THE BUBBLE: Controlled Atmosphere Treatment at Historic New England

Presented by Historic New England Collections Technician Adam Osgood

HISTORIC NEW ENGLAND
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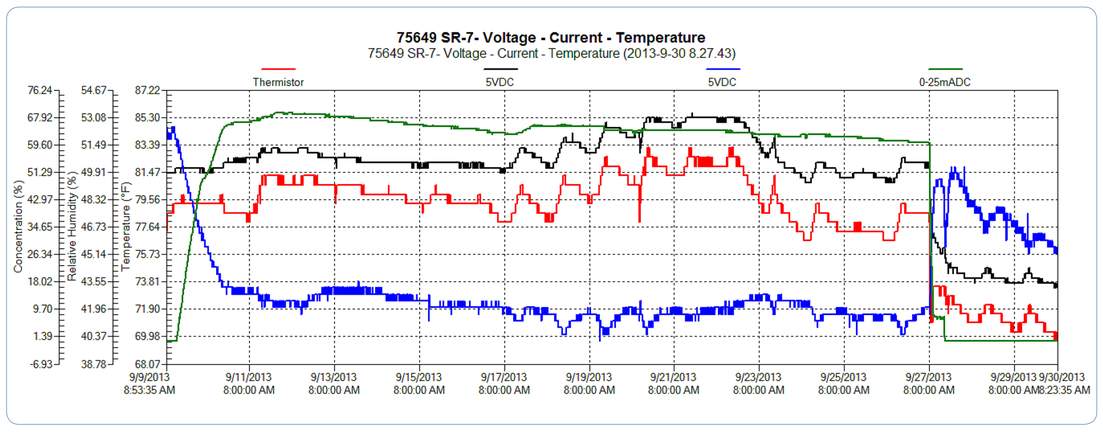
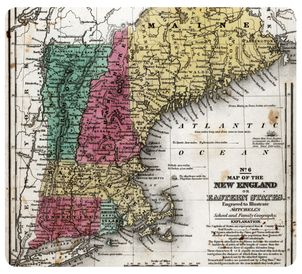
Historic New England has been using a controlled atmosphere treatment facility, "The Bubble," utilizing carbon dioxide (CO_2) for pest remediation in museum collections since 1992. This safe, effective method is widely accepted in cultural heritage preservation.

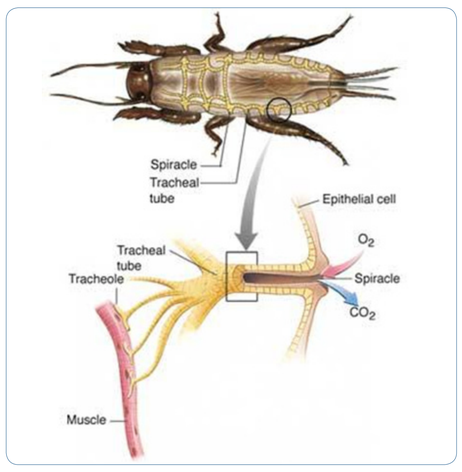


The principle of the treatment is to replace the existing atmosphere, which is roughly .04% CO_2, inside a sealed chamber or The Bubble with a CO_2 rich atmosphere targeted at 60 - 80% CO_2. This atmosphere is then sustained for two to four weeks to eradicate museum pests in collections objects. Note the **green line** on the graph (CO_2 levels inside The Bubble). The process of reaching proper concentration is done slowly and is carefully monitored to ensure the safety of the objects by preventing dramatic shifts in Relative Humidity and Temperature. Note that the **blue line** (RH) decreases at a gradual rate, while the **black line** (Bubble interior temperature) and the **red line** (room temperature) are sustained at around 80° Fahrenheit (27° Celsius) to help ensure efficacy and reduce treatment time.



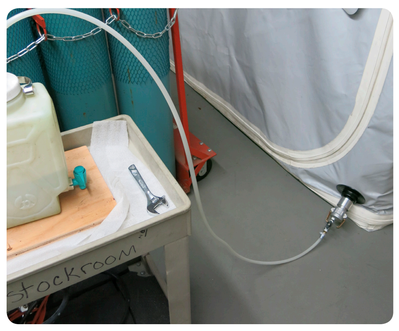
This careful and deliberate process of atmosphere control combined with close monitoring ensures that the treatment is safe for all types of materials.

Historic New England has been successfully treating for some well-known museum pests in the Northeast United States that can be very damaging to museum collections, such as clothes moths, carpet beetles, and wood borers, to name a few.



While this type of CO_2 treatment is sometimes confused with anoxic treatments like oxygen scavenger, nitrogen, and argon systems, it is actually not true anoxia. The physiological effects on insects of a high CO_2 and a low O_2 treatment are similar. In both instances, the insect opens its spiracles widely, releasing moisture and terminating through desiccation.

Historic New England has more than twenty years of operational experience with its CO_2 system and has run nearly consecutive monthly cycles since the facility's beginning. Over these years Historic New England has refined its operation, which was originally established from the guidelines from the Getty Conservation Institute's 1998 publication *Inert Gases in the Control of Museum Pests*. The treatment chamber's membrane or "The Bubble" is made of PVC, has clear plastic windows at the sides to visually monitor objects, and a flap ziplock door which allows for wide clearance and relative ease in opening and sealing.



There are two ports for atmosphere exchange. One at the bottom for CO_2 introduction allowing the denser gas to enter low and build or "layer" up gradually as the existing lighter atmosphere is replaced.

The second port is at the top allowing for the replaced, lighter atmosphere to be forced out and exit the building by hose as the dense CO_2 reaches concentration.

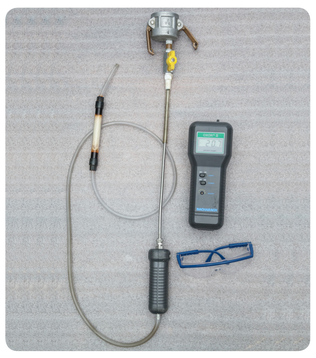
The CO_2 introduction system begins with a regulator attached to the CO_2 canister. CO_2 is extremely cold when released so a heating element prevents the gas from freezing in the hoses.

The heated CO_2 flows through a humidification tank into the chamber at a rate of 5-20 PSI. This slow rate of warming, humidification, and introduction ensures that the cold, ultra-dry CO_2 does not rapidly affect the environment in the chamber and do possible damage to the vulnerable museum objects.

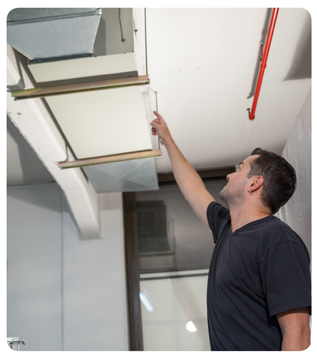
During the entire treatment cycle, oxygen, CO_2, relative humidity and temperature are monitored and adjusted using a variety of instruments and supplemental systems which ensure efficacy and safety for the collections.

Gas monitor tethered to computer for data collection and analysis.

CO_2 sensor for room monitoring and personnel safety.



Manual oxygen analysis system.



Supplemental heat system.

Electronic steam humidification system.

Power vacuum unit.

Sensors that monitor oxygen, relative humidity, and temperature inside The Bubble.

Once the treatment is complete the CO_2 can be removed from the facility and the materials can be handled immediately.

Archivists wrap arms around shrine

Marathon bombing memorial gets museum treatment

By KATIE EASTMAN

On the third floor of the Boston Athenaeum in Haverhill, there are boxes stacked high full of stuffed animals, sneakers and American flags. One box, marked with a sticker, says "Martin Richard's Cross."

"This is the first time we've had to deal with some like this of candy bears," said Adam Osgood, piling small white boxes.

Osgood is the collection technician for the Historic New England Society. But Thursday's work involved more artifacts from bombsite of years ago. These items are just months old.

"I think it's a very emotional thing that should be treated with care," said Osgood, holding up a stuffed animal with "Boston Strong" written on its stomach.

When the Marathon bombing memorial sprang up in Copley Square, the museum community came together to volunteer their services.

Since then, the thousands of items went to Polygon, a company that dries material in a dehumidification chamber. Historic New England then put everything in their fumigation bubble where carbon dioxide kills any kind of insect or larvae for two to three weeks.

Once they're treated in Haverhill, Polygon will drive them back to the Boston City Archives where a team will decide how the items will be archived.

"We saved everything, nothing got thrown out," said Polygon Project Manager Brian Rousseau.

"We hope to see something that is going to show what the people did, a little bit more than a statue."

For the video report, go to bostonherald.com

COMMUNITY OUTPOURING: Adam Osgood, left, collection technician for the Historic New England Society, prepares to dry-freeze items left at the Boston Marathon bombing memorial, top, to be treated in a fumigation bubble where carbon dioxide kills any kind of insect or larvae, above. The collection will be archived.

Historic New England's controlled atmosphere treatment facility has played an important role in providing services to major cultural heritage institutions, art dealers, and private collectors throughout the Northeast United States. Through the operation of this important facility Historic New England continues to fulfill its mandate to serve the public. The institution was honored to play a role in a special project involving the rescue and treatment of the spontaneous memorial that immediately followed the Boston Marathon bombing in 2013.