Standard Operating Procedure for Procurement and Acceptance Testing of Teflon, Nylon, and Quartz Filters

Environmental and Industrial Sciences Division
RTI International*
Research Triangle Park, North Carolina

Prepared by: Erin D. Hardison Date: 9/21/11

Reviewed by: James B. Flanagan Date: 9/21/2011

Approved by: R. K. M. Jayanty Date: 9/19/2011

* RTI International is a trade name of Research Triangle Institute.

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1.0 Purpose and Applicability

This document outlines procedures for procurement and acceptance testing of Teflon, nylon, and quartz filters for their use in chemical speciation of $PM_{2.5}$. Research Triangle Institute (RTI) has contacted the below-mentioned manufacturers/suppliers to confirm their ability to supply the needed filters. The mention of specific suppliers or trade names does not constitute endorsement by RTI.

Whatman 47 mm filters: PTFE (Part Number 7592-304), nylon membrane (Part Number 7410-004), and quartz (Part Number 1851-047), will be purchased through the McConnell Group. Pall 25 mm Tissuquartz™ quartz filters (Part Number 2500 QAT-UP-25MM) will be purchased from Daigger & Company.

2.0 Procedures for Filter Procurement

The individual task leaders along with the sample custodian will have the responsibility for determining project materials and supply requirements, including those of filters needed for collecting ambient aerosol samples. The number of filters ordered will be sufficient for all planned field activities, planned acceptance testing protocols, and field and laboratory quality assurance and quality control activities. Due to extended lead times often required for large filter procurements and the accompanying acceptance testing, filters will be ordered at least 90 days prior to the expected day of field use. The procedure for ordering filters is as follows:

2.1 Contact the filter supplier and obtain a written (or documented verbal) price quote for the intended quantity of filters required. The quote should include per unit price, expected ship date, and expected delivery date. Ensure that the quote is based on the vendor's understanding that all procured filters will be from the same manufacturing lot.

2.2 Complete an eProcurement request containing the following information:

- Filter manufacturer's product number.
- Supplier's product number.
- Complete product description and specifications.
- Unit size.
- Number of units required.
- Unit price and extended price.
- Specification that all filters must be supplied from the same manufacturer's lot number.
- Statement that the supplier can ship partial orders.

- Required receipt date for a completed order.
- Copy of written price quote and/or name and date of supplier's customer service representative who provided the verbal quote.
- Supplier's name, address, telephone number, fax number, and contact name.
- Desired procurement priority.
- RTI project and overhead number.
- Names of individuals requesting and approving the procurement.

2.3 Retain a copy of the completed eProcurement request for future reference. Deliver the original eProcurement request to the designated $PM_{2.5}$ eProcurement requestor, who will enter the requisition into *Procure+*, which is a Web-based procurement application that automates RTI's procurement process, from order placement to fulfillment and receipt.

2.4 Upon receipt of each filter shipment, inspect the shipment to verify that the items appear to be in good condition and that the receiving order accurately represents the shipment's actual contents. If so, sign and date the receiving order, make a photocopy for the RTI Project Leader, and submit the original to the RTI Program Administrative Assistant. If a discrepancy in shipment contents or condition is noted, complete and submit an online RTI Materials Discrepancy Report (MDR). If defective materials need to be returned to the supplier, complete and submit an online MDR. Following receipt of the MDR for any reason, RTI's Office of Purchasing will contact the supplier to arrange for the return of the incorrect or damaged item(s) and shipment of the correct item(s).

2.5 Store acceptable procured filters in their original bulk containers in a climate-controlled environment until required for use. Maintain copies of lot documentation in the filter storage location.

3.0 Filter Acceptance Testing

Filters procured for research purposes typically have project-specific testing and acceptance requirements. Regardless of the filter type or the project's specific analytical requirements, filters must be examined individually prior to use to ensure that defects do not exist.

Teflon: Teflon filters procured for $PM_{2.5}$ compliance measurements have detailed specifications and acceptance testing requirements (e.g., subsequent chemical analysis of collected aerosol deposits places additional acceptance testing requirements on the filters depending on the analytical technique used and the analytes of interest). Teflon filters for use in the chemical speciation program are received from the filter vendor monthly. A number of filters equal to 10% of the total quantity of filters received each month are visually inspected with the aid of magnification and enhanced lighting for an initial determination of acceptability.

In addition to the initial screening inspection, filters must be examined individually prior to use to ensure that one or more of the following defects does not exist:

- **Pinhole**—A small hole or tear in the filter matrix that appears when examined over a light table.
- **Loose material**—Any loose material or particulate contamination on the filter surface.
- **Separation of reinforcing ring**—Any separation or discontinuity of the seal between the filter matrix and the outer retaining or reinforcing ring.
- **Discoloration**—Any visible discoloration that indicates problems during the filter's manufacture or packaging.
- **Filter non-uniformity**—Any obvious difference in the spatial uniformity of the filter matrix structure or color. Analytical techniques, which rely on the uniformity of aerosol deposition (e.g., X-ray fluorescence), are particularly sensitive to filter defects of this type.
- **Other**—Defined as any other defect (e.g., wrinkling, warping) that might prevent a filter from providing accurate measurement data.

If any of the above defects are found on a filter prior to sampling, the filter will be discarded and replaced with another. Pre-sampling inspection and acceptance testing for Teflon filters are described in the standard operating procedure (SOP), *Standard Operating Procedure for $PM_{2.5}$ Gravimetric Analysis*.

Defects detected on a filter during the post-sampling phase of a field study will be noted on the filter's chain-of-custody record or in the laboratory database and the defect will brought to the attention of the appropriate Task Leader. The type and severity of the defect will dictate what corrective actions are necessary regarding further use of the filter and interpretation of the filter's test results. For example, a slight post-sampling separation of a Teflon filter's reinforcing ring would typically invalidate gravimetric test results but may not adversely affect the quality of X-ray fluorescence analysis performed on the filter's center section. For this reason, post-sampling defects in field filters must be evaluated on a case-by-case basis.

Nylon: Cleaning and acceptance for nylon filters are described in the SOP, *Standard Operating Procedure for Cleaning Nylon Filters Used for the Collection of $PM_{2.5}$ Material*.

Quartz: Slightly different cleaning and acceptance procedures are used for the Pall and Whatman quartz filters that are analyzed by the IMPROVE_A and the CSN OC/EC methods, respectively. Both the cleaning procedures and the acceptance criteria are extremely similar for the two filter types, and both methods achieve the goal of removing carbon to very low levels.

The procedures applicable to the 25 mm Pall filters are described in Section 4.5 of the SOP, *Standard Operating Procedure for the Determination of Carbon Fractions in Particulate Matter Using the IMPROVE_A Heating Protocol on a DRI Model 2001 Analyzer (February 13, 2009).* The cleaning procedure and the acceptance criteria in this SOP were based on those given in the SOP, *DRI Standard Operating Procedure: DRI Model 2001 Thermal/Optical Carbon Analysis (TOR/TOT) of Aerosol Filter Samples – Method IMPROVE_A, DRI SOP #2-216r2 (July, 2008).* Section 1.5.

The procedures used for the 47 mm Whatman filters analyzed by the original CSN method are described in Section 4.5 of the SOP, *Standard Operating Procedure for the Determination of Organic, Elemental, and Total Carbon in Particulate Matter Using a Thermal/Optical-Transmittance Carbon Analyzer (February 13, 2009).*