Mason-Grant
CONSULTING

Troubleshooting Humidity & Moisture Problems in Buildings

Hands-On Continuing Education For Facility Engineering, Operations, Maintenance & Management Professionals

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Hands-On Training For Facility Maintenance & Management Professionals

Background

Troubleshooting humidity control and moisture-related problems in commercial and institutional buildings requires a variety of technical skills, along with analytical expertise that is not widely available through secondary or post-secondary education.

Hands-on Training

Mason-Grant Consulting and Camroden Associates offer a three-day course to meet the needs of busy building professionals who have real-world problems which need prompt and economical solutions. The course includes:

- On-site measurement and diagnosis of a local building, which has a history of humidity control concerns, selected by the client organization.
- Post-investigation generation of course materials (on site) which explain the analytical techniques and instrument measurements which are relevant to understanding and fixing the humidity control problems of the local building in question.
- Hands-on training for the specific instruments which local technicians will use to diagnose not only the building in question, but also other local buildings with similar problems.
- Post-instruction hands-on test which allows managers to assess the degree of instrument familiarity achieved by the technicians who attend the training.

Intended Audience & Instructional Approach

The course is designed for primarily for facility operations and maintenance technicians who are asked to "fix that humidity problem before Friday." The instructional approach is optimized for those who have a strong kinesthetic learning abilities—those who learn best by *doing* rather than by reading or listening to lectures of abstract concepts.

Other building professionals such as engineers, architects and facility managers may also find this instructional approach a refreshing change from the usual sit-and-listen style of technical education. But this course is focused on direct observation of a building, along with direct, hands-on use of the instruments which measure the critical aspects of HVAC system and building enclosure performance.

Course Description

The basic course is designed for three (3) full 8-hour days, with an optional 4th day for investigation and diagnosis of a second building.

Our instructors arrive the day before the three-day course, to meet with the client's on-site course manager and logistical coordinator to:

- Collect and inspect the instruments and supplies previously shipped to the site.
- Plan the details of access to the target building as well as its mechanical systems and the key subassemblies of its building enclosure.
- Arrange for and inspect the work/instructional space in a quiet area in—or within short walking distance of—the target building. The space needs to be large enough to comfortably seat the intended class size, and quite enough to allow clear communication without electronic amplification.

Day 1 - Inspect, investigate and understand the target building
On day one, the instructors will work with a small group of two or three supervisory and engineering personnel to fully investigate and diagnose the humidity and moisture problems of the target building. The goal of day one is to understand the building's problems well enough that it can be used on day two to instruct the much larger group of course attendees. Day one generally consists of five parts:

1. Tour the building, including all mechanical spaces, problematic locations and hidden spaces of the building enclosure.
2. For the benefit of the supervisory and engineering group, describe the relevant analytical techniques and instrument procedures which will be used to fully diagnose the problems and their causes
3. Proceed to use the techniques and instruments selected by the instructors, so the group can see the instruments and measurements in real time.
4. Collect and understand the results of measurements and discuss possible solutions to the now-defined problems.
5. Plan the site visit and instructional sequence for the larger group which will be conducted on day two.

Day two - Use the building as a real-time instructional case history
On day two, the larger group of attendees will assemble at the building to learn the techniques and instrument procedures that have been determined to be useful for the building in question on day one. The goal of day two is to transmit relevant knowledge to the larger group, based on the clear understanding gained by the efforts of the 1st day.

By narrowing the focus to those techniques and instruments that are really relevant *to the problematic building*, we avoid the boredom and frustration that comes from overly-broad, abstract theory with is not relevant to technicians. Day two proceeds in four stages:

1. Walk through the building with the trainee group, pointing out relevant areas of concern compared to areas and issues which are not relevant to the building's humidity or moisture problems.
2. Describe and show the techniques and instruments which will be used to diagnose the problems.
3. Proceed to use and demonstrate the instruments and analytical techniques known to be relevant to the building's problems.
4. Discuss the results, and plan possible solutions in light of the day's investigations, including any alternate observations and solutions not uncovered by the smaller group on day one. This is real-time, participatory diagnosis and solution planning which fully involves the entire group of building technicians and professionals.

Day three - Building hands-on skills - Understanding and using tools, instruments and techniques
On day three, the goal is to give all attendees hands-on, repetitive use of the instruments, tools and techniques needed for diagnosing and quantifying humidity and moisture problems, and planning solutions to those problems. Attendees will work in groups of two or three such that they all personally set up and use these instruments and techniques:

1. Blower door and IR camera for building enclosure leak detection and quantification.
2. Flow hood for measuring air flow in the different parts of the building's HVAC and exhaust systems.
3. Duct blaster for measuring air leakage in HVAC systems and smaller building spaces.
4. T/rh instruments and dataloggers and associated software for measuring air conditions both as spot measurements and trends over time.
5. Tools and supplies for sealing up air leaks in building enclosures and in HVAC systems.

Optional Day four - Additional buildings
If the client chooses to contract for a 4th day, our instructors will work with the newly-trained technicians and supervisors to investigate problems and recommend solutions in other buildings owned or operated by the client organization. The critical point to keep in ind is that to be effective, members of this team must have easy access to all parts of the target buildings and their mechanical spaces. (Locked doors do not permit useful investigations)

Optional anonymous web-based skill-retention test
No sooner than seven (7) calendar days after day three, attendees may take a quiz on the Mason-Grant website which will test their retained knowledge of the information learned during the three days of training. The quiz will include both general skill retention and also the specific information learned about the target building. The goal of the test is not to embarrass the attendees (who may not all be adept at test-taking), but rather to reinforce the information they learned during the hands-on training, providing them with the self-confidence necessary to use these tools and techniques on other buildings in the future.

Instructors

Lew Harriman
Lew Harriman is Director of Research at Mason-Grant Consulting in Portsmouth, NH.

Prior to his commercial and industrial experience, Lew served as a Captain in the USAF. He was assigned as Housing Management Officer in the Engineering & Services Directorate of the Strategic Air Command at both base and major command levels between 1971 and 1976. Since that time, he has spent 35 years researching and solving problems related to humidity, moisture and energy in buildings and industrial processes.

Over the last 35 years, he has developed and presented more than 15 courses for organizations such as ASHRAE, NACE International, MFMA, AIA, RIA, GSA, USAF and corporate clients, instructing more than 10,000 engineers, architects, operating and maintenance technicians and property managers in various aspects of building technology, energy optimization, humidity control and moisture management.

In 2002, Lew was the lead author and project manager for the ASHRAE Humidity Control Design Guide, the first book to deal specifically with the issue of humidity control in 100 years of the society's history. That book has also been translated into Japanese and published by the Japan Society of Refrigerating and Air Conditioning Engineers. In 2011 the book is being translated and published in Mandarin as well.

In 2006, Lew was the Chief Thermographer and lead author for the General Service Administration's Protocol for the Exterior Inspection of Building Enclosures Using Thermal Cameras. He also serves as a National Peer in GSA's Engineering Excellence program.

In 2009, Lew was the lead author and project manager for the ASHRAE Guide for Buildings in Hot & Humid Climates, a book which summarizes the experiences of building professionals in hot and humid climates around the world, and also summarizes ASHRAE guidance on ventilation, energy efficiency, thermal comfort and mold risk reduction with respect to hot and humid climates.

In 2010, Lew was elected a Fellow of ASHRAE. He is currently the Chair of ASHRAE Technical Committee 1.12 - Moisture Management in Buildings, and is also the Chair of the ASHRAE Position Document Committee on Indoor Mold.

Mike Clarkin
Mike Clarkin is the lead Building Envelope and Indoor Air Quality Specialist for Camroden Associates. He has served in this capacity for over 20 years.

Mike provides building envelope air tightness design assistance to A&E firms, Design/Build firms and others involved with designing and constructing large facilities which must meet a building envelope air tightness specification. Work typically includes conducting:

- On-site inspections of building envelope and air barrier installations during construction.
- Building pressurization tests to determine building envelope leakage rates.
- Infrared thermal inspections to identify thermal insulation irregularities and locate building envelope air leakage sites.

Completed projects include facilities built for the United States Army Corps of Engineers on military bases across the nation, public and private schools, universities and colleges, and facilities built for local and state government agencies.

In addition. Mike is an Indoor Air Quality Specialist. Projects typically include conducting indoor air quality investigations for diverse clients including private sector clients, school administrations and local and state health departments.

Completed projects include national level research and development projects for the United States Environmental Protection Agency and the New York State Energy Research and Development Authority concerning indoor radon issues in residential, commercial and institutional buildings. Projects also often include investigating the cause, extent of and remedial actions needed to solve mold growth in residential, commercial and institutional buildings.

Mike's experience (1971-1980) has included assignment to Okinawa and Japan as United States Marine Corps Avionics Work Center Supervisor/Staff Non-Commissioned Officer. While serving in the Corps, Mike supervised and directed Avionics Work Center maintenance efforts on McDonald-Douglas A-4 Skyhawk attack aircraft. As a Designated Non-Crew Member, Mike flew back-seat in McDonald-Douglas A-4 Skyhawk attack aircraft to perform in-flight diagnostics and repair of aircraft at remote sites.

Basic Course Costs (Current as of September 15th, 2011)
The basic cost for the course as described above is $18,000. The basic course cost includes time and expenses for auto travel, meals and lodging within four (4) highway drive-time hours of Portsmouth, NH. (See below for costs at more distant locations.)

Standard Options (Current as of September 15th, 2011)
Site conditions, training location and client needs can vary. To adjust the training program costs to specific on-site circumstances of facilities and local personnel training needs, the following standard options can be added to the basic program.

1. Optional 4th day instructor fee - $2500
2. Optional equipment use fees (Add outbound and return shipping costs to the costs below)
    a. Blower door with precision micromanometer - $200/day - (Quantity depends on target building)
    b. Duct blaster and precision micromanometer - $180/day
    c. Additional micromanometers - $100/day
    d. Hand-held ±2% RH Thermohygrometer - $75/day
    e. Digital air flow hood with three (3) frame sets - $300/day
    f. Digital data loggers for T/RH - $25/day each - (Quantity depends on target building)
3. Distant training site location cost adjustments
    a. Locations beyond four hours drive time in the 48 contiguous U.S. States, or Carribbean Islands or Eastern Provinces of Canada including Ontario, Quebec or the Atlantic Provinces - $500 plus tourist class air fare billed at cost (Ask Mason-Grant for quote on exact air fare required for your particular project before the project budget is final... air fares vary widely by time of year and location.)
    b. Locations in Alaska, Hawaii, Western Canadian Provinces, Western Europe, the Pacific, Australia/ New Zealand, the Middle East, India and Continental Asia - $1,000 plus tourist class air fare billed at cost (Ask Mason-Grant for quote on exact air fare required for your particular project location and time of year before your project budget is final... air fares vary widely by time of year and location.)
4. Optional supplemental instructional materials
    a. ASHRAE Guide for Buildings in Hot & Humid Climates - $55.00 each
    b. ASHRAE Humidity Control Design Guide - $75.00 each