Contractor Data

MAXI ONE
Positive Pressure
Microclimate Control Systems

Please note that these Preservatech machines do not operate on principles normally familiar to the construction trades, and this document should be carefully reviewed before beginning any Preservatech equipment installation.

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GENERAL PRINCIPLES

Maxi One Microclimate Control System is standalone device that are designed to provide a continuous flow of filtered air at constant relative humidity to display cases, storage cases, small archives, or other well-sealed enclosures.

Air Handling

This Control unit provide a continuous flow of air at a constant low pressure.
The air supply is a positive pressure feed only, there is no return flow.
Air from the unit is fed into the treated enclosures by an air delivery system consisting of
pipes, hoses, and adjustment valves.
Please note that the air flow is never delivered to the cases at RH levels higher or lower than the target RH setting. Appropriate RH levels are achieved by displacing the existing air in the enclosures with air at the target humidity. Unlike common HVAC techniques, the humidity modification is not accomplished by the addition of air
at higher or lower humidity levels which might endanger the case contents.

Air Distribution Layout

The air distribution system is an integral and major component of the Microclimate system. Correct design and layout of the air delivery system is vital to the operation of the microclimate control system. Correct pipe diameters, hose runs, valve design and locations, and placement of the safety dump valve and sensor must all be carefully planned. As the design of a Microclimate Control System is quite unique, common paradigms for laying out piping or air ducting are not applicable.
We strongly urge contractors to ensure that your pipe layout is supplied by an Engineer who thoroughly understands the particular low pressure design and valve requirements of the microclimate control systems. Failure to do so will cause delays, and may impinge on the correct and efficient operation of the system.

Control Capacity

The control capacity of the unit, and the range of humidity to be controlled will be dependent on enclosure size, enclosure leakage, air distribution system, average ambient temperatures and the degree and speed of ambient temperature changes. Typically, airflows can be supplied at an RH level below as 30% at ambient temperatures of 70 degrees F / 21 degrees C. High humidity levels are unlimited. Output variation at constant temperature is typically less than +/- 1%. Moisture content of the air will be automatically adjusted with changes in ambient temperature to provide constant RH.

Humidity and Temperature Sensing

The unit comes complete with a temperature and humidity sensor that must be mounted in the gallery. Data is returned by stranded wire to the control panel on the unit. Note that correct sensor (and dump valve) location are vital to the correct operation of the unit.

Wiring Requirements for Sensors & External Equipment

The wiring practices required for our Humidity Controllers, sensors, and external equipment is that for low-voltage instrumentation typically found in industrial process control or laboratory situations.
Summary:
• We require eight (8) multi colour conductors, stranded plated copper wire, foil shielded, twisted pair wire, with 18 AWG.
• A continuous wire should be run directly from the Maxi controller to each sensor or external device, and cable splices or excessive lengths should be avoided whenever possible.
• If instrument cables must cross over AC power and control cables, the two should be separated by an adequate distance, and the crossing should be made at right angles to minimize induction.
• If the cable length required exceeds 50 feet from the two connection points, then the Instrumentation cabling should be installed in conduits dedicated to instrument signals only.
• For maximum protection, install all instrumentation cabling in steel conduit because this type of conduit, when properly grounded, provides an excellent

electromagnetic shield as well as an inductive damping action due to the iron content.

Requirements for Wire and cable:

It's common to use twisted pair wire when wiring process control instrumentation to cancel the effects of electromagnetic interference. Twisted pair wiring is more resistant to electrical noise than untwisted wiring. A tighter twist (i.e. a higher number of twists per inch) results in greater immunity.
To add another level of protection from electromagnetic noise, a grounded shield is added over the twisted pair wires. When this is enclosed in a protective jacket, the package is called two-conductor shielded twisted pair cable, and this cable is recommended for most instrumentation field wiring.
There are typically two types of shields, the braided type and the foil type. Because it gives 100% coverage, the foil type is preferred. Be sure that shielded cable also has a drain wire, which is a bare conductor wound inside the cable jacket and in continuous contact with the shield. The drain wire makes terminating the shield easy.
The actual conductors in the cable should be stranded plated copper, and a conductor size of at least 18 AWG is recommended. Most instrument signals can be carried by wiring smaller than this, but keeping the conductors 18 AWG or larger increases reliability and makes terminations easier. The drain wire should also be stranded plated copper and should be at most one size smaller than the conductors, but again at least 18 AWG for reliability.
Insulation should be high-quality thermoplastic and rated for the voltage to be used (most instrumentation circuits operate below 30 VDC). The cable jacket should be rated for the intended use of the cable, and instrument cable is available for all of the common uses (e.g. conduit, tray, outdoors, direct burial, etc.). Also, be sure the jacket is resistant to any chemicals or oils that it may encounter. If the cable is to be run in conduit, make sure the jacket is of the smooth, slippery variety. The soft, rubbery jackets make pulling difficult and can lead to cable damage.
Fillers are nonconducting fibrous strands that are wound into a cable to fill any empty space. They are not usually used in instrument cable, but if fillers are present, make sure they are nonhygroscopic. This means that they will not absorb moisture and draw it into the cable, an obvious advantage.

Cable Terminations

Terminations are an important part of instrument wiring. Proper terminations result in reliable connections and help to eliminate problems like ground loops and electromagnetic interference. Instrument terminations are usually made to screw terminals or compression terminals, and either one can be made reliably. Two conductor shielded twisted pair cable is terminated in two different ways, with the drain wire connected to a terminal or with the drain wire cut off and insulated.

INSTALLATION DETAILS

Location of the Units

Units may be located in almost any location. We suggest that the units be located in a room complete with floor drain, a source of domestic water, an appropriate power supply, a fresh air supply for both heat dissipation and air intake, and adequate room for inspection and maintenance. Units are “portable”, and may be easily disconnected and moved as needed.

Clean Supply of Air

An adequate supply of fresh clean air should be provided to the room in which the Preservatech machines are installed to dissipate any heat generated by the unit, and to supply air for the display cases. The machines take air from the room in which they are installed and modify it to pass it along to the display cases. However, as pollutants and materials suspended in the air will be trapped in the unit’s filter and tank, we suggest that care be taken to provide a supply of clean air for the unit’s air intake. Direct intake of air from outside the museum should be avoided.

Plumbing Connections

The unit should be supplied with a supply of low mineral content water at normal domestic water pressures. Should the unit be installed where ambient humilities are consistently below desired case humidities, or where water is high in dissolved solids,
we strongly suggest the installation of a Reverse Osmosis filter or some other source of water with low levels of dissolved solids. Appropriate valve(s) should be provided for shut off, and to limit normal flow to the machine to a trickle. Supply piping should terminate in a standard compression fitting for ¼ inch flexible copper pipe.
A floor drain should be provided nearby for condensate drainage and use during maintenance.

Power

A standard 30 A NEMA L14-30 female outlet and disconnect should be provided within six feet of the unit.

Floor Space

The unit is shipped and installed on casters for ease of maintenance and repair. The floor or platform should be flat, smooth, and clear of obstacles. Each unit should be provided with a floor area of at least 4 X 6 feet / 1.3 X 1.8 m. In multiple unit installations, the floor area may be reduced to 4 X 4 feet / 1.3 X 1.3 m for each unit. There must be a drain in close proximity to the machines to ensure that any water spilling from the machine is contained and drained.

AIR DISTRIBUTION DESIGN

Air Distribution Design and Materials

Note that this is not a plumbing application- air in the distribution pipe moves at slow speeds and extremely low pressure. Use of appropriate materials and techniques will provide substantial cost savings when compared to conventional plumbing, sprinkler, gas, or HVAC installations.
All piping should be smooth walled, and bends should be large radius. While any material considered safe by the project's owner is acceptable, we suggest the use of copper drainage (thin walled) pipe as it is inert, poses no fire hazard, and has excellent heat transfer properties. As leftover acid flux from soldering may pose a problem for conservators, we suggest that appropriate remedial actions are taken to clean the pipes before use, or that other methods of securing the pipe fittings be used (eg. compression fittings, brazing, aluminum tape, glue, etc.).

Air Distribution System Trunk Line

Piping leaving the Preservatech Control unit should
be no less than 2 inch / 5 cm ID. The unit should be attached to the rigid distribution piping with a flexible hose. The hose should be appropriately supported so that it will not kink or sag.
A 2 inch/ 5 cm Trunk Line distribution pipe should begin at the Dump Valve, and extend along the entire route. The trunk line may be routed at ceiling level, beneath the floor, along the lower edge of a wall, or any location desired. The total length of trunk line piping, from the MCG unit to the last case, should not exceed 450 feet / 150
m. No more than TWELVE (12) 90° bends should be used in the Trunk Line.

Connecting the Trunk Line to the Treated Enclosures (DROPS)

Enclosures may be connected to the Trunk Line with smaller diameter copper piping or other flexible tubing. (Flexible tubing material must be acceptable to the conservator) Connections to the Trunk Line may be done by using standard plumbing fixtures ("Tees") and copper pipes should terminate in a fixture with standard male pipe threads. (Finished drop terminations should be protected from damage, or from the entry of dust or dirt.)

The following chart will assist in designing drops. Note that a smaller case can be fed from a single drop, and larger cases should have multiple drops. Longer drops should
use a larger diameter pipes. Avoid tight bends if possible.

Drop Sizing Recommendations

Enclosures up to 350'$_3$/11m$_3$ volume

	½ "/ 12mm	feed ¾ "/ 20mm feed
connection	ONE – 25'/ 8m or less	ONE – 40'/ 13m or less

Enclosures up to 700'$_3$/25m$_3$ volume

	½ "/ 12mm	feed ¾ "/ 20mm feed
connection	TWO - each 25'/ 8m or less	ONE – 25'/ 8m or less

Enclosures up to 1200'$_3$ /40m$_3$ volume

	½ "/ 12mm	feed ¾ "/ 20mm feed
connection	FOUR - each 25'/ 8m or less	TWO – each 25'/ 8m or less

Enclosures up to 5000'$_3$ /165m$_3$ volume

	½ "/ 12mm	feed ¾ "/ 20mm feed
connection	inquire	inquire

Each connection from the Trunk Line to an enclosure should have no more than FIVE
(5) 90° bends.

Air Distribution System Balancing Valves

Valves for balancing air distribution must be mounted on the input line to each case. They should be positioned within easy reach, each valve should be close to the enclosure to be treated.
We suggest that one of Microclimate Technologies' proprietary balancing and flow adjustment valves be used. (These valves offer a combination of multiple flow control methods as well as built-in facilities for measuring flow to the enclosures and testing input.) Alternatively, you may install a proportional valve and flow meter on each termination

Any proportionally adjustable valve may be used (eg needle, gate, proportional ball valve, etc.). Note that regular plumbing valves (eg regular ball valves) do not offer the fine adjustments needed for balancing case flows.
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Air Distribution System Dump Valve

The Dump Valve should be located on the trunk line as close to the first case as possible. The Dump Valve may be mounted directly on the Microclimate Control unit only if the maximum distance of the Sensor Air Feed Connection (see below) does not exceed 40 feet / 13 m.

Sensor Box Air Feed Connection

An air feed line for the sensor normally initiates at a fitting just before the Dump Valve and extends directly to the sensor box. Use copper piping, 3/4'" diameter.

Ideally, the feed pipe should run through gallery air at ambient temperatures. Take care to avoid hot or cold sources that could modify the temperature of the air feed.

Sensor Box Location

The Sensor Box must be located in the gallery in an area which exhibits the same ambient temperature as the temperature of the showcases. Any changes in temperature of the showcases should be reflected at the Sensor Box. We suggest location of the Sensor Box on a wall about seven feet above floor level, although a variety of other locations may prove adequate.

WHEN PLACING THE SENSOR BOX, IT IS IMPORTANT TO AVOID:

- locations at different heights from the cases
- locations where bright light will affect temperature (eg sunlight or spot lighting)
- locations near windows or on outside walls
- locations where a nearby heating or cooling vent, or a radiator will affect the Sensor

Air Distribution System Electrical Connections

An eight wire, twisted pair stranded copper wire should be provided from the Maxi unit's location to the location of the Sensor Box. Runs should not exceed 175 feet / 55 m. Wires should be clearly labeled.
Any extra wire used in the run should be coiled. Coils must be placed only at the initiation and termination of the run (avoid hidden coils of excess wire as they will change the wire's electronic characteristics). If possible cable should be run inside the sensor air supply pipe.

Sensor Box Wire and Supply Tube Terminations

If the wire and air supply to the sensor box are terminated on a wall, the air supply should terminate in a normal pipe thread fixture at just above the surface of the wall. The wire should extend at least four feet / 1 m from the wall and should be coiled and labeled. Correct terminations for all wires in multiple unit installations should be verified.
Similar procedures should be followed for unusual locations of the sensor box, allowing easy connection to the air supply and an adequate length of wire.

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