

# Bill Warren, Building Science Consulting

## Resume March 2013

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Bill Warren is a nationally recognized building science expert, who has conducted more than 1,400 residential, commercial and industrial building investigations. In addition, Bill has developed and managed energy, indoor air quality and building performance projects for Advanced Energy, The US Department of Energy, The Duke Endowment, State Energy Office of North Carolina, Center for Neighborhood Technology, Building Codes Assistance Project, NC Cooperative Extension Service, Southface, The Energy Center at Appalachian State University and the Manufactured Housing Research Alliance.

From 2000 to 2003, Bill was the project manager for crawl space research and commercialization program, which was funded by the U.S. Department of Energy and Advanced Energy. This project has resulted in significant building performance improvements in the way crawlspaces are designed, constructed and repaired. Bill is co-author of the design guide: Closed Crawlspace: An Introduction to Design, Construction and Performance.

Since 2009, Bill has been a lead air barrier design and commissioning consultant on US Army Corps of Engineers new construction projects, including large barracks, child development centers, training and maintenance facilities and office buildings.

Bill's technical writing includes development of code adoption language, numerous technical reports, various technical guidelines, manuals and bulletins as well as magazine and journal articles.

As a trainer, Bill has developed and conducted professional architect/engineer CEU rated training workshops for the U.S. Department of Energy, state energy offices, nonprofit organizations, churches groups and home inspection agencies.

Bill's 30 plus years of building performance work includes previous employment at the U.S. Department of Energy, Center for Neighborhood Technology, Sud Associates Consulting Engineers and SunShares, mSolve, Southern Energy Management, and BWES Building Science Consulting.

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### PROJECT LIST

#### RESEARCH

- Project manager, Crawlspace Research and Deployment Project, a multi-year effort focused on improving the energy, moisture and indoor air quality performance of crawl space systems, co-funded by the National Energy Technology Laboratory/U.S. Department of Energy (NETL/DOE) and Advanced Energy. Executed day-to-day management of all research, deployment, reporting and financial activities.
- Project manager: Manufactured Home Fuel Switching Research. Developed and managed project to field test un-vented heater pollutant effects in 20 manufactured homes.
- Test team leader, ASHRAE research project: 1478-RP Measuring Air-Tightness Of Mid- And High-Rise Non-Residential Buildings. Recruited and tested buildings for this national research project. The testing is supported and paid for by ASHRAE Research, the Oak Ridge National Labs of the DOE and DuPont Building Innovations.

- Energy Use Characteristics of Existing Manufactured Housing. Assembled database and wrote report for field study, NC Alternative Energy Corporation.
- Pressure testing and repairs of manufactured homes. Protocol development: Rapid duct pressure testing, NC Alternative Energy Corporation.

**PROJECT DEVELOPMENT AND MANAGEMENT**

- US Army Corps of Engineers air barrier commissioning and testing: Large building air barrier design, Construction and performance testing for air leakage and thermography. Bill Warren, Senior consultant and team leader for sales, protocol, service and report template development: 60 plus building projects completed or in progress totaling 3 million plus square feet. 2009-current. Design-Build and Design-Bid-Build.
- Envelope and building science commissioning consulting for mold liability insurance coverage: Low to high rise condominium and office buildings; new construction, renovation and existing buildings. Project manager: Performed design reviews, construction progress inspections and loss control inspections. Projects located in AZ, CA, DC, FL, VA, MD, PA OR, and VA. for Zurich and Ace Insurance companies
- Local Government Energy Audits and Accounting Systems: Cities - Eden, Sanford, Troy; Counties - Rockingham, Guilford, Beaufort and Franklin for NC Energy Division
- Lead evaluator, NC's High Performance Guideline (LEED) Pilot Project. Reviewed 17 pilot building projects across the state. Findings presented to the NC Energy Office, NC State Construction Office, HPG committee and Triangle J Council of Governments.
- Prime Power Energy Management Survey program. Developed report, calculation templates, provided staff training, coordinated work and performed surveys on a total of 45 plus commercial, institutional and industrial facilities, Carolina Electric Cooperatives.
- Duke Endowment Weatherization, Self-Help Church Energy Conservation Managed multi-year project. Responsible for marketing, field surveys, material purchases, logistics and financial grant reporting. Trained and supervised church volunteers to install \$400,000 of thermostats, storm windows, insulation, lighting in 170 plus United Methodist churches, The Duke Endowment and NC Alternative Energy Corporation.
- NC Industrial Energy Audits: Food processing, furniture and textile plants, NC Energy Division. Managed audit assignments and contract. Assisted and conducted audits on over 40 plant facilities.
- Durham nonprofit self-help energy project: Fundraising, technical work, material purchases, NC Alternative Energy Corporation. Trained and supervised volunteers to install thermostats, storm windows, insulation, lighting improvements. Coordinated and reviewed HVAC contractor work.
- Facility Management Study, Chatham County Public Works Department, Project evaluated county buildings for energy conservation, maintenance, HVAC characterization, capital cost replacement, Pittsboro, NC 1998.
- Management consulting, job tracking and invoicing spreadsheet development, Environmental Quality Control, Chapel Hill, NC.
- Home energy audits: Energy audit protocol and spreadsheet development, NC Cooperative Extension Services.

**BUILDING SURVEYS, AUDITS AND CONSULTING**

- Institutional Conservation Program: Technical assistance energy audits, grant processing and implementation of energy conservation measures for NC schools and hospitals, NC Energy Division and U.S. Department of Energy.
- Low Income Housing: Performed load calculations that downsized Insider heat pumps for Goldsboro Public Housing, NC Alternative Energy Corporation.
- Residential Housing: Surveyed 40 plus new homes. Presented observations in interim review. Co-lead 2 public workshops on results, NC Alternative Energy Corporation.
- College Facilities Loan Program, Developed computer ranking strategy to obtain competitively awarded, low interest renovation loans for Lees McRae College (\$2.4 million) and NC Central University (\$3.0 million), U.S. Department of Education.
- Utility Bill Allowances: Evaluated 2 years utility bill data on 2,000 residences to establish surcharge levels for high energy use, Durham Housing Authority.
- Load calculations for heat pump replacements, Carol Woods Retirement Community.
- Nonprofit Energy and Building Health Surveys: Little Church on the Lane, Fries Memorial Church, Benvenue Baptist Church, First Presbyterian of Goldsboro, Church of the Good Shepherd, Blumenthal Jewish Home, Macedonia Moravian Church, Myers Park Baptist Church, Rich Square Friends Meeting, Pilgrim United Church of Christ, Chapel Hill Zen Center.
- Load calculations, Energy Seal Guarantee, Thermafiber industries
- Energy Star homes certifications for site built and manufactured housing.
- Green power White paper, NC Advanced Energy. This paper led the way to establishing NC Green Power: <http://www.ncgreenpower.org/>
- Building commissioning: Design consultation, plan review, and construction inspections for residences and commercial buildings including: New Durham Friends Meeting, NC Botanical Gardens Visitor Center.
- White Paper: Commercial Energy Star Opportunities, Energy Center at Appalachian State University and NC State Energy Office.
- High Performance Building Guidelines Pilot Project Assessment. Design and as-built evaluation of 15 pilot projects, Energy Center at Appalachian State University and NC State Energy Office.
- Design evaluations of nonprofit and residential construction developments, Advanced Energy
- Envelope and HVAC commissioning, Maureen Joy Charter School gut rehab in Durham, NC for Self Help Credit union.

**CONSTRUCTION MANAGEMENT**

- Coordinated \$1.5 million dormitory renovation study: life safety, basic electrical and lighting, windows, and central A/C improvements, Fayetteville State University.
- Coordinated design, Cary Processing Recycling Facility, SunShares
- Construction project manager. Built 1,000 square foot solar greenhouse, supervised volunteer workers in low income neighborhood at the First Presbyterian Church, Woodlawn, Chicago, IL

**BUILDING CODES**

- Crawl space code commentary and compliance checklists for revised SECTION 408 and new SECTION 409, September, 2005, Advanced Energy

- NC Building Code Council and Moisture Ad Hoc committee 2003-04. Key witness on crawl space discussions. Wrote initial draft of revised SECTION 408 and new SECTION 409. Testimony contributed to revision of R322. Change makes vapor retarders optional for all but 6 mountain counties in NC.
- Building Codes Assistance Project: Conducted needs assessment of Southeastern states, energy codes status and implementation progress. Collaborated closely with code officials and state energy offices on strategy and progress assessment.
- Also see training experience.

**MANUFACTURED HOUSING**

- Manufactured Home Heat Pump Demonstration Program. Multi-year project to increase use of heat pumps in manufactured housing in the Southeast funded by the Electric Power Research Institute.
- Manufactured Home Ventilation Testing: Built test module to measure air flow rates through passive orifices: kitchen/bath fan ducts & wall vents. Manufactured Housing Institute

**BUILDING SCIENCE CONSULTING**

- Coordinated powered attic ventilator study, NC Alternative Energy Corporation
- Pressure diagnostics based evaluation of historic district sorority, Kappa Kappa Gamma, UNC-CH.
- Building science consulting, contractor training, work progress inspections and performance testing, Self Help Credit Union, low income housing development.
- Building science design review and construction consulting for low income, 104 multi-family apartment complex major rehab, Woodview Apartments, Urquhart Development, LLC.
- Building science evaluations of residences. Numerous evaluations of homeowner and tenant buildings.
- Combustion safety testing of nonprofit, multi-family housing, Rich Park Apartments.
- Combustion safety investigation of residences at Fort Gordon, GA.
- Energy and indoor air quality design development study for proposed Chapel Hill North indoor pool/recreational facility.
- Building envelope assessments for Camp LeJeune MCB ground source heat pump installations, Camp LeJeune, NC
- Moisture investigation: City Hotel and Bistro, Greenville, NC
- Moisture investigation: Taylor Glen Baptist Retirement Home, Concord, NC
- Moisture investigation: Cypress Creek Apartments, Cookeville, TN
- Moisture investigation: Captive Aire Plant, Wake Forest, NC
- Moisture investigation: Inspire Pharmaceuticals, Durham, NC
- Moisture investigation: Fuquay-Varina Town Hall, Fuquay-Varina, NC
- Moisture investigation: Goldsboro Housing Authority, Goldsboro, NC
- Moisture investigation: Snowed Branch Church of God, Washington, NC
- Moisture investigation: Brunswick County Government Building Campus, Bolivia, NC
- Moisture investigation: Sportsplex Recreational facility, Hillsborough, NC.

- Moisture investigation: Indoor Pool at Residence, Wake Forest, NC
- Moisture investigation: Carolina Power and Light, Henderson, NC
- Moisture investigation: Rose Hill Library, Wilmington, NC
- Moisture investigation: Cedar Rock Apartments, Chapel Hill, NC
- Moisture investigation: Crestline Homes, Fair Bluff, NC
- Moisture investigation: Riverbend Apartments, Charlottesville, VA
- Moisture investigation: Carteret General Hospital, Morehead City, NC
- Moisture investigation: Peace College Dormitory, Raleigh, NC
- Moisture investigation: Heydon Hall Community, Charlotte, NC
- Moisture investigations: Various residences
- Moisture investigations: Crawl spaces - various residences
- Moisture risk assessment: U.S Department of Transportation, Washington, DC
- Moisture risk assessment: Cosmopolitan Condominiums, Washington, DC
- Moisture risk assessment: Emerald Beach Resort Condominiums, Panama City, FL
- Moisture risk assessment: River Place Condominiums, Portland, OR
- Moisture risk assessment: Radius Condominiums, Washington, DC
- Moisture risk assessment: Artisan Condominiums, Washington, DC
- Moisture risk assessment: Silverton Condominiums, Washington, DC
- Moisture risk assessment: Myerton Condominiums, Washington, DC
- Moisture risk assessment: Missions at Sunbow Condominiums, San Diego, CA
- Moisture risk assessment: Missions at Rio Vista Condominiums, San Diego, CA
- Moisture risk assessment: Village Spires Condominiums, Vero Beach, FL
- Moisture risk assessment: Rio Vista Condominiums, Lincoln Harbor, NJ
- Odor investigation: Roanoke Electric Membership Cooperative, Rich Square, NC
- Odor investigations: Various residences
- Commercial photography: South of the Border website update, Dillon, SC
- Building science audit: South of the Border, Dillon, SC

**TRAINING**

- Large Building Air Barrier Design, Commissioning and Testing. Classes provided to USACE Fort Lee VA, Fort Bragg, NC Building Enclosure Council-Research Triangle Park, Advanced Energy (Chapel Hill and Charlotte). 2010 to present
- The Passions of the Crawl Space, VA Association of Real Estate Inspectors, Richmond, VA, October 2, 2010..
- Hot Topics in Residential Moisture Control, Amerispec Home Inspection, Inc. One day class presented in Memphis and Phoenix in 2008; and in Chicago, Orlando, and San Diego in 2005. 2009 NC Energy Code: Changes to the residential and commercial code provisions: Delivered to NC building code officials at various locations throughout the state.

- Energy Star/SystemVision for NCHFA Supportive Housing and Energy Star Affordable Housing Projects, Advanced Energy, October 2008.
- Property Managers Training for Managing Water Intrusion Certification, mSolve and American Risk Management Resources Network, Onsite locations DC, FL MD and VA in 2008.
- Mold, Moisture and the New NC Code Changes: Vapor Retarders and Crawl Spaces, NC Mechanical Inspectors Association, Morganton April 27, 2005 and Rocky Mount May 18, 2005.
- Energy Code and High Performance Building Workshops for residential and commercial buildings. Southface Energy Institute. Subject matter covers energy, moisture, mold, IAQ, comfort and durability. Instructed over 90 seminars (1-3 days) made since 1995 in GA, KY, NC, SC, TN, and WV. Target audience is architects, engineers, code officials and building inspectors. Instructor and course development collaboration.
- The Passions of the Crawl Space, Home Inspectors of Tennessee Association, November 13, 2004, Knoxville, TN. One-half day class on crawl space moisture control inspection and code issues.
- The Passions of the Crawl Space and Selected Reading from the IRC, 2004 National Workshop on State Building Energy Codes, July 21, 2004, Philadelphia, PA. Subject addressed beliefs and code barriers that have frustrated the widespread acceptance of closed crawl space designs and retrofits.
- High Performance Building Workshop and LEED, American Institute of Architects, North Carolina, Ashville, NC April 15, 2004. Subject mater covered LEED program requirements for commercial buildings, renewable energy update and energy smart schools.
- Healthy Housing Workshops for Affordable Multi-Family Housing series, a four workshop series (Mold and Moisture, High Performance HVAC, Healthier Housing and Build-It-Better) for Advanced Energy and NC State Energy Office.
- Crawl Space Research: A Whole New Way of Thinking, Pest World 2003, Dallas TX. Summarized moisture, energy and indoor air quality data from the crawl space research project.
- Building Science and the Code-Moisture Control, 2003 National Workshop on State Building Energy Codes, June 24, 2003, Atlanta, GA. Presented crawl space research data and review code barriers regarding closed crawl space assemblies.
- Dealing with Crawl Spaces, 2002 Affordable Comfort Conference, April 11, 2002, Cincinnati, OH. Presented preliminary crawl space research findings.
- Waste Heat Recovery and Energy Cost Management for Food Processing Plants, NC Energy Division.
- Heating, Ventilating, and Air Conditioning System Efficiency: A Guide to Controlling Costs, NC Alternative Energy Corporation.
- Institutional Conservation Program Auditor Training, NC Energy Division.
- 1997 Home Energy Conservation Calendar, NC Solar Center. Writer.
- Alabama Weatherization Association manufactured housing weatherization training.

**EMPLOYMENT HISTORY**

**1997-Now**

Owner and lead consultant for BWES Building Science, Chapel Hill, NC.

**2010- 2012**

Bill Warren is a senior building science project manager for Southern Energy Management. Bill provides high performance consulting, diagnostic work and training for commercial and for residential buildings.

**2005-2010**

Building Science Project Manager at mSolve Building Science Solutions, a division of Kestrel Management Service; a Madison, WI firm providing residential and commercial builders and building owners with risk prevention strategies, consulting and hands-on solutions to promote more efficient and moisture-managed buildings, including mold prevention.

**1992-1996**

Resourceful Buildings Program Manager, SunShares, Durham, NC

**1982-1992**

Project Coordinator, and Vice President for Development (1988), Sud Associates, P.A., Consulting Engineers, Durham, NC

**1980-1982**

Construction Manager, Center for Neighborhood Technology, Chicago, IL.

**1979-1980**

Energy Conservation Specialist, U.S. Dept. of Energy, Region V, Chicago, IL.

**1976-1978**

Multi-Craft Center Director, U.S. Peace Corps Volunteer, Fiji

**1975-1976**

Woodworking Foreman, Sunshine Design, Ludlow, VT

**1972-1975**

Construction Contractor, Trees Buildall, Inc., Ludlow, VT. New log home construction and renovation work in Vermont, Maine and New York.

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**EDUCATION**

Bachelor of Arts in English, University of Rhode Island, 1972 (RI State Scholarship, 1967-1971)

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**CONTINUING EDUCATION**

- Air Barrier Association of America Third Party Certified Auditor training, December 2011.
- Air Barrier Solutions - Sponsored by the US Army Corps of Engineers and BCRA Design, Richmond VA, September 2009
- Environmental Protection Agency: EPA WEB-based Mold Course, June 2009
- Sixth Annual NC Sustainable Energy Conference, Raleigh, NC April 2009

- North Carolina State Buildings Efficiency Conference - Requirements to Meet Senate Bill 668, Sponsored by the NC Energy Office and Appalachian State University Energy Center, Durham, NC, October 2008
  - Sponsored by the NC Energy Office and Appalachian State University Energy Center, Durham, NC, October, 2008
  - North Carolina Energy Star Conference, Durham, NC managed by the Appalachian Energy Center Dec 2007.
  - HERS Rater Training certification, 2002.
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**PUBLICATIONS**

- Davis, Dastur and Warren, Closed Crawl Spaces: An Introduction to Design, Construction and Performance, Design Handbook, Advanced Energy/U.S. Department of Energy. 2005.
- Davis and Warren, Field Study Pilot Report: A Field Study Comparison of the Energy and Moisture Performance Characteristics of Ventilated Versus Sealed Crawl Spaces in the South. Advanced Energy/U.S. Department of Energy. December 2001.
- Davis and Warren, Characterization Study Pilot Report: A Field Study Comparison of the Energy and Moisture Performance Characteristics of Ventilated Versus Sealed Crawl Spaces in the South. Advanced Energy/U.S. Department of Energy. December 2001.
- Davis, Warren and Rose, Technology Assessment Report: A Field Study Comparison of the Energy and Moisture Performance Characteristics of Ventilated Versus Sealed Crawl Spaces in the South. Davis, Warren, Advanced Energy/U.S. Department of Energy. December 2001