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Subject: Washing of Glassware, Plasticware, and Field Equipment

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
12-01-00	0	Internal	Jim Sumner (ETS)	Original document
12-01-11	1	Internal	Jim Sumner (ETS)	• Added quality control requirements for disposable plasticware used in toxicity tests.
09-28-16	2	External	Rick Sherrard (TVA) Don Snodgrass (TVA) Jim Sumner (ETS)	• Updated references to include Standard Methods 22nd Edition and NELAP standard. • Clarified SOP to indicate that term glassware includes any new or used item in the laboratory, which may include glassware, plasiticware, nitex mesh, field equipment, etc.
03-01-20	3	Internal	Jim Sumner (ETS)	• Updated procedure to include NELAP requirements.

Subject: Washing of Glassware, Plasticware, and Field Equipment

Scope and Application

To clean dirty glassware, plasticware, nitex mesh, and field equipment (The term glassware in this SOP refers to any new or used items in the laboratory, which may include afore mentioned items).

Quality Control

Each batch of items washed must be checked for soap residue using 0.04% bromothymol blue indicator.

Equipment and Materials

Sparkleen™ 1 and 2 detergent powder
Nitric acid
Tap water
Deionized water
Bristle brushes
Scouring pads
30-gallon plastic tub
Rubber gloves
Safety glasses
Sink
Dishwasher
0.04% Bromothymol blue indicator
Storage area for clean glassware
Acetone, pesticide grade
Rinse bottles
Fume hood
Detergent Residue Check Log

Procedure for Washing Glassware, Plasticware, and Field Sampling Equipment used for Analytical Testing

A. Washing of Glassware, Plasticware, and Field Sampling Equipment.

1. New glassware used for testing must be thoroughly cleaned before use.

2. All non-disposable sample containers, test vessels, and other equipment that comes in contact with samples must be washed after use to remove contaminants in the manner described below.

If equipment is washed by hand:

a. Add a small amount of Sparkleen™ 1 detergent (~ 1 Tablespoon) to the sink and fill with hot tap water. Place the dirty glassware in the sink and allow it to soak for at least 15 minutes.

b. Using scouring pads and bristle brushes, scrub the dirty glassware until clean.

c. Immediately rinse the soapy glassware well with hot tap water, followed by deionized water.

d. Test for soap residues using the 0.04% bromothymol blue indicator. Choose a random piece of glassware and place a few drops inside the vessel. If the indicator turns blue, repeat steps a-d. Document the positive/negative result in the Detergent Residue Check Log along with date, analyst initials, and indicator chemical number (Exhibit G1.1).

e. Place the clean glassware upside down in the storage area to dry.

If equipment is machine-washed:

a. Add a small amount of Sparkleen™ 2 detergent to the soap tray in the dish washer.

b. Start the dish washer.

c. After the dish washer's cycle is complete, test for soap residues using the 0.04% bromothymol blue indicator. Choose a random piece of glassware and place a few drops inside the vessel. If the indicator turns blue, repeat steps a-d. Document the positive/negative result in the Detergent Residue Check Log along with date, analyst initials, and indicator chemical number (Exhibit G1.1).

d. Place the clean glassware upside down in the storage area to dry.

Procedure for Washing Glassware, Plasticware, Nitex Mesh, and Field Sampling Equipment used for Toxicity Tests

Note: Gloves and safety glasses must be worn while using nitric acid and acetone.

A. Preparation of the Nitric Acid Bath (10% nitric acid solution).

1. Add 22.5 L of deionized water to a 30-gal plastic tub.

2. Carefully add 2.5 L of nitric acid to the deionized water and mix.

B. Washing of Glassware and Plasticware.

1. New disposable plasticware used for effluent or dilution water collection or organism test chambers do not require thorough cleaning before use. It is sufficient to triple rinse new sample containers with sample or dilution water before use. New non-disposable glassware or plasticware must be soaked overnight in 10% nitric acid (see procedure below) and rinsed well with deionized water.
   - New disposable sample containers (i.e. cubitainers), medicine cups, and Solo® cups must be checked before use in toxicity tests. Dependent on the use of the consumable, either the survival/reproduction of *Ceriodaphnia* or survival/growth of *Pimephales* are evaluated using the new consumable. Side-by-side comparisons of the organisms with the new and old consumables are used (SOP-AT11 or AT20). Organism survival and reproduction/growth are compared between the old and new consumables. If detrimental effects are noted with the new consumables, they must not be used in toxicity tests.

2. All non-disposable sample containers, test vessels, and other equipment that comes in contact with samples must be washed after use to remove contaminants in the manner described below.

   If equipment is washed by hand:

   a. Add a small amount of Sparkleen™ 1 detergent (~ 1 Tablespoon) to the sink and fill with hot tap water. Place the dirty glassware in the sink and allow it to soak for at least 15 minutes.

   b. Using scouring pads and bristle brushes, scrub the dirty glassware until clean.

   c. Immediately rinse the soapy glassware well with hot tap water.

d. Test for soap residues using the 0.04% bromothymol blue indicator. Choose a random piece of glassware and place a few drops inside the vessel. If the indicator turns blue, repeat steps a-d. Document the positive/negative result in the Detergent Residue Check Log along with date, analyst initials, and indicator chemical number (Exhibit G1.1).

e. Soak the rinsed glassware in the 10% nitric acid bath. This will remove scale, metals, and bases.

f. Remove the glassware from the nitric acid bath and rinse well with deionized water.

g. Rinse the glassware once with full-strength, pesticide-grade acetone under the fume hood. Acetone will remove any organic compounds on the glassware.

h. Rinse the glassware 3 times with deionized water.

i. Place the clean glassware upside down in the storage area to dry.

If equipment is machine-washed:

a. Add a small amount of Sparkleen™ 2 detergent to the soap tray in the dish washer.

b. Start the dish washer.

c. After the dish washer's cycle is complete, test for soap residues using the 0.04% bromothymol blue indicator. Choose a random piece of glassware and place a few drops inside the vessel. If the indicator turns blue, repeat steps a-d. Document the positive/negative result in the Detergent Residue Check Log along with date, analyst initials, and indicator chemical number (Exhibit G1.1).

d. Soak the rinsed glassware in the 10% nitric acid bath. This will remove scale, metals, and bases.

e. Remove the glassware from the nitric acid bath and rinse well with deionized water.

f. Rinse the glassware once with full-strength, pesticide-grade acetone under the fume hood. Acetone will remove any organic compounds on the glassware.

g. Rinse the glassware 3 times with deionized water.

h. Place the clean glassware upside down in the storage area to dry.

3. All test chambers and equipment should be thoroughly rinsed with dilution water immediately before use in cultures or toxicity tests.

C. Disposal of the Nitric Acid Bath.

1. Check the nitric acid bath before each use. If the nitric acid become dirty or turns yellow, the nitric acid bath must be renewed.

   a. Turn on the tap water and slowly pour the nitric acid down the drain.

   b. Once completed, see step A.1 for the preparation of the 10% nitric acid bath.

Safety and Hazardous Waste Management

Safety glasses, gloves and lab coats should always be worn.

Review Policy-P6: General Safety Policy and Policy-P9: Radiation Protection Policy for additional safety requirements.

References

USEPA. October 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th ed. EPA-821-R-02-012. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th ed. EPA-821-R-02-013. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, 3rd ed. EPA-821-R-02-014. US Environmental Protection Agency, Cincinnati, OH.

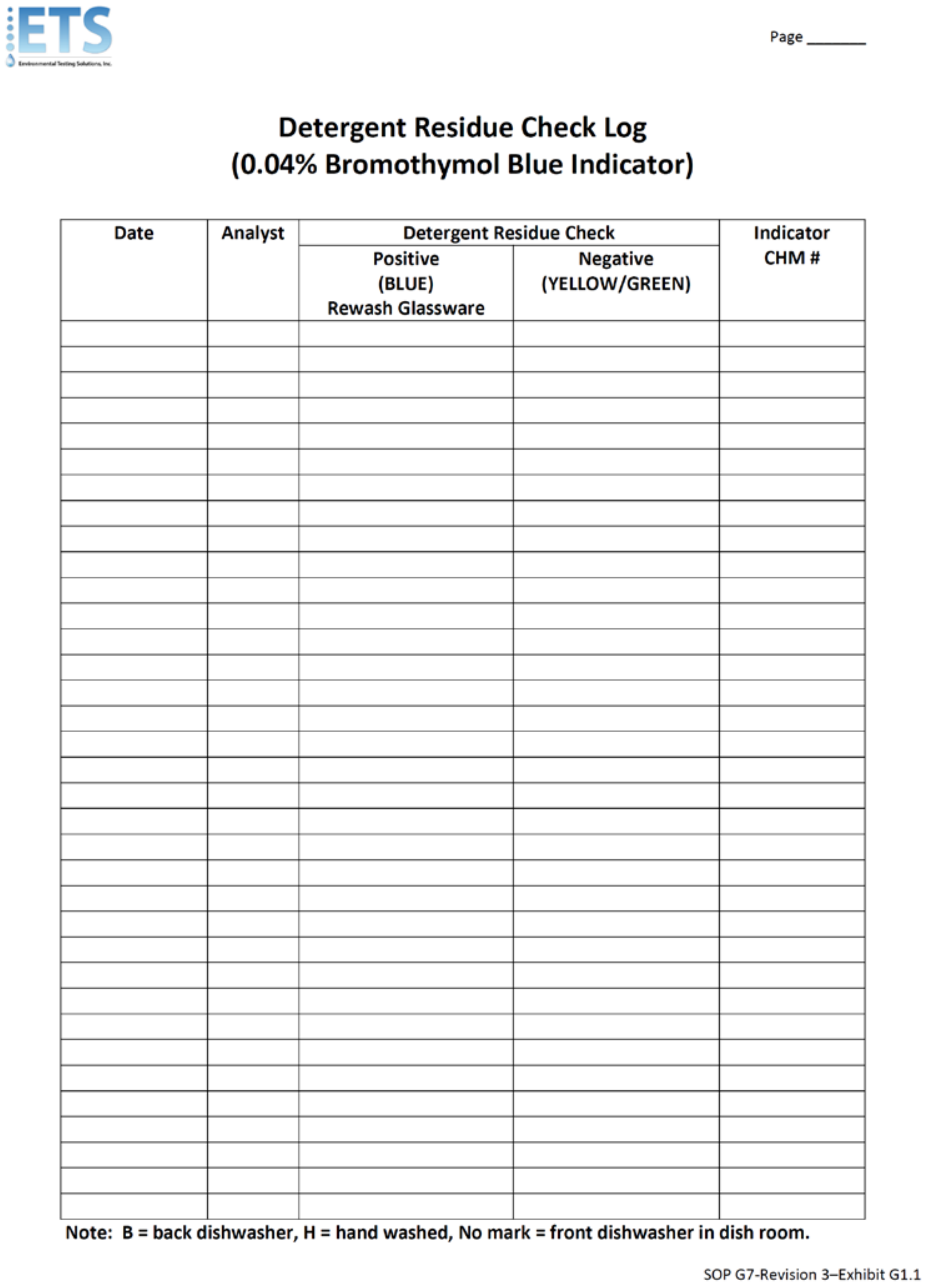
Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012. American Public Health Association, 800 I Street, NW, Washington DC 20001-3710.

TNI Standard. Management and Technical Requirements for Laboratories Performing Environmental Analysis. EL-V1-ISO-2016-Rev2.0. The NELAC Institute, PO Box 2439, Weatherford, TX 76086.

Exhibits

Exhibit G1.1: Detergent Residue Check Log

Exhibit G1.1: Detergent Residue Check Log



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Detergent Residue Check Log
(0.04% Bromothymol Blue Indicator)

Date	Analyst	Detergent Residue Check		Indicator CHM #
		Positive (BLUE) Rewash Glassware	Negative (YELLOW/GREEN)	

Note: B = back dishwasher, H = hand washed, No mark = front dishwasher in dish room.

SOP G7-Revision 3–Exhibit G1.1

Subject: Washing of Glassware, Plasticware, and Field Equipment

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Bottle Preparation and Quality Assurance

Document Revision History

Revision Date	Surveillance number	Surveillance Type	Evaluators	Revisions
05-06-01				Original document
12-01-11	Not applicable	Internal	Kelley E. Keenan Jim Sumner (ETS)	• Corrected typographical errors.

Subject: Bottle Preparation and Quality Assurance

Purpose

To prepare bottles for chemical analyses.

References

Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005. American Public Health Association, 800 I Street, NW, Washington DC 20001-3710.

Equipment and Materials

250-ml plastic bottles
500-ml plastic bottles
1000-ml plastic bottles
Trace Metals Grade Nitric Acid
A.C.S. Certified Sulfuric Acid
Glass Pipettes
Permanent red ink pen
Permanent black ink pen
Bottle labels
Fume hood
Safety glasses
Gloves

Procedure

A. Ordering bottles.

1. Certified unpreserved bottles are ordered from an approved vendor. Bottles containing preservatives, which are used for subcontracted parameters, are ordered from the approved subcontract laboratory performing the analysis.

NOTE: ALL BOTTLES THAT REQUIRE NITRIC ACID ARE PREPARED IN A FUME HOOD AND REQUIRE SAFETY GLASSES AND GLOVES.

B. Preparation of bottles for chemical analyses

1. Preparation of bottles for analyses that require Nitric Acid.

   a. Bottles that required Nitric Acid must be prepared in a fume hood and safety glasses and gloves must be worn.

b. Clients that are not reporting results to NC DENR must be given bottles that are unpreserved. Samples will be preserved upon receipt in the laboratory.

c. Clients that are collecting samples for lead and copper must be given unpreserved 1000-ml bottles. Samples must be received by the laboratory and preserved within 14 days.

d. For a 250-ml bottle, use a glass pipette to deliver 0.5 ml of nitric acid.

e. For a 500-ml bottle, use a glass pipette to deliver 1.0 ml of nitric acid.

f. For a 1000-ml bottle, use a glass pipette to deliver 2.0 ml of nitric acid. For lead and copper analyses, each bottle must receive 2.0 ml of nitric acid.

g. All bottles that are prepared with Nitric Acid are marked with HNO_3 on the top of the bottle lid with a permanent red ink pen.

NOTE: ALL BOTTLES THAT REQUIRE SULFURIC ACID REQUIRE SAFETY GLASSES AND GLOVES.

2. Preparation of bottles for analyses that require Sulfuric Acid.

a. Safety glasses and gloves must be worn when bottles that require Sulfuric Acid are prepared.

b. For a 250-ml bottle, use a glass pipette to deliver 0.5 ml of sulfuric acid.

c. For a 500-ml bottle, use a glass pipette to deliver 1.0 ml of sulfuric acid.

d. For a 1000-ml bottle, use a glass pipette to deliver 2.0 ml of sulfuric acid.

e. All bottles that are prepared with Sulfuric Acid are marked with a ~ on the top of the bottle lid with a permanent red ink pen.

C. Preparation of sample kits.

1. Analysis performed in house.

a. Prepare all sample kits in accordance with the client's needs.

b. Place a label on each bottle with the correct preservative listed. This should be written in permanent black ink.

c. Prepare all sample kits following the procedures provided in Exhibit G2.2.

d. Provide chain-of-custody forms with each kit ordered.

e. If kits must be shipped, pack coolers to preserve the integrity of the bottles.

2. Analysis performed in a sub-contract laboratory.

a. Sub-contract laboratories will provide all bottles to Environmental Testing Solutions, Inc. for testing that will be performed by that laboratory.

b. Prepare all sample kits in accordance with the client's needs.

c. Place a label on each bottle with the correct preservative listed. This should be written in permanent black ink.

d. Prepare all sample kits following the procedures provided in Exhibit G2.2.

e. Provide chain-of-custody forms with each kit ordered.

f. If kits must be shipped, pack coolers to preserve the integrity of the bottles.

Subject: Bottle Preparation and Quality Assurance

	Printed name	Signature
SOP Approval by Laboratory Supervisor:	Jim Sumner	
	Kelley E. Keenan	

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced Standard Operating Procedure (SOP) after (1) the applicable SOP has been read and understood and (2) after training has been received by an approved trainer or laboratory supervisor.

Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced SOP.			**Trainer or Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor

The employee will print, sign and date the trainer section for the referenced SOP after the laboratory supervisor has determined the employee is proficient and experienced in performing the referenced SOP (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced SOP.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Bottle Preparation and Quality Assurance

Subject: Receipt, Handling, and Storage of Samples

Document Revision History

Revision Date	Surveillance number	Surveillance Type	Evaluators	Revisions
12-01-00				Original document
09-01-09	090716.01	External (TVA, Environmental Standard, Inc.) Internal	William Rogers (TVA) Cynthia Russell (TVA) Rick Sherrard (TVA) Rock Vitale (Environmental Standards, Inc.) Jim Sumner (ETS)	• The sample receipt log, including the assignment of project and sample numbers, is completed as samples are received in the laboratory.
08-01-11	Not applicable.	External (NC DENR) Internal	Lance Ferrell (NC DENR) Jim Sumner (ETS)	• NC 72-hour hold time exception removed from SOP.
01-03-12	Not applicable.	Internal	Jim Sumner (ETS)	• Updated exhibits during document review.

Subject: Receipt, Handling, and Storage of Samples

Purpose

To provide instructions to ensure the proper receipt, handling, and storage of water samples used for toxicity and analytical tests. This procedure also provides instructions for documenting sample custody.

References

USEPA. October 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th ed. EPA-821-R-02-012. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th ed. EPA-821-R-02-013. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, 3rd ed. EPA-821-R-02-014. US Environmental Protection Agency, Cincinnati, OH.

Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005. American Public Health Association, 800 I Street, NW, Washington DC 20001-3710.

Equipment and Materials

Mercury-filled or hand-held thermometers
Sample containers
Shipping container (cooler)
Indelible ink pen
DPD Total Chlorine powder
1-oz Medicine cups
Refrigerator
Chain-of-Custody Form
Sample Receipt Log
Sample Condition Form

Procedure for Receipt, Handling, and Storage of Toxicity Samples

A. Transfer of Sample Custody for Samples Delivered by Facility Personnel.

1. Upon receipt at the laboratory, a member of the laboratory inspects the shipping container (cooler) to ensure that the container was not tampered with and that the custody seals are intact (if used).

2. The cooler is opened and sample container (Cubitainer®) is removed and inspected to ensure that the lid remained secure during transport.

3. The chain-of-custody form (Exhibit G4.1) is examined for completeness and correctness of information. At a minimum, the review should ensure that:
   - All pertinent blanks on the form are completed.
   - The sample collection date and times are completed.
   - The sample collector signed and dated the form.
   - The client/facility name, county, permit number, state, and outfall are completed.
   - Test requirements and sample information is complete.

4. If the sample container is not labeled, write the name of the sample and the sample date on the Cubitainer® with an indelible ink marker.

5. Have the person delivering the sample complete or correct the chain-of-custody form, if necessary, before accepting custody of the sample.

6. Measure and record the temperature of the sample (SOP-C1).

7. Determine if the sample contains detectable levels of total residual chlorine. Pour a small aliquot of the sample into a 1-oz medicine cup (approximately 5 ml). Dispense one dose of DPD Total Chlorine powder to the medicine cup containing the sample. Record on the chain-of-custody form if total residual chlorine is present (sample turns pink) or absent (sample color does not change). If total residual chlorine is present, the concentration of total residual chlorine must be measured immediately according to SOP-C8).

   Note: The visible detection limit of DPD Total Chlorine powder is less than 0.10 mg/L total residual chlorine.

8. Have the person delivering the sample relinquish custody by printing their name, signing, and recording the date and time in the “Relinquished to ETS by:” line on the form.

9. A member of the laboratory then prints their name, signs, and records the date and time in the “Received at ETS by:” line on the form.

10. As samples are received, complete the Sample Receipt Log (Exhibit G4.2) by entering the following information:
    - Date and time received.
    - Signature of laboratory analyst that received the sample.
    - Signature of the person that the sample was received by.
    - Sample temperature.
    - Sample name and description.

11. As samples are received, assign the sample a unique project and sample number.

    a. Project numbers are assigned by the next sequential project number for the laboratory. Multiple samples for the same test are given the same project number.

    b. Sample numbers are assigned with an 8 digit number consisting of the Year, Month, Date, and the sequential number for the sample received by the laboratory on that day (YYMMDD.NN). For example the second sample received by the laboratory on February 24, 2008 would be assigned the following sample number: 080224.02.

    c. Record the project and sample numbers on the sample receipt log and chain-of-custody form.

12. If requested, make a photocopy of the chain-of-custody form for the person delivering the sample to the laboratory.

13. A copy of all chain-of-custody forms is maintained in the project folder in the laboratory files.

B. Samples Received by Overnight Carrier.

1. Upon receipt at the laboratory, inspect custody seals (if used) to ensure that the shipping container (cooler) and samples were not tampered with. If the custody seals are broken, contact the Laboratory Supervisor to determine appropriate action and document that the custody seals were not intact upon receipt on the chain-of-custody form (Exhibit G4.1). After inspection, open the cooler.

2. After inspection, the cooler is opened and sample container (Cubitainer®) is removed and inspected to ensure that the lid remained secure during transport.

3. Review the chain-of-custody form for completeness and correctness of information. At a minimum, the review should ensure that:
    - All pertinent blanks on the form are completed.
    - The sample collection date and times are completed.
    - The sample collector signed and dated the form.
    - The client/facility name, county, permit number, state, and outfall are completed.
    - Test requirements and sample information is complete.

4. If the sample container is not labeled, write the name of the sample and the sample date on the Cubitainer® with an indelible ink marker.

5. Measure and record the temperature of the sample (SOP-C1).

6. Determine if the sample contains detectable levels of total residual chlorine. Pour a small aliquot of the sample into a 1-oz medicine cup (approximately 5 ml). Dispense one dose of DPD Total Chlorine powder to the medicine cup containing the sample. Record on the chain-of-custody form if total residual chlorine is present (sample turns pink) or absent (sample color does not change). If total residual chlorine is present, the concentration of total residual chlorine must be measured immediately according to SOP-C8).

   Note: The visible detection limit of DPD Total Chlorine powder is less than 0.10 mg/L total residual chlorine.

7. Check the appropriate boxes if the custody seals were intact and samples were received in good condition.

8. Record the carrier name and tracking number (if provided) that the sample was delivered by in the "Relinquished to ETS by:" line on the chain-of-custody form.

9. A member of the laboratory then prints their name, signs, and records the date and time in the "Received at ETS by:" line on the form.

10. As samples are received, complete the Sample Receipt Log by recording the following information:
    - Date and time received.
    - Name of the carrier that the sample was delivered by.
    - Signature of the person that the sample was received by.
    - Sample temperature.
    - Sample name and description.

11. As samples are received, assign the sample a unique project and sample number according to A.8.

12. If the form is not complete, contact the facility and obtain the required information. Have the facility complete the chain-of-custody form and fax a copy to the laboratory.

13. A copy of all chain-of-custody forms is maintained in the project folder in the laboratory files.

C. Acceptable Temperature upon Receipt

1. Samples must be received at the laboratory at 0.0 to 6.0ºC. Only grab samples collected relatively short distances from the laboratory may be received above 6.0ºC. This exception is only provided if a legitimate effort is made to cool the sample. A legitimate

effort is considered if the sample is buried in crushed ice in its shipping container immediately after collection and if the sample arrives at the laboratory within 3 hours of collection. This must be documented on the chain-of-custody form.

2. Samples received at the laboratory above 6.0ºC with the exception of the above circumstance will be considered invalid.

D. Sample Storage.

1. Samples collected and shipped or delivered to the laboratory must be chilled to 0.0 to 6.0ºC and received on ice. Sufficient ice should be placed in the shipping container to ensure that ice will still be present when the sample arrives at the laboratory.

2. If samples are not to be analyzed upon receipt by the laboratory, they must be stored in a darkened refrigerator at 0.0 to 6.0ºC.

3. Any unused portions of samples not to be disposed of must be stored in a darkened refrigerator at 0.0 to 6.0ºC.

E. Sample Holding Times.

1. Each sample must first be used within 36-hours of completion of the sampling period.

F. Sample Disposal.

1. All excess sample and test water are disposed of by established laboratory protocols.

G. Exhibits.

Exhibit G4.1: Whole Effluent Toxicity Chain-of-Custody Form.
Exhibit G4.2: Whole Effluent Toxicity Sample Receipt Log.

Subject: Receipt, Handling, and Storage of Samples

Procedure for Receipt, Handling, and Storage of Analytical Samples

Note: All samples received by the laboratory are collected by Environmental Testing Solution, Inc. personnel, facility personnel and are hand delivered or shipped through overnight delivery.

A. Transfer of Sample Custody for Samples Delivered by Facility Personnel.

1. Upon receipt at the laboratory, a member of the laboratory reviews the chain-of-custody form (Exhibit G4.3) for completeness and correctness of information. At a minimum, the review should ensure that:
   - All pertinent blanks on the form are completed.
   - The sample collection date and times are completed.
   - The sample collector signed and dated the form.
   - Test requirements and sample information is complete.

2. If the sample container is not labeled, write the name of the sample and the sample date on the bottle with an indelible ink pen or use a bottle label.

3. Have the person delivering the sample complete or correct the chain-of-custody form, if necessary, before accepting custody of the sample.

4. Measure and record the temperature of the sample (SOP-C1).

5. Have the person delivering the sample relinquish custody by printing their name, signing, and recording the date and time in the "Relinquished by:" line on the form.

6. A member of the laboratory then signs their name and records the date and time in the "Accepted by:" line on the form.

7. Assign the sample a unique project and sample number and record in the Sample Receipt Log (Exhibit G4.4).

   a. Project numbers are assigned by the year, date and a sequential number beginning with 500 (YYMMDD.500).
   b. Sample numbers are assigned with a sequential number.

8. Give a copy of the chain-of-custody form for the person delivering the sample to the laboratory.

9. A copy of all chain-of-custody forms is maintained in the project folder in the laboratory files.

Subject: Receipt, Handling, and Storage of Samples

B. Samples Received by Overnight Carrier.

1. Upon receipt at the laboratory, open the shipping container. Review the chain-of-custody form (Exhibit G4.3) for completeness and correctness of information. At a minimum, the review should ensure that:
   - All pertinent blanks on the form are completed.
   - The sample collection date and times are completed.
   - The sample collector signed and dated the form.
   - Test requirements and sample information is complete.

2. If the sample container is not labeled, write the name of the sample and the sample date on the bottle with an indelible ink pen or bottle label.

3. Measure and record the temperature of the sample (SOP-C1).

4. A member of the laboratory then prints their name, signs, and records the date and time in the "Accepted By:" line on the form.

5. Assign the sample a unique project and sample number according to A.7.

6. If the form is not complete, contact the facility and obtain the required information.

7. A copy of all chain-of-custody forms is maintained in the project folder in the laboratory files.

C. Acceptable Temperature upon Receipt

1. Samples must be received at the laboratory at 0.0 to 6.0ºC. Only grab samples, collected relatively short distances from the laboratory, may be received above 6.0ºC. This exception is only provided if a legitimate effort is made to cool the sample. A legitimate effort is considered if the sample is buried in ice in its shipping container immediately after collection and if the sample arrives at the laboratory and demonstrates a downward trend. The initial field temperature must be documented on the chain-of-custody form.

2. If the temperature of the sample is above 6.0ºC, and no initial field temperature is provided on the chain-of-custody the client must be notified and a determination is to be made about recollection of the sample. If another sample can not be secured a Sample Condition Form (Exhibit G4.4) must be completed and faxed to the NC DENR regional office.

D. Sample Preservation and Dechlorination.

1. If any sample that requires preservative or dechlorination (as indicated in QAP-Q5 or Chemistry/Bacteria SOP) is not properly preserved or dechlorinated, the client must be notified and a determination is to be made about recollection of the sample. If a sample can not be secured a Sample Condition Form must be completed and faxed to the NCDENR regional office in Asheville, NC (Exhibit G4.5).

E. Sample Storage.

1. Samples collected and shipped or delivered to the laboratory must be chilled to 0.0 to 6.0ºC and received on ice. Sufficient ice should be placed in the shipping container to ensure that ice will still be present when the sample arrives at the laboratory.

2. If samples are not to be analyzed upon receipt by the laboratory, they must be stored in a darkened refrigerator at 0.0 to 6.0ºC.

3. Any unused portions of samples not to be disposed of must be stored in a darkened refrigerator at 0.0 to 6.0ºC.

F. Sample Holding Times.

1. Please refer to each individual SOP for sample holding times.

2. If a sample is out of hold time, the client must be notified and a determination is to be made about recollection of the sample. If a sample can not be secured, then a Sample Condition Form must be completed and faxed to the NCDENR regional office in Asheville, NC (Exhibit G4.5).

G. Sample Disposal.

1. All excess sample and test water are disposed of by established laboratory protocols.

H. Exhibits.

Exhibit G4.3: Analytical Chain-of-Custody Form.
Exhibit G4.4: Analytical Sample Receipt Log.
Exhibit G4.5: Sample Condition Form.

Subject: Receipt, Handling, and Storage of Samples

Exhibit G4.1: Whole Effluent Toxicity Chain-of-Custody Form.

Environmental Testing Solutions, Inc.

351 Depot Street
Asheville, NC 28801
Phone: (828) 350-9364
Fax: (828) 350-9368

Whole Effluent Toxicity Chain-of-Custody Form

Facility: _____ NPDES #: _____ Pipe #: ____ County: _____
_____ Purchase order: _____

Species: _____ Effluent dilution: _____
Test type: _____ Parameter code: _____

Sample information: (to be completed by sample collector)

Composite sample:
Start date: _____ Time: _____
End date: _____ Time: _____
Number of samples per hour: _____
Chilled during collection? _____
If chilled, specify temperature: _____

Sample location: _____
Volume collected for testing: _____
Number of containers filled for testing: _____
Method of transport to laboratory: _____
Comments: _____

Triple rinse sample container with sample before filling. Completely fill the sample container with no air space.
Pack the sample container completely in ice. The sample must be < 6.0°C upon receipt at the laboratory.

Sample custody: (to be completed by sample collector and facility personnel)

Sample collected by:

Print	Signature	Date and time

Relinquished by:

Print	Signature	Date and time

Received by:

Print	Signature	Date and time

Relinquished by:

Print	Signature	Date and time

Received by:

Print	Signature	Date and time

Sample receipt information: (to be completed by ETS personnel)

Relinquished to ETS by:

Print	Signature	Date and time

Received at ETS by:

Print	Signature	Date and time

Custody seals intact?: ☐ Yes ☐ No ☐ Not used

Samples received in good condition?: ☐ Yes ☐ No

Sample temperature upon receipt at ETS (°C): ☐

Total residual chlorine upon receipt at ETS: ☐ Present ☐ Absent
(DPD Presence/Absense Indicator, MDL = 0.10 mg/L)

Tracking number: _____

Project number: _____ **Sample number:** _____

Comments: _____
_____

Subject: Receipt, Handling, and Storage of Samples

Exhibit G4.2: Whole Effluent Toxicity Sample Receipt Log.

Page ____

Whole Effluent Toxicity Sample Receipt Log

*Sample temperature performed using Sample Receiving Thermometer: SN 6338.

Date received	Time received	Received by	Received from	Sample temperature (°C)*	Project number	Sample	Sample name and description	State	Comments
12-16-11	1003	K. Keenan	Fed - Ex	0.5	7580	111216.01	S&ME, Inc, - Carillon Buildling	NC	
12-16-11	1003	K. Keenan	Fed - Ex	0.9	7581	111216.02	Craven County Wood Energy	NC	
12-16-11	1003	K. Keenan	Fed - Ex	0.6	7584	111216.03	Duke Energy Corporation - McGuire Nuclear Station - Outfall 005	NC	
12-16-11	1003	K. Keenan	Fed - Ex	0.9	7582	111216.04	K&W Laboratories - Norfolk Southern Railway Company	NC	
12-16-11	1003	K. Keenan	Fed - Ex	0.5	7583	111216.05	ECS Carolinas - Wachovia Tryon Street	NC	

Subject: Receipt, Handling, and Storage of Samples

Exhibit G4.3: Analytical Chain-of-Custody Form.

Environmental Testing Solutions, Inc.

PO Box 7565, Asheville, NC 28802

Phone: (828) 350-9364, Fax: (828) 350-9368

CHAIN-OF-CUSTODY / Analytical Request

Client Name: _____

Address: _____

_____

Report to: _____

Phone: _____ Fax: _____

PO Number: _____

Project Name: _____

Project Number: _____

Requested Analyses

pH Checked Upon Receipt

Cl_2 < 0.2 mg/l Upon Receipt

Item Number	Sample Identification	G = Grab, C = Composite	Sample Number ETS Use Only	Matrix: Water, Solid, Liquid	Date Collected (MM/DD/YY)	Time Collected (HH:MM)	# Containers	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH + Ascorbic	$Na_2S_2O_3$							Field Temp. (°C)	Comments
1																					
2																					
3																					
4																					
5																					
6																					

Sample Condition Upon Receipt		Relinquished By	Company	Date	Time	Accepted By	Company	Date	Time
Temperature (°C)									
Received on Ice:	Y / N								
Sealed Cooler:	Y / N								
Samples Intact:	Y / N								

Additional Comments:

Sampler Name and Signature	Date
Printed Name of Sampler:	
Signature of Sampler:	

Subject: Receipt, Handling, and Storage of Samples

Exhibit G4.4: Analytical Sample Receipt Log.

Date received	Client name	Sample identification	Date collected	Time collected	Project number	Sample number	Analyses
21-Dec-11	Justice Academy	Influent - Composite	21-Dec-11	0802	111221.500	90001	BOD, 5 day
							Solids, Total Suspended
		Effluent - Composite	21-Dec-11	0800		90002	BOD, 5 day
							Solids, Total Suspended
							Ammonia Nitrogen
							Fecal Coliform
		Upstream - Grab	21-Dec-11	0809		90003	Fecal Coliform
		Downstream - Grab	21-Dec-11	0814		90004	Fecal Coliform
21-Dec-11	Rugby	Effluent - Grab	21-Dec-11	0850	111221.501	90005	BOD, 5 day
							Solids, Total Suspended
							Ammonia Nitrogen
							Fecal Coliform
21-Dec-11	West Henderson	Effluent - Grab	21-Dec-11	0835	111221.502	90006	BOD, 5 day
							Solids, Total Suspended
							Fecal Coliform
21-Dec-11	Pine Park	Effluent - Grab	21-Dec-11	0912	111221.503	90007	BOD, 5 day
							Solids, Total Suspended
							Ammonia Nitrogen
							Fecal Coliform
		Upstream - Grab	21-Dec-11	0921		90008	Fecal Coliform
		Downstream - Grab	21-Dec-11	0924		90009	Fecal Coliform
21-Dec-11	Weaverville WTP	01-11-025 125	21-Dec-11	0900	111221.504	90010	Coliform, Total
21-Dec-11	Kanuga CC	01-45-403 A10	21-Dec-11	0935	111221.505	90011	Coliform, Total
21-Dec-11	Bearwallow MHP	Effluent - Grab	21-Dec-11	1200	111221.506	90012	Fecal Coliform
21-Dec-11	Madison Middle	01-58-447 E01	21-Dec-11	0840	111221.507	90013	Nitrate Drinking Water
21-Dec-11	Sleepy Valley	01-58-449 E01	20-Dec-11	1041	111221.508	90014	Nitrate Drinking Water
21-Dec-11	Church of God Spillco	01-58-486 E01	20-Dec-11	1130	111221.509	90015	Nitrate Drinking Water

Exhibit G4.5: Sample Condition Form.

Environmental Testing Solutions, Inc.

SAMPLE CONDITION UPON RECEIPT (SCUR)
DEVIATION

The sample(s) identified below deviated from required preservation, hold time, sampling protocol or sample documentation.

Attention: Mr. Jason Smith

Date: _____

Received from:

Name _____

Sample collector _____

Phone number _____

Deviation:

Sample date _____

Analysis _____

Deviation

☐ The sample(s) was not received on ice (0 to 6.0°C).

☐ The sample(s) was not received within holding time.

☐ The sample(s) was not collected and/or preserved correctly (e.g. head space in volatiles, improper container, or preservation/dechlorination) _____

_____

☐ The chain-of-custody did not have all the appropriate information (e.g. collector's name, date collected, time collected, sample identification, number of containers for each analysis).

☐ Other: _____

_____

Action taken:

☐ Sample(s) accepted and analyzed per client request.

☐ SCUR and COC e-mailed to NC DWQ, Asheville Regional Office – Certification Unit.

Confidential

Subject: Receipt, Handling, and Storage of Samples

	Printed name	Signature
SOP Approval by Laboratory Supervisor:	Jim Sumner	
	Kelley E. Keenan	

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced Standard Operating Procedure (SOP) after (1) the applicable SOP has been read and understood and (2) after training has been received by an approved trainer or laboratory supervisor.

Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced SOP.			**Trainer or Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor

The employee will print, sign and date the trainer section for the referenced SOP after the laboratory supervisor has determined the employee is proficient and experienced in performing the referenced SOP (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced SOP.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Receipt, Handling, and Storage of Samples

Subject: Preparation of Toxicity Samples

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
12-01-00	0	Internal	Jim Sumner (ETS)	Original document
07-01-13	1	External (NC DENR) Internal	Lance Ferrell (NC DENR) Jim Sumner (ETS)	• Included clarification that the UV sterilization of samples is only performed for NPDES permits, which include this testing modification. Testing in support of North Carolina NPDES permits are not treated prior to testing.
03-01-20	2	External (TVA) Internal	Rick Sherrard (TVA) Jim Sumner (ETS)	• The use of SSW for NC testing was removed. • Updated procedure to include NELAP requirements. • Section B.1 corrected to state: Use a 50-mL graduated cylinder to measure 10 to 50 mL of sample.

Subject: Preparation of Toxicity Samples

Scope and Application

To prepare samples for use in toxicity tests.

Equipment and Materials

60-µm Nitex mesh
Serological, fixed, or adjustable-volume pipettes (Eppendorf®)
Volumetric flasks
Various sized graduated cylinders
Synthetic water
Mercury-filled or hand-held thermometers
Tap water
Temperature controlled incubator
Various sized beakers
Dissolved oxygen (DO) meter equipped with a DO probe
Aeration pumps and aquarium tubing
Serological pipettes
Marine Mix® - Forty Fathoms® sea salt
Stir bar
Stir plate
Salinity meter
Safety glasses
Gloves
40 watt UV Sterilizer
Various test benchsheets

Procedure

A. Presence of Indigenous Organisms.

1. Filter the water sample through a 60-µm Nitex mesh, if the sample contains indigenous organisms (e.g. copepods or Cladoceran species) that may be confused with the test species. Document on the appropriate toxicity test bench sheet that the sample was filtered through a 60-µm Nitex mesh.

B. Preparation of Dilutions.

1. If dilutions of the water sample need to be made, use the appropriate volumetric flasks, graduated cylinders and pipettes. The level of precision in the preparation of dilutions is increased when smaller volume graduated cylinders and/or serological pipettes are used to prepare the test concentrations. For example, to measure < 10 mL of sample, use a 10-mL serological pipette. Use a 50-ml graduated cylinder to measure 10 to 50 mL of sample.

2. The type of control/dilution water used will depend on the test species (salt or freshwater species).

   a. For freshwater samples using *Ceriodaphnia dubia, Daphnia* or *Pimephales promelas*, moderately hard synthetic water (MHSW) is used (SOP-AT1). MHSW must have a hardness of 80 – 100 mg $CaCO_3$/L, an alkalinity of 57 – 64 mg $CaCO_3$/L and an initial pH of 6.5 – 8.5 S.U. (recommended 7.4 – 7.8 S.U.).

   b. For marine and estuarine samples using *Americamysis bahia* or *Menidia beryllina*, salt synthetic water (SaltSW) is used (SOP-AT1). SaltSW must have a salinity of 5 – 32 ppt (typically 25.0 ± 2.0 ppt) and an initial pH of 6.5 – 8.5 SU.

C. Achieving Test Temperature, Equilibration of Dissolved Gases.

1. Heat or cool the water samples in a water bath or temperature-controlled incubator, as required, to achieve a final temperature of 25.0 ± 1.0°C (26.0 ± 1.0°C for *A. bahia* chronic tests)

2. Measure the dissolved oxygen (D.O.) concentration (SOP-C2) of each sample after it has been warmed to the required temperature. If the D.O. is > 9.0 mg/L or < 4.0 mg/L, then it may be necessary to aerate the sample. If the sample was warmed too quickly, then the D.O. concentration may be greater than 100% saturation (> 9.0 mg/L).

   a. Shake the sample to equilibrate the dissolved gasses. In most cases, vigorously shaking the sample will lower the D.O. concentration.

   b. Re-measure the D.O. concentration.

   c. If the D.O. concentration is still outside the acceptable range, moderately aerate the sample for 1 minute and re-measure the D.O. concentration. Continue aerating for 1-minute intervals and measuring the D.O. concentration until the concentration is within the acceptable range. The sample may be aerated for a total of 15 minutes;

however, aeration during the preparation of samples should be minimized to prevent the loss of volatile compounds. Document the total aeration time on the appropriate toxicity test bench sheet for the sample.

d. If the D.O. concentration is not within the acceptable range after 15 minutes of aeration, each replicate test vessel must be gently aerated throughout the test period. This activity must be documented on the appropriate toxicity test bench sheet for the sample.

D. Saltwater Toxicity Tests, "Salting-Up" the Sample.

1. Measure the salinity of the water sample according to SOP-C5. If the salinity is below the required range (25.0 ± 2.0 ppt unless otherwise specified by the test species and permit requirements), then the sample must be "salted-up" through the addition of sea salts to achieve the required salinity. Consult with the Laboratory Supervisor prior to "salting-up" the sample.

   a. Pour an aliquot of the water sample into a large beaker with a stir bar.

   b. Place beaker on a stir plate and stir the sample.

   c. Place the tip of the salinity probe in the sample. Measure and record the initial salinity (SOP-C5) on the toxicity test bench sheet for the sample.

   d. Slowly add Marine Mix® sea salt to the sample, allow the salinity to stabilize. Continue to add sea salt until the desired salinity is obtained (25.0 ± 2.0 ppt, or as required by the test species and NPDES permit). Record the final salinity on the toxicity test bench sheet for the sample.

E. UV Sterilization of Water Samples to Remove Pathogenic Interferences.

Note: UV sterilization of samples is only performed for NPDES permits, which include this testing modification. Testing in support of North Carolina NPDES permits are not treated prior to testing.

1. To remove pathogenic interferences in minnow chronic toxicity tests, samples may be treated with UV light. A 40-watt UV Sterilizer is used for treating ambient, wastewater, and industrial samples.

   a. Clean the inside of the UV sterilizer according to procedures outlined in SOP-G1.

b. Set the UV sterilizer horizontally in the supports on the counter, with the inlet and outlet tubes facing up.

c. Rinse the inside chamber of the sterilizer with deionized water. Carefully pour approximately 2000 ml deionized water into the outlet tube of the sterilizer. Using a rubber stopper, plug the outlet tube.

d. Remove the UV sterilizer from the counter, making sure to keep the sterilizer horizontal. Gently rock the sterilizer back and forth to thoroughly rinse the inside chamber.

e. Remove the rubber stopper and drain the sterilizer.

f. Beginning with the lowest dilution or control sample, carefully pour the required volume to be treated into the outlet tube. Using a rubber stopper, plug the outlet tube.

g. Plug the ballast cord into the electrical outlet. Ensure the UV light is illuminated, by looking through the view port.

h. Set the timer for 2 minutes and turn the timer on.

i. Remove the UV sterilizer from the counter, making sure to keep the sterilizer horizontal. Gently rock the sterilizer back and forth to provide the maximum exposure of the sample to the UV light.

j. Return the UV sterilizer to the supports on the counter, horizontally with the inlet and outlet tubes facing up.

k. After 1 minute has elapsed, repeat steps i and j.

l. After 2 minutes have elapsed, unplug the ballast cord from the electrical outlet and turn off the timer.

m. Remove the stopper from the outlet tube and carefully pour the sample into a clean glass beaker or flask. The UV treated sample must never come in contact with glassware or equipment that has been exposed to non-treated sample.

n. Repeat steps c through m.

Safety and Hazardous Waste Management

Safety glasses, gloves and lab coats should always be worn.

Review Policy-P6: General Safety Policy and Policy-P9: Radiation Protection Policy for additional safety requirements.

References

USEPA. October 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th ed. EPA-821-R-02-012. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th ed. EPA-821-R-02-013. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, 3rd ed. EPA-821-R-02-013. US Environmental Protection Agency, Cincinnati, OH.

TNI Standard. Management and Technical Requirements for Laboratories Performing Environmental Analysis. EL-V1-ISO-2016-Rev2.0. The NELAC Institute, PO Box 2439, Weatherford, TX 76086.

Subject: Preparation of Toxicity Samples

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Shipping of Samples

Document Revision History

Revision Date	Surveillance number	Surveillance Type	Evaluators	Revisions
05-06-01				Original document
01-03-12	Not applicable	Internal	Kelley E. Keenan Jim Sumner (ETS)	• Removed UPS shipping instructions.

Subject: Shipping of Samples

Purpose

To ensure correct shipping procedures.

Equipment and Materials

Sample bottles
Chain-of-Custody Form (C-O-C)
Shipping Coolers
Fed-Ex shipping forms, Shipping labels
HOLD stickers
Packing Tape
Ice
Plastic baggies
Bubble wrap
Foam packing

Procedure

A. Preparation of Samples bottles for shipping.
NOTE: ALL GLASS CONTAINERS MUST BE WRAPPED IN BUBBLE WRAP OR FOAM PACKING BEFORE SHIPPING.

1. Samples to be shipped by carrier company to a sub-contract laboratory.

    a. Fill out a Chain-of-Custody (C-O-C) for each client.

    b. Use a cooler that will hold the samples to be shipped and provide adequate space for ice to cover the samples.

    c. Enclose the C-O-C and a copy of the original C-O-C.

    d. Use packing tape to seal the cooler. Make sure that the tape will not come loose during shipment.

2. Kits to be sent to clients.

    a. Sample kits to be sent to clients do not contain ice.

    b. Prepare the kits according to the client's specifications (SOP-G2).
    c. If the kits are to be returned by Fed-Ex during the week, pre-fill out forms, make a copy, and include with the sample kit.

d. If the kits are to be returned by Fed-Ex for weekend pick-up, pre-fill out forms, make a copy, include HOLD stickers, and include with the sample kit.

B. Completing the Shipping forms.

1. Fed-Ex Priority Overnight.

   a. Use the proper forms for sample delivery. Forms are specific for Sending, Receiving during the week, and Receiving on the weekend.

   b. Fill out each form according to the instructions on the form.

   c. Make sure that each box in correctly marked e.g. FedEx Priority Overnight, Saturday, and a Release Signature.

   d. Include any stickers that are specific for that shipment (e.g. HOLD stickers).

   e. For shipments being sent, secure the Fed-Ex form on the cooler with packing tape.

   f. When the packages are ready to be picked up, call Fed-Ex and arrange for a pickup.

   g. Take the packages to the shipping and receiving area.

2. Fed-Ex Ground.

   a. The Fed-Ex form in an online sticker that must be completed using the Fed-Ex online shipping service.

   b. Open the Fed-Ex online shipping program.

   c. Follow the instructions in filling out the shipping form.

   d. Once all instructions have been completed, insert a shipping label into the printer and print the label.

   e. Secure the label onto the cooler with packing tape.

   f. When all shipments for the day are completed, print the End of Day record and close the program.

   g. Take the packages and the End of Day record to the shipping and receiving area.

Subject: Shipping of Samples

	Printed name	Signature
SOP Approval by Laboratory Supervisor:	Jim Sumner	
	Kelley E. Keenan	

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced Standard Operating Procedure (SOP) after (1) the applicable SOP has been read and understood and (2) after training has been received by an approved trainer or laboratory supervisor.

Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced SOP.			**Trainer or Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor

The employee will print, sign and date the trainer section for the referenced SOP after the laboratory supervisor has determined the employee is proficient and experienced in performing the referenced SOP (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced SOP.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Shipping of Samples

Subject: Disposal of Samples and Containers

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
05-06-01	0	Internal	Jim Sumner (ETS)	Original document
03-01-20	1	External (TVA) Internal	Rick Sherrard (TVA) Jim Sumner (ETS)	• Updated procedure to include NELAP requirements. Corrected grammatical errors. • For TVA sample containers, obliterate the name "TVA" (if present) with a sharpie.

Scope and Application

To properly dispose of samples and containers.

Equipment and Materials

Sample containers (Glass or Plastic)
Samples
Recycling bin
Sharpie

Procedure

A. Disposal of Non-hazardous Samples

1. Samples can be disposed only after all analyses have been performed.

2. All sample containers must be properly disposed.

    a. To purge a sample, turn on the cold water tap and slowly pour the sample down the drain.

    b. After the sample container is empty, rinse it with tap water.

c. For TVA sample containers, obliterate the name "TVA" (if present) with a sharpie.

d. Place the container in a recycling bin.

e. Recycled materials are taken to the recycling center every week.

B. Disposal of Hazardous Samples and Containers.

1. All containers that contain hazardous wastes must be returned to the client.

2. The laboratory must not dispose of any samples that contain asbestos, PCB's or oil contaminated waste.

Safety and Hazardous Waste Management

Safety glasses, gloves and lab coats should always be worn.

Review Policy-P6: General Safety Policy and Policy-P9: Radiation Protection Policy for additional safety requirements. Additional requirements for the disposal of tritiated samples is contained within this policy.

Subject: Disposal of Samples and Containers

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Reagent Water System Maintenance

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
12-01-00	0	Internal	Jim Sumner (ETS)	Original document
06-29-09	1	Internal	Jim Sumner (ETS)	• Included a flow diagram for the deionized water system.
03-01-20	2	External (TVA) Internal	Rick Sherrard (TVA) Jim Sumner (ETS)	• The Milli-Q water system was removed. • Increased deionized water system tanks to 3.6 CF. • Updated procedure to include NELAP requirements.

Scope and Application

To maintain the deionized water system for cultures and toxicity/analytical tests.

Quality Control

1. Total residual chlorine is monitored in deionized water through the testing of blanks (SOP-C8). Blanks are tested with each batch of toxicity samples analyzed for chlorine. Levels of chlorine should be less than ½ the detection limit (0.10 mg/L). If detectable results are obtained, corrective action must be taken.

2. The activated carbon tank is replaced every 6 months.

3. The prefilters and post filters in the deionized water system are replaced every 6 months.

4. The working and polishing deionizers are replaced when the resistivity light goes out or every 6 months (whichever comes first).

5. All maintenance activities must be recorded in the Reagent Water System Log (Exhibit G8.1).

Subject: Reagent Water System Maintenance

Equipment and Materials

Potable water
Pressure regulators
Course filter
Prefilters and housings
Prefilter Cartidge, 1 micron
Prefilter housing assembly, 20''
Activated carbon tank, 3.6 cf
Mixed bed deionizers, 3.6 cf
Post filter Cartridges, 0.2 micron, 10"
Post filter housing assemblies, 10''
Interconnecting assembly (includes resistivity lights, pressure regulator, standard FDA grade tubing and fittings, and water meter)
Water valve
Reagent water system log

Procedure

A. Flow Chart.

1. City of Asheville, NC potable water is diverted from the city supply line into the laboratory. The main line passes through a pressure regulator and then through a course filter and prefilter to supply the laboratory with potable water (Figure G8.1).

2. Standard FDA grade tubing is diverted from the source potable water line to a pressure regulator.

3. From the pressure regulator, water is passed through a 20-inch, 1-micron prefilter and then a 3.6 cubic-foot activated carbon tank.

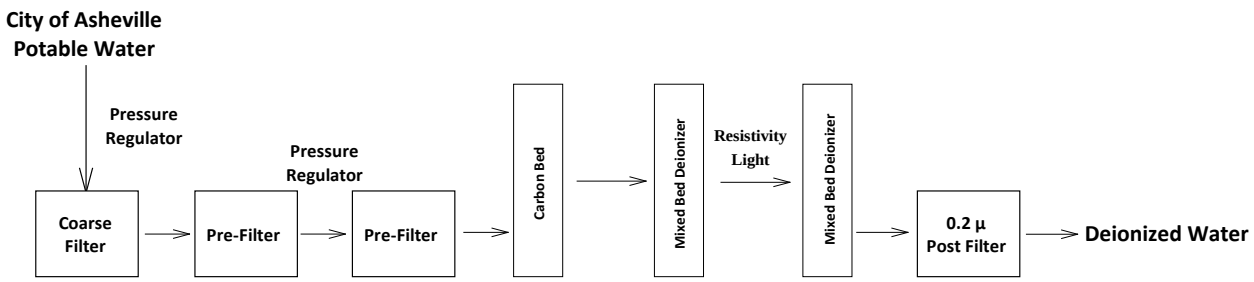
4. From the activated carbon tank, water is passed through a 3.6 cubic-foot working deionizer. After the working deionizer, a resistivity light indicates the quality of megaohm-cm water. The light is illuminated green with high quality water. When the working deionizer has been exhausted, the light will turn red. At this time, the working deionizer and activated carbon tank must be replaced.

5. From the working deionizer, the water passes through a second 3.6 cubic-foot polishing deionizer.

6. After the polishing deionizer, the water passes through a 10-inch, 0.2-micron post filter.

7. From the post filter, deionized water is available.

Figure G8.1: Diagram of the deionized water system.



Safety and Hazardous Waste Management

Safety glasses, gloves and lab coats should always be worn.

Review Policy-P6: General Safety Policy and Policy-P9: Radiation Protection Policy for additional safety requirements.

References

Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012. American Public Health Association, 800 I Street, NW, Washington DC 20001-3710.

USEPA. October 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th ed. EPA-821-R-02-012. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th ed. EPA-821-R-02-013. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, 3rd ed. EPA-821-R-02-014. US Environmental Protection Agency, Cincinnati, OH.

TNI Standard. Management and Technical Requirements for Laboratories Performing Environmental Analysis. EL-V1-ISO-2016-Rev2.0. The NELAC Institute, PO Box 2439, Weatherford, TX 76086.

Exhibits

Exhibit G8.1: Reagent Water System Log.

Subject: Reagent Water System Maintenance

Exhibit G8.1: Reagent Water System Log.

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Reagent Water System Log

Location: ☐ Main Laboratory ☐ Fish Culture Laboratory

Service Date	Analyst	Activity (type of service performed and comments)

SOP G8-Revision 1–Exhibit G8.1

Subject: Reagent Water System Maintenance

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Instrument Maintenance and Repair

Document Revision History

Revision Date	Surveillance number	Surveillance Type	Evaluators	Revisions
09-01-09				Original document
06-20-12	120620.03	External (TVA) Internal	William Rogers (TVA) Donald Snodgrass (TVA) Rick Sherrard (TVA) Jim Sumner (ETS)	• Exhibit G9.1 amended to include the dates of routine maintenance, removed from service and returned to service.

Subject: Instrument Maintenance and Repair

Purpose

To provide instruction and documentation on the maintenance and repair of laboratory instruments.

References

Instrument Manuals

Procedure

A. Maintenance, Repair, and Non-Conformances

1. Service contracts or in-house preventive maintenance and/or repair are documented in a central maintenance log, which may include documentation for each instrument (example provided in Exhibit G9.1). Documentation may include annual maintenance and maintenance performed at other times due to malfunction (with the exception of routine cleaning).

2. Non-conformances (e.g. exceeding quality control limits) for each instrument are also documented in the maintenance log. This includes what led to the non-conformance, probable cause, and how the non-conformance was resolved. In addition, non-conformances are documented through QAP Q3, Surveillance and Corrective Action Reports.

3. Manuals provided by the instrument manufacturers are maintained on file as reference tools to trouble shoot problems with instrumentation. In the event that problems cannot be resolved internally, service technicians are hired to repair or calibrate the malfunctioning instruments.

4. Calibration documentation for each instrument is maintained in various logbooks for the tests performed on that instrument or in calibration logbooks maintained for that instrument. Calibration information is not documented in the maintenance log.

B. Exhibits.

Exhibit G9.1: Example Maintenance Log.

Subject: Instrument Maintenance and Repair

Exhibit G9.1: Example Maintenance Log.

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Equipment Maintenance Log

Item	Serial number	Make and Model
Bacteria Incubator # 1	11AX-4	Precision, Curtis Matheson Scientific, Equatherm Model: 1487
BOD Incubator # 1	WB72043714	Precision, Electrolux Model: FFU2064DW8
BOD Incubator # 2	WB94157442	Precision, Electrolux Model: TFFU2065FW0
Algae and YWT Refrigerator	E2001648367	Haier Model: HSL04WNAWW
Refrigerator # 1	BA64722418	Electrolux Model: FRT17L3FW1
Refrigerator # 2	BA65013194	Electrolux Model: FRT17L3FW1
Refrigerator # 3	6J248008	Sears Coldspot
Refrigerator # 4	WA42501619	Frigidaire Model: R22CW11
Refrigerator # 5	WA42500397	Frigidaire Model: R22CW11
Toxicity Incubator # 1	WB41340472	Precision, Electrolux Model: FFU20FC4CW2
Toxicity Incubator # 2	WB22114693	Precision, Electrolux Model: FFU20F3AW3
Toxicity Incubator # 3	WB22114719	Precision, Electrolux Model: FFU20F3AW3
Toxicity Incubator # 4	WB95219633	Precision, Electrolux Model: MFU20F3GW7
Toxicity Incubator # 5	WB60643874	Precision, Electrolux Model: FFU2064DW4
Conductance and Reagent Incubator # 1	1001199	VWR Model: 2020
Water Bath # 1	602111280	Precision Model: 51221033
Water Bath # 2	M5-9491	BLUE M Model: MW-1110A-1
Toxicity Water Bath	603031364	Precision Cat No.: 51221070
60°C Oven	TA180	BLUE M Model: 100A
105°C Oven	1000136	Fisher Isotemp Oven
180°C Oven	P-6	Precision Thelco Model: 16
Autoclave	9008061	ASME
COD Reactor	920200006723	HACH P/N 45600-00
Vacuum Pump	0905603559	GAST Manufacturing Model: 0523-V191Q-G588DX
Quanti-Tray Sealer Model 2X	05545	IDEXX Model: 89-10894-02

SOP-G9, Exhibit G9.1 – revision 06-20-12

Subject: Instrument Maintenance and Repair

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Equipment Maintenance Log

Analyst	Date Routine Maintenance Performed	Date Removed from Service (Not Applicable for Routine Maintenance Activities)	Date Returned to Service (Not Applicable for Routine Maintenance Activities)	Item	Maintenance Activity

SOP-G9, Exhibit G9.1 – revision 06-20-12

Subject: Instrument Maintenance and Repair

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Instrument Maintenance Log

Item	Serial number	Make and Model
Pan Balance	BO39128	Denver Instrument Co. XL-3K
Balance	14107050	Fisher ACCU-224 (XX47-0015)
CAHN Balance	155037	CAHN 21 Automatic Electrobalance
CAHN Balance	41520	CAHN 28 Automatic Electrobalance
Turbidimeter	14472	HACH Model 2100A
DO Meter # 1	02J1236	YSI Model 52 DO Meter, Model: 52CE
DO Meter # 2	08A100271	YSI Model 52 DO Meter, Model: 52CE
pH / Conductivity Meter	AR93312452	ACCUMET AR20
pH / Ion Meter # 1	AR93311757	ACCUMET AR25
pH / Ion Meter # 2	XL94004132	ACCUMET XL25
Spectrophotometer	0509V0002601	HACH DR/4000V
Salinity Meter	265251	Oakton Salt 6, Acorn Series
BOD Probes	Various	YSI Model 5905 BOD Probe
pH Probes	Various	Orion 9106BNWP Low Maintenance pH Probe
Specific Conductance Probes	Various	ACCUMET Catalog # 13-620-160
Residual Chlorine Electrodes	Various	ORION
Drinking Water Nitrate Probes	Various	ORION 9300BNWP 93 Series Electrode Body, ORION 900200 Sure Flow D/J Reference
Ammonia Electrodes	Various	ORION 9512

SOP-G9, Exhibit G9.1 – revision 06-20-12

Subject: Instrument Maintenance and Repair

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Instrument Maintenance Log

Analyst	Date Routine Maintenance Performed	Date Removed from Service (Not Applicable for Routine Maintenance Activities)	Date Returned to Service (Not Applicable for Routine Maintenance Activities)	Item	Maintenance Activity

SOP-G9, Exhibit G9.1 – revision 06-20-12

Subject: Instrument Maintenance and Repair

	Printed name	Signature
SOP Approval by Laboratory Supervisor:	Jim Sumner	
	Kelley E. Keenan	

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced Standard Operating Procedure (SOP) after (1) the applicable SOP has been read and understood and (2) after training has been received by an approved trainer or laboratory supervisor.

Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced SOP.			**Trainer or Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor

The employee will print, sign and date the trainer section for the referenced SOP after the laboratory supervisor has determined the employee is proficient and experienced in performing the referenced SOP (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced SOP.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Instrument Maintenance and Repair

Subject: Balance and Weight Calibration

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		07-01-20
Quality Assurance Officer	Jim Sumner		07-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
12-01-00	0	Internal	Jim Sumner (ETS)	Original document
09-01-09	1	External (TVA, Environmental Standard, Inc.) Internal	William Rogers (TVA) Cynthia Russell (TVA) Rick Sherrard (TVA) Rock Vitale (Environmental Standards, Inc.) Jim Sumner (ETS)	• Balance calibration range changed to bracket all potential measurements performed in the laboratory. • Removed warning limits from acceptance criteria. • Corrective action included if certified weights exceed acceptance criteria. • Changed balance logs and exhibits to reflect these changes and to provide traceability to the last balance and NIST calibrations performed by external vendors. • NIST certified weights recalibrated, which changed the true values. Amended associated exhibit and values throughout document. • Ammended wall chart to provide the source (SOP G10 – Table G10.1, revision 09-01-09).
01-03-12	2	Internal	Jim Sumner (ETS)	• Included calibration procedure for the Cahn 28 Automatic Electrobalance. • Updated exhibits during document review.
07-01-20	3	Internal	Teresa Sleeper (ETS) Jim Sumner (ETS)	• Replaced calibration instructions for Fisher Scientific ACCU-224 with instructions for Mettler-Toledo ME204. • Updated procedure to include NELAP requirements. • Additional guidance included in SOP. • Updated log to reflect new control limits for certified weights.

Subject: Balance and Weight Calibration

Scope and Application Purpose

To maintain balance and weights for toxicity and analytical tests.

Quality Control

1. Balances must be serviced yearly by an approved company (e.g. Laboratory Instruments, Inc.). Documentation is maintained in the laboratory's QC files.

2. Balances must be verified and/or calibrated before each use.
    - Mettler-Toledo ME204:
        - Internal calibration performed at least weekly.
        - Balance level verified and corrected as needed before each use.
        - Balance tared before each use.
        - Balance verified with at least two Class "S" Weights each day prior to use. The weights must bracket the items to be weighed.
        - Balance verified with seven Class "S" Weights weekly.
    - Cahn 28 Automatic Electrobalance:
        - Balance tared and calibrated before each use.
        - Balance verified with two Class "S" Weights before and after use. The weights must bracket the items weighed.

2. Class "S" Weights must be verified every 5 years against NIST certified weights. Precision Weighing, Inc. in Cary, NC is used to perform this verification. Documentation is maintained in the laboratory's QC files.

3. All certified weight measurements <u>must</u> be within the control limits before any materials or samples can be analyzed. If the measurements are out of range, perform the balance internal calibration and document in the balance log. Re-analyze the certified weights. If the measurements still exceed the control limits, notify the Laboratory Supervisor to determine if the balance requires cleaning or adjustment. If the balance cannot be corrected to meet the control limits through cleaning or adjustment, the balance must be serviced by an approved instrument calibration company (e.g. Laboratory Instruments, Inc.). If final measurements using the Cahn Electrobalance exceed the control limits, all weight measurements performed that day must be re-analyzed. Refer to Table G10.1 for the lower and upper control limits for weights used to calibrate balances.

Table G10.1: Lower and upper control limits for Class "S" Weights used to calibrate balances.

True value (g)	**Control Limit (g)** (0.00499 to 0.20001 g weights ± 2.0%) (1.0000 to 150.0000 g weights ± 0.10%)	
	Lower	**Upper**
0.00499	0.00489 (4.89 mg)	0.00509 (5.09 mg)
0.0103	0.0101	0.0105
0.04993	0.04893 (48.93 mg)	0.05093 (50.93 mg)
0.1005	0.0985	0.1025
0.20001	0.19601	0.20401
1.0000	0.9990	1.0010
10.0000	9.9900	10.0100
50.0000	49.9500	50.0500
100.0000	99.9000	100.1000
150.0000	149.8500	150.1500

Equipment and Materials

Balance (Mettler-Toledo ME204, Cahn 28 Automatic Electrobalance)
Class "S" Weights
0.00499, 0.0103, 0.04993, 0.1005, 0.20001, 1.0000, 10.0000, 50.0000, 100.0000 and 150.0000 g
Anti-static brush
Forceps
Spatula
Weigh boat or medicine cup
Balance Log

Subject: Balance and Weight Calibration

Procedure

Note: Always use forceps to place weights on the balance.

A. Calibration of the Mettler-Toledo ME204.

1. The balance must be verified before each use. Record calibration information in the Balance Log (Exhibit G10.1).

2. Turn the balance on by pressing the **→0/T←** button.

3. Level the balance using the leveling feet so that the air bubble is centered within the circle of the level indicator and document in the Balance Log.

4. Wait until the balance reads 0.0000 g before starting. Use the **→0/T←** key to tare the reading.

5. For weighing chemicals and materials, use two certified weights that bracket the weight of chemicals or materials to be measured. Record the measurement of both weights in the Balance Log.

6. Weekly perform the internal calibration of the balance and record in the Balance Log. Press and hold the **Cal** button until **ADJUST** appears. Select **ADJ.INT** by pressing **Menu** and allow the balance to perform the internal calibration. Once the calibration is complete, the balance will read **ADJ.DONE** and **0.0000 g** will appear when the balance is ready.

7. Weekly (when the internal calibration is performed), verify the balance with all the Class "S" Weights identified on the log. Record the measurements in the Balance Log.

B. Weighing Chemicals or Materials using the Mettler Toledo ME204 Balance

1. Before weighing any materials or at a minimum daily, verify the balance according to B.4 – B.9.

2. Place a weigh boat on the balance pan and press **→0/T←** to tare to 0.0000 g.

3. Using a spatula, carefully spoon the chemical or place the material onto the center on the weigh boat. Make sure to close the glass doors to ensure a correct reading. Allow the reading to stabilize and record the measurement.

4. Once completed, remove the weigh boat and sweep out the interior with an anti-static brush.

5. Place the balance in standby by pressing and holding the **→0/T←** button until **STANDBY** appears. The balance will display **MT.GREEN** while in standby mode.

C. Calibration of the Cahn 28 Automatic Electrobalance.

1. The balance must be verified before each use. Record calibration information in the Balance Log (Exhibit G10.1).

2. Turn the balance on by pressing the **POWER** button (located in the back of the balance). The balance should warm for a minimum of 1-hour before use.

3. Set the balance to the **A** Range (**200 mg – 1 µg**).

4. Press the **TARE** button on the balance (the balance must read 0.00 mg before starting).

5. Place the 200.01 mg weight on balance Pan A and wait until ready. Record the answer in the Balance Log. Press the **CAL** button to correct the reading and record the corrected value in the Balance Log.

6. Remove the weight from Pan A and allow the balance to stabilize to zero. If the reading has drifted, recalibrate the balance.

7. Place the 4.99 mg weight on balance Pan A and wait until ready. Record the answer in the Balance Log.

8. Place the 49.93 mg weight on balance Pan A and wait until ready. Record the answer in the Balance Log.

D. Weighing Materials (weigh pans used in toxicity tests).

1. Before weighing any materials, calibrate the balance according to A.4 – A.9.

2. Using the forceps, carefully place the weigh pan onto the center of Pan A. Make sure to close the glass door to ensure a correct reading. Allow the reading to stabilize and record the measurement. Record the date that the measurements are being made and your initials on the bench sheet.

3. Once completed, remove the pan.

4. Once all measurements are completed, measure the 4.99 mg and 49.93 mg weights. Allow the readings to stabilize and record the answers in the Balance Log.

5. Turn the balance off by pressing the **POWER** button (located in the back of the balance).

References

Instrument Manual

Exhibits

Exhibit G10.1: Balance Log.

Subject: Balance and Weight Calibration

Exhibit G10.1: Balance Log (Mettler-Toledo ME204).

Environmental Testing Solutions, Inc.

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Mettler-Toledo ME204 Balance Log

Instrument	Serial number	Calibration date	Calibration company
Mettler-Toledo ME204 Balance	C006982938	04-28-20	Laboratory Instrument Services
Certified Weights	20410	03-19-18	Precision Weighing

Date	Internal Cal. (√)	Level (√)	Certified weight (g) and control limits*							Analyst initials
			0.0103	**0.1005**	**1.0000**	**10.0000**	**50.0000**	**100.0000**	**150.0000**	
			0.0101–0.0105	0.0985–0.1025	0.9990–1.0010	9.9900–10.0100	49.9500–50.0500	99.9000–100.1000	149.8500–150.1500	

*Certified weights must be within established control limits before measurements are made.
If certified weights exceed control limits, perform balance internal calibration and re-measure certified weights.

SOP G10-Revision 3–Exhibit G10.1

Subject: Balance and Weight Calibration

Exhibit G10.1: Balance Log (Cahn 28 Automatic Electrobalance).

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Cahn 28 Automatic Electrobalance Log

Instrument	Serial number	Calibration date	Calibration company
Cahn 28 Automatic Electrobalance	41520	01-17-20	Laboratory Instrument Services
Certified Weights (4.99 and 49.93 mg)	20410	03-19-18	Precision Weighing
Certified Weight (200.01 mg)	1000055140	03-28-18	Precision Weighing

Date	Zero Tare (V)	Calibration weight (200.01 mg)		Initial verification weights (mg) (before measurements are taken)		Final verification weights (mg) (after measurements are taken)		Analyst initials
		Initial	Final (calibrated to 200 mg)	4.99 Control Limit* (4.89-5.09)	49.93 Control Limit* (48.93-50.93)	4.99 Control Limit* (4.89-5.09)	49.93 Control Limit* (48.93-50.93)	

*Initial and final verification weights must be within established control limits. If verification weights exceed control limits, re-zero and re-calibrate balance and re-analyze samples.

SOP G10-Revision 3– Exhibit G10.1

Subject: Balance and Weight Calibration

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		07-01-20
Quality Assurance Officer	Jim Sumner		07-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Mechanical Pipette and Polypropylene Cylinder Volume Verification

Document Revision History

Revision Date	Surveillance number	Surveillance Type	Evaluators	Revisions
12-01-00				Original document
01-03-12	Not applicable.	Internal	Jim Sumner (ETS)	• Updated exhibits during document review. Added leak test to procedure.
06-20-12	120620.01	External (TVA) Internal	William Rogers (TVA) Donald Snodgrass (TVA) Rick Sherrard (TVA) Jim Sumner (ETS)	• Graduated cylinder volume verification procedure added.
10-31-12	120620.01	External (TVA) Internal	William Rogers (TVA) Donald Snodgrass (TVA) Rick Sherrard (TVA) Jim Sumner (ETS)	• Clarified graduated cylinder volume verifications for only polypropylene cylinders. • Updated exhibit to provide acceptable ranges for polypropylene cylinders and included a table with these limits.

Subject: Mechanical Pipette and Polypropylene Cylinder Volume Verification

Purpose

To maintain mechanical pipettes for toxicity and analytical tests.

References

Pipette Instruction Manual

Equipment and Materials

Balance (Fisher Scientific ACCU-224, or equivalent)
Weights (0.10049, 0.5004, 1.0000, 10.0001, 50.0000, and 100.0000 g)
100-ml beaker, Erlenmeyer flask
Deionized water
Thermometer
Adjustable-Fixed Mechanical Pipettes (Eppendorf®), Various Graduated Cylinders
Mechanical pipette tips
Pipette Volume Verification Logsheet, Graduated Cylinder Volume Verification Logsheet

Procedure

A. Calibration Frequency.

1. All mechanical pipettes must be verified every six months. Polypropylene graduated cylinders, which are washed in a dishwasher, must be verified yearly.

2. Leak tests of mechanical pipettes must be performed every six months.

B. Mechanical Pipette Verification Procedure.

1. Calibrate the balance according to SOP-G10.

2. Complete the following on the Pipette Volume Verification Logsheet (Exhibit G11.1):
   - Date
   - Analyst's initials
   - Pipette serial number
   - Pipette manufacturer
   - Water and ambient temperature
   - Volumes checked

3. Fill a 100-ml beaker with deionized water. Allow the water to adjust to room temperature. Record the temperature on the logsheet.

4. Perform a leak test by placing a tip on the pipette and filling with deionized water to the maximum nominal volume and placing the pipette on a vibration-free stand. Observe the meniscus in the tip for 1 minute. After 1 minute, there should be no visible droplet formation at the tip. If there are no signs of droplet formation, proceed with the calibration check. If droplet formation is observed, maintenance and corrective action must be taken or the pipette must not be used. Record whether the pipette passed or failed the leak check.

5. Place a weigh boat on the balance pan and **TARE** to 0.0000 mg

6. Draw up the required volume of deionized water.

7. Release the water into the weigh boat and wait until the balance is stable. Record the reading on the Pipette Volume Verification Logsheet (Exhibit G11.1). Repeat this process 10 times.

8. Continue to verify and record the different pipette volumes.

C. Polypropylene Graduated Cylinder Volume Verification Procedure.

1. Calibrate the balance according to SOP-G10.

2. Complete the following on the Polypropylene Graduated Cylinder Volume Verification Logsheet (Exhibit G11.2):
   - Date
   - Analyst
   - Water and ambient temperature
   - Volume verified
   - Cylinder type (100 mL, 250 mL, etc.)
   - Cylinder identification number

3. Fill an Erlenmeyer flask with deionized water. Allow the water to adjust to room temperature. Record the temperature on the logsheet.

4. Place the cylinder on the balance pan and **TARE** to 0.0000 mg

5. Fill the cylinder with deionized water to the appropriate volume to verify.
   Wait until the balance stabilizes. Record the reading on the Graduated Cylinder Volume Verification Logsheet (Exhibit G11.2). Correct the volume using the Z factor (Table G11.2) and record on the logsheet.

6. Continue to verify and record for each cylinder to be checked.

C. Quality Control.

1. All pipettes must be within the recommended limits established by the manufacturer. If the readings are out of range, notify the Laboratory Supervisor and take the pipette out of use. If the pipette cannot be corrected to meet the recommended limits through cleaning or adjustment, the pipette must be sent to an approved instrument calibration company (e.g. Precision Weighing) to be recalibrated. Refer to Table G11.1 for the recommended limits for pipette volumes used to calibrate mechanical pipettes.

Table G11.1: Recommended limits for mechanical pipette volumes

Repeater Pipettes:

True value (ml)	**Recommended Limits (g)**		**Recommended CV (%)**
	Lower	**Upper**	
0.0500	0.0494	0.0506	< 0.6%
0.1000	0.0992	0.1008	< 0.2%

Adjustable Finnpipettes:

True value (ml)	**Recommended Limits (g)**		**Recommended CV (%)**
	Lower	**Upper**	
0.0100	0.0097	0.0103	< 1.0%
0.0500	0.0494	0.0506	< 0.6%
0.1000	0.0990	0.1010	< 0.6%
0.2500	0.2480	0.2520	< 0.5%
0.5000	0.4960	0.5040	< 0.4%
1.0000	0.9940	1.1060	< 0.2%

2. Polypropylene graduated cylinders must be within ± 5% of the true value. If the readings are out of range, notify the Laboratory Supervisor and take the cylinder out of use. Refer to Table G11.2 for the recommended limits for cylinder volumes used to verify polypropylene graduated cylinders.

Table G11.2: Recommended limits for polypropylene graduated cylinder volumes

True value (ml)	**Recommended Limits (g)**	
	Lower	**Upper**
100	95	105
250	237.5	262.5

3. Each pipette or graduated cylinder volume is corrected for the Z factor as indicated in Table G11.3. For pipettes, the coefficient of variation (CV) is also calculated.

Table G11.3: Z Factors based on Temperature and Air Pressure in Asheville, NC (elevation = 2200 feet, Air Pressure = 93.059 KPa).

Temperature (ºC)	**Z Factor (µl/mg)**
18.0	1.0024
18.5	1.0025
19.0	1.0026
19.5	1.0027
20.0	1.0028
20.5	1.0029
21.0	1.0030
21.5	1.0031
22.0	1.0032
22.5	1.0033
23.0	1.0034
23.5	1.0036
24.0	1.0037
24.5	1.0038
25.0	1.0039
25.5	1.0041
26.0	1.0042
26.5	1.0043
27.0	1.0045
27.5	1.0046
28.0	1.0047

D. Exhibits.

Exhibit G11.1: Pipette Volume Verification Logsheet.
Exhibit G11.2: Graduated Cylinder Volume Verification Logsheet.

Subject: Mechanical Pipette and Polypropylene Cylinder Volume Verification

Exhibit G11.1: Pipette Volume Verification Logsheet

Pipette Volume Verification

Date: _____

Analyst: _____

Pipette serial number: Repeater Pipette - CULTURE

Pipette manufacturer: Eppendorf

Water and ambient temperature: _____

Pipette Volume (mL)	
0.0500	**0.1000**

Leak check: Pass ☐ Fail ☐

Confidential

Subject: Mechanical Pipette and Polypropylene Cylinder Volume Verification

Pipette Volume Verification						
	Date:		06-04-12	Temperature (^{o}C):	24.0	
	Analyst:		M. Fields	Z Factor:	1.0037	
	Pipette serial number:		**Repeat Pipette - CULTURES**			
	Pipette manufacturer:		**Eppendorf**			
	True value:		**0.0500**	**0.0500 with**	**0.1000**	**0.1000 with**
				Z Factor Correction		**Z Factor Correction**
	Measurements:	1	0.0494	0.0496	0.1001	0.1005
		2	0.0494	0.0496	0.0993	0.0997
		3	0.0490	0.0492	0.0994	0.0998
		4	0.0495	0.0497	0.0990	0.0994
		5	0.0490	0.0492	0.0994	0.0998
		6	0.0490	0.0492	0.0993	0.0997
		7	0.0490	0.0492	0.0993	0.0997
		8	0.0491	0.0493	0.0993	0.0997
		9	0.0494	0.0496	0.0990	0.0994
		10	0.0496	0.0498	0.0993	0.0997
	Mean:			**0.0494**		**0.0997**
	Suggested range:			0.0494 - 0.0506		0.0992 - 0.1008
	Percent CV:			**0.4900**		**0.3046**
	Suggested range:			< 0.6%		< 0.2%

Subject: Mechanical Pipette and Polypropylene Cylinder Volume Verification

Exhibit G11.2: Polypropylene Graduated Cylinder Volume Verification Logsheet

1 of 1

Polypropylene Graduated Cylinder Volume Verification

Date: _____

Analyst: _____

Water and ambient temperature: _____

Z factor: _____ (SOP G11 – Table G11.2)

Cylinder type	Cylinder identification number	Volume Verified (mL)	Weight of volume in cylinder (g)	Corrected Volume* (mL) (weight of volume in cylinder x Z-factor)

*The corrected volume for each cylinder must be within ±5% of the true volume or volume verified (100 mL volume acceptance limit = 95 – 105 mL, 250 mL volume acceptance limit = 237.5 – 262.5 mL). If a cylinder exceeds these limits, it must be taken out of service.

SOP G11 – Exhibit G11.2, revision 10-31-12

Subject: Mechanical Pipette and Polypropylene Cylinder Volume Verification

	Printed name	Signature
SOP Approval by Laboratory Supervisor:	Jim Sumner	
	Kelley E. Keenan	

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced Standard Operating Procedure (SOP) after (1) the applicable SOP has been read and understood and (2) after training has been received by an approved trainer or laboratory supervisor.

Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced SOP.			**Trainer or Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor

The employee will print, sign and date the trainer section for the referenced SOP after the laboratory supervisor has determined the employee is proficient and experienced in performing the referenced SOP (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced SOP.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Mechanical Pipette and Polypropylene Cylinder Volume Verification

Subject: Thermometer Calibration

Document Revision History

Revision Date	Surveillance number	Surveillance Type	Evaluators	Revisions
12-01-00				Original document
09-01-09	090716.06	External (TVA, Environmental Standard, Inc.) Internal	William Rogers (TVA) Cynthia Russell (TVA) Rick Sherrard (TVA) Rock Vitale (Environmental Standards, Inc.) Jim Sumner (ETS)	• Incubator, refrigerator, and drying oven temperatures section and associated exhibits removed and added to SOP C1.
01-03-12	Not applicable.	Internal	Jim Sumner (ETS)	• Updated exhibits during document review.

Subject: Thermometer Calibration

Purpose

To calibrate thermometers used to measure the temperature of water samples used in toxicity tests, wastewater, receiving water, drinking water, and incubators/refrigerators.

References

Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005. American Public Health Association, 800 I Street, NW, Washington DC 20001-3710.

Equipment and Materials

Mercury-filled thermometers
Hand-held thermometers
Digital thermometers
NIST traceable thermometers
Rinse bottle
Deionized water
Waste container
Thermometer Calibration Logsheet

Procedure

A. Calibration.

1. All mercury-filled and hand-held thermometers and meters, which measure temperature, must be calibrated twice a year with a traceable NIST thermometer (refer to Exhibit G12.1 for NIST certification records).

    a. Thermometers used to measure the temperature within temperature-controlled incubators are calibrated at 20.0 ± 1.0ºC, 25.0 ± 1.0ºC, or 35.0 ± 0.5ºC.

    b. Thermometers used to measure the temperature within refrigerators are calibrated at the ice-point (0.1 - 4.0 ºC).

    c. Thermometers used to measure the temperature within drying ovens are calibrated at 60.0 ± 2.0ºC or 105 ± 2.0 ºC.

    d. General use and sample receiving thermometers are calibrated at 25.0 ± 1.0ºC and 0.1 - 4.0 ºC.

2. Place all thermometers to be calibrated at the desired temperature in a beaker of water with the NIST thermometer. Place the beaker of water in the respective temperature-controlled incubator for calibrating thermometers at 20.0 ± 1.0ºC, 25.0 ± 1.0ºC, or 35.0 ± 0.5ºC, a refrigerator for calibrating thermometers at 0.1 ± 4.0ºC, or the respective drying oven for calibrating thermometers at 60.0 ± 2.0ºC or 105 ± 2.0ºC. Allow the water to reach the desired temperature. For each thermometer, compare the temperature measurement to the measurement on the NIST thermometer. If the thermometer has an immersion line, it must be utilized. If it does not have an immersion line, both calibration and measurements must be made under the same water depth.

3. Record the date of calibration, serial number of the thermometer, calibration temperature, and correction factor (temperature adjustment of the thermometer to equal the measurement of the NIST thermometer) on the Thermometer Calibration Logsheeet (Exhibit G12.2) and on a label affixed to the thermometer.

4. Thermometers having breaks in the mercury or having a correction factor > 1.0 are taken out of service.

C. Exhibits.

Exhibit G12.1: NIST Thermometer Certification Records.
Exhibit G12.2: Thermometer Calibration Logsheet.

Subject: Thermometer Calibration

Exhibit G12.1: NIST Thermometer Certification Records.

ilac-MRA ACCREDITED Calibration Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4007-4075428

Traceable® Certificate of Calibration for Memory Wide-Range Thermometer (Old Model)

Instrument Identification:

Environmental Testing Solution, 351 Depot Street, Attn. Jim Sumner, Asheville, NC 28801 U.S.A. (RMA:966179)

Model: 15-078-2 S/N: 61786906 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Thermocouple Calibrator	00633877	12/29/11	1000290384

Certificate Information:

Technician: 177 Procedure: CAL-4007 Cal Date: 12/16/11 **Cal Due: 12/16/12**

Test Conditions: 24.0°C 44.0 %RH 1022 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°F	-300.000	-302	Y	-300.000	-300	Y	-302	-298	1.060	1.9:1
°F	-40.000	-40.6	Y	-40.000	-39.8	Y	-41.8	-38.2	0.234	>4:1
°C	0.000	-0.1	Y	0.000	0.1	Y	-1.0	1.0	0.130	>4:1
°F	32.000	31.5	Y	32.000	32.2	Y	30.2	33.8	0.234	>4:1
°F	98.600	98.2	Y	98.600	98.8	Y	96.8	100.4	0.234	>4:1
°F	212.000	211.4	Y	212.000	212.3	Y	210.2	213.8	0.342	>4:1
°F	750.000	749.3	Y	750.000	750.2	Y	748.2	751.8	0.486	3.7:1
°F	1,500.000	1,500	Y	1,500.000	1,501	Y	1,498	1,502	0.828	2.4:1
°F	1,800.000	1,798	Y	1,800.000	1,799	Y	1,798	1,802	0.828	2.4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = Nominal(Rounded) - Tolerance; Max = Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez, Quality Manager

Wallace Berry, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Memory Wide-Range Thermometer (Old Model) should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Memory Wide-Range Thermometer (Old Model)s change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-ANAB.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Page 1 of 1 Traceable® is a registered trademark of Control Company © 2009 Control Company

Subject: Thermometer Calibration

Calibration complies with
ISO/IEC 17025 and ANSI/NCSL Z540-1

Cert. No.:4014-4076842

Traceable® Certificate of Calibration for Stainless-Steel Type-K Probe

Instrument Identification:

Environmental Testing Solution, 351 Depot Street, Attn. Jim Sumner, Asheville, NC 28801 U.S.A. (RMA:966179)
Model Numbers: 15-078-2B, FB61221, 255P4 S/N: 61789314 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath TC-275	A9A237		
Digital Thermometer	B16815	6/06/12	B1606038
PRT Temperature Probe	01641	5/28/12	B1526085
Standard Temperature Indicator Type K	51292214	9/23/12	4007-3913640

Certificate Information:

Technician: 68 Procedure: CAL-03 Cal Date: 12/16/11 **Cal Due: 12/16/12**
Test Conditions: 24.0°C 50.0 %RH 1022 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C	25.000	24.7	Y	25.000	24.7	Y	24.0	26.0	0.170	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.
A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full without the written premission of Control Company.

Wallace Berry
Wallace Berry, Technical Manager

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±uc=Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2

Maintaining Accuracy:

In our opinion once calibrated your Stainless-Steel Type-K Probe should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Stainless-Steel Type-K Probes change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

Control Company 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is ISO 9001 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-AQ-HOU.

Page 1 of 1 Traceable® is a registered trademark of Control Company © 2004 Control Company

Subject: Thermometer Calibration

Exhibit G12.2: Thermometer Calibration Logsheet.

Page 1 of 3

Thermometer Calibration

Traceable Thermometer:	Fisher Scientific Digital Thermometer	Date:	12-28-11
Probe Serial number:	61786906	Analyst:	Yumie
Meter Serial number:	61789314		
Calibration date:	Probe: 12-16-11, Meter: 12-16-11	Ice Point of Traceable Thermometer:	0.0°C
Re-calibration due:	Probe: 12-16-12, Meter: 12-16-12		

Thermometer Serial Number	Location	Location Serial Number	Thermometer Temperature (°C)	Traceable Thermometer Temperature (°C)	Correction Factor (°C)
96-01587	Refrigerator # 1	BA64722418	0.2	0.2	0.0
6934	Refrigerator # 2	BA65013194	0.2	0.2	0.0
96-01566	Refrigerator # 3	BA11411547	0.2	0.2	0.0
6959	Refrigerator # 4 TOP	WA42501619	0.2	0.2	0.0
6916	Refrigerator # 4 BOTTOM	WA42501619	0.2	0.2	0.0
4565	Refrigerator # 5 TOP	WA42500397	0.2	0.2	0.0
6315	Refrigerator # 5 BOTTOM	WA42500397	0.2	0.2	0.0
95-07120	Refrigerator – Algae/YWT	E2001648367	0.3	0.2	-0.1
WB72043714	BOD Incubator # 1	WB72043714	* CALIBRATED	→	0.0
7049	BOD Incubator # 1 Thermometer	WB72043714	20.0	20.0	0.0
WB94157442	BOD Incubator # 2	WB94157442	* CALIBRATED	→	0.0
7126	BOD Incubator # 2 Thermometer	WB94157442	20.0	20.0	0.0
307058	Toxicity Water Bath	603031364	25	25.0	0
5030	Conductivity and Reagent Inc.	1001199	25.0	25.0	0.0
WB41340472	Toxicity Incubator # 1	WB41340472	* CALIBRATED	→	0.0
111898250	Toxicity Incubator # 1 MIN/MAX	WB41340472	24.7	25.0	+0.3
6272	Toxicity Incubator # 1 TOP	WB41340472	25.0	25.0	0.0
4673	Toxicity Incubator # 1 BOTTOM	WB41340472	25.0	25.0	0.0
WB22114693	Toxicity Incubator # 2	WB22114693	* CALIBRATED	→	0.0
111898411	Toxicity Incubator # 2 MIN/MAX	WB22114693	25.1	25.0	-0.1
4676	Toxicity Incubator # 2 TOP	WB22114693	25.0	25.0	0.0
4755	Toxicity Incubator # 2 BOTTOM	WB22114693	25.0	25.0	0.0
WB22114719	Toxicity Incubator # 3	WB22114719	* CALIBRATED	→	0.0
111898403	Toxicity Incubator # 3 MIN/MAX	WB22114719	24.8	25.0	+0.2
1526	Toxicity Incubator # 3 TOP	WB22114719	25.0	25.0	0.0
4767	Toxicity Incubator # 3 BOTTOM	WB22114719	25.0	25.0	0.0

Note: If correction factor is ≥ 1.0°C, the thermometer must be taken out of service.

* CALIBRATED INC. TO DESIRED TEMPERATURE (BASED ON INTERNAL THERMOMETERS) 12-28-11
BOD = 20.0°C
TOXICITY = 25.0°C

SOP G12 – Exhibit G12.2, revision 09-01-09

Subject: Thermometer Calibration

	Printed name	Signature
SOP Approval by Laboratory Supervisor:	Jim Sumner	
	Kelley E. Keenan	

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced Standard Operating Procedure (SOP) after (1) the applicable SOP has been read and understood and (2) after training has been received by an approved trainer or laboratory supervisor.

Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced SOP.			**Trainer or Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor

The employee will print, sign and date the trainer section for the referenced SOP after the laboratory supervisor has determined the employee is proficient and experienced in performing the referenced SOP (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced SOP.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Thermometer Calibration

Subject: Desiccator Maintenance

Purpose

To ensure proper desiccator maintenance by drying the desiccant.

Equipment and Materials

Desiccator with plastic desiccant pans
Color Indicating Desiccant
Desiccator Maintenance Log
103 -105 ^{o} C forced air oven
Metal drying pan
High temperature gloves

Procedure

A. Drying the Desiccant

1. Empty the desiccant into the metal drying pan. Desiccant should be blue if dry or purple if it has absorbed moisture.

2. Place the metal pan into the 103 – 105°C oven until desiccant turns blue.

3. After the desiccant turns blue, use the high temperature gloves and pour the desiccant into the plastic desiccant trays.

4. Place the plastic trays into the bottom of the desiccator.

5. Record the date and the desiccant is dried in the desiccator maintenance log.

6. Desiccator is to be dried at least monthly.

B. Exhibits.

Exhibit G13.1: Desiccator Maintenance Benchsheet.

Subject: Desiccator Maintenance

Exhibit G13.1: Desiccator Maintenance Benchsheet.

Environmental Testing Solutions, Inc.

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Desiccant Logsheet

Date Dried	Desiccator #1	Dessicator #2	Dessicator #3	#4	Analyst
04-17-06	✓	✓	✓		AAB
05-19-06	✓	✓	✓		AAB
0610-06	✓	✓	✓		KEN
07-30-06	✓	✓	✓		KEN
08-27-06	✓	✓	✓		KEN
09-24-06	✓	✓	✓		KEN
10-14-06	✓	✓	✓		LAB
11-18-06	✓	✓	✓		LAB
12-18-06	✓	✓	✓		KEN
01-22-07	✓	✓	✓		KEN
02-10-07	✓	✓	✓		KEN
03-29-07	✓	✓	✓		KEN
04-21-07	✓	✓	✓		KEN
05-26-07	✓	✓	✓		LAB
06-22-07	✓	✓	✓		KEN
07-31-07	✓	✓	✓		KEN
08-26-07	✓	✓	✓		KEN
09-30-07	✓	✓	✓		KEN
10-23-07	✓	✓	✓		JPD
12-19-07	✓	✓	✓		KEN
01-29-08	✓	✓	✓		EZ
02-25-08	✓	✓	✓		KEN
03-28-08	✓	✓	✓	✓	KEN

Subject: Desiccator Maintenance

	Printed name	Signature
SOP Approval by Laboratory Supervisor:	Jim Sumner	
	Kelley E. Keenan	

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced Standard Operating Procedure (SOP) after (1) the applicable SOP has been read and understood and (2) after training has been received by an approved trainer or laboratory supervisor.

Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced SOP.			**Trainer or Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor

The employee will print, sign and date the trainer section for the referenced SOP after the laboratory supervisor has determined the employee is proficient and experienced in performing the referenced SOP (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced SOP.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Desiccator Maintenance

Subject: Illumination

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
12-01-00	0	Internal	Jim Sumner (ETS)	Original document
01-03-12	1	Internal	Jim Sumner (ETS)	• Updated exhibits during document review.
03-01-20	2	External (TVA) Internal	Rick Sherrard (TVA) Jim Sumner (ETS)	• Updated procedure and bench sheet to describe the current quality control and measurement of luminosity.

Scope and Application

To document the photoperiod and intensity of light necessary for maintaining cultures and toxicity tests.

Quality Control

1. The intensity of light (luminosity) in all incubators used for maintaining cultures and toxicity tests and the algae culture area must be measured at least **quarterly** or when light fixtures are replaced. The luminosity should be maintained between 50 – 100 foot-candles (ft-c) for maintaining cultures and toxicity tests and between 360 – 440 foot-candles for maintaining algae cultures. For toxicity tests in support of AL NPDES discharges, the luminosity of incubators must be measured each day that the tests are performed. This is documented on the test specific bench sheets.

2. A uniform photoperiod of 16-hours light and 8-hours dark must be maintained in all incubators used for maintaining cultures and toxicity tests as well in the fish culture laboratory. Automatic timers and internal timers within the incubators regulate this photoperiod. The correct time displayed on these timers is documented and adjusted according to SOP-G16. The correct

photoperiod is documented **quarterly** when luminosity is documented. Timers may need to be adjusted when incubators are serviced. Algae cultures are maintained under constant illumination.

Equipment and Materials

Light meters
Incubators
Light fixtures
Window screen or black electrical tape
Automatic timers
Luminosity Log Sheet

Procedure (Meter: TACKlife LM01 Light Meter, SN 201612033203)

A. Verification of Light Meter.

Prior to taking luminosity measurements, verify the luminosity of the meter. To verify the Tacklife LM01 Light Meter, compare the luminosity displayed to a separate meter (Leaton L860 LUX Meter, SN not provided). Place each probe face up on the surface of an area to be measured. Each display must be with 10% of one another prior to taking luminosity measurements. Measure and record the luminosity of each meter and percent difference on the Luminosity Log Sheet (Exhibit G14.1).

B. Measuring Luminosity.

1. Turn the light meter on and set the meter to read in foot-candles (ft-c).

2. Place the probe with the sensor face up on the surface of the area to be measured. Check the luminosity throughout the area where cultures or tests are maintained. In the fish culture laboratory to monitor the luminosity of each tank, hold the probe with the sensor face up close to the water surface.

3. If the luminosity is outside the 50 – 100 ft-c suggested range (360 – 440 ft-c for algae), adjust the light intensity by adding or removing light fixtures. Window screen or black electrical tape may also be placed over light fixtures to adjust the light intensity in specific areas.

4. Once the luminosity has been corrected in all areas, measure and record the luminosity at the four corners and middle of each shelf in each incubator, the location were algae is

cultured and at the water surface for each tank in the fish culture laboratory. Allow readings to stabilize before recording in the Luminosity Log. Measurements must be in foot-candles (ft-c) and reported to the nearest 1 ft-c.

5. Verify and document in the Luminosity Log that the time is correct, and the photoperiod program is set for 16-hour light and 8-hours dark for each incubator and in the fish culture laboratory.

Safety and Hazardous Waste Management

Safety glasses, gloves and lab coats should always be worn.

Review Policy-P6: General Safety Policy and Policy-P9: Radiation Protection Policy for additional safety requirements.

References

USEPA. October 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th ed. EPA-821-R-02-012. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th ed. EPA-821-R-02-013. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, 3rd ed. EPA-821-R-02-014. US Environmental Protection Agency, Cincinnati, OH.

TNI Standard. Management and Technical Requirements for Laboratories Performing Environmental Analysis. EL-V1-ISO-2016-Rev2.0. The NELAC Institute, PO Box 2439, Weatherford, TX 76086.

Instrument Manuals

Exhibits

Exhibit G14.1: Luminosity Log Sheet.

Subject: Illumination

Exhibit G14.1: Luminosity Log Sheet.

Page 1 of 2

Luminosity Log

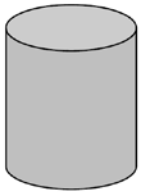
Meter:	**TACKlife Digital LUX Meter, LM01**			**Date:**	
Serial number:	**201612033203**			**Analyst:**	
Purchase date:	**06-23-17**				
Light Meter Verification	Comparison to Leaton L830 Lux Meter SN not provided. (must be ± 10% prior to taking measurements)	TACKlife (ft-c)			
		Leaton (ft-c)			
		% Difference			

Incubator number	Shelf	Luminosity (ft-c) at location indicated on shelf Acceptable range = 50 – 100 ft-c	Incubator number	Shelf	Luminosity (ft-c) at location indicated on shelf Acceptable range = 50 – 100 ft-c
Incubator 1 SN: WB41340472	A	< 50 Do not use.	Incubator 2 SN: WB22114693	A	< 50 Do not use.
	B			B	
	C			C	
	D			D	
	E			E	
	F			F	
	Initials	Verified photoperiod program (16-hours light and 8-hours dark) and current time.		Initials	Verified photoperiod program (16-hours light and 8-hours dark) and current time.
Incubator 3 SN: WB22114719	A	< 50 Do not use.	Incubator 4 SN: WB95219633	A	< 50 Do not use.
	B			B	
	C			C	
	D			D	
	E			E	
	F			F	
	Initials	Verified photoperiod program (16-hours light and 8-hours dark) and current time.		Initials	Verified photoperiod program (16-hours light and 8-hours dark) and current time.

Confidential

Luminosity Log

Meter:	**TACKlife Digital LUX Meter, LM01**	**Date:**	
Serial number:	**201612033203**	**Analyst:**	

Incubator number	Shelf	Luminosity (ft-c) at location indicated on shelf Acceptable range = 50 – 100 ft-c	Incubator number	Shelf	Luminosity (ft-c) at location indicated on shelf Acceptable range = 50 – 100 ft-c
Incubator 5 SN: WB60643874	A	< 50 Do not use.	Incubator 6 SN: WB42667925	A	< 50 Do not use.
	B			B	
	C			C	
	D			D	
	E			E	
	F			F	
	Initials	Verified photoperiod program (16-hours light and 8-hours dark) and current time.		Initials	Verified photoperiod program (16-hours light and 8-hours dark) and current time.
Incubator 7 SN: WB42668003	A	< 50 Do not use.	Algae Culture Area	Luminosity (ft-c) at location indicated Acceptable range = 360 – 440 ft-c	
	B				
	C				
	D				
	E				
	F				
	Initials	Verified photoperiod program (16-hours light and 8-hours dark) and current time.			

Confidential

Subject: Illumination

Luminosity Log, Fish Culture Laboratory

Meter:	**TACKlife Digital LUX Meter, LM01**			**Date:**	
Serial number:	**201612033203**			**Analyst:**	
Purchase date:	**06-23-17**				
Light Meter Verification	Comparison to Leaton L830 Lux Meter SN not provided. (must be ± 10% prior to taking measurements)	TACKlife (ft-c)			
		Leaton (ft-c)			
		% Difference			

Verified photoperiod program (16-hours light and 8-hours dark) and current time.	**Analyst:**	

Breeding Tank Set	ID #	Luminosity (ft-c) at water surface Acceptable range = 50 – 100 ft-c	Breeding Tank Set	ID #	Luminosity (ft-c) at water surface Acceptable range = 50 – 100 ft-c
A	1		B	1	
	2			2	
	3			3	
	4			4	
	5			5	
	6			6	
C	1		D	1	
	2			2	
	3			3	
	4			4	
	5			5	
	6			6	
E	1		F	1	
	2			2	
	3			3	
	4			4	
	5			5	
	6			6	
G	1		H	1	
	2			2	
	3			3	
	4			4	
	5			5	
	6			6	

Stock tank 1: _____ 2: ____ 3: _____ 4: ____ 5: _____ 6: ____ 7: _____ 8: ____

Confidential

Subject: Illumination

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Reagent, Stock Standard, and Chemical Preparation

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
12-01-00	0	Internal	Jim Sumner (ETS)	Original document
09-01-09	1	External (TVA, Environmental Standard, Inc.) Internal	William Rogers (TVA) Cynthia Russell (TVA) Rick Sherrard (TVA) Rock Vitale (Environmental Standards, Inc.) Jim Sumner (ETS)	• Updated exhibits during document review. • Exhibits modified to include the initials and date of the author making entries to the logbooks. Logbooks modified to provide additional traceability. • Provided further clarification on the use of expiration dates.
01-03-12	2	Internal	Jim Sumner (ETS)	• Updated exhibits during document review. • Provided further clarification on the use of expiration dates.
06-20-12	3	External (TVA) Internal	William Rogers (TVA) Donald Snodgrass (TVA) Rick Sherrard (TVA) Jim Sumner (ETS)	• Expiration dates changed from 1 year or 5 years from open to 1 year or 5 years from receipt.
03-01-20	4	External (TVA) Internal	Rick Sherrard (TVA) Jim Sumner (ETS)	• Provided additional guidance for chemicals and consumables used for toxicity testing, which require testing prior to use.

Scope and Application

To provide traceability of all reagents, stock standards, and chemicals used in the laboratory.

Toxicity Testing Quality Control

In addition to being "checked in" (as described in this SOP), analytical testing or toxicity "checks" may be required of certain chemicals or consumables used for toxicity testing. These chemicals or consumables must be tagged as "do not use" prior to testing. After testing is performed and the chemicals or consumables meet quality control requirements, these items will be tagged with "Acceptable to Use" and the date that testing was performed. At this time, these chemicals or consumables are cleared for use. Chemicals and consumables that fall under this requirement include: cubitainers, medicine cups, Solo cups, MarineMix and synthetic water chemicals used in toxicity tests.

Equipment and Materials

Reagent log
Stock standard log
Chemical log

Procedure

A. "Checking-In" Reagents, Stock Standards, Chemicals and Consumables.

1. All reagents, stock standards, and chemicals must be checked-in and assigned an identification number, date received, date opened sticker (or placed into use), and a safety label. Information is recorded in one of the following logs (Exhibit G15.1):
   - Chemical Log
   - Reagent Log
   - Stock Standard Log

2. Chemicals, stock standards, and reagents are used on or before their expiration dates. At the time of analysis, any unused, expired chemicals, stock standards, and reagents are disposed. Expiration dates for chemicals, stock standards, and reagents (that are not assigned as expiration date by the manufacturer) are assigned in a MONTH – DAY – YEAR format. These chemicals, stock standards, and reagents expire on the expiration date.

3. The chemical log is used to record information for all chemicals and consumables (e.g. Petri dishes, filters). Each chemical or consumable is assigned an identification number (CHM#).

   a. Each chemical receives a label with the CHM#, date received, expiration date, date opened (or placed into use), and initials. The expiration date for dry chemicals that are not assigned an expiration date by the manufacturer is five years from the date received. The expiration date for wet chemicals, that are not assigned an expiration date by the manufacturer, is one year from the date received. Consumables, such as containers, medicine cups, solo cups, acetone or acid used for cleaning purposes only, are not assigned an expiration date.

   b. If a Safety Data Sheet (SDS) is not received with the chemical or is not contained in the SDS Log, contact the supplier to obtain the SDS. SDS's for each chemical

must be stored in the SDS Log. As new chemicals are received, SDS's are replaced with the most current SDS received from the manufacturer.

c. If the chemical is not compatible with other types of chemicals, it must be stored in a separate location. This may include acids, oxidizers, ammonium hydroxide, flammables, etc.

d. If more than one container of the same chemical is received, assign each container the same chemical number (provided they are the same lot or batch). For example. If two containers are received, they should be labeled "1 of 2" and "2 of 2".

e. Record the following information for the chemical or consumable in the chemical log:
- Page number
- Chemical number
- Analyst
- Date
- Chemical name
- Test or application used for
- Material type
- Toxicity Testing Quality Control required?
- Manufacturer
- Lot number
- Chemical concentration
- Number or volume received
- Date received
- Expiration date
- Received by
- Comments
- Storage
- Hazards
- Personal hygiene (health, fire, reactivity, personal equipment)

4. The reagent log is used to record information for all reagents. Each reagent is assigned an identification number (INR#).

   a. Each reagent receives a label with the INR#, date prepared or received, expiration date (1 year from preparation or manufacturer expiration date), date opened (or placed into use) and initials. The expiration date for reagents, that are not assigned an expiration date by the manufacturer, is one year from the date received or preparation date.

   b. If an SDS is not received with the reagent or is not contained in the SDS Log, contact the supplier to obtain the SDS. SDS's for each reagent must be stored in the SDS Log. As new reagents are received, SDS's are replaced with the most current SDS received from the manufacturer.

   c. If the reagent is not compatible with other types of chemicals, it must be stored in a separate location. This may include acids, oxidizers, ammonium hydroxide, flammables, etc.

   d. If more than one container of the same reagent is prepared or received, assign each container the same reagent number (provided they are the same lot or batch). For example. If two containers are prepared or received, they should be labeled "1 of 2" and "2 of 2".

e. Record the following information for the reagent in the reagent log:
- Page number
- Reagent number
- Analyst
- Date
- Reagent name
- Test or application used for
- Type
- Manufacturer
- Lot number
- Reagent concentration
- Number and/or volume
- Date received/prepared
- Expiration date
- Received/prepared by
- Directions for preparing reagent
- Reagent prepared from
- Storage
- Hazards
- Personal hygiene (health, fire, reactivity, personal equipment)

5. The stock standard log is used to record information for all stock standards. Each stock standard is assigned an identification number (INSS#).

a. Each stock standard receives a label with the INSS#, date prepared or received, expiration date (1 year from preparation/received or manufacturer expiration date), date opened (or placed into use) and initials. The expiration date for stock standards, that are not assigned an expiration date by the manufacturer, is one year from the date received or preparation date.

b. If the stock standard is not compatible with other types of chemicals, it must be stored in a separate location. This may include acids, oxidizers, ammonium hydroxide, flammables, etc.

c. If more than one container of the same stock standard is prepared or received, assign each container the same stock standard number (provided they are the same lot or batch). For example. If two containers are prepared or received, they should be labeled “1 of 2” and “2 of 2”.

f. Record the following information for the stock standard in the stock standard log:

- Page number
- Stock standard number
- Analyst
- Date
- Standard name
- Test or application used for
- Type
- Manufacturer
- Lot number
- Stock concentration
- Number and/or volume
- Date received/prepared
- Expiration date
- Received/prepared by
- Directions for preparing stock
- Stock prepared from
- Storage
- Hazards
- Personal hygiene (health, fire, reactivity, personal equipment)

Safety and Hazardous Waste Management

Safety glasses, gloves and lab coats should always be worn.

Review Policy-P6: General Safety Policy and Policy-P9: Radiation Protection Policy for additional safety requirements.

References

Standard Methods for the Examination of Water and Wastewater, 22nd Edition, 2012. American Public Health Association, 800 I Street, NW, Washington DC 20001-3710.

USEPA. October 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th ed. EPA-821-R-02-012. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th ed. EPA-821-R-02-013. US Environmental Protection Agency, Cincinnati, OH.

USEPA. October 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, 3rd ed. EPA-821-R-02-014. US Environmental Protection Agency, Cincinnati, OH.

TNI Standard. Management and Technical Requirements for Laboratories Performing Environmental Analysis. EL-V1-ISO-2016-Rev2.0. The NELAC Institute, PO Box 2439, Weatherford, TX 76086.

Exhibits

G15.1: Example Chemical, Reagent and Stock Standard Logs

Subject: Reagent, Stock Standard, and Chemical Preparation

G15.1: Example Chemical, Reagent and Stock Standard Logs

Page _____

Chemical Log

Chemical number: CHM_____

Analyst: _____

Date: _____

Chemical name: _____

Test or application used for: _____

Material type: ☐ Consumable ☐ Chemical

Toxicity Testing:

Quality Control required? ☐ Yes ☐ No

Manufacturer: _____

Lot number: _____

Chemical concentration: _____

Number and/or volume: _____

Date received: _____

Expiration date: _____

Dry Chemicals = 5 years from receipt, if not assigned by manufacturer
Wet Chemicals = 1 year from receipt, if not assigned by manufacturer
Consumables = no expiration date, unless assigned by manufacturer

The Chemical identified on this form was discarded on or before the expiration date listed above.

Received by: _____

Comments:

_____

_____

_____

_____

Storage: _____

Hazards:

_____

_____

_____

Personal hygiene:

Health: _____

Fire: _____

Reactivity: _____

Personal equipment: _____

SOP G15-Revision 4–Exhibit G15.1

Page _____

Environmental Testing Solutions, Inc.

Reagent Log

Reagent number: INR_____

Analyst: _____

Date: _____

Reagent name: _____

Test or application used for: _____

Type: ☐ Purchased ☐ Laboratory prepared

Manufacturer: _____

Lot number: _____

Reagent concentration: _____

Number and/or volume: _____

Date received/prepared: _____

Expiration date: _____ (1 year from preparation/receipt, if not assigned by manufacturer)

The Reagent identified on this form was discarded on or before the expiration date listed above.

Received/prepared by: _____

Directions for preparing reagent:

_____

_____

_____

_____

Reagent prepared from: _____ (CHM # or INR #)

Storage: _____

Hazards:

_____

_____

_____

Personal hygiene:

Health: _____

Fire: _____

Reactivity: _____

Personal equipment: _____

SOP G15-Revision 4– Exhibit G15.1

Page _____

Environmental Testing Solutions, Inc.

Stock Standard Log

Stock standard number: INSS_____

Analyst: _____

Date: _____

Standard name: _____

Test or application used for: _____

Type: ☐ Purchased ☐ Laboratory prepared

Manufacturer: _____

Lot number: _____

Stock concentration: _____

Number and/or volume: _____

Date received/prepared: _____

Expiration date: _____ (1 year from preparation/receipt, if not assigned by manufacturer)

The Stock Standard identified on this form was discarded on or before the expiration date listed above.

Received/prepared by: _____

Directions for preparing stock:

_____

_____

_____

_____

Stock standard prepared from: _____ (CHM #)

Storage: _____

Hazards:

_____

_____

_____

Personal hygiene:

Health: _____

Fire: _____

Reactivity: _____

Personal equipment: _____

Confidential

Subject: Reagent, Stock Standard, and Chemical Preparation

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Subject: Time Calibration

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Document Revision History

Effective Date	Revision number	Review Type	Evaluators	Revisions
06-01-11	0	Internal	Jim Sumner (ETS)	Original document
06-01-11	1	External (TVA) Internal	Cynthia Russell (TVA) Rick Sherrard (TVA) Jim Sumner (ETS)	• Method for calibrating, recording and documenting time.
09-01-11	2	External (TVA) Internal	Rick Sherrard (TVA) Jim Sumner (ETS)	• Corrected typographical error.
03-01-20	3	Internal	Jim Sumner (ETS)	• Updated procedure to include NELAP requirements.

Scope and Application

To calibrate various clocks used to record and document time throughout the laboratory

Quality Control

All clocks, which are used to document or record time, must be calibrated quarterly.

Equipment and Materials

Various clocks
Atomic clock
Cell phone
Time Calibration Log

Subject: Time Calibration

Procedure

1. All clocks, which are used to document or record time, must be calibrated quarterly.

2. Clocks are calibrated to the nearest minute, since the recording of time on individual log sheets is documented to the nearest minute in the laboratory.

3. An atomic clock (Lathem Model 1500E, SN 1E5025768) is used as the standard to calibrate clocks within the laboratory. The Lathem Model 1500E atomic clock receives an Atomic Signal from the **National Institute Of Standards And Technology's Atomic Clock** in Boulder, Colorado.

4. A cell phone is calibrated to the atomic clock time as indicated above and will be used to calibrate all individual clocks throughout the laboratory. This is documented in Time Calibration Log (Exhibit G16.1).

References

Time and Frequency Division, National Institute of Standards and Technology (NIST) Measurement Laboratory, US Department of Commerce.

Instrument Manual

Exhibits

Exhibit G16.1: Time Calibration Log.

Subject: Time Calibration

Exhibit G16.1: Time Calibration Log.

Page_____

Time Calibration Log

Standard:

Atomic Clock Model	**Lathem Model 1500E**
SN	**1E5025768**

Date	Atomic Clock Time	All Clocks Calibrated to Atomic Clock Time (Analyst Initials)

SOP G16-Revision 3–Exhibit G16.1

Subject: Time Calibration

Approval

Title	Name	Signature	Date
Laboratory Supervisor	Kelley E. Keenan		03-01-20
Quality Assurance Officer	Jim Sumner		03-01-20

Employee Training Documentation

The employee will print, sign and date the trainee section for the referenced procedure after (1) the applicable procedure has been read and understood and (2) after training has been received by an approved trainer, laboratory supervisor or quality assurance officer. Failure to adhere or comply with laboratory procedures may be grounds for immediate termination of employment.

Trainee By signing below, the trainee has Read, Understood, and Will Comply with the referenced procedure.			**Trainer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**

Trainer Approval by Laboratory Supervisor or Quality Assurance Officer

The employee will print, sign and date the trainer section for the referenced procedure after the laboratory supervisor or quality assurance officer has determined the employee is proficient and experienced in performing the referenced procedure (as indicated in QAP Q2) and is able to effectively explain and demonstrate all requirements of the referenced procedure.

Trainer By signing below, the trainer will uphold all requirements and expectations of the laboratory supervisor in training employees.			**Laboratory Supervisor or Quality Assurance Officer**		
Printed name	**Signature**	**Date**	**Printed name**	**Signature**	**Date**