



*Curriculum Vitae*  
**MATTHEW A. CARR, Ph.D., P.E.**  
President MCES Forensics, LLC, and Senior Engineer

## **EDUCATION**

Ph.D., Mechanical Engineering, The Catholic University of America, Washington, DC  
M.S.E., Civil - Environmental Engineering, The Catholic University of America, Washington, DC  
M.E.A., Engineering Administration, The George Washington University, Washington, DC  
B.S., Ocean Engineering, United States Naval Academy, Annapolis, MD

## **REGISTRATIONS**

Registered Professional Engineer, State of Maryland  
Registered Professional Engineer, Commonwealth of Virginia

## **FIELDS OF EXPERTISE**

Mechanical and Civil Engineering (structural and environmental). Forensic Analysis, Engineering Design, Project Management, and Operations & Maintenance of Facilities and Energy Systems including various fuels and combustion appliances. Additional areas of expertise include engine machinery, piping and plumbing valves and instruments, HVAC, marine propulsion, power plants and nuclear power systems, codes and standards.

## **PROFESSIONAL MEMBERSHIPS**

American Society of Mechanical Engineers (ASME)

## **WORK EXPERIENCE**

### **Engineering Consultant 2001 – present:**

Consulting engineering services in Mechanical and Civil Engineering. Forensic analysis of mechanical and structural system and equipment failures; design, maintenance and control of machinery; boilers, furnaces and related fuel systems; radiant heating systems; chillers and related refrigerants; heat pumps and geothermal systems; HVAC - forced air systems; ducting and zoning; indoor air quality (IAQ); plumbing and related pipes and valves, water well/hydrogeology, soil contamination, supply, waste, venting, water intrusion and freeze-related issues, and storm water systems; automotive and marine power systems including electric generation and propulsion; residential and commercial construction; construction codes and other regulatory requirements (OSHA, MOSHA, et al.); and project management.

### **Professor of Mechanical Engineering 1998 – 2020:**

#### *United States Naval Academy*

Taught thermodynamics, fluid mechanics, energy conversion, design engineering and project management courses to undergraduate students. Lead author/editor for the course textbook, “Naval Engineering – Propulsion and Auxiliary Systems.” This textbook is for a course taught to approximately 700 students per year and covers the engines used in naval applications: diesel, gas turbine, conventional and nuclear steam; combustion of fuels; auxiliary systems such as HVAC, psychrometrics, refrigerants, vapor compression chillers; lube oil; and desalination; and components such as heat exchangers, pumps, valves, and instruments. Program coordinator for extensive facility modifications and new construction projects in the School of Engineering. Offshore Sail Training Squadron (OSTS) instructor and officer-in-charge (OIC) of “Navy-44” sailboats during small group leadership training.



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**Senior Design Engineer 1991 – 1998:**

*Baltimore Gas and Electric Company*

Technical evaluation of existing plant facilities; design of modifications to repair and upgrade a twin reactor nuclear power plant; and ensured compliance with codes, standards, and licensing documents in an exacting regulatory environment. Design engineer in a project matrix organization for various HVAC-related projects; cranes and other load handling systems; various civil-environmental projects including NPDES permit compliance, dredging plans, and constructed wetlands; and nuclear safety-related structural restoration projects including seismic compliance. Management of maintenance activities during plant nuclear refueling outage periods. Significant forensic experience with various root cause analysis techniques involving material and human factors failures and near-misses.

**County Engineer 1989 – 1991:**

*Charles City County, Virginia*

Facilities management of all County government facilities and capital improvements projects; design oversight and environmental permitting for the first community water treatment facility in Virginia to use reverse osmosis technology; management of water/well and sewer utility systems including a zero-discharge wastewater treatment plant; and contract administration for and monitoring of design, construction, and operation of a state-of-the-art, regional sanitary landfill and its associated leachate and gas management systems. County's engineering representative for school construction projects, including design review of three schools utilizing water-air heat pump HVAC technology integrated with cooling towers and boilers, and remote energy management systems. Maintenance of all County vehicles and rolling equipment, including vehicle maintenance and fueling facilities.

**Nuclear Submarine Officer 1981 – 1988:**

*United States Navy*

Engineering officer on two nuclear submarines. Assignments included Main Propulsion Assistant, Damage Control Assistant, Chemistry & Radiological Controls Assistant, and Quality Assurance Officer. Responsibilities included supervision of the operation and maintenance of a nuclear-powered submarine including its propulsion, auxiliary, and HVAC & environmental control equipment both during normal operations and during a nuclear reactor refueling overhaul valued in excess of \$160 million; and management and training of up to 44 technicians.



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**FORENSIC CASE EXPERIENCE**

Vapor Compression Heat Pump, Air Conditioner, and Chiller System failures  
Plumbing & Heating System failures, including steam systems  
Fire Sprinkler systems including freeze-related failures and false activations  
Water wells, pumps and plumbing systems degradation and failures  
Wastewater system and pumping station failures  
High Density Polyethylene (HDPE) piping system installation defects  
Gas-fired radiant heater failures and fires  
Fuel gas tubing including CSST installation, failures and resulting gas explosions/fires  
Gas-fired and oil-fired convective heater and forced air furnace failures  
Heating boiler and related system failures  
Failure to maintain heat evaluations  
Boiler and furnace fires and overheating events, heat exchanger ruptures, puff-back/blow-back, and soot emission events  
Gas logs, Fireplace, and Fireplace Insert malfunctions and soot emission events  
Combustion appliance and fireplace venting system/chimney evaluations  
Liquid and Gaseous Fuels Transport, Storage, and Transfer Systems  
Motor Vehicle and Marine Vessel Engine and Related Systems events and failures  
Maritime Vessel auxiliary system failures  
Structural Water Intrusion evaluations  
Building Code and Contract compliance evaluations  
Structural storm, tree impact, and vehicle impact damage evaluations and repair plans  
Structure thermal performance and energy efficiency evaluations