UCD IMPROVE Standard Operating Procedure #151

Installation of Samplers

Interagency Monitoring of Protected Visual Environments
Air Quality Research Center
University of California, Davis

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DOCUMENT HISTORY

Date Modified	Initials	Section/s Modified	Brief Description of Modifications
04/08/21	SRS	All	Added sections (2, 3, 4, 5, 6, 7, 10, 11, 12) and moved sections (2 to 7, 3 to 8, 5 to 9); redistributed content to fit document guidelines.
5/17/21	IVP	8,9	Added clarifying remarks about positioning on modules when mounting. Also removed references to old controller that is no longer used.

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1. PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) describes the procedures for installing new aerosol sampling sites according to IMPROVE sampling network protocol.

The IMPROVE aerosol monitoring program is designed to collect quantitative information on the composition and concentration of fine ($PM_{2.5}$) aerosol particles that reduce visibility. Aerosol data provide information to decision-makers and the public on the state of Class I area visibility, causes of visibility impairment, and trends in visibility for a region. Finally, elemental analysis of aerosol samples can identify tracers for emission sources.

An IMPROVE aerosol sampling site generally has a controller and four sampling modules. The modules run in parallel; the controller sends the same signals to each module. The four standard sampling module types are 1A, 2B, 3C and 4D. Module 1A collects fine particles (0-2.5µm) on a stretched Teflon® filter and provides data on elemental composition of fine particles. Module 2B collects fine particles (0-2.5µm) on a nylon filter, has a denuder before the nylon filter to remove acidic gases, and is used to quantify particulate anions (nitrate, nitrite, sulfate, and chloride). Module 3C collects fine particles (0-2.5µm) on a quartz filter to measure organic and elemental carbon. Module 4D collects coarse and fine particles (0-10µm) on a stretched Teflon® filter and provides data on PM_{10} mass loading. Some sites have a fifth module for collocated precision measurements (called a 5X module), which can be a duplicate of a 1A, 2B, 3C, or 4D module.

Each module is independent with a separate inlet, sizing device, flow measurement system, critical orifice flow restrictor, and pump. All modules are wired to a common controller, which is programmed for IMPROVE sampling to collect a twenty-four hour sample every third day from midnight to midnight.

The design is simple and rugged to withstand ambient field conditions and for ease of operation and maintenance.

The purpose of this SOP is to facilitate installation of IMPROVE aerosol samplers; to assure consistent, quality data; and to minimize data loss by installing aerosol monitoring systems according to design specifications and EPA requirements.

2. SUMMARY OF THE METHOD

The principal investigator, field manager, and local contact work together to find a suitable location and prepare housing for new IMPROVE monitoring sites. The procedures and criteria for selecting new site locations are provided in *UCD IMPROVE SOP #126: Site Selection.* Lab personnel prepare boxes of filters to initiate sampling at

the site. A field technician is sent to the location to install and calibrate the sampler, train the new operator(s), and to complete documentation of the site.

3. DEFINITIONS

- AQRC: Air Quality Research Center of UC Davis
- EPA: Environmental Protection Agency
- IMPROVE: Interagency Monitoring Program of Visual Environments
- PM: Particulate Matter
- SOP: Standard Operating Procedure
- UCD/UC Davis: University of California, Davis

4. HEALTH AND SAFETY WARNINGS

Be aware that various stinging insects, venomous creatures, and large mammals (such as bears) can be found at many of the IMPROVE sites. Be cautious when stepping in tall grass surrounding a site or when opening doors.

Inclement weather is often an issue at many IMPROVE sites. If severe weather is impending, wait it out in the vehicle or reschedule visiting the site.

Always carry a first aid kit when working in the field.

Many IMPROVE sites are located in restricted or limited access areas. Be sure to communicate visit to the site with the proper local authorities.

Some IMPROVE sites are remote and require hiking to the site or driving off-road. Be sure to have detailed maps of the area when walking or off-road driving.

Many IMPROVE sites do not have cellular reception. Take this into consideration when planning visits.

5. CAUTIONS

IMPROVE Sites are expected to run for over a decade. All structural and electrical work should be done with this longevity in mind.

All national and local building and electrical codes must be met.

Any structure built for the purpose of housing the air samplers must be securely anchored to the ground. Several improve sited have been destroyed due to falling over in high wind events.

6. INTERFERENCES

Interference for initial site set up are the same as for regular site maintenance. See *UCD IMPROVE SOP #226: Site Maintenance* for details.

7. PERSONNEL QUALIFICATIONS

7.1 Principal Investigator

The principal investigator will:

- Approve final site configuration materials including photographic documentation, maps, installation location, and site configuration specifications.
- Verify funding and approval of the final site configuration and location by contacting the agency(ies) or program(s) responsible for the funding of the site.

7.2 Field Manager

The field manager will:

- Schedule the aerosol sampler installation.
- Make suggestions on construction of the support structure for the aerosol sampler based on the site photos and descriptions returned with the siting document.
- As required, review the determined site preparation and installation requirements with the local contact.
- Schedule an operator training session for all identified operators and the primary local contact.
- Enter the site documentation and configuration information into the site database.
- Review the site calibration equations derived by the field technician.

7.3 Field Technician

The field technician will:

- Install the sampling modules at the site.
- Clean and test the sampling modules.
- Calibrate the sampling modules.
- Take photographs of the site and final equipment configuration and complete on-site documentation.
- Produce detailed directions for access to the site and create any necessary maps of the site location.

7.4 Lab Technician

The lab technician will:

- Initiate the new site in the aerosol samples and analysis databases.
- Create site-specific filter and sampling date identification labels for the new site.
- Assemble cassettes, shipping boxes, and labels for shipping samples between UC Davis and the new site.
- Verify the address to which the samples will be shipped.
- Send out the filters to initiate sampling at the site, as scheduled by the field manager.

7.5 Local Contact

The local contact will:

- Review the determined site preparation and installation requirements with the field technician
- Identify and contact local land owners, primary contacts, and site operators regarding site installation and routine maintenance requirements
- Finalize contracts with land owners for site installation and power usage
- Perform any necessary site preparation prior to the installation (e.g. tree or brush removal, access road maintenance, electrical re-wiring to meet power requirements, aerosol sampler support structure construction, etc.)
- Maintain communications with the field technician and local land owners to confirm scheduled installation requirements
- Schedule operator training session with the field technicians and the field manager
- Provide site access and installation assistance as needed
- Verify site location and geographic reference specifications documented by the field manager

8. EQUIPMENT AND SUPPLIES

The materials required to install an IMPROVE aerosol sampler depend on the type of installation: in an existing building, in a newly constructed sampler shed, or on an outdoors stand. Other factors include how many aerosol sampling modules are being installed; up to five sampling modules fit within standard protocol.

Information for the local contact on preparing existing buildings for sampler installation, constructing new buildings to house aerosol samplers, or constructing an outdoors stand for aerosol samplers is included in Section 5.1 Site Preparation and Communication Procedures. However, as the local contact at each site will encounter different problems, no general listing of the equipment required for site preparation prior to sampler installation will be made.

8.1 Sampler Installation Equipment

The installation of the aerosol sampler(s) by field technicians will occur only after all site preparations are completed. This includes ensuring adequate power supply, preparing access roads, sampler stand with adequate roof access, or support structure construction, etc. Standard equipment and materials required for installation of aerosol samplers to collect samples include:

- 1 aerosol sampler controller
- Module 1A ($PM_{2.5}$) sampler for elemental analysis
- Module 2B ($PM_{2.5}$) sampler to analyze for nitrate, nitrite, sulfate, and chloride ion
- Module 3C ($PM_{2.5}$) sampler to analyze for carbon
- Module 4D (PM_{10}) sampler for gravimetric analysis
- Module 5X (where X represents A, B, C, or D) if applicable
- Vacuum tubing for each sampling module, long enough to run between the air sampling modules and pumps
- One pump for each sampling module
- Relay control boxes for activating pumps
- One module cable long enough for each module
- One temperature measurement probe, long enough to fit into the airstream of chosen module (usually 3C)
- One anodized aluminum inlet stack long enough to meet EPA requirements for each sampling module (see SOP #126, Figure 5): modules with 2.5µm cut points ($PM_{2.5}$ samplers) require a pipe with 1/16" wall and outer diameter 1.5"; modules with 10µm cut points (PM_{10} samplers) require a pipe with 1/16" wall and outer diameter 1.25"
- 1 cleaned, coated aluminum denuder for the 2B module
- 1 inlet head for each $PM_{2.5}$ sampling module. Note that inlet heads for all $PM_{2.5}$ modules are identical
- 1 inlet head for each PM_{10} module being installed (Andersen Samplers Inc. 16.7 LPM low flow rate Sierra inlet)

8.2 Site Calibration Equipment

Refer to *UCD IMPROVE SOP #226: Site Maintenance* for a detailed list of equipment required to calibrate an IMPROVE aerosol sampler.

8.3 Sampling Initiation Materials

The following materials are necessary for site initiation.

- 2 boxes of unexposed filter cartridges configured for the new site and sampling dates. Each box should contain the following:
    - 3 1A module cartridges, labeled, quality-checked, and containing pre-weighed Teflon® filters

- 3 2B module cartridges, labeled, quality-checked, and containing nylon filters
- 3 3C module cartridges, labeled, quality-checked, and containing quartz filters
- 3 4D module cartridges, labeled, quality-checked, and containing pre-weighed Teflon® filters
- 3 log sheets, each representing one week of cartridges for the sampler, to record sampling data
- 3 re-closable bags, each containing one week of cartridges for the sampler, to prevent contamination of the cassettes during shipment
- 1 SD memory card for recording data at the site
- 1 UPS return label or business reply USPS label (depending on the site) for returning the box to the Air Quality Research Center lab at UC Davis

8.4 Site Documentation Materials

The following materials are required to complete the site documentation process:

- One camera for site documentation photos
- Photographs of the site and final equipment configuration
- On-site documentation by the field technician during installation
- Maps of the site location and directions for access

9. PROCEDURAL STEPS

This section describes site installation and documentation procedures and includes two major subsections, 9.1 and 9.2.

9.1 Site Preparation and Communication Procedures

Prior to installation of an IMPROVE aerosol sampler, the local contact must ensure the site is prepared for sampler installation. The field technician informs the local contact of the site preparation and installation requirements determined as necessary by the field manager and the principal investigator. The local contact is then responsible for ensuring the preparations are completed prior to the date set for site installation. The information communicated to the local contact must include:

1. The selected site configuration, whether in an existing building, a newly constructed sampler shed, or on an outdoor stand. Samples of sheds (C76-NPS-2841, C76-NPS-2842) and outdoors stands (C76-IS-2430) for IMPROVE aerosol samplers may be found in the diagrams packet.
2. The basic requirements for the sampler module support structure include —
    a. The mounting surface on the structure should consist of two horizontal 2x6 studs separated by 18” center to center.

b. The top of the lower 2x6 stud should be positioned roughly 52" above the floor to ensure the cyclones are at or near eye level. At the final mounting position stacks must be chosen to extend at least 1m above the peak of the roof.
    i. For an indoor site, the distance between the top of the upper stud and the top of the roof should be reported to the field manager for calculation of the required inlet stack length.
    ii. For an outdoor site, the standard inlet stack length of 6 feet should be used unless there are unusual circumstances.
c. The mounting structure must be stable to avoid vibration or shifting of the sampler modules after installation.
d. The mounting structure must be strong enough to support the weight of the sampler module(s). A complete IMPROVE set-up, with a controller and four modules, weighs 209 lbs.
e. The mounting structure must be long enough to support all of the modules, which is generally 96 inches long. An optimal spacing of the modules is roughly 24" between stack to stack. The preferred installation is all modules on one wall. If there is not enough space, other walls may be used pending approval from the field manager.
f. For an indoors site, the mounting structure must be constructed in a location where holes may be drilled vertically through the roof above the modules once mounted. Field technicians should receive express permission to drill through roofs and do not accept liability for water leaks caused by the penetrations.
g. Preparations for installation of samplers in pre-existing concrete and/or metal structures may include additional requirements. Careful discussion of sampler mounting options with property managers is required, as is assistance from the local contact and maintenance workers. Damage to structural integrity is possible, and on-site supervision of installation by personnel responsible for the structure is required. In these situations, for insurance purposes, the Air Quality Research Center requires the property managers to approve, oversee, and hire the appropriate personnel to attach the support structure, drill the holes for the stacks, and re-seal the roof once the samplers are installed. Due to these constraints, installation in pre-existing concrete or metal structures does not generally occur.
h. Each shelter must be equipped with a safe means of accessing the roof and stacks. A permanent staircase or ladder is preferred, but portable lean-to ladders may be used as long as there is a clear and un-obstructed access from the ground to set them up. Maintenance technicians generally travel with a 12-foot ladder when performing maintenance, but local operators are expected have access to a ladder whenever needed year-round.
i. Pump enclosures are required for outdoor sites and recommended for indoor sites. Outdoor enclosures must be big enough to allow at least two

cubic feet per pump and must be well ventilated. Indoor pump enclosures are generally constructed by sectioning off a portion of the shelter from the main area that houses the modules in order to prevent heat from the pumps affecting the modules. The sectioned-off pump area must be well ventilated to prevent overheating.

j. The shelter or stand must be securely mounted to the ground with anchors to prevent issues caused by high wind.

3. The location of installation of sampler modules —
    a. Determine which wall or surface the sampler be mounted on. Note it is preferred that the sampling modules are mounted facing north.
    b. The modules are general mounted roughly 52” above the floor or ground to put the cyclones in the modules at eye level. Also, the modules cannot be mounted closer than 5” from a corner in order to allow the doors to open freely.
4. The power requirements for the sampler. The IMPROVE aerosol sampler uses 120V, 60Hz electrical power during normal use. The sampler requires two 20-amp breakers or one 30-amp breaker. 30-amp breakers are generally discouraged due to the required wire, breaker, and receptacle sizing. A minimum of four outlets is necessary, preferably two for each 20-amp breaker.
5. Obstructions to air flow, such as trees or bushes, which must be removed or trimmed.
6. Necessary site access path or road maintenance.
7. What assistance, in terms of tools and equipment (e.g. four-wheel drive vehicles, concrete, etc.), will be necessary for the field technicians to complete installation of the sampler.

9.2 Installation of Aerosol Samplers

The IMPROVE aerosol samplers are installed on walls or stands according to site requirements. The basic configuration requirements are that all modules and inlets are located with the same air mass, as required by EPA siting documents, and the cyclones are mounted vertically for optimal efficiency. Installation procedures for IMPROVE aerosol samplers are described in the following subsections.

9.2.1 Attachment of Aerosol Sampler to the Support Structure

The local contact, prior to site installation, constructs a support structure for the sampler modules. The support must meet the requirements specified by the field manager for strength and stability. Any special arrangements, such as installing the samplers in a pre-existing building, must be made in advance in order for the installation process to proceed smoothly.

The modules are attached to the 2x6 studs. The modules are checked during mounting to insure the cyclones are vertical. The cyclones should be at or near eye level.

The modules are installed in alphabetical/numerical order (e.g. 1A, 2B, etc.) from left to right and along one wall if possible. There must be enough space between modules to allow the door to stay open. A spacing of 24" between stacks is optimal.

9.2.2 Installation of Inlets and Inlet Stacks

Following the mounting of the aerosol sampler modules, the inlet stacks must be installed. The procedures for installation are listed below:

- Mark the location of the center hole for each stack on the ceiling using the special IMPROVE module mounting template.
- Drill at least a 1¾" to 2" hole (1½" to 1¾" for 4D module) centered on the marks made on the ceiling. 2" holes are preferred for all the stacks to allow extra stack clearance in case of building settling.
- For modules 1A, 2B, and 3C, slide the 1.5" stacks through the holes in the roof and into the stock collars on top of the modules. Twist the stacks into the aluminum T-connectors as far as they will go.
- For the 4D module stack, slide the 1.25" stack through the hole in the roof and in the top of the 4D module. Twist the stack into the top of the black funnel inside the module until it rests on the O-ring seat inside the funnel. Then, lock it into place with the stack brace.
- For the 2B module only, install the denuder in the stack.
    - Remove the stack bottom plug from the base of the stack Tee.
    - Push the denuder up into the stack above the Tee, and then place the O-ring detainer inside. Allow the denuder to rest on top of the O-ring detainer.
- Slip a loose-fitting roof jack over each stack, lay a bead of silicone caulk between the roof jack and roof, nail or screw in the roof jack at each corner, and seal around the edges of the roof jack and the roof with silicone caulk. Place a tight-fitting second roof jack over each stack. Caulk the upper roof jack to the stack to prevent any leaks.
- Install the inlets at the tops of the stacks by twisting them on.

9.2.3 Wiring the IMPROVE Aerosol Sampler to Power

The IMPROVE controller module is the only module containing control circuitry. The controller's power cord should be connected to a surge protector. The surge protector should be exclusive to the controller. Each sampling module not having controller circuitry should be connected to the controller by the twelve-conductor

wiring harness. Two relay boxes (three relay boxes for the site configured with 5 modules) and a temperature probe are also connected to the controller module. Two pumps are plugged into each relay box. Each relay box has a power cord. If two breakers are available, plug one relay box into each. For the site with 5 modules, the controller and 1A/2B relay box share one breaker, 3C/4D and 5X relay boxes share the second breaker.

9.2.4 Connecting Pumps to the Aerosol Sampler

The aerosol sampler uses external pumps, switched on by the circuitry in the relay boxes to produce the appropriate flow rate. External pumps reduce the weight of the sampler modules and are easier to maintain or replace. The procedures for installing pumps are as follows:

1. Set vacuum pumps upright in selected location.
2. Plug the pumps into the two relay boxes connected to and switched on by the controller module. Follow the color code when plugging in the pumps.
3. Connect the vacuum tubing from each module to the pump plugged into the outlet labeled as switching on that module. Follow the color code.
4. Verify the functionality of the pumps.
    a. Press **Menu** on main screen, then **EQUIMPENT TEST**, and then **Vacuum Test**. When ready, press **Start**. Make sure the pumps turn on in sequence in alphabetical/numerical order. The max orifice values should be at nominal values for that site.

9.2.5 Sampler Function Check

Once the sampler has been installed, validation procedures to verify the correct wiring and functioning of the sampler components are necessary. The following are instructions for sampler validation checks.

9.2.5.1 Verify Module Values

1. Insert audit cartridges into their matching modules. On the controller display, in the main menu, select Menu for the Menu. Select Advanced Menu from the next page, and enter the code “9051”. Press Submit after typing in the code. This will take you to the maintenance menu. Select the More button, then select Calibration.
2. The first module shown is the 1A module. Press the Pump:Off button and the pump for module 1A should turn on. The display will show two values for CYC and ORI. Pressing the buttons, S1:Off, S2:Off, S3:Off, or S4:Off will turn on solenoids 1, 2, 3, or 4, respectively. On the CYC (Cyclone) row, the value will be displayed in inches water (_” H2O) on the left column, and liters

per minute (LPM) on the right column. The ORI (Orifice) row will display the measured pressure value in pounds per square inch (PSI), and LPM on the right column. The LPM values are valid on the CYC column for non-4D type modules and the LPM is valid on the ORI column for 4D type module. Check to make sure the pressures and flows are reasonable and confirm that the pump is running. If the solenoid control button says "S1: On", that means the solenoid is on. Pressing it again will turn it to "S2: Off", meaning the solenoid is off. Only one solenoid should be on at a time for accurate values. Check all four solenoid positions individually. After verifying Module 1A values, use the > button to page over to Module 2B.

3. Repeat step 2 for the 2B, 3C, and 4D modules (as well as for the 5X module, if applicable).

9.2.5.2 Verify Integrity of the Vacuum System

1. From the Home Screen, press Menu to enter Menu. Press the Equipment Tests button, then the Vacuum Test button, and then the Start button. Note these values. The MxORI/VAC values for all modules should be less than 4 psi. Press the Stop Pumps when finished. This will take you back to the Equipment Tests menu.
2. From the Calibration menu, described above, note the value of each module's CYC and ORI with the first solenoid (S1) on, and the pump off. These are the zero values for the ORI and CYC of each module. CYC should be very close to 0" H2O and ORI will be 14.7 psi at sea level on an average day. Cycle through each module using the, > and < buttons. Record the values for each module. Press the ⌂ (Home) button to return to the Home Screen.

9.3 Flow Check of the Modules

Before the site can begin running samples, the field technician must check and adjust as needed the flow rate for all modules. Detailed instructions are found in *UCD IMPROVE SOP #226: Site Maintenance.*

9.4 Operator Training

The operator training session is run by the field technician and generally lasts about one hour or less (depending on the number of people being trained and their level of experience). The session involves reviewing *UCD IMPROVE SOP #201: Sampler Maintenance by Site Operators* and answering any questions the operator may have about sampling and the sampling schedule. Supervised hands-on training is also provided. The subjects covered include:

- Overview of the function and operation of each sampler module
- Pump functioning
- Procedures for data recording prior to and following sampling
- Filter cassette installation/removal
- Troubleshooting
- Phone numbers to call if problems arise

9.5 Site Documentation

Site documentation for the IMPROVE modular aerosol sampler involves completion of the Site Information Sheet (Form 1). This information is filed with the site documentation data collected during the siting procedure.

Details required to complete the site configuration form are described in detail in the following summaries:

Site Name: Record the 5-letter side code (e.g., BAND1 or THSI1).

UC Code: Record the four-digit University of California Inventory ID number.

Date/Initials: The date the site was installed and the initials of the field technician who installed it.

Shelter and Roof: List the type of shelter, its dimensions and materials used to build it, as well as a description of the shelter's ventilation.

Controller and Modules: List the configuration/order of the modules and controller, the location and height of the modules, the sampling cycle of the site, the filter specs, the length of the module cables, stack information, the location of the temp probe, E-box versions, and the E-box cyclone zeros.

Pumps: List the location of the pumps and the distances from the pump to the relay boxes, from the relay boxes to the electrical outlets, and from the relay boxes to the controller. Note the dimensions of the pump box (if applicable) and anything used to control the climate in the pump area.

Power: List information regarding any surge suppressors and circuit breakers. Describe where the electrical outlets are and what equipment is plugged into each. List the distance between each outlet and the controller.

Surroundings: Describe the source of any potential contamination (within 300 yards of the site) and any clearance violations or issues.

After site documentation has been completed, the field technician must take pictures of the following:

- Modules
- Pumps

- Power
- Breakers
- Roof
- Stacks (inlets)
- Inward views facing the site (N, NE, E, SE, S, SW, W, NW)
- Outward views facing away from the site (N, E, S, W)

10. DATA AND RECORDS MANAGEMENT

The field technicians are responsible to keep all paperwork associated with the installation and calibration of the sampler in a shared and backed up network drive. The documents are organized by site ID and include the following:

- All photographs taken at the site during site set up and updated photographs taken at site maintenance. These are to be clearly labeled and organized by year.
- Contact information for the site operator and backups including email and phone numbers. UC Davis is responsible for updating this information when notified of changes.
- Equipment information for site after installation and maintenance. This includes serial numbers, inventory tags, calibration forms, and detailed descriptions for the equipment layout of the site. See *UCD IMPROVE SOP #226: Site Maintenance* for details.
- Results from Flow Check procedure in the form of an Excel spreadsheet. See *UCD IMPROVE SOP #226: Site Maintenance* for details.

11. QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance procedures are the same for initial site set up as in regular site maintenance outlined in *UCD IMPROVE SOP #226: Site Maintenance*.

12. REFERENCES

1. *UCD IMPROVE SOP #126: Site Selection for IMPROVE*
2. *UCD IMPROVE SOP #201: Sampler Maintenance by Site Operators*
3. *UCD IMPROVE SOP #226: Site Maintenance*
4. Appendix A (see below)

Appendix A: Site Information Sheet

IMPROVE Aerosol Monitoring Site Information Sheet

Please change any information that is not current and fill in all blank fields.

SITE CODE: **SITE ID:** **DATE/INITIALS:**

SHELTER AND ROOF:

Type:

Door Dimensions (type of door and dimensions):

Climate control:

Wall Dimensions (height x width x depth):
N: E:
S: W:

Roof Style (shape):

Shelter Wall Material:

Roof Peak Heights (floor to inner peak):

Roof Material (material and shingle style):

Ventilation:

Wall	Size, Type and X,Y coordinates (0,0)=bottom left of inner wall
N:	
S:	
W:	
E:	

CONTROLLER AND MODULES:

Sample Configuration:

Cable lengths:

MOD Location (e.g. N Wall inside):

A: C:
B: D:

Filter Specs:
C (prim/sec):

Stacks:
Anodized:
Length:
Braces or guide lines:
Clearances:
A-B: C-D:
B-C: D-X:

BLBX Sequence:

Program Version:

MOD Height:
Floor to top of MOD:
Top of MOD to roof:

Temp Probe in MOD:

EBox Version

A: B: C: D: X:

Pumps:

Pump Location:

Pump Area Climate Control:

Dimensions of Pump Box:

Pump to RBOX distances:
A/B: X:
C/D:

RBOX to Outlet Distances:
A/B: X:
C/D:

Power:

Surge Suppressor:

Circuit Breaker:
Size (e.g./ 20A):
Location:
Outlets/Equipment:

Outlets:

	Wall	Type, Distance to CNTRLR and X,Y coordinates (0,0) = bottom left of wall
1		
2		
3		
4		

Surroundings:

Contamination (within a 300 yd. Range):

	Source (equip., unpaved roads, VC, etc.)	Distance from site: (straight line distance)	Direction: (due from site)	Frequency run: (days, times, avg. cars)
1				
2				
3				
4				

Clearance Violations/Issues

	Object (trees, buildings, equipment)	Distance from site: (straight line distance)	Direction: (due from site)	Height: (height of object)
1				
2				
3				
4				