



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

QSM Approval: \_\_\_\_\_

## Preparation, Shipping, and Unloading of ChemComb Cartridges

### 1 INTRODUCTION

- 1.1 The following procedures are used to prepare, ship, and receive ChemComb Speciation Sampling Cartridges with Aluminum or Teflon inlet heads designed to collect fine particulate matter (PM<sub>2.5</sub>) and gaseous precursors (NH<sub>3</sub>, SO<sub>2</sub>, HNO<sub>3</sub>) under the PM 2.5 Speciation Program, using either the Rupprecht and Patashnick Co., (R&P) Partisol Model 2300 or the Met One Instruments SuperSASS-Plus Speciation Samplers. Both the R&P and Met One samplers use similar ChemComb sampling cartridges with the following difference. The outlet port on the R&P cartridges connects to the sampler by the side of the port, whereas the Met One connects to the sampler by the top of the port.
- 1.2 The large shipping box contains two sets of three (A, B and C) cartridges sufficient for two sampling events. The small shipping box contains one set of three cartridges sufficient for one sampling event or used for field blanks. The A cartridge is fitted with a Quartz filter, the B cartridge with Quartz and Teflon filters, while the C cartridge is fitted with two Honeycomb denuders (sodium carbonate and citric acid coated) as well as Nylon and Teflon filters (See Appendix 1 for schematic views of the cartridge configuration).
- 1.3 The prepared cartridges are shipped as necessary to meet the assigned requirement of a three or six day sampling period.

### 2 SAMPLE REQUIREMENT

To decrease the amount of contamination of the Honeycomb denuders and filters during the preparation of the cartridges wear powder free Nitrile gloves, use clean forceps to handle the filters, and reduce the exposure time of the denuders to the outside environment. Pre-fired Blank Quartz filters are stored in the freezer until needed for cartridge assembly (Consult SOP 2.6/\*.\* /S).



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

### 3 APPARATUS and MATERIALS

- ChemComb cartridges, with Aluminum and Teflon coated inlets and either side or top exit outlet ports;
- Glass (1”), (1/4”) plastic spacers, and metal springs;
- Citric acid and sodium carbonate coated Honeycomb denuders (Consult SOP 6.9/\*.\*/\*S);
- Teflon filters (Pall Teflo, 2.0µm 47mm);
- Quartz filter (Pall 2500 QAT-UP, 8 x 10 in.);
- Nylon filters (Pall Nylasorb, Nylon Membrane Filter 1.0µm 47mm);
- Impactor foams;
- Petri-dishes, Petri-slides, Forceps;
- Components of the ChemComb Cartridges:



Fig.1 Plastic Filter Screen



Fig.2 Honeycomb Denuder



Fig.3 Glass Spacer



Fig.4 Metal Spring

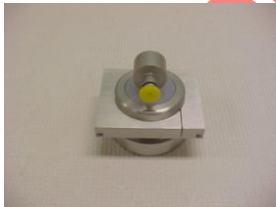


Fig.5 Outlet Port



Fig.6 Cartridge Body



Fig.7 Aluminum Inlet



Fig. 8 ChemComb Cartridge



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

## 4 PREPARATION of the CHEMCOMB CARTRIDGES

### 4.1 Cartridge A Assembly (Aluminum inlet)

- 4.1.1 Unclip and detach the inlet port (Fig.7), from the main body and further unclip the two stages of the inlet port, removing the two impactor plates (Fig.9).
- 4.1.2 First place impactor foam into the centre of each plate (Fig.10), then place an impactor plate into each stage of the inlet port. With the foam facing the inlet opening, re-assemble the two stages using the clips.
- 4.1.3 Place the remaining cartridge body and outlet port upside down in the cartridge assembly stabilizer (Fig.11).
- 4.1.4 Unclip the main body from the outlet port, and place it aside, leaving the outlet port being held up by the cartridge stabilizer.
- 4.1.5 Place inside the cartridge outlet port, two filter screens (Fig.1), and a Quartz filter followed by another filter screen.
- 4.1.6 Attach the main body to the outlet port using the clips. Attach the inlet port to the main body using the clips.
- 4.1.7 Remove the assembled cartridge from the assembly holder and label it as described in appendix 2.
- 4.1.8 Insert a yellow protective cap into the outlet port opening.
- 4.1.9 Put the labeled cartridge into a zip-lock bag and close the bag. Place the bag and cartridge into the shipping case.



Fig. 9 Disassembled Inlet Port

Fig. 10 Inserting Impactor foam

Fig.11 Assembly stabilizer holding outlet port and main body

<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

## 4.2 Cartridge B Assembly (Aluminum inlet)

- 4.2.1 Follow steps 4.1.1 to 4.1.4 to assemble the inlet port with impactor foams.
- 4.2.2 Place inside the cartridge outlet port; one filter screen, a Quartz filter, another filter screen, followed by a pre-weighed Teflon filter (with the o-ring side facing down) and a final filter screen.
- 4.2.3 Follow steps 4.1.6 to 4.1.9 to re-assemble and prepare the cartridge for shipping.

## 4.3 Cartridge C Assembly (Teflon inlet)

- 4.3.1 Follow steps 4.1.1 to 4.1.4 to assemble the inlet port with impactor foams. Note this cartridge uses a Teflon inlet.
- 4.3.2 Place inside the cartridge outlet port, one filter screen, a Nylon filter, another filter screen, followed by a Teflon filter (with the o-ring side facing down) and a final filter screen.
- 4.3.3 Attach the main body to the outlet port using the clips.
- 4.3.4 Tilt the cartridge on a 30-degree angle from the horizontal so that the coated denuders (SOP 6.09/\*.\*S) and spacers will slowly slide down the inside of the cartridge without damaging one another (Fig.12).
- 4.3.5 Inside the ChemComb body housing, place the following in the given order: metal spring, 1/4" plastic spacer, citric acid coated denuder, 1/4" plastic spacer, sodium carbonate coated denuder, 1/4" plastic spacer and a glass spacer.
- 4.3.6 Attach the inlet port to the main body using the clips.
- 4.3.7 Follow steps 4.1.7 to 4.1.9 to re-assemble and prepare the cartridge for shipping.



Fig.12 ChemComb cartridge body at a 30-degree angle



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

## 5 LABORATORY and FIELD BLANKS

- 5.1 During the preparation of the ChemComb cartridges, one Teflon, Nylon and Quartz filter along with a freshly prepared citric acid and sodium carbonate coated denuder are placed in Petri dishes or in the case of the denuder, capped, properly labeled and sent to the appropriate laboratory for analysis as "Laboratory Blanks" (See Appendix 2 for laboratory blank component labeling format).
- 5.2 At least once a month during the preparation of the ChemComb cartridges, one of the A, B, and C cartridges is shipped to each station as a "Field Blank" (See Appendix 2 for field blank cartridge and component labeling format).

## 6 PREPARATION for SHIPPING

- 6.1 Re-set a Min/Max thermometer and place it in the shipping case containing the cartridges for shipment of denuders.
- 6.2 Place a Field Data Sheet in the shipping case.
- 6.3 Record the shipping date in the log book, and update the projected sampling date in the "Shipping Schedule Speciation.xls" file.

## 7 RECEPTION of EXPOSED CHEMCOMB CARTRIDGES and REVIEWING of FIELD DATA SHEETS

- 7.1 Routine sample collection is a field activity, and the details of field activities are beyond the scope of this method.
- 7.2 Upon reception of the shipping case of exposed ChemComb cartridges, open each case and remove the field data sheets and cartridges checking that the serial numbers on the sheets match those on the cartridges. If the field data sheet and/or cartridges are missing, notify the laboratory supervisor and begin the process of contacting the station operators in order to obtain missing information and/or cartridges.
- 7.3 Review the comments made by the field operator and take action accordingly. If an equipment or hardware malfunction is reported, inform the Supervisor and subsequently NAPS Operations Unit.



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

7.4 The Field Data sheets are reviewed and information entered into their corresponding station sheet (6.10S/F1-ver\*.\*). If correction or explanation of information on the sheet is required, the lab supervisor shall be consulted. Corrections shall be made in pen and initialled by the person making the correction/comment. The sheet is dated, signed then scanned to a PDF file and saved for future reference.

7.5 Verify that the sampling duration is approximately 24 hours. (1440 minutes). Samplers must have operated for at least 23 hours (1380 minutes) but not more than 25 hours (1500 minutes). Cartridges with elapsed times greater than 25 hours may have sampled on successive days and are invalid. Samples taken for less than 23 hours up to 18 hours (1080 minutes) are still considered valid at this point, and the cartridge is passed on for chemical analysis with an appropriate comment added to the station sheet (6.10S/F1-ver\*.\*). Samples with elapsed times of less than 18 hours are invalid.

Sampling Duration (minutes)

<1080	Invalid with comments
1080-1379	Valid with comments
1380-1500	Valid
>1500	Invalid with comments

7.6 Verify that the sampling average flow rate was approximately 10.00 lpm for Speciation sampler. If the sampler flow rate decreased because of heavy particulate loading on the filters (Quartz, Teflon, Nylon), the sample should not be invalidated because the heavy loading may indicate an episodic situation that deserves study.

Sampling Flow Rate for SASS Speciation Samplers (10.00 lpm)

<8.00	Invalid with comments
8.00-9.50	Valid with comments
9.51-10.50	Valid
10.51-12.00	Valid with comments
>12.00	Invalid with comments

7.7 Consult with the laboratory supervisor then record an appropriate comment for invalid samples.



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

### 7.8 Cartridge A Unloading

- 7.8.1 Place the sampled cartridge in the assembly stabilizer. Unclip and remove the main cartridge body from the outlet port
- 7.8.2 While holding the cartridge outlet port, carefully flip it upside down and let the filter and the filter screens fall into your hand.
- 7.8.3 Using forceps carefully remove the Quartz filter and place in a labeled Petri-slide (See Appendix 2 for component labeling format).
- 7.8.4 Place dirty filter screens in appropriate tub for washing.
- 7.8.5 Unclip, and remove the two stages of the inlet port from the main cartridge body.
- 7.8.6 Remove impactor plates and foams from both stages of the inlet port and place in appropriate tub for washing.
- 7.8.7 Record comments and code description of the filter condition in the station sheet (6.10S/F1-ver\*.\*).

### 7.9 Cartridge B Unloading

- 7.9.1 Follow steps 7.8.1 to 7.8.2
- 7.9.2 Using forceps carefully remove the Teflon and Quartz filters and separately place into its appropriately labeled Petri-dish and Petri-slide respectively.
- 7.9.3 Follow steps 7.8.4 to 7.8.7.

### 7.10 Cartridge C Unloading

- 7.10.1 Follow steps 7.8.1 to 7.8.2.
- 7.10.2 Using forceps carefully remove the Teflon and Nylon filters and separately place each into its appropriately labeled container. The Teflon filter is bent using two forceps and placed in a pre-cleaned 20 ml scintillation vial and capped. The Nylon filter is folded in three using two forceps and placed in a 12 ml polypropylene test tube making certain that the filter is completely at the bottom of the tube and then capped. When a new batch of test tubes is purchased, prior to use the cleanliness of the tubes must be evaluated by analyzing several (minimum 3) tube blanks to ensure that they are free of contamination. If contamination is found the supervisor is notified and the tubes are cleaned following SOP 6.02/\*.\*/\*S. The records should be kept in the IC-VIAL-1 logbook.
- 7.10.3 Place dirty filter screens in appropriate tub for washing.
- 7.10.4 Unclip, and remove the two stages of the inlet port from the main cartridge body and set aside.
- 7.10.5 Tilt the main cartridge body slightly so that the glass spacer and the first plastic spacer slide out. Place them in the appropriate tub for washing.



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

- 7.10.6 Slide the first denuder (sodium carbonate coated) out and immediately cap both ends with clean red caps. Place a label on the red cap. Place the denuder in a container designated for transport to the analytical labs.
- 7.10.7 Slide the second plastic spacer out and place in the appropriate tub for washing.
- 7.10.8 Slide the second denuder (citric acid coated) out and immediately cap both ends with clean red caps. Place a label on the red cap. Place the denuder in a container designated for transport to the analytical labs.
- 7.10.9 Remove the last plastic spacer and the metal spring and place them in the appropriate tub for washing.
- 7.10.10 Remove impactor plates and foams from both stages of the inlet port and place in appropriate tub for washing
- 7.11 Inspect the Filters and denuders for defects or damage. Teflon Filters incapable of being weighed due to damage are invalid. Consult with the laboratory supervisor then record an appropriate comment for the affected filter and or denuder.
- 7.12 If the filters and or denuders are not valid, inform the supervisor and remove them from the normal system at this point. Invalid filters are placed in the Archive for at least 6 months before disposal. Invalid denuders are sent for cleaning and re-used.
- 7.13 Record the reception date and minimum and maximum temperatures in the station sheet (6.10S/F1-ver\*.\*.) and update the "Shipping Schedule Speciation.xls" file.
- 7.14 Record comments and code description of both the filter and denuder condition in the station sheet (6.10S/F1-ver\*.\*.) using the comment codes provided in the sheet.

**8 SAMPLE TRANSFER for ANALYSIS**

- 8.1 Open the file labeled "\_Speciation Tracking Sheet Template.xls" (6.10S/F2-ver\*.\*).
- 8.2 From the appropriate station data sheets, copy the data for the samples received to the tab labeled "tracking sheets".
- 8.3 Run the macro labeled sort components.
- 8.4 Copy all AQ/BQ samples to the tab labeled "AQBQ", repeat for samples of type "BT" and finally "CT CC CN CS" to their respective tabs
- 8.5 Run the macro labeled "print tracking sheets". This will create and automatically print the tracking sheets for the samples.





<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

8.6 Transfer the “A” and “B” Quartz filters to the OC/EC laboratory, the “B” Teflon filter to the Gravimetric laboratory and finally the “C” Teflon and Nylon filters with the Citric Acid and Sodium Carbonate Denuders to the Ion Chromatography laboratory with their respective Tracking Sheets (Consult SOP 6.01/\*.\*S)

**9 CLEANING of CHEMCOMB CARTRIDGE COMPONENTS**

- 9.1 Fill the tub containing plastic spacers, glass spacers, metal springs, impactor plates, and foams with de-ionized (DI) water and let stand.
- 9.2 Remove the Filter screens from their tub and place them on a towel on the counter.
- 9.3 Rinse the tub three times with DI water.
- 9.4 Wash each screen individually three times and replace in the tub.
- 9.5 Fill the tub with DI water and then drain. Repeat this two more times.
- 9.6 Drain the tub that contains the spacers, springs, plates and foams.
- 9.7 Fill the tub with DI water and then drain. Repeat this two more times.
- 9.8 Arrange parts on paper towel in the lab and cover all with Kimwipes. Let them air dry
- 9.9 Wipe the cartridge inlet, outlet, and main body with a Kimwipe wet with de-ionized water.
- 9.10 Check if clips and o-rings are in good condition. Replace if necessary.
- 9.11 When parts are dried, store inside covered plastic containers or place them directly inside a ChemComb cartridge if necessary.
- 9.12 Consult SOP 6.9/\*.\*S for Honeycomb denuder cleaning.



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

## 10 APPLICABLE SOP'S

2.6/\*./S "Laboratory Refrigerators and Freezers"

6.1/\*./S "Sample Management"

6.2/\*./S "Labware Cleaning"

6.9/\*./S "Coating and Extraction of Honeycomb Denuders"

19.04/\*./S "AAQS Water Purification System"

## 11 REVISIONS

**Sept 2004:** Section 7: Mention the name of the Excel file used.  
 Section 7.1. and 7.2. Change the order of the steps and mention the cleaning tubs.  
 Section 7.3. Change the order of the steps, container details and washing details.  
 Section 8. Mention the name of the Excel file and worksheets used.  
 Section 9.1. Remove mention of filter screens.  
 Expand sections 9.2 to 9.4. to become 9.2. to 9.11. giving more cleaning details.  
 Modify Appendix 2 and 4 to mention sodium carbonate denuders.

**June 2007:** Section 7.3.6: Change Citric Acid to Sodium Carbonate.  
 Section 7.3.8: Change Sodium Carbonate to Citric Acid.  
 Appendix 1: Switch places for Sodium Carbonate and Citric Acid in diagram for Cartridge C.

**June 2011:** Reviewer: David Mathieu  
 Section 1.1: Remove reference to Model 3500 ChemComb cartridge since we now use a mix of old 3500's and modified 3500's to fit in the new Met One samplers. Explain modification of outlet port on Chemcomb cartridge. Insert mention of gaseous precursors.  
 Section 1.2: Correct text to reflect that field blank sampling cartridges are shipped in their own smaller box, not with regular sampling cartridges.  
 Section 3.1: Remove specific reference to Model 3500 ChemComb cartridge and refer instead to the two different outlet ports.

<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: <b>##</b>
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: <b>###</b>

**Sept 2013:** Reviewer: David Mathieu

Section 1.1 Change PM to PM<sub>2.5</sub>

Section 1.2 Change reference to large and small shipping boxes being used only for samples or blanks to both

Section 1.3 Add 6 day sampling period

Section 2 Add “pre-fired” to Quartz filter description

Section 4.1.7 Clarify wording of reference to appendix 2

Section 4.3.4 Add reference to SOP 6.09 and “coated” to denuder description

Section 7: Major revision of the section “Unloading of the ChemComb Cartridges” to become “Reception of Exposed ChemComb Cartridges and Reviewing of Field data Sheets”

Section 8: Major revision to section to show new procedures for preparing sample tracking sheets.

Section 10: Add reference to SOP 19.04 AAQS Water Purification system

Appendix A: Use new schematic of SASS cartridges instead of R&P cartridges.

Appendix C and D: Reference “forms” instead.

## 12 REFERENCES

Operating Manual, ChemComb Model 3500 Speciation Sampling Cartridge, January 2000, Revision A, Rupprecht & Patashnick Co., Inc.

Operating Manual, Model SASS & SuperSASS PM<sub>2.5</sub> Ambient Chemical Speciation Samplers. Document No. SASS-9800 Rev C.

US EPA QA Handbook Volume II, Appendix D – Measurement Quality Objectives and Validation Templates

State of Oregon Department of Environmental Quality, Gravimetric Analysis of Particulate Collected with R&P Partisol samplers and MetOne SASS Samplers. DEQ03-LAB-0027-SOP.

<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

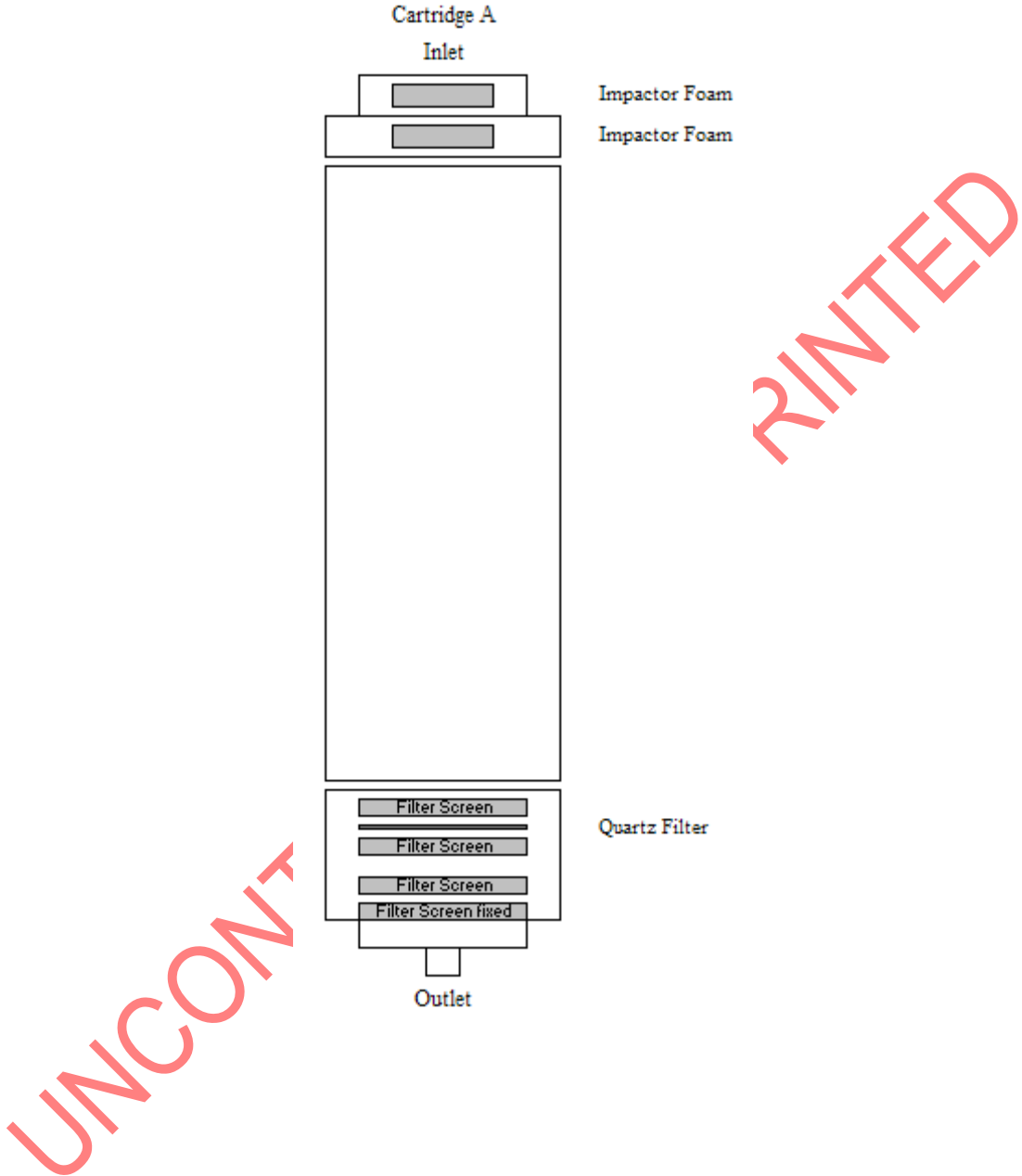
**Lead Reviewer:** David Mathieu  
**Title:** Supervisor, Particulate Characterization Unit

**Approved By:** Ewa Dabek  
**Title:** Head, Particulate Characterization Unit

UNCONTROLLED IF PRINTED

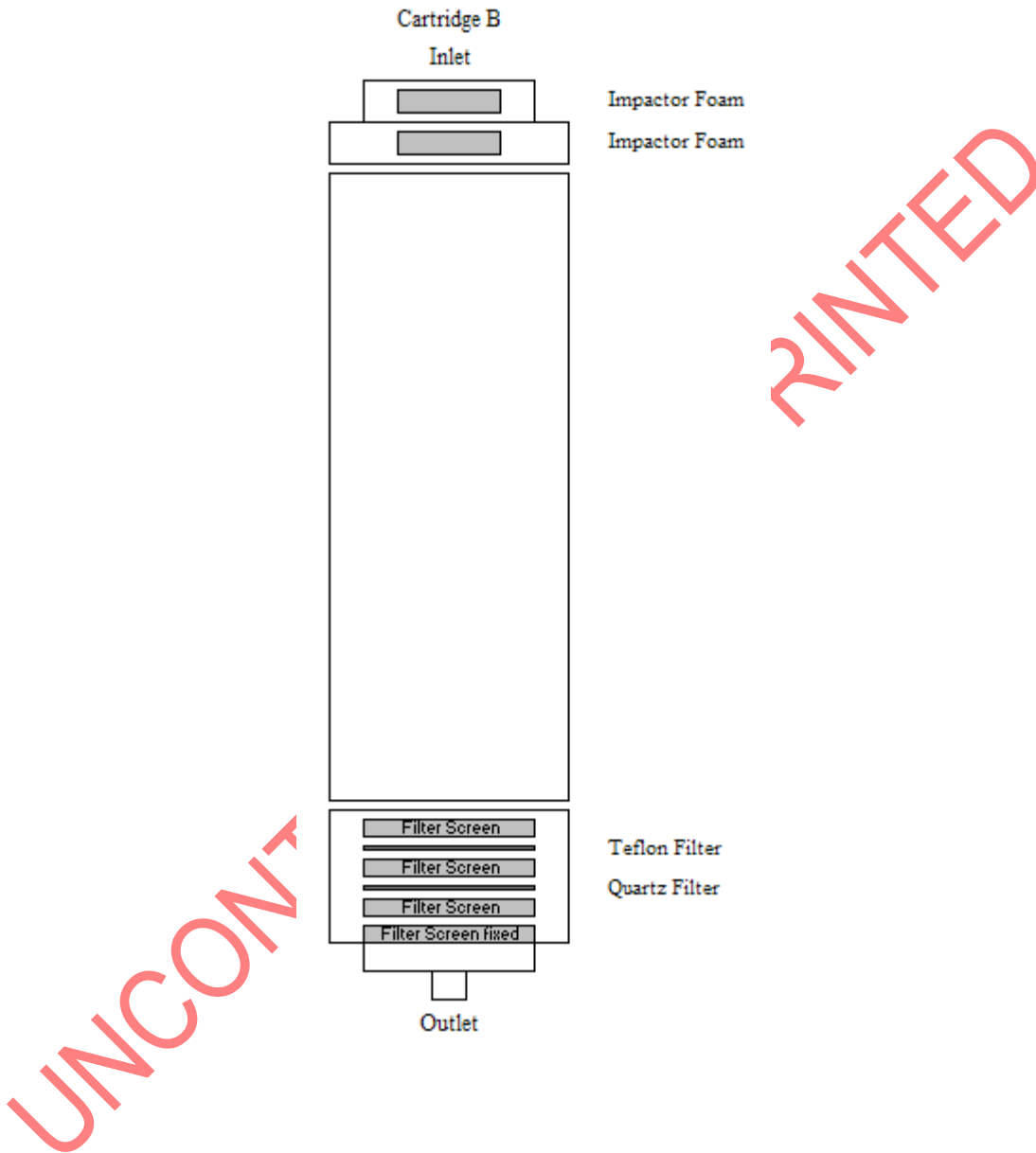
<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

**APPENDIX 1: ChemComb Component Configuration**



<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

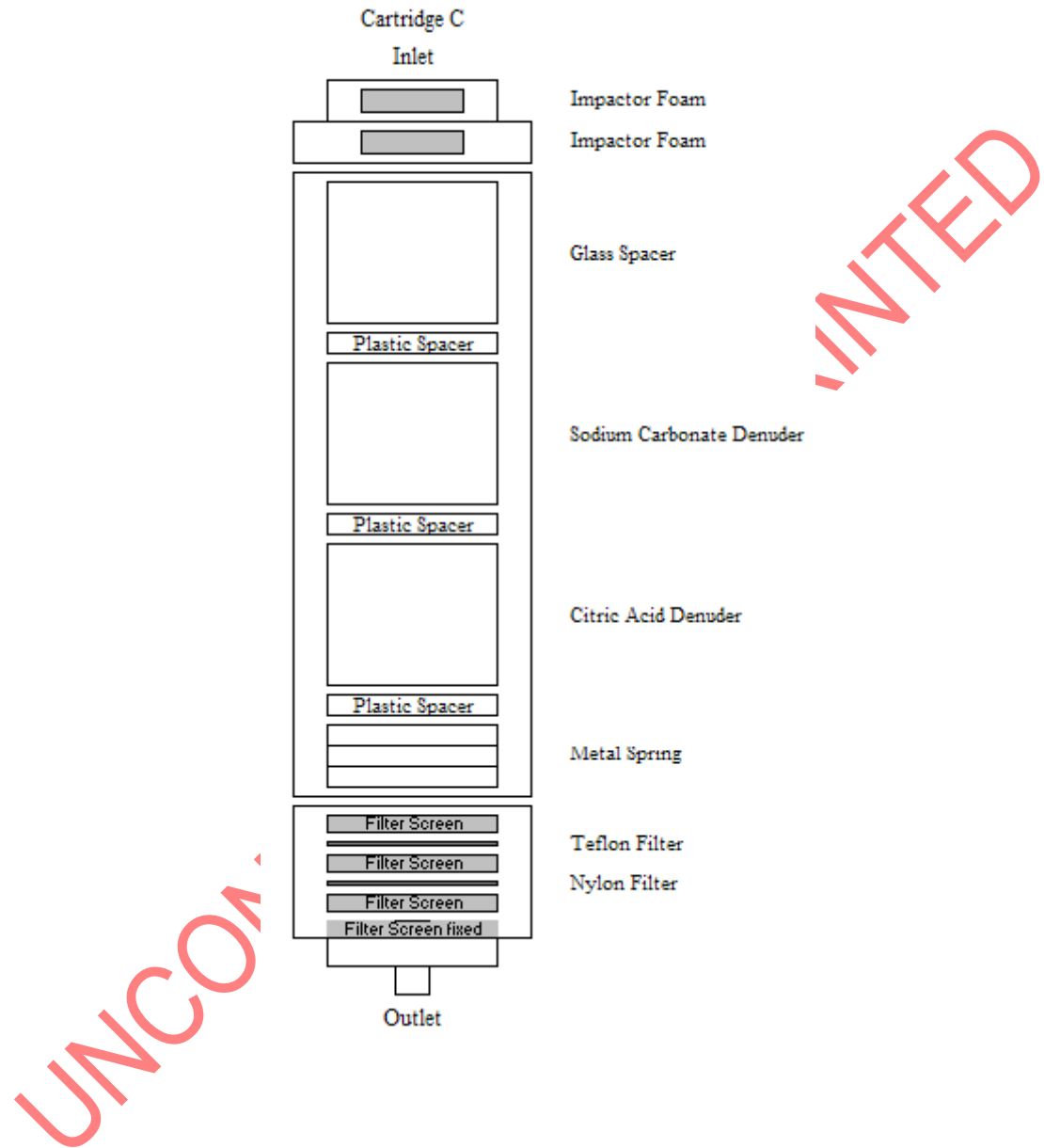
**APPENDIX 1: ChemComb Component Configuration**





<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: ##
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: ###

### APPENDIX 1: ChemComb Component Configuration





<b>Title: Preparation, Shipping, and Unloading of ChemComb Cartridges</b>		Copy No: <b>##</b>
SOP No.: 6.10/3.0/S	Effective Date: September 19, 2013	Location: <b>###</b>

**APPENDIX 2: Labeling of samples, laboratory, and field blank cartridges and components**

SAMPLES:

1. The ChemComb cartridges are labeled on the outside of the main body.
2. The Components of the ChemComb cartridges are labeled either on the cover of the petri dish or the redcap on the denuder

LABORATORY BLANKS:

1. The Components used in ChemComb cartridges set aside as field blanks are labeled either on the cover of the petri dish or the redcap on the denuder using the following format:

FIELD BLANKS:

1. The ChemComb cartridges are labeled on the outside of the main body.
2. The Components of the ChemComb cartridges are labeled either on the cover of the petri dish or the redcap on the denude

LABELING FORMAT:

Label position	Sample	Lab blank	Field blank
Cartridge body	LLLNNNNX	NA	LLLBNNNNX
Cartridge components	LLLNNNNXY	LABNNNXY	LLLBNNNNXY

Where, **LLL** is a three letter code for the name of the sampling station

**NNNN** is a number beginning at 0001 (or 001 for laboratory blanks) and continuing increasing by one for each sampling event/ blank,

**X** is the letter A, B or C denoting specific cartridges and

**Y** is the letter Q, T, N, C or S, where

**Q** is used for a Quartz filter,

**T** is used for a Teflon filter,

**N** is used for a Nylon filter,

**C** is used for a Citric acid coated denuder and

**S** is used for a Sodium Carbonate coated denuder