1.0 GENERAL DISCUSSION

1.1 Purpose of Procedure

This procedure delineates the process for pre-firing and acceptance testing of quartz fiber filters. Quartz fiber filters absorb organic gases from ambient air and organic artifacts from the manufacturing process. By pre-firing the quartz filters before sampling, these absorbed gases and artifacts are reduced to constant, insignificant levels.

The filters are pre-fired in preparation for thermal/optical reflectance and/or transmittance (TOR/TOT) carbon analysis, which is a thermal desorption process that subjects the filters to temperatures between 25 °C and 920 °C. In preparation for this analysis, the filters are pre-fired at 900° C to remove all possible interferences with the TOR/TOT analysis. Filters that will be used for additional ionic analysis also undergo ionic acceptance testing to ensure that any impurities are minimal.

1.2 Measurement Principle

(Not applicable)

1.3 Measurement Interferences and Their Minimization

(Not applicable)

1.4 Ranges and Typical Values

(Not applicable)

1.5 Typical Lower Quantifiable Limits, Precision, and Accuracy

As defined by the SOP for TOR carbon analysis, pre-fired quartz filters are acceptance tested after pre-firing. The upper limit for organic carbon levels is 1.5 ug/cm^2, elemental carbon levels is 0.5 ug/cm^2, and total carbon levels is 2.0 ug/cm^2. The upper limit for ions is <1.0 ug/filter. Ions routinely tested for are chloride, nitrate, and sulfate by Ion Chromatography (IC), ammonium by Automated Colorimetry (AC), and sodium and potassium by Atomic Absorption (AA or IC).

1.6 Personnel Responsibilities

All technicians in the laboratory should read and understand this entire standard operating procedure before performing pre-firing and acceptance testing preparation.

The laboratory coordinator is responsible for: 1) ensuring that the procedure is being followed, 2) maintaining the supplies necessary to insure uninterrupted pre-firing, and 3) ensuring that documentation is properly maintained.

The DRI quality assurance officer is responsible for revising the procedure when necessary.

1.7 Definitions

There are no terms in this procedure which require definitions.

1.8 Related Procedures

DRI SOP #2-216.1	Model 2001 Thermal/Optical Carbon Analysis (TOR/TOT) of Aerosol Filter Samples – Method IMPROVE_A.
DRI SOP #2-204.6	Thermal/Optical Reflectance Carbon Analysis of Aerosol Filter Samples.
DRI SOP #2-203.4	Anion Analysis of Filter Extracts and Precipitation Samples by Ion Chromatography
DRI SOP # 2-207.5	Analysis of Filter Extracts and Precipitation Samples for Ammonium by Automated Colorimetric Analysis
DRI SOP #2-206.3	Analysis of Filter Extracts and Precipitation Samples by Atomic Absorption Spectroscopy
DRI SOP #2-208.1	Cation Analysis of Filter Extracts and Precipitation Samples by Ion Chromatography

2.0 APPARATUS, MATERIALS, AND FORMS

2.1 Apparatus and Instrumentation

The following items are used in the pre-firing process:

- Muffle Oven (Model 51894, General Signal Corp., Watertown, WI).
- Quartz fiber filters 2500 QAT-UP (Pall Sciences, Ann Arbor, MI),) in 25, 37, or 47 mm disks, as required by the projects in progress.
- Flat-tipped tweezers (Millipore, South San Francisco, CA).
- Gloves, non-powdered (Fisher Scientific, #11-393-26).
- Coors Evaporating Dishes, 12 cm, #60234 (Van Waters & Rogers, #60234).
- Household aluminum foil (local grocery store).
- Light table
- PetriSlides, 47mm, #PD1504700 (Van Waters and Rogers, Brisbane, CA).

- Extraction Vials, 15 ml, #188271 (Intermountain Scientific, Kaysville, UT).

2.2 Reagents

(Not applicable)

2.3 Forms

The only paperwork required for the pre-firing process is the DRI Filter Media Acceptance Log (Figure 2-1).

3.0 CALIBRATION PROCEDURES

(Not Applicable)

4.0 PROCEDURES

4.1 General Flow Diagram

The process of pre-firing is depicted in Figure 4-1.

4.2 Preparation

- Each DRI lot consists of 100 filters of the same manufacturer lot and size; this generally corresponds to four boxes of 25 filters (37mm and 47mm) or one box of 100 filters (25mm). When filters are to be pre-fired, assign a DRI lot number to each lot; refer to previous entries in the Filter Media Acceptance Log binder for the correct lot number.

- Record the DRI lot number on each box using a marker or gummed label. If more than one box is required to make a lot of 100, use a suffix of -1, -2, etc. to distinguish between the boxes.

- Record the manufacturer, manufacturer's lot number, and filter size in the Filter Media Acceptance Log binder.

4.3 Pre-firing of Filters

- Obtain two ceramic dishes, one for a base and one for a lid. Clean with a dry Kimwipe.

DRI FILTER MEDIA ACCEPTANCE LOG

Filter Type	Filter Size	Manufacturer	Mfg Lot #	DRI Lot #	Pre-fire Date	Tech	TOR Accept Date	Tech	XRF Accept Date	Tech

Figure 2-1. DRI Filter Media Acceptance Log.

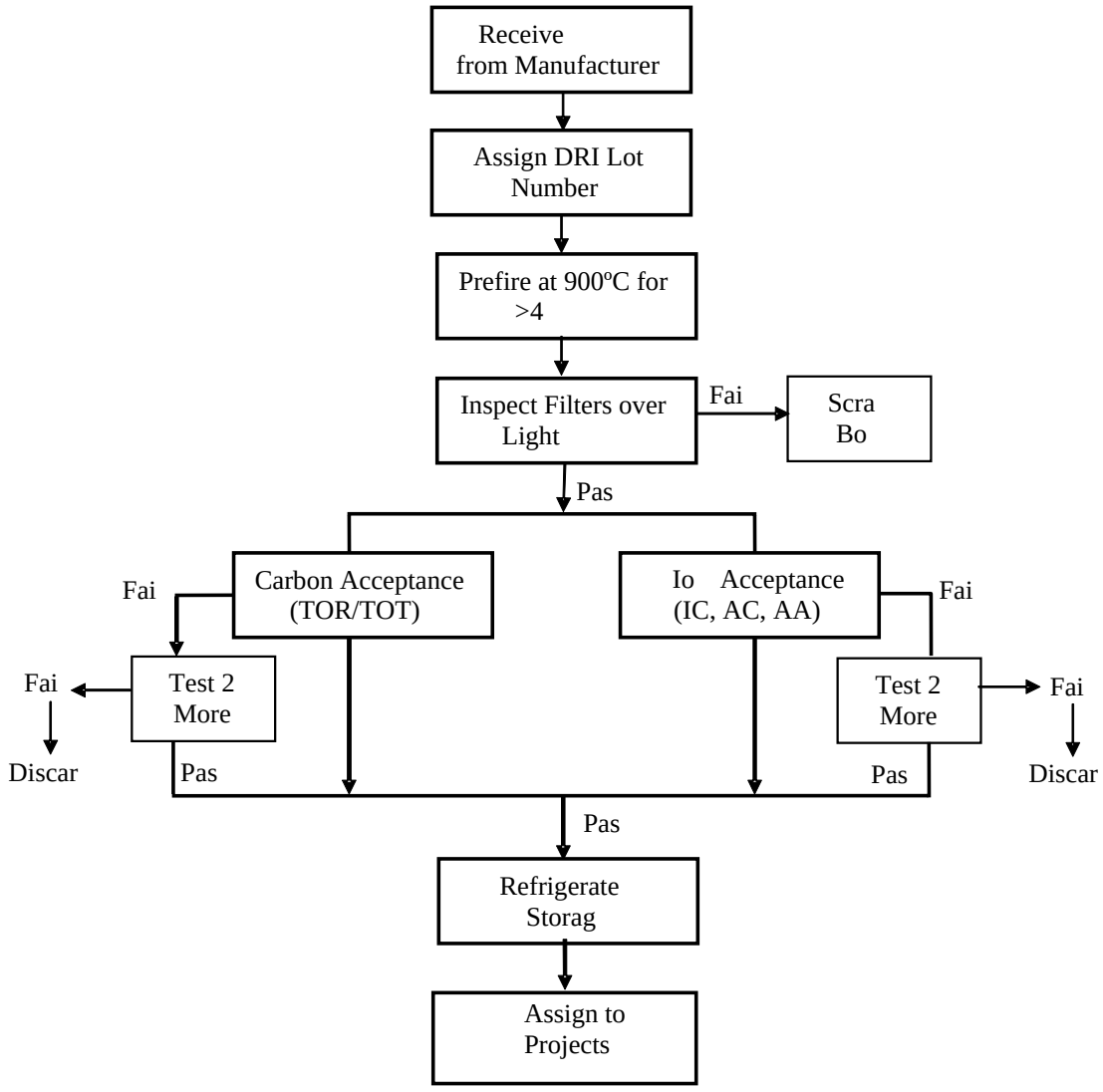

Figure 4-1. DRI Quartz Pre-firing Flow Diagram.

- Obtain 100 filters of the required size from the stocking shelf in the Shipping and Receiving room, and assign the next consecutive lot number as determined from the Filter Media Acceptance Log binder.

- Wearing gloves, place one filter flat in the center of the dish. Place additional filters in the dish in a circle, resting on the side of the dish and the center filter. The completed dish will have the appearance of a rosette. Place 50 in each dish if pre-firing 47mm or 37 mm filters or 100 filters per dish if pre-firing 25mm filters. CAUTION: too much overlap of filters will not allow carbonaceous vapors to escape.

- Invert the second dish and place it as a cap on top of the first dish.

- Repeat the previous steps until sufficient lots are prepared to fill the oven.

- Place the dishes in the oven. The dishes are placed three in a stack. Close and latch the oven door.

- Turn on the oven. Set the oven temperature to 900 °C by pressing the small black push button and turning the set point adjustment knob until "900" appears in the display. When the push button is released the display will return to the current oven temperature.

- Record the pre-fire date in the Acceptance Log binder and the acceptance data base. Line the original boxes with aluminum foil, because the pre-fired filters are returned to them for storage. Also, prepare 2 tubes and 2 slides for all lots that will be used for projects requiring ion analysis (usually the 47mm and 37mm).

- Turn the oven off after a minimum of 4 hours have elapsed. Allow the oven to cool without opening the door. Generally the oven is left overnight to cool.

4.4 Acceptance Testing

- When the oven has cooled, remove the dishes from the oven..

- Using flat-tipped tweezers, hold each filter to the light table and inspect it for holes or uneven texture. Place any rejects in a separate unlined box for use in test packs. Place the accepted filters in the prepared aluminum lined boxes. NOTE: inspect the filters carefully; for most air sampling projects the equivalent value of each filter may reach several hundreds of dollars; make sure that only clean, unblemished filters are accepted.

- When all filters have been light checked, place two of the filters in PetriSlides for carbon acceptance testing. Label the PetriSlides with the code "Q"+lot number+"A" or “B” (e.g., "Q160A"). For 37mm and 47mm filters, also fold and place two filters in extraction tubes for wet chemistry acceptance testing. Store the boxes of filters, extraction tubes, and PetriSlides in the designated freezer. Inform

the laboratory coordinator that there are pre-fired filters that will need an analysis list for acceptance testing.

- Carbon acceptance testing is performed as described in SOP #2-216.1
- Ion acceptance testing is performed as described in SOPs #2-203.4, 2-207.5, 2-206.3, or 2-208.1, as required.
- Two additional filters from lots that fail acceptance testing are subjected to further testing. The process outlined above is followed except the filters are identified with a "C" and "D" suffix. If the filters fail again, the lot is discarded and a note is made in the Acceptance Binder.
- Boxes containing filters which pass acceptance testing are placed in zip-lock bags, and stored in the freezer until they are assigned to a project.

5.0 QUANTIFICATION

(Not applicable)

6.0 QUALITY CONTROL

(Not applicable)

7.0 QUALITY ASSURANCE

(Not applicable)

8.0 REFERENCES

Refer to the oven's owner's manual for additional information concerning its operation.