

FORCON INTERNATIONAL

CHARLES A. HANNING, III PE

SUMMARY

Mr. Hanning has more than 40 years of experience in all phases of mechanical engineering and construction. Mr. Hanning has successfully designed building systems for various federal, state and local agencies, as well as private companies. Over the years Mr. Hanning has been specifically sought out to provide expert design assistance and consultation for humidity control, forensic analysis, industrial ventilation, building envelope issues, and energy performance improvements.

The following are a list of system types that Mr. Hanning's areas of forensic expertise has included over the years:

- Building Automation
- Condenser Water
- Direct Digital Control
- District Utility & Distribution
- Dust Collection
- Foam & Other Fire Suppression
- High Pressure Air Distribution
- Low Temperature Air
- Natural Gas
- Radiant
- Water Harvesting
- Chilled Water
- Convection
- Direct Expansion
- Domestic Hot Water
- Electric Control
- Fuel-Fired Equipment
- Hot Water
- Material Handling
- Pneumatic Control
- Steam & Condensate Return
- Water Treatment
- Compressed Air
- Dedicated Outside Air
- Direct Expansion
- Domestic Water
- Fire Protection
- Heat Recovery
- Liquid Propane Gas (LPG)
- Medical Gas
- Process
- Ultraviolet Disinfection

EDUCATION

Bachelor of Science in Mechanical Engineering – University of South Carolina, Columbia; 1977

REGISTRATIONS & CERTIFICATIONS

Registered Professional Engineer:

- Alabama
- Georgia
- Mississippi
- Pennsylvania
- South Carolina
- Tennessee

PROFESSIONAL ASSOCIATIONS

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); Member
National Society of Professional Engineers (NSPE); Member

CAREER HISTORY

FORCON International – Mechanical Engineer

Providing forensic investigation analysis and expert witness services as it relates to his fields of expertise.

Expert Consultations, LLC – Senior Mechanical Engineer

Responsible for mechanical designs of projects, this includes working with clients, writing proposals, and negotiating contracts. Projects include central plants, health clinics, retail developments, and industrial. Provides services as a forensic consultant and expert witness on selected projects.

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Rosser, International – Mechanical Engineer Principal & Vice President

Responsible for office operations and mechanical designs of projects. Worked with clients, wrote proposals and negotiated contracts. Projects included labs, industrial, health care, correctional and educational.

Ivey Electric – Mechanical Engineer

Responsible for the sales, design and servicing of energy management systems sold by the company. Work included client contacts, proposals for the proposed system including pay back, design and oversee construction.

Lockwood Greene Engineers – Mechanical Engineer

Responsible for HVAC designs of Government and manufacturing projects.

Southwire Company – Mechanical Engineer

Responsible for mechanical and plumbing designs for educational and office projects designed through a joint venture with a local Architectural firm. Worked on HVAC issues within the plant to develop solutions in space comfort and some emissions control. Traveled to Venezuela plant to correct mechanical issues within the new plant.

Harley Bag Corp. – Mechanical Engineer

Responsible for upgrades to existing printing press and bag making machines. Helped to develop preventive maintenance program. Designed test equipment to detect pinholes in thin wall plastic containers produced at Harley Bag.

HIGHLIGHTED PROJECT EXPERIENCE BY TYPES

Excessive Humidity in Construction

- (2012) FORENSIC LAB had experienced high humidity if the labs and odors were throughout the building. Upon investigation it was discovered that the air handler serving the building was returning air from the labs as well as the office areas. In addition, the make-up air to the fume hoods in the labs was not conditioned and was ducted to the hood from a make-up air unit dedicated for each fume hood. A design was developed and implemented to correct the issues and meet Code.
- (2011) CAFETERIA AT AIRCRAFT SERVICE CENTER had been experiencing large temperature swings and humidity issues in the cafeteria and kitchen. Upon investigation, it was discovered that the same air handler served the kitchen and cafeteria with a single thermostat. In addition, the make-up air for the kitchen hoods was not treated. A design was made to add an air handler for the kitchen and a unit to pre-treat the make-up air to the hoods. The design resolved all issues in the cafeteria.
- (2008) MEDICAL OFFICE BUILDING in Savannah Georgia experienced high humidity levels in the spaces. After examination of the construction and air conditioning systems it was Discovered that the vertical wall between the mansard roof and the space above the ceiling did not have a vapor barrier to prevent humidity from the soffit vents from migrating to above the ceiling. A corrective action was reached and implemented to resolve the issue.

Rehabilitation of Abandoned or Obsolete HVAC Equipment

- (2014) A MANUFACTURING COMPANY LABORATORY moved into an old lab used by the US Customs Department in Savannah, Ga. The existing building had several humidity issues that needed to be corrected. All HVAC equipment was replaced except for the chiller. All HVAC equipment was increased in capacity to handle the increased amount of fume hoods in the new layout. The project included a storage shed for over 80 cylinders of compressed gasses used in the lab. All gasses were piped into the labs and connected to point of use panels. All gas pipes were ¼” stainless steel tubing and installed in a pipe rack that was part of the design.
- (2011) A COUNTY COURTHOUSE had an HVAC system that was at the end of useful life and was not able to shut down to have components replaced. The facility had recently had a pitched metal roof installed over the existing flat roof. The new HVAC design included a new addition at the rear of the facility to house a new air handler and chiller yard. New medium pressure duct was routed through the attic space and dropped through the roof at several locations without shutting down the facility. The next phase included moving departments to a large meeting room while the VAV boxes and ductwork was installed. Once all the areas were finished the old air handlers were removed and the spaces were renovated for additional office space dropped through the

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roof at several locations without shutting down the facility. The next phase included moving departments to a large meeting room while the VAV boxes and ductwork was installed. Once all the areas were finished the old air handlers were removed and the spaces were renovated for additional office space.

- (2008) HIGH RISE SENIOR LIVING FACILITY required the replace of 40-year-old Mechanical and Plumbing systems in a 12-story facility in Jacksonville Fl. The existing HVAC system was a 2-pipe hydronic system with riser pipes routed in chases vertically through the building. Due to the mild climate the new system was designed to be a chilled water system with small strip heat in each unit since the chiller was new and the old boiler needed replacement. The contractor opted to renovate the occupied building on a floor by floor bases and with the Mechanical systems routed vertically provided several challenges during construction. As the chases were opened it was discovered that the main risers for the Mechanical and plumbing systems required replacement. The design was modified, and work continued to provide the seniors living in the facility a new and renovated space.

Indoor Air Quality and Human Comfort

- (2013) A MEDICAL OFFICE had issues with uneven temperatures across the office and issues with mold in some spaces and odors in others. The facility was comprised of several additions and different HVAC systems over the years. A study was performed to determine the causes for the issues the facility was having. It turned out that HVAC equipment sizing and proper outside air was the cause of the complaints. Recommendations were made to correct the issues through different HVAC equipment and air distribution modifications. Due to funding issues the study was never acted upon.
- (2000) A COUNTY COURTHOUSE was experiencing temperature swings through the 6- story facility. The facility was constructed in 1976 and at the time had the latest in controls installed. Over the years the controls manufacturer had ceased supporting the older technology and Owner changes in the building had had not allowed for proper air distribution. In addition, ventilation Codes changed. All of these facts resulted in the problems they were having. The building was served by 2 cooling air handlers and 1 heating air handler. With the changes in building and Code changes the design indicated that additional airflow was needed. Since the facility could not be shut down a plan was devised that allowed the building to remain occupied except for the floor that the changes were occurring. A 4th air handler was installed on the roof to serve the 3rd and 4th floors while the existing AHU-1 serves the 1st and 2nd and AHU-3 server the 5th and 6th. The revised air distribution system was a dual duct VAV system since the Owner did not want to route hot water pipes through the building and the power service in the building could not support strip heat. During the construction, all the medium pressure ductwork was cleaned, and all low pressure was replaced. After construction, the comfort level and air quality were greatly improved.
- (1996) CLUBHOUSE had issues with condensation, mildew and air devices falling out of the ceiling. During a site visit to the facility and review of the construction documents, the source of the problem was revealed. The areas with the most condensation issues were where 10-ton units with a single compressor were installed. This fact resulted in short-cycling of the units and an inability to properly dehumidify the air. A lack of proper duct insulation at some diffusers resulted in condensation around some air devices installed in sheetrock ceilings allowing the fasteners to give way in the wet sheetrock and allow the air devices to fall out. Due to the Owner's budget, the units were not changed out, so a dehumidification mode was proposed for the systems to allow the existing equipment to run longer and dehumidify the space.

Building Envelope Failure

- (1990) ELEMENTARY SCHOOL had issues of mold and mildew growth through the school. A complete investigation of the HVAC system and building structure was made. It was discovered that at several locations where additions were made the soffit areas were not properly sealed from the occupied spaces. Recommendations were provided to the Owner for execution.

Mechanical Design

- (2013) A COLLEGE PARADE FLOAT was desired by a local college and the design was started to resemble a pirate boat. The plans had to consider highway regulations for movement to events as well as occupants on the float. The frame was assembled on an aluminum boat trailer with tubular aluminum. The boat deck was aluminum checker plate to prevent occupants from slipping. The exterior was thin wood siding covered in a rubberized coating and then painted to resemble a wood boat. The float was a hit in the parades in entered.

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- (2011) AIRCRAFT MANUFACTURER had a compressed air filter mounted on wheels that was used during a test of the aircraft. They requested to have the cart and construction documented for uniformity of construction at other facilities. The documents were completed and then they requested that all components related to this test be documented as a process. Documents were then developed for each component and the process. This documentation was for the equipment only and not related to the aircraft test. The documents have been sent to other facilities with great success.

Piping System Failures

- (2003) UTILITY COMPANY had a relay facility that had a pipe rupture and flood the facility. An investigation was made to the facility and testing of the CPVC pipe that was installed. The contractor at the site was interviewed as to how the pipe was cut. It was determined that the 2" pipe that ruptured was cut with a ratchet cutter instead of a saw as recommended by the pipe manufacturer. In addition, a close look at the failed pipe revealed fractures on opposite sides of the pipe as a result of the ratchet cutter being used. The documents and reports were turned over to the Owner.