

Wet Deposition Sampling



Asia Pacific Mercury
Monitoring Network



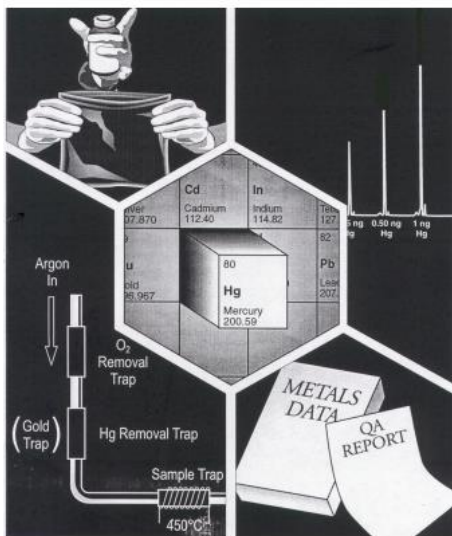
Center for Environmental
Monitoring and Technology
National Central University

Reference



Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

August 2002



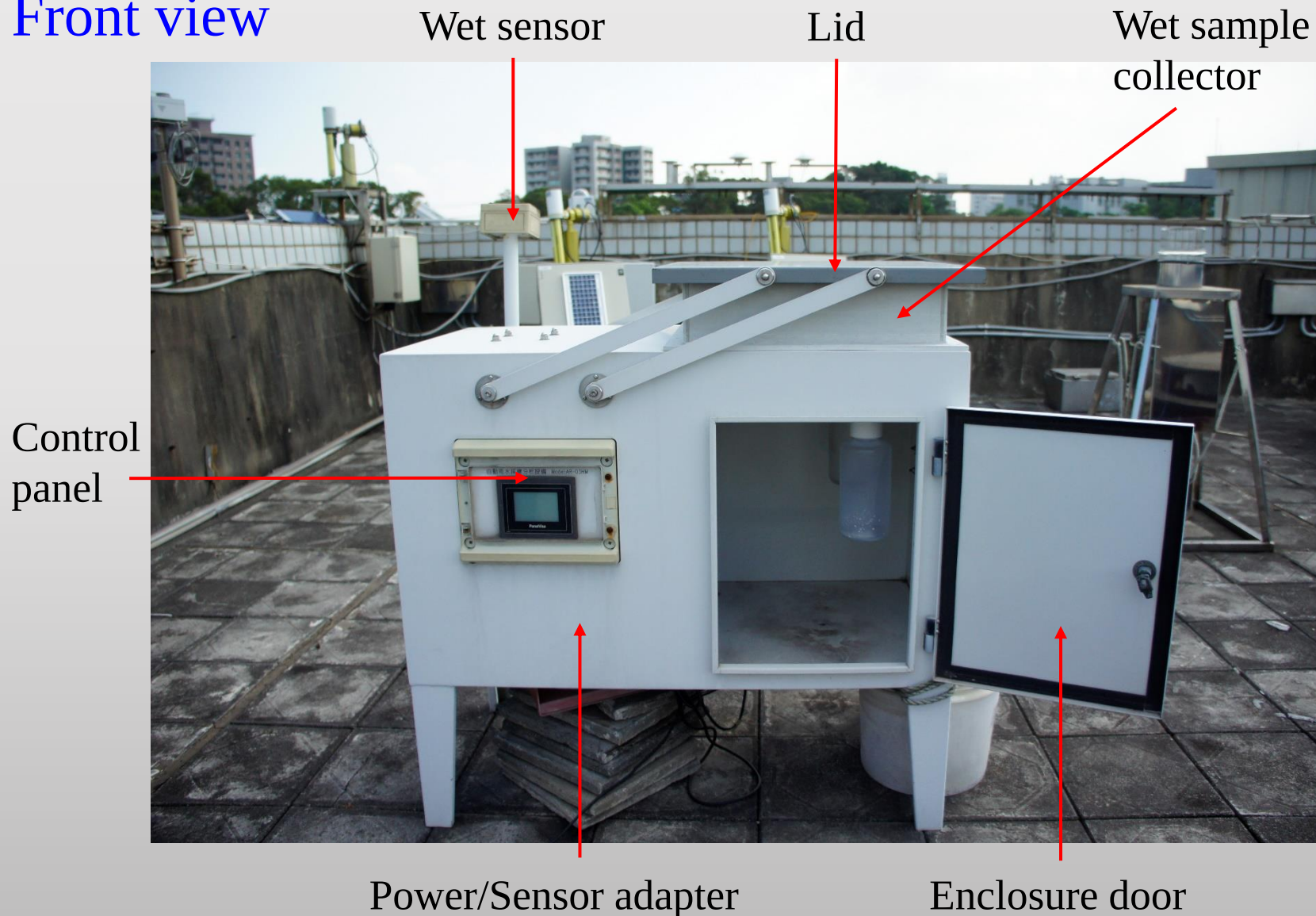
Asia – Pacific Mercury Monitoring Network (APMMN)

Mercury Wet Deposition Network Field Standard Operating Procedures

Version 1.3-, February, 2015

Wet-only precipitation collector-MIC type

Front view

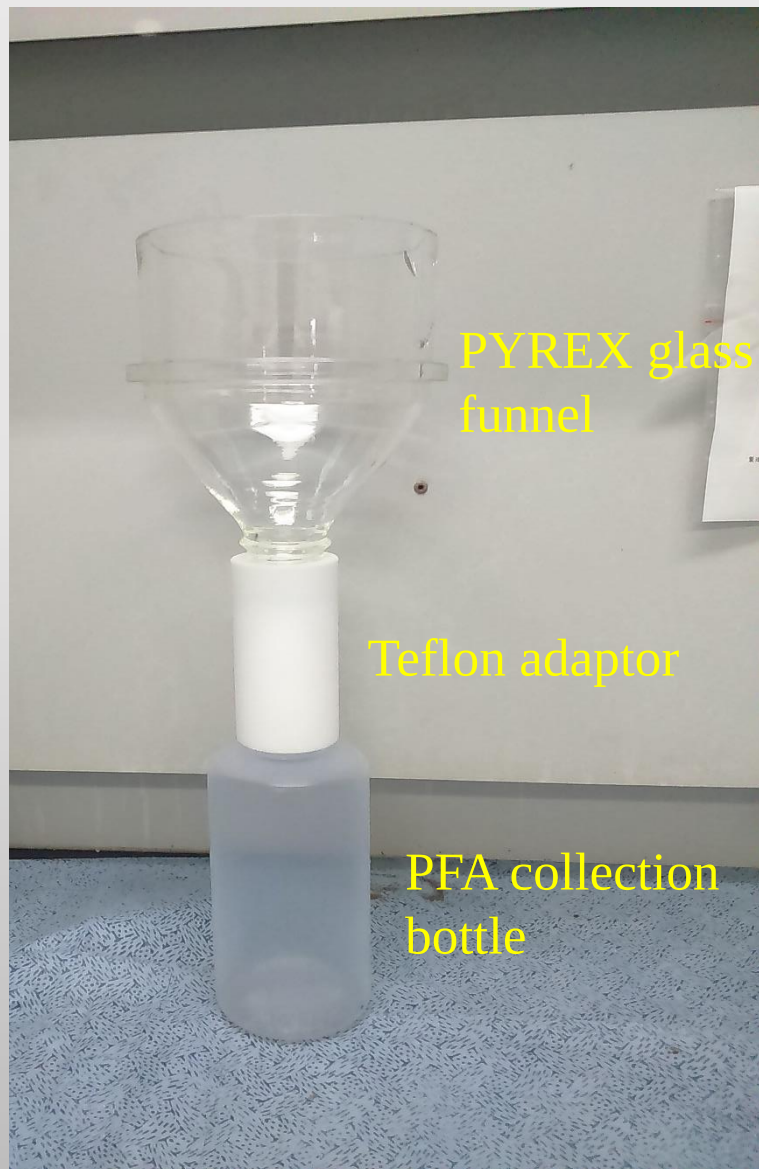


MIC type

Top view

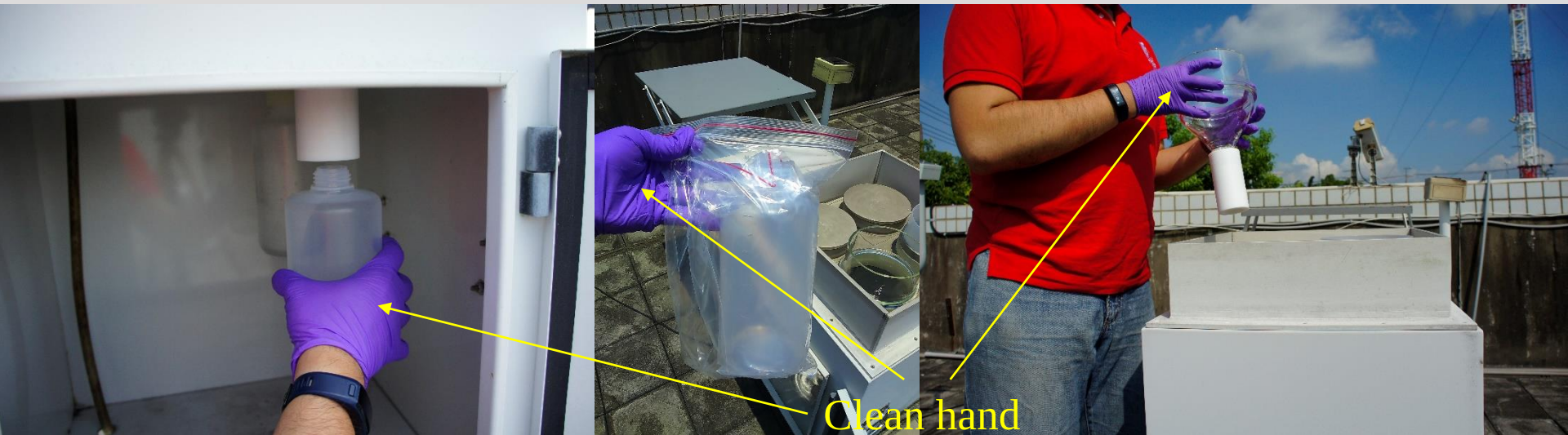


Mercury collection device



Retrieve your sample

- Changes on Tuesday morning between 8 to 10 AM local time.
- Approach collector **facing into the wind**
- Fill in the NOF



Network Observer Form (NOF)

OBSERVER FORM				Send Completed Form With Each Shipping		LAB ID		Courier/Tracking # _____																																																																														
1. STATION Name _____ ID		2. OBSERVER Print name _____ Initials		HAL/NADP Use Only Sample Receipt Name (print): _____ Date Cooler # Time Bag Open? ☐ Yes ☐ No Leak? ☐ Yes ☐ No Full WL <table border="1" style="width: 100%; height: 20px;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Empty WL <table border="1" style="width: 100%; height: 20px;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Net WL <table border="1" style="width: 100%; height: 20px;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Leak WL <table border="1" style="width: 100%; height: 20px;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Total WL <table border="1" style="width: 100%; height: 20px;"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>																																																																																		
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7. PRECIPITATION RECORD Type _____ Circle one: <table border="1" style="width: 100%; text-align: center;"> <tr> <th>MON</th><th>TUES</th><th>WED</th><th>THURS</th><th>FRI</th><th>SAT</th><th>SUN</th><th>MON</th><th>TUES</th><th>WED</th> </tr> <tr> <td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td> </tr> </table> Inches _____ or Circle one: <table border="1" style="width: 100%; text-align: center;"> <tr> <th>MON</th><th>TUES</th><th>WED</th><th>THURS</th><th>FRI</th><th>SAT</th><th>SUN</th><th>MON</th><th>TUES</th><th>WED</th> </tr> <tr> <td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td> </tr> </table> Z - Zero T - Trace MM - Missing Total Precipitation		MON	TUES	WED	THURS	FRI	SAT	SUN	MON	TUES	WED	R	S	M	U	R	S	M	U	R	S	M	U	R	S	M	U	R	S	M	U	MON	TUES	WED	THURS	FRI	SAT	SUN	MON	TUES	WED	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	6. SITE OPERATIONS Check yes or no for all samples. <table style="width: 100%;"> <tr> <td style="width: 50%;"> <table border="1" style="width: 100%;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> </table> 1. Sensor heater and motor box are operating properly. Lid is in correct position. 2. Rain gauge operated properly during the week. </td> <td style="width: 50%;"> <table border="1" style="width: 100%;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> </table> </td> </tr> </table>						<table border="1" style="width: 100%;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> </table> 1. Sensor heater and motor box are operating properly. Lid is in correct position. 2. Rain gauge operated properly during the week.	YES	NO	☐	☐	☐	☐	☐	☐	<table border="1" style="width: 100%;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> <tr><td>☐</td><td>☐</td></tr> </table>	YES	NO	☐	☐	☐	☐	☐	☐
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10. REMARKS For example: equipment malfunction, contamination, farming, burning, logging, leakage, etc.		Laboratory Use Only Preservation: HCL mL BrCl mL Composition: mL Split: mL Split Bottle ID																																																																																				
8. OVERFLOW (check one) Overflow mL		9. ENCLOSURE TEMPERATURE MAXIMUM deg. C MINIMUM																																																																																				

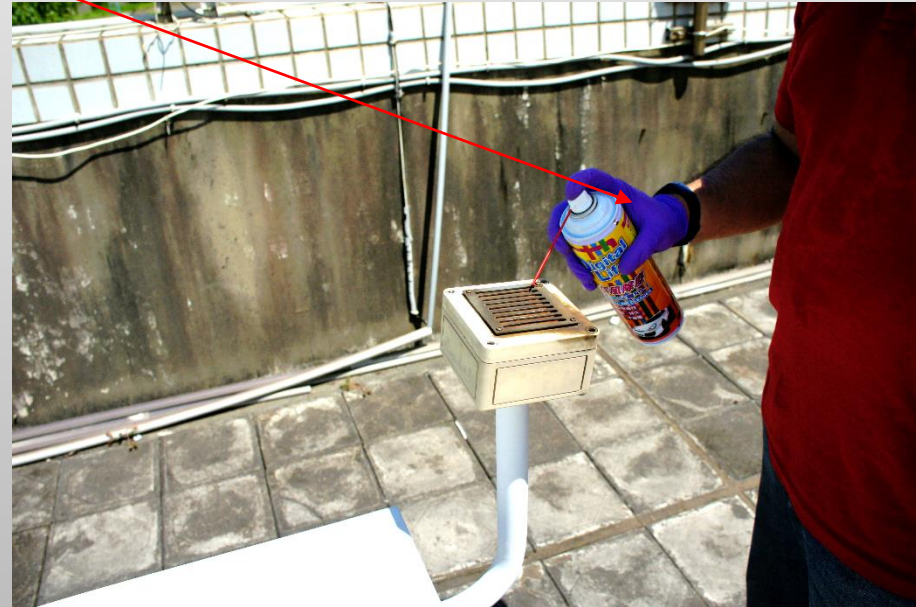
1. Station
2. Observer
3. Bottle
4. Observations
5. Site operations
6. Precip. record
7. Overflow
8. Enclosure Temp.
9. Remarks

ATEL/APMMN
use only

Cleaning the collector

- Clean any surface have dirt with paper towel
- Clean any debris off sensor by brush or compressed air

Dirty hand



Deployment of new sample collector

- Use new gloves !
- Install new sample collector
- Avoid to touch the inner wall of glass funnel
- Start the next week NOF
- Loose 1/8 turn of PFA bottle – prevent pressure lock



Weigh, transfer and storage

- Weigh the sample bottle and subtracting the pre-sample weight of bottle (recode it on the NOF)
- Transfer the sample from 1L to 150ml sample bottle
- Label the sample with sampling site ID, start/end date
- Place the sample into **double** sealable plastic bag
- Store the sample in a **Hg-free and secure place** (or refrigerator) if not shipping immediately.
- Capture rain gauge data
- Complete the NOF



Sample label

- The most important part of taking sample

Site ID

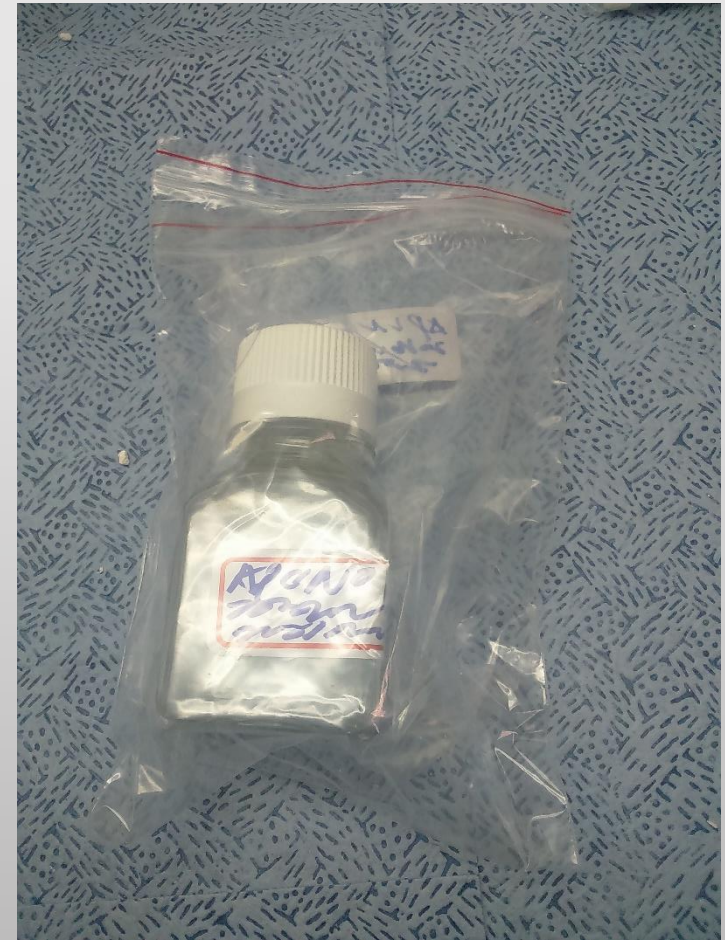
Start Date (MM/dd/yyyy)

End Date

APTW01

07/12/2016

07/19/2016



Code of Federal Regulations

40 CFR 136.3 - Identification of test procedures.

DEP-SOP-001/01
FS 1000 General Sampling Procedures

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*
Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

Parameter No./Name (refers to parameter number on Tables IA,B, C, D,E, F, G & H as noted)	Container ¹	Preservation ^{2, 3}	Maximum holding time ⁴
35. Mercury (CVAA)	P, FP, G	HNO ₃ to pH<2	28 days
35. Mercury (CVAFS)	FP, G; and FP-lined cap	5 mL/L 12N HCl or 5 mL/L BrCl ¹⁷	90 days ¹⁷
3, 5-8, 12, 13, 19, 20, 22, 26, 29, 30, 32-34, 36, 37, 45, 47, 51, 52, 58-60, 62, 63, 70-72, 74, 75. Metals, except boron, chromium VI, and mercury.	P, FP, G	HNO ₃ to pH<2, or at least 24 hours prior to analysis ¹⁹	6 months

¹⁷ Samples collected for the determination of **trace level mercury (<100 ng/L)** using EPA Method 1631 must be collected in tightly-capped fluoropolymer or glass bottles and **preserved with BrCl or HCl solution within 48 hours of sample collection**. The time to preservation may **be extended to 28 days if a sample is oxidized in the sample bottle**. A sample collected for dissolved trace level mercury should be filtered in the laboratory within 24 hours of the time of collection. However, if circumstances preclude overnight shipment, the sample should be filtered in a designated clean area in the field in accordance with procedures given in Method 1669. If sample integrity will not be maintained by shipment to and filtration in the laboratory, the sample must be filtered in a designated clean area in the field within the time period necessary to maintain sample integrity. A sample that has been collected for determination of total or dissolved trace level mercury must **be analyzed within 90 days of sample collection**.

Acid Clean of Collection Devices

Material/Equipment

- Personal Protective Equipment
- Deionized water – $\rho \geq 18.2 \text{ M}\Omega$
- **Hydrochloric acid** – J.T Baker Hydrochloric Acid, 36.5-38.0%, BAKER INSTRA-ANALYZED[®] Reagent or equivalent
- PE box/tank

Certificate of Analysis

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530-00
Batch No.: 0000083492
Manufactured Date: 2014/04/22
Retest Date: 2019/04/21

Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCl) (by acid-base titrn)	36.5 – 38.0 %	37.7
ACS – Color (APHA)	<= 10	5
ACS – Residue after Ignition	<= 3 ppm	1
ACS – Specific Gravity at 60°/60°F	1.185 – 1.192	1.190
ACS – Bromide (Br)		
ACS – Extractable Organic Substances		
ACS – Free Chlorine (as Cl ₂)		
Phosphate (PO ₄)		
Sulfate (SO ₄)		
Sulfite (SO ₃)		
Ammonium (NH ₄)		
Trace Impurities – Arsenic (As)		
Trace Impurities – Aluminum (Al)		
Arsenic and Antimony (as As)		
Trace Impurities – Barium (Ba)		
Trace Impurities – Beryllium (Be)		
Trace Impurities – Bismuth (Bi)		
Trace Impurities – Boron (B)		
Trace Impurities – Cadmium (Cd)	<= 20.0 ppb	< 5.0
	<= 1.0 ppb	< 1.0

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis

Material No.: 9530-00
Batch No.: 0000083492

Test	Specification	Result
Trace Impurities – Germanium (Ge)	<= 3.0 ppb	< 2.0
Trace Impurities – Gold (Au)	<= 4.0 ppb	< 0.2
Heavy Metals (as Pb)	<= 100 ppb	< 50
Trace Impurities – Iron (Fe)	<= 15.0 ppb	1.9
Trace Impurities – Lead (Pb)	<= 1.0 ppb	< 0.5
Trace Impurities – Lithium (Li)	<= 1.0 ppb	< 1.0
Trace Impurities – Magnesium (Mg)	<= 10.0 ppb	< 1.0
Trace Impurities – Manganese (Mn)	<= 1.0 ppb	< 1.0
Trace Impurities – Mercury (Hg)	<= 0.5 ppb	0.3
Trace Impurities – Molybdenum (Mo)	<= 10.0 ppb	< 5.0
Trace Impurities – Nickel (Ni)	<= 4.0 ppb	< 0.3
Trace Impurities – Niobium (Nb)	<= 1.0 ppb	< 1.0
Trace Impurities – Potassium (K)	<= 9.0 ppb	< 2.0
Trace Impurities – Selenium (Se), For Information Only	ppb	1.0
Trace Impurities – Silicon (Si)	<= 100.0 ppb	< 10.0
Trace Impurities – Silver (Ag)	<= 1.0 ppb	< 1.0
	ppb	< 5.0
	ppb	< 1.0
	ppb	< 0.9
	ppb	< 5.0
	ppb	< 0.8
	ppb	< 1.0
	ppb	< 1.0
	ppb	< 1.0
	ppb	< 1.0

Country of Origin: US

ACS – Assay (as HCl) (by acid–base titrn) 36.5 – 38.0 % 37.7

Trace Impurities – Mercury (Hg) <= 0.5 ppb 0.3

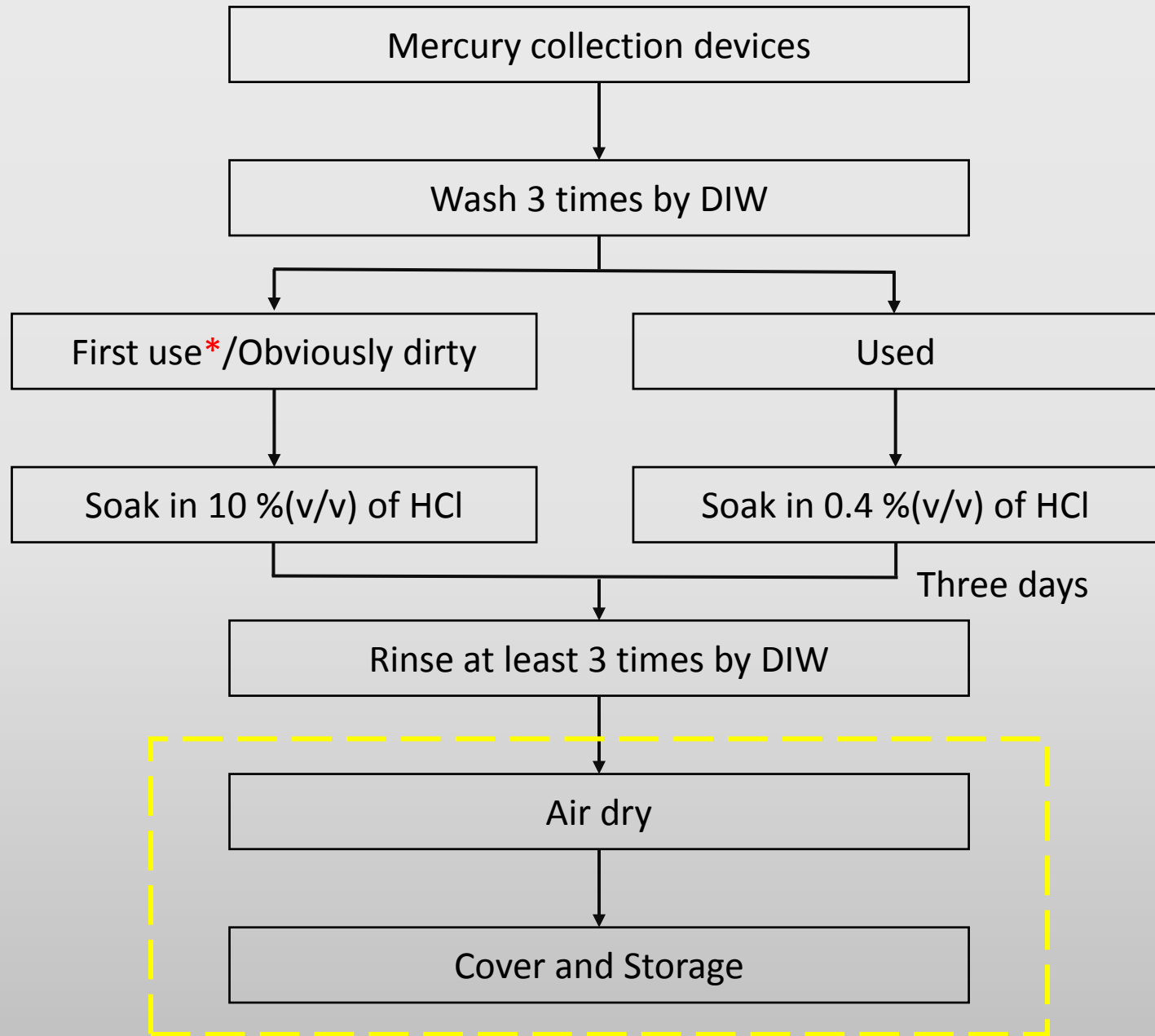
For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.573.2600
Avantor™ Performance Materials Inc.
3477 Corporate Parkway, Suite #200, Center Valley, PA 18034, U.S.A. Phone: 610.573.2600 . Fax: 610.573.2610



Phillipsburg, NJ 9001:2008, 14001:2004
Paris, KY 9001:2008
Mexico City, Mexico 9001:2008
Deventer, The Netherlands 9001:2008, 14001:2004, 13485:2003
Gliwice, Poland 9001:2008, 17025:2005
Selangor, Malaysia 9001:2008
Dehradun, India, 9001:2008, 14001:2004, 13485:2003
Mumbai, India, 9001:2008, 17025:2005
Panaji, India 9001:2008

Richard M. Siberski
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Vice President Global Quality

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.573.2600
Avantor™ Performance Materials Inc.
3477 Corporate Parkway, Suite #200, Center Valley, PA 18034, U.S.A. Phone: 610.573.2600 . Fax: 610.573.2610



* : independent tank, fresh solution

Under the clean room/clean bench

Acid Clean of Collection Devices

- Separate the collection device and wash by DIW



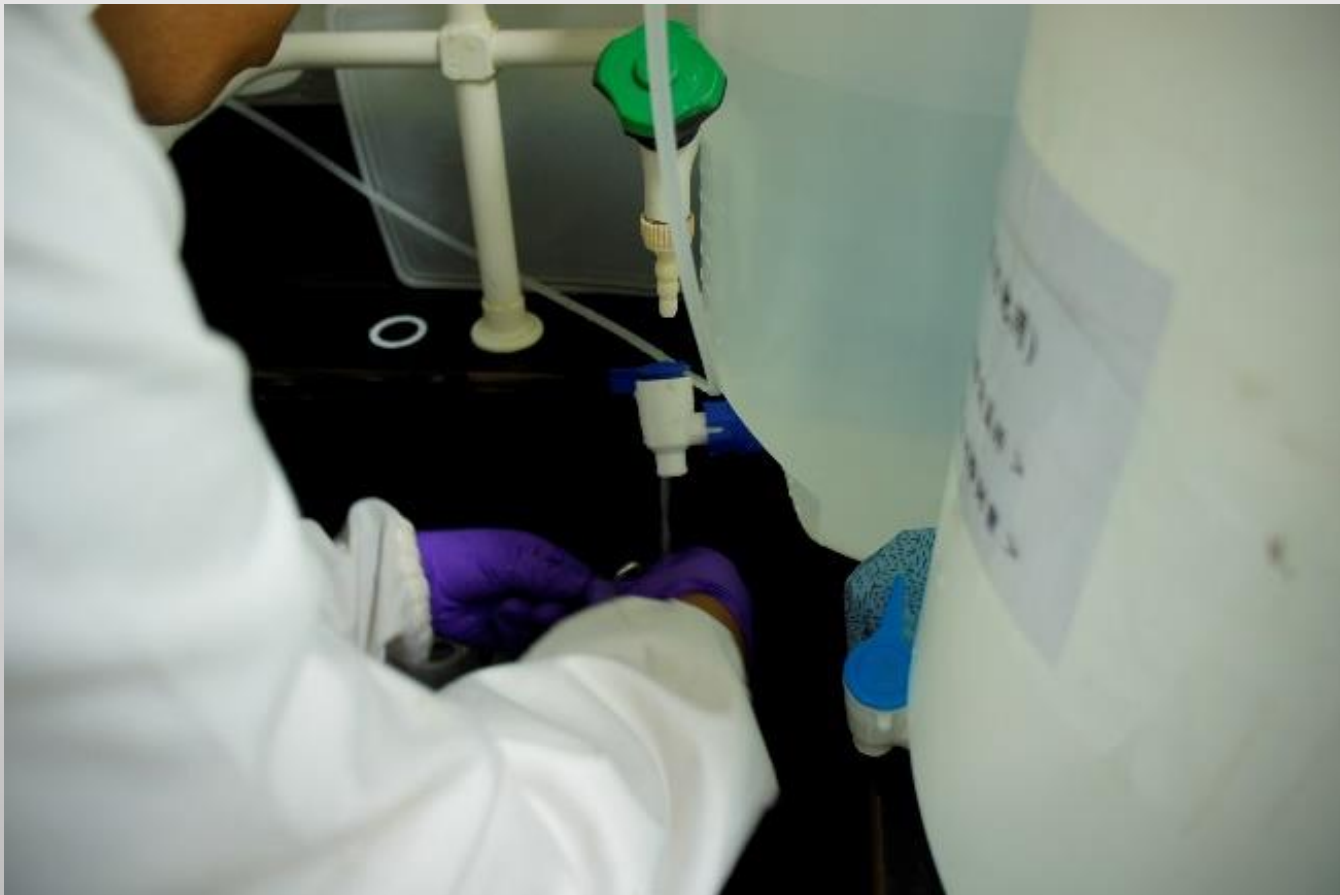
Acid Clean of Collection Devices

- Soak within hydrochloric acid for 72 hours (**except O-ring**)



Acid Clean of Collection Devices

- Rinse thoroughly each component with deionized water ($\rho \geq 18.2 \text{ M}\Omega$) at least **3 times**



Acid Clean of Collection Devices

- Air dry each component in the clean bench



Acid Clean of Collection Devices

- Cover each component with clean plastic bag and store
- Assemble each component before use

