performed. NOTE: Probe type thermometers will also have a specified immersion depth. Refer to the manufacturer's manual for the proper immersion depth.

- Unless greater precision is required by the permit or data receiving agency, it is recommended that all temperatures reported for compliance monitoring, be reported in whole numbers as recommended by the *Precision in Discharge Monitoring Reports* document found here:

<https://www.deq.nc.gov/about/divisions/water-resources/permitting/npdes-wastewater#NPDESComplianceGuidance-3079>

- Sample duplicates are not a required quality control element for Field parameters.

Documentation:

The following must be documented in indelible ink whenever sample analysis is performed:

1. Date and time of sample collection
2. Date and time of sample analysis - Alternatively, one time may be documented for collection and analysis with the notation that samples are measured *in situ* or immediately at the sampling site (i.e., immediately following collection at a location as near to the collection point as possible). When this 'one time' option is used, state that the documented time is both collection and analysis time.
3. Facility name or permit number, and sample site (ID or location)
4. Collector's/analyst's name or initials
5. Sample temperature measurement in permit specified units
 $^{\circ}\text{C} = (^{\circ}\text{F} - 32) / 1.8$
 $^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32$
6. Unique thermometer/instrument identification (serial number preferred)
7. Parameter analyzed
8. Method reference
9. Data qualifiers, when necessary

Refer to <http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/technical-assistance-policies> for additional resources.

Ref: Standard Methods 2550 B-2010