# Jack W. Sparks, Ph.D., PE, RG, RM

President and Principal Engineer

Licensed Professional Engineer**:**

Registered Professional Engineer, Fla. PE 16877, 1972
Registered Professional Engineer, AL, 28115-E, 2006
Registered Professional Engineer, MS, 20189, 2011
Registered General Contractor, Fla. RG 61440, 1990
Registered Mechanical Contractor, Fla. RM 60577, 1990.
Expert Consultant/Witness in the States of:
Alabama, Florida, Mississippi, Louisiana, Georgia and Wyoming

Education:

University of Florida
Doctor of Philosophy in Mechanical Engineering, 1970
Master of Science in Mechanical Engineering, 1967
Bachelor of Mechanical Engineering, 1965

Field of Practice:

**Principal Design Engineer** for Process Tanks and Piping Systems, Conveying Equipment and Machinery, Heavy Lifting Equipment and Structural and Mechanical Applications at SERF, Inc.
**Forensic Engineering Analysis**, Accident Reconstruction, Mechanical and Machine Design, Thermal and Fluid Systems, ASME Pressure Products, Pneumatic and Mechanical Conveyors.

Professional Service: *Past Service

University of Florida Mechanical Engineering Advisory Committee
Engineering Service Advisor to the University of Florida ERC.
* Technical Advisor to the UWF Technology Council.
* Advisor to the Pensacola Junior College Welding Department
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Professional and Honorary memberships (present and past):

Pi Tau Sigma, honorary Engineering Fraternity, American Society of Mechanical Engineers, American Welding Society, Society of Automotive Engineers, Society of Accident Reconstructionists, Association for the Advancement of Automotive Medicine, National Association of Professional Accident Reconstructionist, National Fire Protection Association, International Association of Arson Investigators.

Journal of Publications:

Journal of Applied Mechanics, 1968. Journal American Society of Mechanical Engineers, 1968.
Journal of Mechanisms, 1967 and Yugoslav Council for the Theory of Machines, 1968.

Research Experience - University of Florida:

Kinematics, Mechanisms and Machine Design, 1965-1970. Solar Energy
Analysis & Fallout Shelter Analysis, 1967-1968. Thermal Energy Analysis for Large Building, 1965-1967

Teaching Experience (Partial) – Adjunct Professor – University of West Florida:

**Machine Design and Analysis** – Tension and Compression Stresses, Shear and Bending Moments, Types of Failure, Material selection and ASME code, Testing requirements, Steel Shapes and Shafting, Deflection and Buckling, Stress Analysis and Fatigue, Design Safety factors, Vibration, Impact and Shock, Energy for Deformation and Shearing.
**Design Applications** – Shafting, springs, fasteners, belts, clutches, brakes, chain, welded connections, bearings, gears, Wire rope, and Engineering materials and Selection.
**Fluids and Hydraulics** – The properties Fluids and Gases, Applications for transferring power and heat, The use and characteristics of Pumps and Compressors, Flow of liquids and gases in pipes, channels and over surfaces, Compressible and Incompressible flow, Pump head and NPSH applications.
**Heat Transfer** – Conduction, Convection and Radiant heat transfer, Mass and heat transfer, Solar and Radiant heat transfer applications, HVAC systems Load and Humidity determination. Applications and Types of heat exchangers, and Boiler systems.
**Economy Engineering** – Financing Interest rates and final cost of Equipment, Present cost and Future cost, Return on Investment, The cost of manufacturing and construction, The cost of Operations, The cost of services including utilities, variable and fixed costs, Investment analysis, Profit and, Loss statements.

Distinguished Lecturer and Speaker - Universities, National Engineering Societies and Associations in the field of Engineering and Forensics.

# Florida Engineering and Construction Licensing Boards and other Specialized Training and Certifications

## Engineering Forensics, Design, Construction and Maintenance

**Fracture Mechanics Approach to Life** – Prediction Linear Elastic Fracture Mechanics, Fatigue Initiation, Fatigue Crack Growth, Stress Concentration Effect of Flaws, Life Prediction, Stress Corrosion Cracking, Variable Amplitude (Cyclic) Loading, Fracture control, Fatigue design. ASME, 2004

**Wind Load Calculations and other Wind Issues** – Wind characteristics, Codes and standards, Structural characteristics, Structural analysis examples Group activities, Wind analysis software, High-rise buildings, University of Florida, 2007

**Building/Structural, University of Florida Extension service, 2002**
Standard Building codes for wind, floor and attic loading, windows and doors, building attachments for frame constraints for homes, metal buildings and block construction. Foundation built-up, slab and frame type.

**Advanced Code - Building/Structural, Contractors Institute, 2006**
New building code implementation for Florida, specific to the new wind code requirements for hurricane resistant buildings

**Shallow Foundation Design, Construction, and Repair –** Shallow Foundation Science, Evaluating Building Sites, Shallow Foundation Design, Shallow Foundation Construction, Managing Special Situations in Foundation Design and Construction, Diagnosing and Repairing Foundation Problems. Half Moon, LLC, Mobile, AL 2012

**Pressure Vessel Alteration and Repair, ASME, 1983**
Inspection, repair, welding specification, welding procedures, welder qualifications and records, testing and documentation for ASME code and the National Board of Boiler and Pressure Vessel Inspectors.

**Heating Boilers; Construction, Care and Operation ASME Sections IV and VI, ASME, 2001**
ASME codes and standards for inspection, repair, service and testing of heating boilers and hot water heaters, including welding, qualifications, procedures and documentation.

**Plumbing and Fuel Technical, University of Florida Extension service, 2002**
Application of the building codes for the selection, installation, inspection and testing of plumbing and fuel equipment.

**Energy** – Residential Energy Uses and Consumption, Air Changes, Stack Effect, Cooling, Heating, Refrigeration, Water Heating, Lighting, Ratings of Equipment, Conduction, Convection and Radiation, Humidity, Thermal Insulation, HVAC Systems, Windows, Solar Heat Gain. University of Florida Ext. Services, 2005

**Mechanical Energy** – Florida Building Code, Electrical, Plumbing, Fuel, NFPA, Hazards, Guards, Ventilation, Combustion air, Boilers and Hot Water Heaters. University of Florida (FEES), 2002

**Building/Fire, University of Florida Extension service, 2002**
Building code standards for fire rating, prevention, egress, signs, inspection and safety applications for plumbing, heating, electrical and combustion sources.

**Forensic Engineering in Building Inspection** – Damage from Moisture and Water in Building walls, Windows, Doors, Terminations, Connections, Construction procedures and installation. ASHRAE, 2005

**Indoor Environmental Quality** – Investigation and Re-mediation of Indoor Air Pollution, Moisture, Mold, Combustion Gases, CO Carbon Monoxide, Biological Contaminants, VOC's, Formaldehyde, Radon, Ozone, Asbestos and Lead pollution. University of Florida Ext. Services, 2005

**Mold, Moisture, Indoor Contaminants - Flood Water Damage** – Dangers, Construction techniques, Site evaluation, inspection Procedures & protocols, Procedures to remediate, Design deficiencies and improper structure maintenance, Liability and Risk. Contractors Institute, 2006

## Engineering, Construction Standards, and Maintenance

**Meeting ASHRAE Standards for Thermal Comfort and Ventilation-** Definition and Factors, Psychometric Chart, Assumptions, Thermal Sensation Scale, Six Primary Thermal Comfort Variables, Recommended Comfort Zone, Air Stream Classifications, Particulates, Ozone. Auburn University, 2010

**Controlling Chillers in Primary only CHW Systems – ASHRAE, 2006**
Chiller control on load demand based upon time, history and instrumentation

**Selecting Valves for Variable Flow Systems – ASHRAE, 2006**
Optimizing valve design selection for controllability of thermal heat/cool sources.

**Design for Absolute Humidity Control** – Humidity control, ventilation air treatment, dehumidification technologies (desiccant and mechanical) and psychometrics. ASHRAE, Pensacola, FL 2005

**Building Pressurization – ASHRAE, 2007**
Methods to maintain internal building pressure and equalization utilizing fan and flow control.

**Outside Air Ventilation – ASHRAE, 2007**
Controlling outside air temperature and humidity including adverse conditions of weather and occupant loading.

**Gas Hydrates** – The Future of Energy-Global warming, Origin of Gas Hydrates, Thermodynamics of Gas Hydrates. Production of Natural Gas from Gas Hydrates. Auburn University, 2010, David Dyer.

**The World of Sound** – Sources of Sound and Sound Propagation, Sound of nature, Sound Propagation and Decibels, Audible Sounds, Normal and Damaged Hair Cells, Vibration control, Sound Absorbing Materials, Sound Absorption Coefficient, Sound Transmission Loss, Barriers. Auburn University, 2010, Malcolm Crocker

**Electrical Codes & Plan Interpretation, FCILB, 2000**
Building codes for electrical panels, wiring, outlets, lighting, ground fault breakers, load calculations, testing and inspection.

## Crane Inspection, Training, Operation and Safety

"**Certified Mobile Crane Inspector" Crane Inspection and Certification Bureau, 2007**

Equipment – Mobile Hydraulic and Mechanical cranes
OSHA – Crawler cranes, Truck cranes and Derrick cranes and the Power Crane and Shovel Association
ANSI, ASME – Hooks, Rigging & Components
Inspections – Safety devices, Electrical, Auxiliary, Structural & Hoisting Systems, warning labels and decals
Manufacturers' Specifications – Design, Load charts, Lift operation and Maintenance

**Crane Inspection and Certification Bureau "Mobile Crane Management", 1999**

Crane management including inspection and operations, training, qualifications, OSHA, and ANSI standards for mobile, derrick, track and truck cranes. The inspection and applications of wire rope, rigging, slings, personal protection equipment, signals, power lines and transporting/moving equipment. Calculations of load, equipment's load chart and outriggers' restrictions for tipping and mechanical limitations. The use of lift plans, hand signals, radios barriers and markers for compliance with OSHA safety.

## OSHA Construction Safety Laws and Responsibility

**Understanding OSHA, Understanding Workers' Compensation and Green Marketing – OSHA Subpart C 29 CFR** 1926.1 – 1926.35, The General Duty Clause, Safety and Health Program, Fire Protection and Prevention, housekeeping, Personal Protective Equipment, Training and Education, Inspections, Citations, and Record Keeping. University of Florida Ext. Services, 2005

**OSHA Safety Standards** – Organization, Worker's rights, Inspection procedures, Testing laboratories, Safety resources, Case studies. Auburn University, 2010, L.N. Payton.

**OSHA Confined Space Training, 29 CFR 1910.146** – Permits, Procedures, Enclosure, Authorized Entry, Safety Watch, Ventilation, Fire and Explosions, Minimum Air Standard, Oxygen Meter, Standard Rescue Access. Emergent Enterprises 2006.

**Construction Safety & Health OSHA Certificate, 1994**

Contractors are by law (OSHA 1926) subject to providing a safe working environment including personal safety equipment, working above 6 feet height, ladders, scaffolding, electrical power and lockout, lifting equipment, cranes, rigging, confined space and below grade elevation, air quality and sound environment.

**Ethics & Responsibilities of the Contractor, 1995**

Contractor's responsibility by contractual agreement, which includes ethics and responsibilities implied in the law, building codes and standards of construction.

**Arbitration & Mediation in Construction, 1996**

Disputes between contractors, subcontractors and owners including proposals, standards, law and ethical resolve. Means of solving disagreements by contracts and mutual understanding to avoid court intervention.

**Fundamentals of Construction Design, Worker's Compensation and Workplace Safety, 1998**
**Basics for Contractors, Laws & Safety, FCILB, 2001**
**Construction Business Management, FCILB, 2001**

## Biomechanics of Injury and Impact Analysis from Accidents

**AAAM- (University of Maryland Medical School**) Biomechanics of Impact Trauma, 1998

Biomechanics analysis based upon impact trauma and vehicle design and performance to determine the injury mechanics of the human anatomy. Injury data from physical testing and computer modeling has been tabulated to provide thresholds of injury to the skeleton and the bodies internal organs, cervical injury due to whiplash, blunt trauma to the head, thorax and ribs cage, internal organs, face and eyes. Brain injuries caused from acceleration and impacts to the head can be determined and evaluated by engineering analysis and injury mechanics.

**University of California School of Medicine,** Accidental Injury: Biomechanics & Prevention, 1999

Human anatomy and injury mechanics are combined to provide a Biomechanics analysis of automotive accidents. Injuries to the face, eyes, head, brain, cervical, thorax and lumbar spine are evaluated based upon physical data, human testing and instrumental dummies under impact simulation. Injury to internal organs, heart, liver, spleen and lungs are evaluated from cadaver tests and autopsy. Skeletal injuries to ribs, sternum, long bones, head, feet and ankles are tabulated for vehicle delta-velocity.

**Wayne State University, School of Medicine**, Clinical and Biomechanical Aspects of Lower Extremity Injuries, 2000

Impact injury mechanics of the Lumbar spine, Pelvic, Legs, Knees and Feet.

**TEEX – (Texas A & M)** Biomechanics for Traffic Accident Reconstruction, 1998

Vehicular impact mechanics to the human anatomy, occupant movement within the vehicle, interior assessment of points of impact, data for injury evaluation based upon impact force and duration of time. Effect of restraints – air bags and seat belts in roll over, air bag deployment, time, position, and occupant movement. Post-accident injury analysis from photos, x-rays, MRI data and autopsy reports.

## Experience as Principal Engineer in Design and Manufacture of:

**PROCESS SYSTEMS DESIGN**

- Radioactive Waste Concentration Systems
- Recovery of Plating Waste
- High Temperature for Seawater Conversion
- Textile Finish Waste Recovery
- Fuel In Flight Simulator for the F-15 Eagle
- Brine Freeze System For Saltwater Conversion
- Molten Salt Bath Heating System
- Agitation Cleaning Systems for Aircraft Parts
- Computer Controlled Pumping Systems
- Citric Acid Hot Wash System for Ship Cleaning
- Containerized Vacuum and Pressure Tank Systems
- Power Boiler Venturi Scrubber Systems Controls
- Environmental Control Chamber for Critical Machining
- Fuel Haulers for the Space Shuttle Support Vehicles

**MATERIAL HANDLING SYSTEMS**

- Computerized Conveyor System for containers
- Handling in a Large Textile Plant
- Activated Carbon Handling System for Water Filtration Plant
- Bulk Bag Loading and Weighing Station With Computerized Automation
- Pneumatic Convey System that Weighs, Feeds, and Inventories for Selected Silo Systems
- Large Robotic Positioning System for Welding of Heavy Components for Missile Launcher
- Live Bottom Hopper Feed Systems for Ammunition Production
- Large Screw Conveyor for Explosive Powders
- Vacuum Pneumatic Loaders for Material Conveying
- Overhead Tote Bin Loading Station and Conveying
- Drag Conveyor for Coal and Ash Handling System
- 1,100,000 Lb. (3) Crane Lift Fixture
- Belt Conveyors
- Dump Hoppers

**ASME CODE PRESSURE VESSEL DESIGNS**

- 32000 Lb. Jacketed Lead Lined Reactor for Chlorine Generation
- Hyberbaric Fire Tanks, Water Tanks, Waste Tanks For Man-rated Diving Chambers
- Rotary Multi-Tube Digester Converting Wood Chips
- Nuclear Waste Resign Separation Pressure Vessels For Primary Loop Water in Submarine Service
- Titanium Scrubbing Column with Packing and Separation Processes
- Titanium Adsorber for Chlorine Dioxide Service
- Refrigerated Reactor for Process Development
- High Temperature-Altitude Simulator for Fuels R&D

## Crane Design, Alterations, Manufacturing and Repairs

- Lifting Equipment to 1,100,000 lbs (550 tons)
- Lattice Boom Weld Repairs
  - Tower Cranes
  - Booms and Jibs
- Hydraulic Crane Boom Repairs
  - End Sheave Sections
  - Boom Sections
- Rotating Turret
- Hydraulic Backhoe Digger modified to dig – 100 feet deep.