
DILIBERTO + ASSOCIATES CONSULTING, INC.

MICHAEL C. DILIBERTO, PE

3020 Bridgeway, #235
Sausalito, CA 94965
tel: 415-332-2227

toll free fax: 800-257-7763
toll free: 800-922-4750
e-mail: mcd@dilibertoassoc.com

PROFESSIONAL PROFILE

- Registered Professional Engineer with over 35 years of direct hands-on fire protection and safety engineering experience, including forensic engineering and Expert Witness testimony.
- Areas of expertise involve Aerospace, Chemical, Educational, General Manufacturing, Hazardous Waste, Industrial, Material Handling/Storage, Medical, Mining, Nuclear, Petrochemical, Petroleum, Power and Waste to Energy Utility industries and both Government and Military. (For depth of project experience, see following Project and Pub. Info.)
- Project duties included design, consultant, construction supervision, project engineer, and project manager.
- Member of the Society of Fire Protection Engineers; National Fire Protection Association; National Association of Fire Investigators; and International Association of Fire Investigators
- Former member of various NFPA committees in the Special Expert category and Member of the Society of Civil Engineers' Air Supported Structures committee—For specifics, See "Professional Affiliations" on page 4 below.
- Served as a special consultant for the U.S. Air Force, NASA and Martin-Marietta Corp. for various aerospace launch complex fire protection and fire analysis projects at Cape Canaveral, Fla., and Vandenberg AFB, California.

CAPABILITIES

- Integrated system(s) design approach – incorporating all engineering disciplines, along with safe process and related equipment shutdown/operation and notification upon fire protection system activation.
- In-depth comprehensive and analytical analysis / review of protection needs along with innovative, cost-effective solutions.
- Custom-tailored solution to specific hazards.
- Produce compliant protection and related designs within project budgets.
- Project locations have included: the Americas; Europe; the Middle East; Antarctica; the North Slope, AK; coastal environments (both fresh and salt water); and the Pacific Islands.
- Analysis and recommendations take into consideration: applicable Code & Standard Compliance; impact of suppression system(s) on protected area(s)/process equipment during and after discharge; reliability of system(s) and related components; long-term maintenance requirements and ease of maintenance.
- Employ state-of-the-art design concepts.
- Peer Review -- Fire Protection Analysis & Design: Reports and Design Packages--Drawings, Specs & Estimates,
- Project Management / Construction Supervision
- Fire & Explosion Forensic Engineer / Expert Witness
- Experienced in the following specialized areas: fire suppression; alarm & detection; explosion venting and suppression; spark detection and suppression systems; flammable vapor and combustible solids exhaust systems; hazardous location protection and electrical classification; flammable and combustible liquid & gas handling and storage; and fireproofing, and all related applicable Codes & Standards. Protection of material handling systems (loading/unloading --- dock side, rail, mouth-of -mine & reclaim), and related storage silos and enclosed facilities.

EXPERIENCE

2004 - Present	Diliberto + Associates Consulting, Inc. (D+AC) President Engineering design and consulting firm specializing in fire protection and safety engineering for the following:	Sausalito, CA
	<ul style="list-style-type: none"> • Industries: <ul style="list-style-type: none"> •• aerospace •• chemical •• general manufacturing •• hazardous waste •• industrial •• material handling/storage •• medical 	<ul style="list-style-type: none"> • Industries • Industries <ul style="list-style-type: none"> •• mining •• petrochemical •• petroleum •• power •• waste to energy • Government • Military

EXPERIENCE cont'd

2004 - Present **Diliberto + Associates Consulting, Inc. (D+AC) – cont'd** **Sausalito, CA**

Providing the following services in the highly specialized engineering disciplines listed above:

- analysis
- engineering design (water supplies, fire suppression, alarm and detection)
- specification development
- Code Compliance – Building, Fire Protection & Electrical (Hazardous Location)
- estimating
- site observation
- waterflow analysis
- system acceptance testing, for both new and retrofit design projects
- troubleshooting existing systems
- evaluation of existing fire protection programs
- development of new fire protection programs

2001- 2003 **Gage Babcock & Associates. (GBA)** **Larkspur, CA**

Principal—San Francisco Office

Nationwide Engineering Design and Consulting firm specializing in fire protection and safety engineering for the following:

Note: Services provided are similar to those provided and described under D+AC above.

- | | |
|--|---|
| <ul style="list-style-type: none">• Industries:<ul style="list-style-type: none">•• aviation•• education•• general manufacturing•• industrial | <ul style="list-style-type: none">• Industries<ul style="list-style-type: none">•• petrochemical•• petroleum• Government• Military |
|--|---|

1987 - 2001 **Diliberto + Associates Consulting, Inc. (D+AC)** **Sausalito, CA**
President **(formerly Denver, CO & Buena Park, CA)**

Provided the same services for the Industries and organizations as described above for D+AC

1973 - 1987 **Stearns Roger, Inc. (now known as Washington Group Intl., Inc.)** **Denver, CO**

Chief Corporate Fire Protection Engineering and OSHA Consultant

International A/E firm specializing in Aerospace, Heavy Industry, Government and Military Design and Engineering Projects.

- Responsible for Fire Protection Engineering and Occupational Safety & Health Act (OSHA) compliance for all company projects.
- Supervised staff of engineers and designers for all fire protection phases of projects.
- Met with client's underwriter and/or insurance company to review fire protection requirements or changes.
- Recommended and laid out all fire protection required for projects including water supplies and fire pump requirements.
- Interfaced with regulatory agencies to achieve acceptance/approval of project fire protection.
- Worked with architectural and general arrangement groups to ensure compliance with all building codes and regulatory authorities relating to fire protection integrity and safe means of egress.
- Prepared fire protection flow diagrams and yard piping layouts for use by project personnel.
- Reviewed all fuel and other flammable/combustible liquid and solid fuel (coal, coke, peat) material handling and transfer/pumping systems, and storage facilities for fire and explosion suppression protection, and detection, and proper hazardous location electrical classification and, both system and facility design.
- Prepared technical input for all fire protection specifications, (fire pumps, controllers, yard piping, all sprinkler and special agent extinguishing/explosion suppression, and alarm/detection systems).
- Reviewed all fire protection system contractor drawings and calculations.
- Ensured compliance with:
 - Environmental Protection Agency (EPA) "Oil Pollution Spill Prevention" program
 - Factory Mutual, Industrial Risk Insurers, and other Highly Protected Risk insurance company regulations (as applicable) for fire protection, combustion controls, flammable/combustible liquid and pulverized fuel systems, and hazardous location electrical classification and design requirements.

EXPERIENCE cont'd

1973 - 1987 **Stearns Roger, Inc. (now known as Washington Group Intl., Inc.), cont'd:** **Denver, CO**

- Coordinated all projects to ensure they met general safety and applicable OSHA, and for mining projects — the Mine Safety Health Act (MSHA) requirements, or the intent of the Acts.
- Reviewed and conducted field acceptance tests for fire protection systems/equipment (pumping, alarm, detection and suppression); and combustion controls for industrial furnace and boiler installations.

1968 - 1973 **Western Electric Company, Incorporated (now Lucent Technology)** **New York, NY**
Corporate Fire Protection/Safety Engineer

Headquarters Plant Design and Construction Organization of AT&T. Responsible for development of new and retrofit projects for all Western Electric and Bell Labs facilities throughout the U.S.

- Responsible for analyzing, recommending and design of fire protection systems, including fire service water storage, distribution and pumping systems; and building code compliance for fire protection structural integrity and safe means of egress.
- Developed fire protection standards for Western Electric plants and Regional Centers, and Bell Labs research facilities.
- Represented Western Electric's interests during new and retrofit construction design meetings with co-insurance companies (Factory Mutual and Factory Insurance Assoc.)
- Reviewed insurance company recommendations of inspected plant facilities, and advised plants on compliance approaches
- Reviewed existing fire protection system problems in the field and provided corrective action
- Reviewed/accepted contractor drawings on fire protection systems; witnessed/accepted field testing of installed fire protection equipment and systems.
- Supervised on-site Fire Protection Systems, underground fire service mains & Fire Pump installations at new facilities in Phoenix, AZ, Rolling Meadows, IL, & Northglenn, CO

1966 - 1968 **Factory Mutual Engineering Corp. (now FM Global)** **Norwood, MA and Philadelphia, PA**
Fire Protection Engineer

Fire Protection Engineering and Research Division of the Factory Mutual System— comprised of five Highly Protected Risk (HPR) Industrial Mutual Insurance Companies.

- Performed fire protection consulting service for insured locations
- Analyzed and recommended fire protection required for candidate and insured locations.
- Represented FM member insurance company interests during review meetings with insured and their architect/engineering firms on new designs and construction
- Reviewed for acceptance all fire protection system contractor drawings (sprinkler, CO₂, dry chemical, foam systems; alarm and detection systems; fire pump and yard piping layouts)
- Performed field troubleshooting of fire protection systems to determine/resolve problems

EDUCATION

B.S., Industrial Engineering/Business, Villanova University, PA
Factory Mutual Engineering Corporation, Fire Protection Engineering Training Course

- Intensive course curriculum consisted of 240 hours (six weeks) of fire protection subjects consisting of: Chemistry of Fire, Smoke and Heat Release, Effects of Fire on Building and Construction Materials, Smoke and Flame Spread/Development and Migration in Conventional, High-Rise and Warehouse/High-Piled Storage Occupancies; Fire Resistance of Building Materials and their Application in both New and Retrofit Construction; Hydraulics; Water Supply Evaluation, Implementation and Design; Fire Pump Evaluation and Design; Sprinkler System Application, Design and Hydraulic Calculations; Special Agent Suppression and Extinguishing Systems – Evaluation, Design and related Calculations; and Fire Alarm and Detection System Analysis and Design.

REGISTRATION

Professional Engineer (Wisconsin #E-19101)

PROFESSIONAL AFFILIATIONS

- Society of Fire Protection Engineers, Professional Member
- National Fire Protection Association
 - Former member of following committees in the Special Expert category:
 - Mining Standards (NFPA 120, 121, 122, 123 and 124)

PROJECT EXPERIENCE INFORMATION

PROFESSIONAL AFFILIATIONS cont'd

- National Fire Protection Association cont'd
 - Former member of the following Committees/Subcommittees in the Special Expert category:
 - Hydroelectric Generating Plants (NFPA 851)
 - Alternate Fuels Subcommittee (NFPA 850 — Electric Generating Plants)
- American Society of Civil Engineers
 - Member of Air Supported Structures Committee—responsible for Fire Protection and Safety
- National Association of Fire Investigators
- International Conference of Building Officials (Sponsors of the Uniform Bldg. Code), Member
- International Association of Arson Investigators

The following projects, which Mr. Diliberto was directly associated with, involved fire protection analysis and/or design (new, conceptual or retrofit), except where noted. Many projects also included safety engineering, which involved compliance with Life Safety Code and applicable Occupational Safety and Health Act (OSHA) requirements. Mining projects included compliance with the Mine Safety and Health Act (MSHA) requirements.

- Notes: (1) Many project descriptions involve multiple facilities of the same type identified, except where specific locations are identified.
- (2) Mr. Diliberto has also worked on many projects, as a consultant for other Architectural, Engineering & A-E firm clients in all of the industries / agencies listed below. However, confidentiality agreements prohibit identifying such projects by name / location.

Aerospace

- **Air Force:**
 - Kennedy Space Center---Cape Canaveral Launch Complex, FL: Fire Protection (Complexes 40 and 41)
 - Cape Canaveral Integrate-Transfer-Launch Facilities, FL: Fire Protection Analysis Study
 - Cape Canaveral RIS, MIS and Complex 41, FL: Suppression and Alarm/ Detection (Heat/Flame and Vapor) systems demolition and retrofit design
 - Edwards Air Force Base, CA: Hypergolic Fuel Storage: Fire Suppression and Alarm/Detection systems analysis/design
 - Vandenberg AFB, CA (various facilities and Launch Complexes): Fire Suppression/Alarm/Detection system analysis / design modifications
 - Aerospace Data Facility, Sunnyvale, CA: Halon Fire Suppression and Alarm/Detection systems analysis/design
 - Space Command Aerospace Data Facility, Buckley ANG Base, CO: Halon system design and installation
 - Kelly AFB, San Antonio, TX: Cryogenic Spin Test Facility Halon fire suppression system
 - Offett AFB, Omaha, NE: Hangar fire suppression systems
- **Martin Marietta:**
 - Vandenberg AFB, CA: Shuttle Launch Complex Fire Protection
- **National Aeronautics & Space Administration (NASA):**
 - Special Consultant for Fire Protection---Kennedy Space Center-Cape Canaveral, FL. & Vandenberg, AFB, CA

Aviation

- Jefferson County Airport, CO: Fuel Storage Facility Fire Protection
 - Imperial Palace Air, Ltd., Clark County Airport, Las Vegas NV: Hangar Foam Suppression; Alarm/Detection systems and Fire Pump analysis and upgrade design
 - Oakland, CA International Airport Expansion Project: Fire Protection Water Supply and Fire Pump Analysis and Design Upgrade; New Terminal Wide Fire Suppression Alarm/ Detection Systems and Life Safety Analysis & Design
- See also — **Aerospace, Military, Navy and Air National Guard**

Education

- Naval War College Campus-- **See Military – Navy, Monterey, CA**
- Canada College –22 Buildings (single and multi-story): Alarm/Detection Systems Analysis & Retrofit Design, Redwood City, CA
- College OF San Mateo – 27 Buildings (single and multi-story): Alarm/Detection Systems and Fire service water supply & pumping system-- Analysis & Retrofit Design, San Mateo, CA
- Skyline College –10 Buildings (single and multi-story): Alarm/Detection Systems Analysis & Retrofit Design, San Bruno, CA

PROJECT EXPERIENCE INFORMATION cont'd

Government — Hospitals / Medical Centers / Housing / Office /Research / Storage / Convention Center & Correctional Facilities

- **Air Force Hospital:**
 - Grand Forks Air Force Base, ND: Fire Safety Evaluation Survey & Fire Protection (Sprinkler /Alarm and Detection) Systems—Analysis and Retrofit Design
- **Veterans Administration Medical Centers:**
 - Long Beach, CA
 - Fire Alarm System Upgrade (analysis & retrofit design) for 8 building complexes
 - Fire Safety Evaluation System (FSES) Survey 8 Building Complex
 - Fire Protection Upgrade, including complete sprinkler system analysis and retrofit design for 11-story hospital building, and fire/smoke damper upgrade involving over 900 dampers interlocked to smoke barrier doors throughout
 - JCAHA Fire Safety and Protection Compliance Analysis
 - West Los Angeles, CA
 - Hospital –wide: Fire protection and smoke barrier retrofit design for 500 bed hospital
 - Hospital –wide: Fire protection standpipe system retrofit design
 - San Diego, CA
 - Hospital-wide: Sprinkler system, alarm & detection retrofit design
 - Ft. Meade, SD
 - Hospital-wide: Sprinkler system, alarm & detection retrofit design
 - Jerry L Pettis Loma Linda, CA
 - Sprinkler system retrofit of entire first floor and part of 2nd floor of hospital
 - Ft. Lyon, CO
 - Hospital –wide: Ventilation System Fire Damper Analysis and Retrofit Design
 - Denver, CO
 - Fire Safety Improvement Project: Sprinkler, Alarm & Detection System Retrofit design of entire 9-story hospital and four adjacent multi-story patient care building
 - Navy:
 - Camp Pendleton Naval Hospital. San Diego, CA
 - Existing HVAC system over-pressurization Study and conceptual retrofit design
 - Fire/smoke damper and Building Smoke/HVAC duct detection and control system modification - retrofit design for 600-room hospital. Over 1100 dampers interlocked to smoke barrier doors throughout hospital
 - Philadelphia Naval Base, PA
 - Naval Infirmary Fire Safety Evaluation Upgrade and System Design (Alarm/ Detection & Sprinkler Systems)
- **Army Corps of Engineers' Hospitals:**
 - Afghanistan National Army Regional Hospital, Kandahar Afghanistan, Site Review for Design / Installation compliance with NFPA Fire Protection criteria (Fire Pump and Water Storage Tank; Hospital Sprinkler and Detection/Alarm System) and Life-safety Systems (Emergency Exit signs / Lighting; Fire/smoke dampers; Firewalls / Fire partitions; Fire Doors and Egress routing). On-site field design of corrective action/ and supervision of installation modifications; and all System Acceptance Testing/ Commissioning.
 - Ft. Carson, CO
 - Infirmary Fire Alarm Detection Evaluation Upgrade and System Design
- **Federal Correctional Facility:**
 - Colorado State Prison – Southern Colorado
 - Sprinkler system, fire hose stations standpipe, and underground fire service water distribution retrofit design
- **Housing and Multi-use Facility:**
 - Sacramento Housing Development Agency (SDHA) —Sacramento, CA
 - Hi-Rise Senior Housing Facility with mixed commercial-use occupancy on the ground floor. Alarm/ Detection System Analysis and retrofit design, including installation system checkout and acceptance testing
- **Office Facilities:**
 - Government Services Administration (GSA) —Social Security Admin.—Richmond, CA
 - Multi – story mid-rise building -- Sprinkler & Fire Alarm/ Detection System Analysis and retrofit design, including system installation checkout and acceptance testing
- **Research:**
 - Inhalation Toxicology Research Institute, Albuquerque, NM
 - Facility Fire Suppression System Evaluation and Retrofit Study
 - Battelle Labs, Richland, WA
 - Facility Alarm / Detection System Evaluation and Retrofit Study

PROJECT EXPERIENCE INFORMATION cont'd

Government — Hospitals / Medical Centers / Housing / Office /Research / Storage / Convention Center & Correctional Facilities cont'd

- **Storage:**
 - Government Services Administration (GSA) — Denver Federal Center, Bldg. 41, Denver, CO
 - Sprinkler System Analysis and development of As-Built Drawings
- **Convention Center:**
 - City of San Diego Convention Center, CA
 - Detection & Suppression System, and Fire Pump's analysis & retrofit conceptual design

Hazardous Waste

Facility- wide underground mains/ Fire Pump and Water Storage Tank designs; Fire suppression, alarm/detection system's analysis and design, and Hazardous Waste storage tank deluge/ detection systems have been provided for the following project locations, except where noted:

- Chemical Handling Corporation, CO
- CLERA Waste Water Plant: —Rocky Mountain Arsenal, CO, Morrison-Knudson Engineers
- Hazardous Waste Storage Warehouse: CO. Merrick Engineers.
- Highway 36 Land Development Co.: CO. Merrick Engineers
- Marin Sanitary Services — Household Hazardous Waste Facility: Fire Hazard Risk Assessment Analysis & Fire Protection Upgrade; CA
- Phillips Petroleum — Sweeney Plant, TX
- USPCI — Clive Incinerator Facility Project, UT
- Waste-Tech Services, Inc. — Kimball Plant, NE
- Waste Tech Services, Inc. — Southeast Regional Service Center, WV
- Waste-Tech Services, Inc. — Ash Disposal Facility, Mercer County, IL
- **See also Corps of Engineers — Johnston Island and Rocky Mountain Arsenal under Military**

Industrial / Manufacturing / Research / Transportation

- Alza Corporation: Pharmaceutical Production and Packaging Cleanroom Facility – Automatic Sprinkler and Detection Sys. design; and Analysis of Clean Room Total Flooding Gaseous Suppression System – Vacaville, CA
- Bell Labs Research
 - Building fire protection systems (analysis and design), including Clean Room Protection, Allentown, PA and Baltimore, MD
 - New R&D Facility (300,000 sq. ft.) Fire Suppression and Alarm/Detection System Design, Northglenn, CO
- Burlington Northern Santa Fe (BNSF) Railroad, Rail Loading/Unloading Facility, Richmond, CA
 - Fire Hydrant Retrofit Peer-Review and Design Analysis
- Coors Brewing Company: Brewery Facility: Sprinkler, and Alarm/Detection System Retrofit Design, Boulder, CO and Shreveport, LA
- Gates Rubber-Hose Manufacturing Plant: Sprinkler and Alarm/Detection Systems Retrofit Design; Denver, CO
- Gates Rubber: Belt Mfg. Plant: Sprinkler and Alarm/Detection Systems Retrofit Design; Denver, CO
- Georgia Pacific: Wood Product Plant: Fire Suppression and Alarm/Detection Systems Design, WA
- Hiram Walker Distillery: Sprinkler (Process Facilities) and Halon (Control Rooms) fire suppression, Alarm/Detection Systems Retrofit Design. Ontario, Canada
- ICN: Radiological Hazard Analysis and Fire/Safety Study, Oceanside, CA
- Kodak Film Processing Plant: Sprinkler, Alarm/Detection Systems Design. Windsor, CO
- Lexmark Corp.: Copier / Printer Manufacturing Plant, Boulder, CO
 - Production Process Fire Protection Analysis-- Fire suppression, alarm/detection; fire/smoke venting and flammable vapor exhaust system's Design Analysis Study
- Masonite Corporation: Hard Board Manufacturing Facilities: Sprinkler, Alarm/Detection Systems Design. VA
- Olympia Brewing Company: Alcohol Recovery Plant: Sprinkler, Alarm/Detection Systems Design. WA
- Syntex Corp.: Chemical Manufacturing Plant, Boulder, CO
 - Fire Suppression and Alarm/Detection Analysis Study
- Texas Instruments: Wafer Board Manufacturing Plant: Fire Suppression and Alarm/Detection Systems Design TX
- Thiokol: Solid rocket Fuel Facility: Fire Suppression and Alarm/Detection Systems Design UT
- Western Electric Co.
 - Telephone and Cable manufacturing plants
 - Various Fire Suppression and Alarm/Detection systems (analysis and design) — Allentown, PA; Andover, MA; Baltimore, MD; Cicero, IL; and Phoenix, AZ
 - •• PBX Manufacturing Plant (1,300,000 sq. ft.). Northglenn, CO New Plant Design — Fire service water pumping and underground distribution system; Manufacturing and Automated High Rack Storage building's fire suppression and alarm/detection systems design, and construction supervision.

PROJECT EXPERIENCE INFORMATION cont'd

Industrial / Manufacturing / Research / Transportation cont'd

- Western Electric Co cont'd
 - Cable Manufacturing Plant Addition –Phoenix, AZ
 - New Plant Design — Cable Manufacturing building's fire suppression and alarm/detection systems design, and construction supervision
 - Regional Office Center & Warehouse Facility – Rolling Meadows, IL
 - New Facility – Fire service water supply, fire suppression & alarm/detection systems design, and construction supervision

Military

- **Air Force:**
 - Travis Air Force Base (AFB), Travis CA – New Officers Quarter's construction fire sprinkler and alarm / detection system design, construction supervision, and acceptance testing
 - Kelly AFB, San Antonio, TX: Cryogenic Spin Test Facility Halon fire suppression system
 - Offett AFB, Omaha, NE: Hangar Foam fire suppression systems
 - **See also Aerospace**
- **Corps of Engineers:**
 - Automated bomb detoxification facility: fire supp/alarm & detection: Analysis and design; Johnston Island Atoll, Pacific Ocean and Rocky Mountain Arsenal- Denver, CO
 - UDMH and Hydrazine Hypergolic Fuel Blending Plant and Storage Facility: fire suppression /alarm/detection: analysis & design; Rocky Mountain Arsenal- Denver, CO
 - Base-wide Radio Fire Alarm Study/Design; Ft. Carson, CO
 - Control Tower: Sprinkler System and Life Safety Design Review and Corrective Action Design; Bagram Air Force Base, Afghanistan
 - C-130 Hangar Project-- Cairo West Air Force Base. Corps of Engineers Project for Egyptian Air Force. Design Review, Modification and Supervision of Installation of: Replace/install three fire pumps (2500 gpm/125 psi) and controllers. Install new Automatic Sprinkler and Fire Alarm/ Detection (Smoke) Systems throughout the Shop/Admin Areas, and install High Bay ceiling level Auto Sprinkler Systems; and UV/IR Detector System actuated High Expansion Foam (Fifteen-15,000CFM units) Systems; Cairo, Egypt.
 - Defense Fuel Supply Point (DFSP) Fuel Farm: Foam fire suppression /alarm & detection, incl. fire pumps analysis & design; Grand Forks, ND
 - Vehicle Maintenance Garage Facility: Fire Service Dual Water Storage Tanks and Diesel Fire Pumping Facilities: Design Review and Analysis; Bagram Air Force Base, Afghanistan
 - Hazardous Waste Incineration Projects: fire protection / suppression & alarm/detection system analysis and design; Johnston Island Atoll, Pacific Ocean and Rocky Mountain Arsenal, Denver, CO
 - MX Project: fire protection analysis/review and design; Offutt AFB, NE
 - NORAD Command Center: Fire Alarm/Detection and Suppression System Analysis and Design; Cheyenne Mountain, Colorado Springs, CO
 - Warren Air Force Base: Minuteman III Command & Control Support Facility, and Missile Service Complex, Fire Alarm Detection and Suppression System Design, and Building/Life Safety Code Design Analysis, Wyoming
 - Various Other Military Facilities: Fire Prot. Evaluation Studies and Design Projects; U.S/ Europe/ Middle East
- **Navy:**
 - Multiple Fire Pump Retrofit Design and Supervision of Installation & Acceptance Testing — Willow Grove Naval Air Station, PA; and Naval Air Propulsion Center; Trenton, NJ
 - Multiple Occupancy Structures and Warehouses -- Life Safety Evaluations & Fire Suppression, Alarm/Detection System Design; Philadelphia Naval Yard, Philadelphia, PA
 - Fuel Storage Tank Farm Foam Fire Suppression/detection Systems, & Pier underside sprinkler protection & pier side hydrant protection, Analysis & Design; Defense Fuel Support Point (DFSP) Melville, RI; Naval Communications Unit, Cutler, ME; and DFSP, Casco Bay, ME
 - Aircraft and Helicopter Hangars (Foam) and Control Tower (Sprinkler) Fire Suppression and Alarm/Detection System: Design & Acceptance Testing; Willow Grove Naval Air Station, PA
 - Multiple Occupancy Structures and Warehouses—Fire Suppression & Alarm/Detection System's: Analysis & Retrofit Design; Naval Air Development Center, Warminster, PA and Naval Training Center, San Diego, CA
 - Human Centrifuge Test Facility: Fire Suppression & Alarm/Detection System Analysis & Design; Naval Air Development Center, Warminster, PA
 - Multiple Occupancy Structures, Hangars and Warehouses -- Radio Fire Alarm and Detection Sys: Analysis & Design; Treasure Island, San Fran., CA ; Naval Air Station, Glenview, IL; & Naval Reserve Center, Avoca, PA
 - Joint Spacecraft Operations Center — Fire suppression and alarm / detection system design; National Science Foundation, McMurdo Station, Antarctic Program

PROJECT EXPERIENCE INFORMATION cont'd

Military cont'd

- **Navy cont'd**
 - Naval War College Campus- Fire Alarm & Detection System Retrofit, and System Acceptance Testing, Monterey, California
 - Various Other Naval Facilities -- Fire Protection (Suppression/Alarm & Detection System) Evaluation Studies & Design Projects throughout the U.S./Europe/ Asia
- **Air National Guard:**
 - Utah ANG Base, Salt Lake City, UT
 - Base Wide Fire Suppression & Alarm Detection Alarm Systems Retrofit Upgrade Analysis and Design
 - Base Wide Radio Fire Alarm System Analysis and Design
 - Base Wide Fire Service Water Storage, Pumping and Piping Distribution System' Analysis and Retrofit Design
 - Aircraft Maintenance Hangars — Foam Fire Suppression & Alarm/Detection Systems; and Foam/Water Discharge Containment Collection Systems' Analysis and Design

Mining / Material Handling Systems

- AMAX — Climax Uranium Mine — Existing sprinkler system analysis and retrofit design for all above & below ground Conveyor Systems; Henderson, CO
- Anaconda Uranium Corp — Uranium Solvent Extraction Plant, Underground Fire Main and Pumping Systems; Facility Fire Suppression and Alarm / Detection System Design; WY
- APC Plant Aqaba Warehouse Extension – Potash Port Facility – Control Room FM200 Suppression System analysis and design; Jordan, UAE
- Bateman Engineering's Guilt Edge Project, -- Underground Fire Main and Pumping Systems; Facility Fire Suppression and Alarm / Detection System Design; WY
- Bateman Engineering's Zarafshan Newmont Joint Venture, Muruntau Heap Leach Project —Structure Fire protection and Underground Fire Service Water Distribution & Pumping System Design, Uzbekistan, Russia
- El Paso Energy Corp. — Sulfur Brill processing, underground fire service water distribution system and fire pumps; also, fire suppression (water oscillating monitors) and alarm/detection system's for Enclosed Storage Dome (450' dia. x 200' high) and sprinkler systems for above/underground reclaiming Conveyor System's Analysis & Design, Island of Aruba
- IMC — Uranium Solvent Extraction plants (three facilities) -- water distribution and pumping system, Also, fire suppression and alarm/detection system's Analysis & Design. (2) WY; (1) NM
- Kerr-McGee Nuclear - Uranium Solvent Extraction Plants-- water distribution and pumping system, also, fire suppression and alarm/detection system's Analysis & Design; WY
- Koppelman Series —Uranium Process Facilities, water distribution and pumping system, also, fire suppression and alarm/detection system's Analysis & Design; Gillette; WY
- Negev Phosphates, Ltd. - Support structure's fire supp.; alarm/ det...; & conveyor supp sys, design. Phosphate Project
- Philips Petroleum – Oil Shale Facility: Underground fire service water & piping systems; area process structures and material handling sys. conveyor fire suppression & alarm/detection system design; Oxbow, WY
- Rockwell Hanford Site — Area 200 Coal Conveying fire suppression system design; Richmond, WA
- Shell — Jumping Pond --Oil Shale Recovery project--Underground fire service water pumping, storage, and dist. system; Area process structures and material handling sys. Conveyor fire supp. & alarm/detect system design; WY
- Shell — Teckla Project, Oil Shale Recovery project-- Underground fire service water pumping, storage, and dist. system; Area process structures and material handling sys. Conveyor fire supp.& alarm/detect system design; WY
- Stauffer Chemical Company — Process Facility: Structure fire suppression alarm and detection system design; TX
- Texas Gulf Soda Ash Project - Area process structures and material handling system conveyor fire suppression & alarm/detect system design; CO
- Utah Power & Light Co. Coal Mines, underground, mouth-of-mine and overland material handling system conveyor fire suppression & alarm/detect system, & water distribution and pumping system's design; UT

Nuclear

- DOE—Various Fire Protection System (Supp., Alarm / Detection) studies & conceptual design & retrofit projects.
- Nuclear Waste Storage Facility — fire protection system (Suppression, Alarm / Detection) analysis; Oak Ridge, TN
- Nuclear Waste Storage Facility — fire protection system (Suppression, Alarm / Detection) analysis & design; NM
- Facility Wide (320 buildings) Radio fire alarm system — Study and system design; Rockwell Hanford Operations, Richland, WA
- Nuclear Processing Facility; Various occupancy & warehouse structures--fire suppression, & Alarm / Detection system -- analysis & design. Rocky Flats, Jefferson County, CO
- Rocky Flats (Building 71) — Plutonium Fire Analysis; Jefferson County, CO
- Texas Municipal Power Authority, Comanche Peak Station: nuclear power plant fire protection (Suppression [water/gas], alarm & detection) various structures/ control & cable spreading rooms-- analysis & design; Texas
- Public Service Company of Colorado — Fort St. Vrain Power Plant (Light Water Reactor); Control and Cable Spreading Rooms; Halon Suppression and Detection System-- analysis & design; Fort St. Vrain , CO

PROJECT EXPERIENCE INFORMATION cont'd

Petroleum/Petrochemical and Gas

- 25 Hydrocarbon Facilities & Refineries: Various fire protect. (Supp., Alarm & Det.) analysis / design / retrofit projects.
- Amoco Production Co. Oil Refinery: Water-mist & fire supp., alarm / det. Systems-- analysis & design; Houston, TX
- Amoco Gas Processing Plant: Deluge water suppression and gas detection system design; Wattenberg, CO
- ARCO: Kuparuk Central Gas Production Project: Inside Modules & Outside Vessels, incl. Utility Areas & Treatment Plants: Water dist. & pumping systems, foam fire Supp. & alarm / det. sys. --analysis & design; North Slope
- Chevron: Truck Loading Rack – retrofit foam- sprinkler suppression & det. systems, and upgrade water supply mains for foam system and monitor nozzles---analysis, design, superv. - install. & accept. testing . Richmond, CA
- Colorado Interstate Gas: Gasification plant- Water-mist & fire supp., alarm / det. Systems-- analysis & design; CO
- Conoco Oil Co. Refinery: Fuel Storage Tanks foamfire suppression system, & area water distribution and pumping system --analysis & design; Commerce City, CO
- Diamond Cubic Corp., Polysilicone Plant B- Fire Prot. Sys (supp., alarm & det.)&Safety Analysis; Oceanside, CA
- DOE: Solvent Refined Coal Demonstration Plant: Fire Suppression, Alarm & Detection Sys.--analysis & design; CO
- DOE: Gasifier Pilot Plant: Fire Suppression, Alarm & Detection Sys.--analysis & design; CO
- DuPont Chemical Plant Upgrade Project: Various Structure Fire Supp., Alarm & Detect. Sys.--analysis & design; DE
- El Paso Sulfur Pellet Processing Facility- division of El Paso Gas, Houston, TX: water dist and pumping system; Pier Load / unload & overland material handling systems, incl. underground reclaim conveyors; 400' dia. enclosed Dome Storage facility --Fire suppression, alarm & detection systems--Analysis & Design; Island of Aruba
- Exxon Chemical Company Low Density Polyethylene plant: fire service water dist.& pumping systems; various structure fire suppression [foam/ water], alarm & detection sys.--analysis & design; Houston, TX
- Exxon: Tasco Shale Oil Recovery Facility: fire service water dist.& pumping systems; various structure fire suppression [water], alarm & detection sys.--analysis & design; CO
- Gulf Oil Co.: Parson's Lake Central Gas Production Project, incl. Port Unloading / Pier facilities — Interior water distribution and fire pump systems; Fire Protection [Foam suppression systems and alarm/detection sys.]-- analysis and design, North Slope, AK
- Mobil Low Density Polyethylene Plant: fire service water dist.& pumping systems; various structure fire suppression [foam/ water], alarm & detection sys.--analysis & design; Houston, TX
- Pacific-Texas Pipeline Co.: LN Gas Storage Facility- fire service water dist.& pumping systems; various structure & gas Storage tank's fire suppression, alarm & detection sys.--analysis & conceptual design; Los Angeles Harbor, CA
- Phillips Petroleum -HDPE Plant Expansion: fire service water dist.& pumping systems; various structure fire suppression [foam/ water], alarm & detection sys.--analysis & design; Houston, TX
- Syrian Petroleum Company: Production, Storage and Port Facilities- fire service water dist.& pumping systems; various structure fire suppression [Halon --total flood./water], alarm & detection sys.; tank farm –internal tank and floating roof seal foam systems, berm area foam protection and area monitor nozzles - analysis and retrofit design & International Tender preparation; Port of Latakia, Hassaka & Jebessa, Syria
- Texas Instruments: PDP 3 Plant- fire service water dist.& pumping systems; various structure fire suppression [foam/ water], alarm & detection sys.--analysis & design; Houston, TX
- Union Oil Company: Oil Shale Recovery Facility- fire service water dist.& pumping systems; various structure fire suppression [foam/ water], alarm & detection sys.--analysis & conceptual design; CO
- Veco-Alaska, Inc., Valdez Fuel Terminal & Pier Facilities: Analysis of existing fire service water distribution system, hydrant and foam monitor nozzle layout, and tank foam suppression systems Valdez, AK

Utility (Including Associated Material Handling Systems for Fossil Fuel Plants)

- **See also Nuclear**
- 60 fossil power plants ranging in size from 150 MW to 650 MW: Various Structures(water/ total flood.-Halon & CO2/ local appl. Dry Chem.); Turbine Gen bearing & Lube Oil system [CO2 & water-spray]; Unit Train Rotary Car Dump Facility, enclosed Coal Storage Facilities, and conveyor systems-- fire suppression, alarm & det. systems, incl. fire service water dist. & pump. sys.—Analysis & Design, & Life Safety Emer. Egress sys. design: Utah, WY,NM & CO
- DOE --10 MW solar power pilot plant [Solar 1]: fire service water dist.& pumping system; various structure fire suppression, alarm & detection sys.--analysis & design — Barstow, CA
- DOE –Wind Turbine Facilities: fire service water dist.& pumping system; various structure fire suppression, alarm & detection sys.--analysis & conceptual design; CA, CO, WY
- Coal conveying systems: Unit Train Rotary Car Dump, enclosed Coal Storage Facilities, and conveyors--overland from mouth of mines to power plants: fire suppression, alarm & detection systems, incl. under/above ground fire service water dist. & pumping systems—Analysis & Design & Life Safety Emer. Egress sys. design: Utah, NM & CO
- Cogeneration plants (coal, gas, oil, waste): The following Plants were reviewed for compliance with the Calif. State required Fire Protection for Permitting/ Construction, as well as QA Review during Construction- Pico, Tracy and Silicon Valley Power(Combined Cycle), CA
- Commonwealth Edison--Coal transportation (rail and river barge), and Enclosed Storage Facilities: fire service water dist.& pumping systems; various structure & coal conveyor fire suppression, alarm & detection sys.—analysis, feasibility studies and conceptual design; IL

PROJECT EXPERIENCE INFORMATION cont'd

Utility (Including Associated Material Handling Systems for Fossil Fuel Plants) cont'd

- Pulp dryer fuel conversion project: Fire Suppression and Alarm/Detection Systems' Analysis & Design; WA
- 10 Scrubber projects: Fire Suppression and Alarm/Detection Systems' Analysis & Design; AZ, CO, NM & WY
- Precipitator Retrofit Projects-- Fire Suppression and Alarm/Detection Systems' Analysis & Design: AZ, CO, NM & WY
- Commonwealth Edison-- Coal Fired Power Plant: Fire Protection Analysis & Design Upgrade-Plant Wide: fire service water dist. & pumping systems; coal conveyor fire suppression, alarm & detection sys.--analysis & retrofit design; Chicago, IL.
- Utah Power and Light- Huntington Canyon Power Plant (Units I and II): Coal Pulverizers: Internal Manual Water spray Fire suppression and Automatic Alarm/Detection Systems-- Analysis & Design; Utah
- Peat Fired Boiler and Feeding Conveyors: Fire Suppression & Alarm/Detection Systems--Analysis & Design; Hilo, HI
- Public Service of CO, Coal Unit Train Loading & Unloading Fac, incl. Coal Conveyor Fac.; Pueblo, CO
- Public Service Co of NM-- Four Corners & Utah Power & Electric-- Huntington Canyon Power Plant: Turbine Generator bearing fire protection [CO / Automatic Water spray] & Alarm/Detection Systems--Analysis & Design; NM & Utah
- Tucson Gas & Electric -Fuel Oil Tank Farm: Underground fire service water distribution & pumping system, Foam Fire Suppression & Detection Systems--Analysis and Design; Tucson, AZ
- Pacific Gas & Electric-- Gas Storage/Distribution Facility: Gas Alarm and Detection systems-- Analysis and Design; San Diego, CA
- Waste-to-Energy Projects: Fire Suppression and Alarm/Detection Sys' Analysis & Design: AZ, CA, CO, HI, NM & WY

Research Fire Tests

The following tests were conducted in the capacity as Lead Project Research Engineer, except where noted. Work performed included securing testing site and funding, developing test protocol, soliciting participants for testing, obtaining equipment to be used in tests and preparing testing reports.

Type Test	Location
Air Preheater Basket Fires — Detection & Suppression Methods	Public Service Co. of New Mexico, San Juan Station (Unit I), Farmington, NM
Coal Conveyor Fire Suppression using Medium Expansion Foam	Public Service Co. of Colorado, Pawnee Plant, Pueblo, CO
Coal and Stack-out Conveyor Fugitive Dust Suppression using Medium Expansion Foam	Pubic Service Company of Colorado, Pawnee Plant, Pueblo, CO
Fire Resistive Coatings in ASTM E-119 and E-5 Hydrocarbon Pool Fire Test [Co-researcher with Carboline personnel]	Carboline Co. Research Facility — St. Louis, MO
Launch Complex (41) Fire Analysis and Suitability of wet pipe sprinkler systems to provide protection for the Area Ground Equip. Structure(AGE) [Lead Investigative Engineer for Air Force/NASA]	Cape Canaveral, FL

Expert Witness

Industrial

- **Syncrude Oil v. Bechtel, et al**, \$100 million fire at crude oil refinery.
- **Jemison Const. Co. v. Peak Fire Protection** — Wastewater treatment plant fire.
- **State of California v. Tire Plant** – Tire Recycling Plant outdoor rubber tire storage fire.
- **Donlee Pump Co. v. Souza** – Truck Fuel Tank Flash Fire with resultant personal injury.
- **Sheldon United Terminals v. Industrial Specialists** ---Propane Rail and Truck Receiving, Storage and Truck Fuel Dispensing Facility –Alleged Building / Fire Code Design and Construction Defects.
- **Various cases** involving aerospace, petrochemical, chemical, petroleum, mining and utility facilities with in-house legal departments, while Chief Corporate Fire Protection Engineer at Stearns-Roger (now Washington Group Int'l)

PROJECT EXPERIENCE INFORMATION cont'd

Expert Witness cont'd

Commercial

- **Rip Griffin Truck Service Center v. Ziegler Fire Protection, Inc.** — Restaurant kitchen fire.
- **Crown Media International v. Western States Fire Protection Co., et al.** — Accidental sprinkler head actuation in Broadcast Equipment Room.
- **Denver Management Inc.** —Burger King restaurant kitchen fire.
- **Sacramento Partners v. Swinerton Walberg, Simplex-Grinnell** – Improper design of fire pump and electrical wiring, resulting in failure of fire pump operation on loss of the hotel's main power supply.
- **Ethan Allen** -- Sprinkler activation with extensive water damage to showroom.
- **Eagle Ridge Condominiums** -- Sprinkler system activation with extensive water damage to condominium building under
- **Fireman's Fund v. Heath Plumbing** – Sprinkler system activation with extensive damage to high-valued antiques in store below.
- **McChesney Construction v. Yan** – Restaurant kitchen cooking area fire.
- **Peerless v. Six Counties Fire Protection** – Sprinkler system activation with extensive water damage to window covering manufacturer's warehouse and office area.
- **California Central Fire Protection v. Norma Fulivo, Fuliva Bond & Insurance** -- Evaluation of Fire Protection Construction Project Award Dispute with Federal Correctional Contract re: Sprinkler Contractor's bid for Sprinkler and Detection System Retrofit at Lompoc, CA Federal Correctional facility.,

Residential

- **Rifkin Residence** – Sprinkler system activation with extensive water damage to artwork.
- **Lutzker Residence** – Sprinkler system activation with extensive water damage.

Personal Injury

- **Turshani v. Laramie County Sheriff** — Jail Cell Sprinkler system activation with resultant personal injury.
- **Barela et al. v. Mars et al.** —Hotel arson fire with resultant loss of life and personal injury.
- **Fire Insurance Exchange v. Craftmatic Organization** --- Electrical fire involving electrical articulating bed with resultant personal injury.
- **Estate of Roudolf Corsini v. Jackson Motor Parts, Inc.** (aka. Butler Motor Speedway) – Racecar Speedway Fuel Refueling Facility Explosion & Fire with resultant fatality.

Publications/Presentations

- "A Comparison of Fire Resistive Coatings in ASTM E-119 and E-5 Hydrocarbon Pool Fire Test Environments," 1982 ASTM Symposium; April 1985 Hydrocarbon Processing
- "Electrical and Electronic Equipment Protection — Pros and Cons," 1984 World Oil and Gas Conference
- "The Coal Dust Explosion Phenomenon — Safeguards and Preventions," 1984 Bulk Solids and Powder Conference
- "Coal Dust Fire/Explosion Hazards and Prevention," 5th International Coal Utilization Conference, 1982 Coal Technology, and 3rd European Conference on Coal Utilization
- "Fire Protection and Safety Engineering for Coal Fire Power Plants," 1982 American Power Conference
- "Coal System Fire Protection and Safety Considerations," 3rd International Coal Utilization Conference, 1980
- "Air Pre-Heater Basket Fire Tests and Fire Protection Approaches," Stearns-Roger, 1974

Seminars

Five-Day Comprehensive Fire Protection Engineering Seminar for the entire U.S. Naval Facilities Engineering Command Divisions' Fire Protection Engineering Staff—hosted at the Philadelphia Naval Shipyard, PA

Seminar addressed: Selection, based on the hazard requiring protection and design, of all forms of Fire Suppression Systems—Water (wet, dry, pre-action, deluge sprinkler systems); Foam / Gaseous systems (local and total flooding) & Dry Chemical systems. Detection Systems: selection and design -Thermal (fixed temp./rate-of-rise/ continuous line /thermister); Smoke (Ionization/photoelectric/beam/ sampling);and Optical (UV/IR and combination). Fire Alarm systems-selection and design -Hard-wired (conventional and multiplex) and Radio. Design of Explosion Suppression and related Detection systems. Selection and sizing of Fire/ Booster Pumps and design, along with selection of water supplies (open bodies of water, reservoirs, tanks and public mains) and water system distribution design, including sectional of fire service underground piping materials(Cement-lined steel, Ductile Iron, FRP, HDPE), isolation valves, and layout /placement of fire hydrants and monitor nozzles. Cathodic protection of underground fire service piping and above / underground water and fuel storage tanks Electrical Grounding and Lightning Protection of structures and tanks. Building Code Analysis and Design Compliance. Life Safety Analysis and related Design Features: Emergency egress, lighting and evacuation; Alarm Systems; Fire Walls/ Partitions, Fire- proofing (walls /columns / beams); Penetration Sealing; Fire/ Smoke and combination Dampers; and Smoke and Heat Venting-evaluation & design.