
MICHAEL C. DILIBERTO, PE

Curriculum Vitae

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PROFESSIONAL PROFILE

- Registered Professional Engineer with over 45 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 experience includes consultant, construction supervision, design, project engineer, and project manager.
- Member of the Society of Fire Protection Engineers; National Fire Protection Association; and International Association of Fire Investigators
- Former member of various NFPA committees in the Special Expert category.
- Member of the Society of Civil Engineers' Air Supported & Tensioned Structures committee — Fire Protection.
- Served as a special consultant for the U.S. Air Force, NASA and Martin-Marietta Corp. for various aerospace launch complexes fire analysis and protection projects at Cape Canaveral, Fla., and Vandenberg AFB, California.

EXPERIENCED IN THE FOLLOWING SPECIALIZED AREAS

- Code Compliance Review / Analysis
- Concept and Feasibility Studies
- Consulting and Engineering Design (Fire Protection & Life Safety) and Analysis
- Estimating
- Explosion Suppression, Explosion Venting and Spark Detection System's design for Bag houses, Dust Collectors, Silos and Storage Buildings and related ductwork
- Fire Alarm, Detection & Notification Systems
- Fire (all agents) Suppression Systems
- Fire & Explosion Forensic Engineering - Expert Witness
- Fireproofing analysis and design, and in- place testing during installation
- Hazard Analysis and Evaluation
- Hazardous location protection and electrical classification
- Peer Review --Fire Protection Analysis & Design: Reports and Design Packages-- Drawings, Specs. & Estimates
- Material handling system's protection for combustible solid materials [coal, sulfur, peat, and other similar materials] and non-combustible materials (loading / unloading --- dock-side, rail, mouth-of-mine & reclaim), and related storage silos and enclosed facilities
- Project Management / Construction Supervision
- Risk Assessment / Feasibility Analysis
- Smoke, Flammable Vapor & Combustible Dust Exhaust System design & protection
- Smoke Management System - Evaluation & Design
- Specification Development
- System Acceptance Testing and Commissioning

APPROACH TO PROJECTS

- Analysis, evaluation and recommendations take into consideration: hazards involved; 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.
- Custom-tailored solution to specific hazards.
- Employ state-of-the-art design concepts.
- In-depth comprehensive and analytical analysis / review of protection needs along with innovative, cost-effective solutions.
- 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.
- Produce compliant protection and related designs within project budget.

PROJECT LOCATIONS

Project locations have included:

- Americas
- Asia
- Europe
- North Slope, AK
- Antarctica
- Canada
- Middle East
- Coastal environments (both fresh & salt water)
- Pacific Islands

EXPERIENCE

2004 - Present **Diliberto + Associates Consulting, Inc. (D+AC)** **Sausalito, CA**
President

International engineering design and consulting firm specializing in fire protection and safety engineering for the following:

- Industries:
 - aerospace
 - chemical
 - commercial/l-high rise & very tall buildings
 - education
 - gas
 - hazardous waste
- Industries:
 - health care
 - hotels/ housing (residential)
 - industrial: manufacturing, research and warehousing
 - material handling systems and storage
 - mining
- Industries
 - nuclear
 - petrochemical
 - petroleum
 - transportation: aviation, rail and shipping
 - utility
 - Government
 - Military

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

- 3rd party peer review- fire protection analysis /design reports & design packages--drawings, specs & estimates
- Code compliance review / analysis – building, fire protection & electrical (hazardous location)
- Concept and feasibility studies
- Consulting & engineering design (fire suppression, alarm and detection, water supplies & pumping sys.)
- Corrosion protection / Cathodic protection
- Design review and code analysis
- Estimating
- Evaluating existing and developing new fire protection programs
- Fire & explosions forensic engineering - Expert witness
- *Explosion suppression, Explosion venting and Spark detection system's design for Bag houses, Dust Collectors, and combustible dust generating material Storage Silos & Buildings, and related ductwork*
- Fireproofing analysis and design, and in- place testing during installation
- Fire protection (suppression [all agents] , alarm/detection & notification) & Life Safety analysis & design: design bid packages (drawings, specifications & estimates), reports and studies
- Hazard analysis and evaluation
- Hazardous location protection and electrical classification
- Material handling system's protection for combustible solid materials [coal, sulfur, peat, and other similar materials] and non-combustible materials (loading / unloading --- dock-side, rail, mouth-of-mine & reclaim), and related storage silos and enclosed facilities
- Project management / construction supervision
- Risk assessment / feasibility analysis
- Smoke & fire modeling
- Smoke management system analysis and design
- Smoke, Flammable Vapor & Combustible Dust Exhaust System design & protection
- Specification development
- System acceptance testing and commissioning, for both new and retrofit design projects
- Testing (in-place): HVAC fire/smoke dampers, emergency stair tower and elevator pressurization systems, smoke management systems; smoke exhaust systems; flammable vapor / combustible dust exhaust/collection systems; and fire/explosion suppression & spark detection systems. Troubleshooting existing systems (Fire & explosion suppression, Alarm & Detection, and water supply & pumping systems)
- Water flow analysis

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.

Provided similar services for most of the Industries and Organizations described under D+AC

EXPERIENCE cont'd

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

International Engineering Design and Consulting firm specializing in fire protection and safety engineering

Provided the same services for the Industries and Organizations described under D+AC.

1973 - 1987 **Stearns Roger, Inc. (now URS Corporation)** **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 contractor prepared fire protection system 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.
- 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 Engineering and OSHA Consultant

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; developed engineer's estimates for Fire Protection Systems; participated in acceptance 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
- Site Project Manager at new construction facilities in Phoenix, AZ, Rolling Meadows, IL

EXPERIENCE cont'd

- 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)
 - 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)
- Member of Air Supported & Tensioned Structures Committee—responsible for Fire Protection and Safety
- International Conference of Building Officials,
- International Association of Arson Investigators

PROJECT EXPERIENCE INFORMATION

Personal Project Experience

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 many of the industries / agencies listed below. However, Confidentiality Agreements prohibit identifying such Clients and projects by name / location.

PROJECT EXPERIENCE INFORMATION cont'd

Abbreviations: (Following abbreviations are used in the project descriptions below)

- **Code Compliance Analysis (CCA)**
- **Explosion /Spark Suppression Systems (E/SS)**
- **Engineer's Design Package (EDP)**
[Estimate, Plans & Specifications]
- **Fire Proofing Analysis / Design (FPA/ D)**
- **Hazardous Location Electric Classification (HEC)**
- **Risk Assessment/Analysis (RA/A)**
- **Smoke, Dust, Vapor Removal (S,D,V /R) Systems**

Aerospace

- **Air Force:**
See also Military-
 - **NORAD Command Center.**
 - **Minuteman III Command Center-Warren Air Force Base, WY**
- **Kennedy Space Center---Cape Canaveral, FL**
 - Cape Canaveral Integrate-Transfer-Launch Facilities: Code Compliance (CCA) & Fire Protection Analysis Study
 - Cape Canaveral - Motor Assembly Building (MAB); Vehicle Integration Building (VIB); Missile Inert Storage (MIS); and Rocket Inert Storage (RIS) Structures, CCA; RA/A; S&V/R; EDP; Fire Suppression and Alarm / Detection (Heat / Flame and Vapor) system's retrofit design, and acceptance testing.
 - Fire Protection (Launch Complexes 40 and 41) Area Ground Equipment (AGE) facilities: CCA; RA/A; EDP; Fire Suppression and Alarm/ Detection (Heat / Flame and Vapor) for entire AGE facilities; Halon fire suppression system and photoelectric detection system's designs for control trailers located within AGE facilities. Analysis and design upgrade of existing underground water supply to complex areas; installation supervision, and acceptance testing / commissioning.
- **Edwards Air Force Base, CO: CCA; RA/A; FAA; EDP: Space Shuttle Program Hypergolic Fuel Storage Facility: fire suppression and alarm / detection systems' analysis / design: installation supervision, and acceptance testing/commissioning.**
- **Vandenberg AFB,CA (various facilities and Launch Complexes): CCA; RA/A; EDP; Fire Suppression / Alarm/Detection system analysis and design modifications.**
- **Aerospace Data Facility, Sunnyvale, CA: CCA; RA/A; S/R; EDP; Halon Fire Suppression and Alarm / Detection systems analysis / design, and acceptance testing.**
- **Space Command Aerospace Data Facility, Buckley ANG Base, CO:CCA; RA/A; S/R; EDP; Halon system design and installation supervision, and acceptance testing.**
- **McMurdo Station - Joint Spacecraft Operations Center / National Science Foundation:: CCA, EDP; Fire Suppression, Alarm/Detection, and Life Safety systems design. Antarctica .**
- **Martin Marietta:**
 - **Vandenberg AFB, CA: Shuttle Launch Tower & AGE support building: CCA; RA/A; S&V/R; EDP; Tower water-spray deluge system analysis & design; AGE building protection - same as for Cape Canaveral Launch Complexes 40 and 41.**
- **National Aeronautics & Space Administration (NASA):**
 - **Special Consultant for Fire Protection---Kennedy Space Center-Cape Canaveral, FL. & Vandenberg, AFB, CA**

Commercial / Hotel / Residential / High Rise and Very Tall Buildings

- **Commercial**
See also Government (San Diego Convention Center and Sacramento Housing Development Agency) for additional occupancies
Note: Commercial occupancies are also located in many High-Rise and Very Tall Building Projects listed below.

Similar Fire Protection and Life Safety features were provided for the following new construction enclosed Shopping Centers and Mall. Projects consisted of CCA; EDP; analysis and new design included: underground fire service water distribution (including valving and fire hydrant) layout, pumping systems, and water supply (underground water storage tanks for Beaver Creek), complete automatic sprinkler and alarm / detection systems, and Emergency Notification Systems, and layout of emergency egress lighting. Project work also consisted of Peer review of the Smoke Management System design, and acceptance testing of the Fire Protection and Smoke Management Systems.

 - **Beaver Creek Ski Area Shopping Center, Beaver Creek, CO**
 - **Longmont Shopping Center, Longmont, CO**
 - **Northglenn Shopping Mall, Northglenn, CO**
- **Hotels**
See also Very Tall Building – Trump Towers project for additional Hotel occupancy

Similar Fire Protection and Life Safety features were provided for the following Hotels. Projects consisted of CCA; EDP; analysis and retrofit design, which included: fire service water pumping systems, complete automatic sprinkler protection, alarm and detection systems, and Emergency Notification systems, and acceptance testing.

 - **Holiday Inn 8-story High-Rise. Denver, CO**
 - **Brown Palace 14 story High-Rise. Denver, CO**

PROJECT EXPERIENCE INFORMATION cont'd

Commercial / Hotel / Residential / High Rise and Very Tall Buildings cont'd

- **Residential**

See also Education (Dormitories) / Gov- Medical Centers-VAMC (Chief of Staff & Chief Eng's residences), Housing, & Military- (Officers and enlisted men's quarters) projects for additional Residential occupancies

- Gramacy Towers - Private Residence 22-story High Rise Condominium. San Francisco, CA
Project consisted of Code Compliance evaluation of the existing Fire Alarm / Detection, and Evacuation Systems, and retrofit design, including Specifications, engineer's estimate, and acceptance testing.
- Huntington House - Private Residence 18-story High Rise Condominium. Denver, CO
Project consisted of Code Compliance Evaluation for new structure for Fire Protection and Life Safety design. Analysis and design of the water supply and pumping system, complete building sprinkler and alarm and detection system, and acceptance testing.

- **High -Rise Buildings**

See Education, Government, Hotels & Residential

- **Very Tall Buildings**

Note: Some of these Buildings also qualify as Commercial and Hotel Occupancies

- Provided Code Compliance analysis and Peer review of the water distribution system, including sequential pumping stations throughout intermediary floors, alarm / detection, and Evacuation system's design.
 - World Trade Center Towers No. I - 104 Story (592M) & Tower No. II- 88 Story (449M), New York, NY
 - Sears Tower - 110 Story (442M), Chicago IL
- Provided Code Compliance analysis and Peer review of Automatic Sprinkler systems, and the alarm / detection & Evacuation system designs.
 - Trump Tower - 92 Story (360 M to Roof), Chicago IL

Distribution Cooling Plants / Cooling Towers

- **Distribution Cooling Plants**

See Education for Fire Protection project associated with the UC Davis, CA Campus listed below.

- University of California—Davis Campus, Davis, CA: CCA; RA/A; EDP; analyzing existing fire suppression and alarm & detection systems through the Cooling plant for Code Compliance, design retrofit fire suppression and alarm / detection systems, including new FAC panel to interface with new Radio Fire alarm System provided for the entire Campus.
- University of Colorado Boulder Campus, Boulder, CO and University of Arizona--- Los Alamos Campus, Los Alamos, AZ:
CCA; EDP; layout & design of the Fire Alarm / Detection, and automatic sprinkler systems throughout the Cooling plants building. Each Plant's local Control Panel for the fire alarm/detection system was connected into the respective Campuses' Central Alarm Monitoring System. Total flooding suppression system actuated by cross-zoned - combination ionization / photo-electric detection was provided for the Control Room's; and each Plant's Compressor Lube Oil system was protected with its own pre-action water spray system, actuated by rate-compensated thermal detectors. Lube Oil storage tanks were provided with a concrete containment basin.

- **Cooling Towers**

See Utility for Cooling Tower projects

Designed and / or supervised the Cooling Tower fire protection design - (Deluge & Pre-Action Systems-all actuated by rate -compensated thermal detectors), for over 100 Cooling Towers associated with fossil, & Waste-to-Energy Power Plants in the range of 150-1000MW units. Developed fire resistant partitions to minimize fire spread and limit the number of sprinkler system actuation between adjacent Tower cells.

Education

See also Distribution Cooling Plants

- **Naval War College Campus-- See Military - Navy**
- Canada College -22 Buildings (single and multi [2 through 5]-story): Code Compliance; EDP; & Alarm/Detection Systems, and Fire service water supply & pumping system-- Analysis & Retrofit Design, Redwood City, CA
- College OF San Mateo - 27 Buildings (single and multi [2 through 5] -story): Code Compliance; EDP; & Alarm/Detection Systems, and Fire service water supply & pumping system-- Analysis & Retrofit Design, San Mateo, CA
- Skyline College -24 Buildings (single and multi [2 through 5]-story):Code Compliance; CCA; EDP; & Alarm/Detection Systems, and Fire service water supply & pumping system-- Analysis & Retrofit Design, San Bruno, CA
- University of California - Davis Campus, Davis, CA : Campus consists of 133 buildings (7,300 acres [2,950 ha]) with the following multi story buildings: 27 - two through five-story buildings and 3 - seven-story high-rise dormitory buildings. CCA; RA/A; EDP; Entire campus -Radio Fire Alarm System retrofit design. Project included removing the

PROJECT EXPERIENCE INFORMATION cont'd

Education cont'd

existing telegraphic fire alarm system - Gamewell system and associated underground cable plant), and tying in all the building's existing fire alarm system panels-(12 different alarm manufacturers) and integrate into a single campus-wide fire alarm reporting system with dual reporting you bastard consoles located at both the campus' Fire Station headquarters and the independent Security facility.

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

- **Air Force Hospital**
 - Grand Forks Air Force Base, ND: Fire Safety Evaluation Survey & Fire Protection (CCA; Sprinkler /Alarm and detection) Systems—Analysis and Retrofit Design
- **Veterans Administration Medical Centers (VAMC)**
 - Long Beach, CA
 - Fire Alarm System Upgrade (CCA; EDP;& retrofit design) for medical campus (fifteen - 2 through 4-multi-story medical / office buildings and one 11-story hospital building,)
 - Fire Safety Evaluation System (FSSES) Survey 8 Building Complex
 - Fire Protection Upgrade, including complete sprinkler system analysis and retrofit design for all buildings on the complex, and Smoke Management System, incl., fire/smoke damper upgrade involving over 900 dampers interlocked to smoke barrier doors throughout the 11 story hospital building
 - JCAHA Fire Safety and Protection Compliance Analysis
 - Chief of Staff, and Chief Engineer's on site residences-Sprinkler & Fire alarm system design
 - West Los Angeles, CA
 - Hospital –wide: CCA; EDP; Fire protection and smoke barrier retrofit design for single multi-story 500-bed hospital
 - Hospital –wide: Fire protection standpipe system retrofit design
 - San Diego, CA
 - Hospital (4 story): CCA; EDP; Sprinkler system, alarm & detection retrofit design
 - Ft. Meade, SD
 - Hospital-wide: multi-building campus with 5 single story buildings and 1 three-story hospital building) CCA; EDP; Sprinkler system, alarm & detection retrofit design
 - Chief of Staff and Chief Engineer's on site residences-Sprinkler & Fire alarm system design
 - Jerry L Pettis Loma Linda, CA
 - CCA; Sprinkler system retrofit of entire first floor and part of 2nd floor of hospital
 - Ft. Lyon, CO
 - CCA; EDP; Hospital –wide: Ventilation System Fire Damper Analysis and Retrofit Design
 - Denver, CO
 - Fire Safety Improvement Project: CCA; EDP; Sprinkler, Alarm & Detection System Retrofit design of entire 8-story hospital and four adjacent multi (2 through 4)-story patient care buildings
- **Navy Hospitals**
 - Camp Pendleton Naval Hospital (10 story high-rise). San Diego, CA
 - Existing HVAC system over-pressurization Study and conceptual retrofit design, including estimate
 - Fire/smoke damper and Building Smoke Management System, incl., 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 (four-story) - CCA; EDP; Fire Safety Evaluation Upgrade and System retrofit Design (Alarm/ Detection & Sprinkler Systems)
- **Army Corps of Engineers' Hospitals**
 - Afghanistan National Army Regional Hospital (100 bed), Kandahar Afghanistan, Site-wide review design / Installation Code compliance with NFPA standards (Fire Pump and Water Storage Tank; Hospital Sprinkler and Detection/Alarm System) and Life-safety Systems (Emergency Evacuation & Notification System; Emergency Exit signs / Lighting; Fire/smoke dampers; Firewalls / Fire partitions; Fire Doors and Egress routing), and Smoke Management System. On-site field retrofit design for corrective action; supervision of installation modifications; System Acceptance Testing and Commissioning.
 - Ft. Carson, CO
 - Infirmary CCA; EDP; Fire Alarm / Detection & Notification system Evaluation Upgrade and System Designs

PROJECT EXPERIENCE INFORMATION cont'd

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

- **Federal Correctional Facility:**
 - Colorado State Prison (Burns –Mc Donald) – Southern Colorado
 - CCA; RA/A; EDP; Sprinkler system, fire hose stations standpipe, and underground fire service water distribution retrofit design
- **Housing and Multi-use Facility:**
 - Sacramento Housing Development Agency (SHDA) —Sacramento, CA
 - Hi-Rise Senior Housing Facility (18- story high-rise building) with mixed commercial-use occupancy on the ground floor. CCA; EDP; Alarm / Detection; Emergency Evacuation & Notification System Analysis and retrofit design, including Smoke Management system; installation system checkout, acceptance testing and commissioning.
- **Office Facilities:**
 - Government Services Administration (GSA) —Social Security Admin.—Richmond, CA
 - 5 - story mid-rise building -- CCA; EDP; Sprinkler & Fire Alarm/ Detection System Analysis and retrofit design, and Smoke Management System, including system installation checkout and acceptance testing.
- **Research:**
 - Battelle Labs, Richland, WA
 - Facility-wide -- CCA; RA/A; EDP; Alarm / Detection System Evaluation and Retrofit design
 - Inhalation Toxicology Research Institute, Albuquerque, NM
 - Facility-wide -- CCA; RA/A; EDP; Fire Suppression & Alarm / Detection Systems' Evaluation and Retrofit Study
 - Sandia National Laboratories, Albuquerque, NM
 - Facility-wide -- CCA; RA/A; HEC; Fire Suppression and alarm / detection System Evaluation and Retrofit Study
- **Warehousing:**
 - Government Services Administration (GSA) — Denver Federal Center, Bldg. 41, Denver, CO
 - Warehousing (3 buildings) and Office Building (four - 4-story buildings) Complex -- CCA; EDP; Sprinkler System Analysis and development of retrofit automatic sprinkler system design drawings.
- **Convention Center:**
 - City of San Diego Convention Center, CA
 - Entire Convention Center Complex, including two- 4-story buildings: CCA; EDP; Detection & Suppression System, and Fire Pumps' analysis & retrofit conceptual design,.

Hazardous Waste

Facility- wide-- CCA; RA/A; EDP; E/SS; FPA; HEC; V/R; 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:

- **See also Military - Corps of Engineers: Johnston Island and Rocky Mountain Arsenal**
- 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,

Industrial / Manufacturing / Research / Warehousing

- Alza Corporation: Pharmaceutical Production and Packaging Clean room Facility – CCA; HEC; EDP; Automatic Sprinkler and Detection Sys. design; and Analysis of Clean Room Total Flooding Gaseous Suppression Syst. – Vacaville, CA
- Bell Labs Research
 - Building - CCA; EDP; FPA; fire protection systems (analysis and design), including Clean Room Protection, Allentown, PA and Baltimore, MD
 - New R&D Facility (300,000 sq. ft. [27870 sq m]) CCA; EDP; Fire Suppression and Alarm/Detection System Design, Acceptance Testing and Commissioning. Northglenn, CO

PROJECT EXPERIENCE INFORMATION cont'd

Industrial / Manufacturing / Research / Warehousing cont'd

- Burlington Northern Santa Fe (BNSF) Railroad, Rail Loading/Unloading Facility, CCA; EDP; Fire Hydrant Retrofit Peer-review and Design Analysis. Richmond, CA
- Coors Brewing Company: Brewery Facility: CCA; EDP; Sprinkler, and Alarm/Detection System Retrofit Design, Boulder, CO and Shreveport, LA
- Gates Rubber-Hose Manufacturing Plant: EDP; Sprinkler and Alarm/Detection Systems Retrofit Design; Denver, CO
- Gates Rubber: Belt Mfg. Plant: EDP; Sprinkler and Alarm/Detection Systems Retrofit Design; Denver, CO
- Georgia Pacific: Wood Product Plant: CCA; EDP; E/SS; Fire Suppression & Alarm/Detection Systems Design, WA
- Hiram Walker Distillery: CCA; FPA; HEC; EDP; Sprinkler (Process Facilities) and Halon (Control Rooms) fire suppression, Alarm/Detection Systems Retrofit Design. Ontario, Canada
- ICN: Radiological Hazard Analysis; CCA; and Fire/Safety Study, Oceanside, CA
- Kodak Film Processing Plant: CCA; EDP; Sprinkler, Alarm/Detection Systems Design. Windsor, CO
- Lexmark Corp.: Copier / Printer Manufacturing Plant, Boulder, CO
 - Production Process Fire Protection Analysis—CCA; EDP; Fire suppression, alarm/detection; fire / smoke venting and flammable vapor exhaust system's Design Analysis Study
- Masonite Corporation: Hardboard Mfg. Facilities: CCA; EDP; E/SS; Sprinkler, Alarm / Detection Systems Design. VA
- Olympia Brewing Company: Alcohol Recovery Plant: CCA; EDP; Sprinkler, Alarm/Detection Systems Design. WA
- Syntex Corp.: Chemical Manufacturing Plant, Boulder, CO: CCA; Fire Suppression and Alarm/Detection Analysis Study, including estimate
- Texas Instruments: Wafer Board Manufacturing Plant: CCA; EDP; Fire Suppression and Alarm/Detection Systems Design. TX
- Thiokol: Solid Rocket Fuel Facility: CCA; HEC; EDP; Fire Suppression and Alarm/Detection Systems Design. UT.
- Western Electric Co
 - Telephone and Cable manufacturing plants, incl. Warehousing facilities
 - Various CCA; EDP; 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. [120770 sq. m]). Northglenn, CO
 - New Plant Design —CCA; FPA; EDP; Fire service water pumping and underground distribution system; Manufacturing and Automated High Rack Storage building's fire suppression and alarm /detection systems design, Smoke Management System, construction supervision, and acceptance testing and commissioning.
 - Cable Manufacturing Plant & Warehouse Addition –Phoenix, AZ
 - New Plant Construction (500,000 sq. ft. [46,450 sq. m]): Cable Manufacturing building's fire suppression and alarm/detection systems design, construction supervision, and acceptance testing.
 - Regional Office Center & Warehouse Facility – Rolling Meadows, IL
 - New Facility (350,000 sq. ft. [32,575 sq. m]) : CCA; EDP; room here when we can square feet square meters 2770 Fire service water supply, fire suppression & alarm/detection systems design, construction supervision, and acceptance testing and commissioning.

Military

- **Air Force**
 - **See also Aerospace**
 - B-1 Bomber Hangars Fire Protection: third-party code compliance analysis, review; of foam fire suppression, UV / IR detection systems, and emergency evacuation system. Project also included preparation of specifications and engineer's estimate. Grand Forks AFB, Grand Forks, ND
 - Cryogenic Spin Test Facility, Kelly AFB, San Antonio, TX: CCA; RA/A; FPA; HEC; EDP; Halon Fire Suppression and Alarm / Detection systems analysis / design, and acceptance testing.
 - Offett AFB Hangar fire protection: CCA; RA/A; EDP; Foam fire suppression & detector system's, designs, and acceptance testing & commissioning. Omaha, NE
 - Homestead Air Force Base, FL: CCA; RA/A; S/R; EDP: Complete analysis and design of Hangar High Expansion Foam systems, including the underground water supply system to the hangar. Analysis and design also included automatic UV/IR optical system for actuation of the foam systems.
 - Travis Air Force Base (AFB), CA – Ten new 3-story Officers Quarter's construction: CCA; EDP; fire sprinkler and alarm / detection system design, construction supervision, acceptance testing and commissioning
- **Corps of Engineers (COE)**
 - Automated Bomb Detoxification Facility: CCA; RA/A; E/SS; FPA; HEC; EDP; fire supp/alarm & detection: analysis and design, including off- ship material handling system, and dockside pier fire protection systems, and water supply piping, hydrants, and control valves. Hollywood is underneath here; Johnston Island Atoll, Pacific Ocean
 - Automated Bomb Detoxification Facility: CCA; E/SS; FPA; HEC; EDP; fire supp/alarm & detection: analysis and design, Rocky Mountain Arsenal- Denver, CO
 - UDMH and Hydrazine Hypergolic Fuel Blending Plant and Storage Facility: CCA; RA/A; FPA; HEC; S&V/R; EDP; fire suppression / alarm / detection analysis & design; Rocky Mountain Arsenal- Denver, CO

PROJECT EXPERIENCE INFORMATION cont'd

Military cont'd

• **Corps of Engineers (COE) cont'd**

- Ft. Carson Base-wide multiple Occupancy Structures, and Warehouses -- Analysis & retrofit design of Radio Fire Alarm system and detection / alarm system for all facility buildings (fifty-nine buildings of which twenty-six were 4 story buildings), two Hangars, Control Tower & Terminal building and fifteen Warehouses. , CO
- Control Tower: Sprinkler System and Life Safety Design Code compliance Peer Review of entire sprinkler system, including hydraulic calculations, and Emergency Lighting, Exit sign layout, & egress routing. Project included development of corrective action design drawings. Bagram Air Force Base, Afghanistan.
- Multiple new Vehicle Maintenance and Repair Shops: coat compliance Year Review of the design of dual water storage tanks and diesel fire pumps / controllers, and associated discharge and underground fire service water piping / valving to the Maintenance and Repair Shop's sprinkler systems. Required design changes were performed and revised design drawings issued for construction. Bagram Air Force Base, Afghanistan.
- C-130 Hangar Project -- Cairo West Air Force Base. COE Project performed for Egyptian Air Force. On-site peer review of the facility Fire Protection and Life Safety design was performed. Required design modifications were made in the field. Construction supervision of Fire Protection / Life Safety systems, acceptance testing and commissioning was also performed. Project scope consisted of the replacement of 3 existing electric fire pumps with the installation of three new diesel fire pumps (2500 gpm/125 psi [570 cu. m/hr. / 862 kPa,]) and one electric pressure maintenance pump (100 gpm/125 psi [22 cu. m/hr. / 862 kPa]), and associated controllers, replacement of all existing fire pump's water supply and discharge piping, and installation of and tie-in of new system supply piping from the existing underground to the new fire service water valve house. Project also included: conversion of the existing water storage tanks for automatic refill; installation of a new automatic sprinkler system throughout the existing fire pump house; automatic sprinkler and fire alarm/ detection (smoke) systems throughout the Maintenance / Repair Shops and attached 3-story Administration office / 80 seat Theater facility; installation of High Bay ceiling level auto sprinkler systems and a UV / IR detection system actuated roof-mounted High-Expansion system (Fifteen-15,000CFM foam generator units) for the three-bay Hangar. Project also included a Smoke Management system and an Emergency Evacuation & Notification system. Cairo, Egypt.
- Defense Fuel Supply Point (DFSP) Fuel Farm: CCA; RA/A; EDP; 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 / Analysis and corrective action Design. Bagram Air Force Base, Afghanistan
- Hazardous Waste Incineration Project: CCA; RA/A; FPA; HEC; E/SS; EDP; fire protection / suppression & alarm / detection system analysis and design; Johnston Island Atoll, Pacific Ocean
- Hazardous Waste Incineration Project: CCA; RA/A; FPA; HEC; E/SS; EDP; fire protection / suppression & alarm / detection system analysis and design; Rocky Mountain Arsenal, Denver, CO
- MX Project: CCA; RA/A; FPA; HEC; EDP; fire protection analysis/review and design; Offutt AFB, NE
- NORAD Command Center: CCA; RA/A; EDP; Fire Alarm/Detection and Suppression System Analysis and Design; Cheyenne Mountain, Colorado Springs, CO
- Minuteman III Command & Control Support Facility, and Missile Service Complex - Warren Air Force Base: CCA;RA/A; EDP; Fire Alarm Detection and Suppression System Design, and Building/Life Safety Code Design Analysis, WY
- Various Other Military Facilities: Fire Prot. Evaluation Studies and Design Projects; U.S/ Europe/ Middle East

• **Navy**

- Multiple Fire Pump: EDP; Retrofit Design and Supervision of Installation & Acceptance Testing. — Willow Grove Naval Air Station, PA; and Naval Air Propulsion Center; Trenton, NJ.
- Multiple Occupancy Structures (twenty-three [2 through 4 story] buildings) and ten Warehouses -- Life Safety Analysis / Evaluations; CCA; EDP; Fire Suppression, Alarm/Detection System Design; Philadelphia Naval Base, Philadelphia, PA
- Defense Fuel Support Point (DFSP) Fuel Storage Tank Farm: CCA; RA/A; EDP; Foam Fire Suppression / detection Systems, & Pier underside sprinkler protection & pier side hydrant protection, Analysis & Design; Melville, RI; Naval Communications Unit, Cutler, ME; and DFSP, Casco Bay, ME
- Willow Grove Naval Air Station, - Aircraft & Helicopter Hangars (Foam) and Control Tower & Terminal (Sprinkler/ alarm & detection' and emergency notification system); CCA; EDP; Fire Suppression and Alarm/Detection System: Design & Acceptance Testing; PA
- Multiple Occupancy Structures and Warehouses—Fire Suppression & Alarm/Detection System's: CCA; RA/A; EDP; & Retrofit Design; Naval Air Development Center (sixteen [2 through 4 story] buildings) and four Warehouses, Warminster, PA and Naval Training Center (sixteen [2 through 4 story] buildings) and four Warehouses, San Diego, CA
- Human Centrifuge Test Facility for Aerospace Program: CCA; EDP; Fire Suppression & Alarm/Detection System Analysis & Design; Naval Air Development Center, Warminster, PA

PROJECT EXPERIENCE INFORMATION cont'd

Military cont'd

- **Navy cont'd**
 - Multiple Occupancy Structures, Hangars and Warehouses -- CCA; EDP; Analysis & design of Site-wide Radio Fire Alarm system and detection / alarm system for all facility buildings (Fifteen [2 through 5 story] buildings, one Hangar) and former Terminal, and five Warehouses, including base Fire Station. Project also involved, retrofitting the Commanding Officer's Residence and twelve [2 through 3 story] Officer's / Enlisted Men's quarters with sprinkler, alarm / detection, and notification systems. . Treasure Island. San Francisco, CA
 - Glenview Naval Air Station Multiple Occupancy Structures, Hangars and Warehouses -- CCA;EDP; Analysis & design of Site-wide Radio Fire Alarm system, alarm / detection, and emergency notification systems for all facility buildings (twenty-seven buildings of which four were 4 story buildings), three Hangars, Control Tower & Terminal, and two Warehouses. IL
 - Multiple Occupancy Structures -- Analysis & design of Site-wide Radio Fire Alarm system and alarm / detection, and emergency notification systems for all facility buildings (five [2 through 4- story buildings) and one Warehouse. Naval Reserve Center, Avoca, PA
 - Joint Spacecraft Operations Center —CCA; RA/A; EDP; Fire suppression and alarm / detection system design; National Science Foundation, McMurdo Station, Antarctic Program, Antarctica
 - Naval Avionics Center, multiple Occupancy / Structures (sixty-four [2 through 4 story] buildings, encompassing over 3 million ft.² [2 78,700 sq. m]). All-encompassing Code Compliance Analysis addressing: all building's Electrical, Fire Protection, including underground fire service water distribution system and multiple fire pumps; Mechanical, Life Safety, & Structural compliance. Project also involved Conceptual Design of underground fire service water supply piping / valving system, along with fire pumps; fire suppression, alarm and detection systems, including emergency notification systems, & all related Estimated Cost of construction by discipline, Indianapolis, IN.
 - Naval War College Campus (one 6-story and four [2 through 4 story] buildings) CCA; EDP; Fire Alarm & Detection System Retrofit, and System Acceptance Testing, Monterey, California
 - Various Other Naval Facilities –CCA; RA/A; EDP; Fire Protection (Suppression / Alarm & Detection Systems design), Life Safety Evaluation Studies & Design Projects throughout the U S / Europe & Asia
- **Air National Guard**
 - Utah ANG Base, Salt Lake City, UT
 - Base Wide, including Control Tower: CCA; RA/A; SV/R; HEC; EDP; Retrofit Upgrade Analysis and Design for Fire Suppression & Alarm Detection Alarm Systems
 - Base Wide Radio Fire Alarm System Analysis and Design, including estimate
 - Base Wide Fire Service Water Storage, Pumping and Piping Distribution System' Analysis and Retrofit Design
 - Aircraft Maintenance Hangars — CCA; V/R; HEC; EDP; Foam Fire Suppression & Alarm/Detection Systems; and Foam/Water discharge automated underground Containment Collection & Removal Systems' Analysis and Design

Mining / Material Handling Systems / Storage

- AMAX — Climax Uranium Mine —CCA; EDP; Existing sprinkler system analysis and retrofit design for all above & below ground is this Conveyor Systems; Henderson, CO
- Anaconda Uranium Corp —Uranium Solvent Extraction Plant: CCA; EDP; Underground Fire Main and Pumping Systems; Facility Fire Suppression and Alarm / Detection System Design; WY
- APC Jordan - Plant Aqaba Warehouse Extension – Potash Port Facility – Control Room FM200 Suppression System. Third party peer review design analysis; Jordan
- APC Jordan - Plant Aqaba Warehouse Extension – Potash Port Facility – Process Control Cable Tunnel-Water mist suppression systems. Third party peer review design analysis; Jordan
- Bateman Engineering - Guilt Edge Project -- CCA; EDP; Underground Fire Main and Pumping Systems; Facility Fire Suppression and Alarm / Detection System Design. South Dakota
- Bateman Engineering's Zarafshan Newmont Joint Venture, Murantau Heap Leach Project —CCA; FPA; EDP; Structure Fire protection and underground Fire Service Water Distribution & Pumping system design, Uzbekistan, Russia
- Kerr-McGee Nuclear - Uranium Solvent Extraction Plants-- CCA; E/SS; D&V/R; FPA; HEC; EDP; water distribution and pumping system, also, fire suppression and alarm/detection system's Analysis & Design. WY
- Koppelman Series —Uranium Process Facilities, CCA; EDP; water distribution and pumping system, also, fire suppression and alarm/detection system's Analysis & Design; Gillette; WY
- Pathfinder Mine Corp. - Mc Uranium Solvent Extraction plants (three facilities) -- CCA; EDP; water distribution and pumping system, Also, fire suppression and alarm/detection system's Analysis & Design. (2) WY; (1) NM
- Philips Petroleum–Oil Shale Facility: CCA; RA/A; HEC; EDP; Underground fire service water & pumping systems; area process structures and material handling sys. conveyor fire suppression & alarm/detection system design; Oxbow, WY

PROJECT EXPERIENCE INFORMATION cont'd

Mining / Material Handling Systems / Storage cont'd

- Rockwell Hanford Site — CCA; D/R; EDP; Area 200 Coal Conveying fire suppression & detection system design Richmond. WA
- Shell — Jumping Pond --Oil Shale Recovery project-- CCA; RA/A; EDP; Underground fire service water pumping, storage, and dist. system; Area process structures and material handling system conveyor fire suppression & alarm/detect system design. WY
- Shell — Teckla Project, Oil Shale Recovery project—CCA; FPA; HEC; EDP; Underground fire service water pumping, storage, and dist. system; Area process structures and material handling sys. Conveyor fire suppression & alarm / detect system design. WY
- Stauffer Chemical Company — Process Facility: CCA; RA/A; FPA; HEC; EDP; Structure fire suppression alarm and detection system design. TX
- Texas Gulf Soda Ash Project – CCA; EDP; Area process structures and material handling system conveyor fire suppression & alarm/detect system design. CO
- Utah Power & Light Co. Coal Mines, CCA; RA/A; D/R; EDP; underground, mouth-of-mine and overland material handling conveyor system & 120 car Unit Train Rotary Car Dump facility fire suppression & alarm / detection system, & water distribution and pumping system's design, and acceptance testing. UT

Nuclear

- DOE—Various Classified Projects: CCA; RA/A; EDP; fire protection system (Supp., Alarm / Detection) studies & conceptual design & retrofit projects.
- Nuclear Waste Storage Facility - CCA; RA/A; S/R; FPA; HEC; EDP; fire protection system (Suppression, Alarm / Detection) analysis; Oak Ridge, TN
- Nuclear Waste Storage Facility - CCA; RA/A; S/R; FPA; HEC; EDP; fire protection system (Suppression, Alarm / Detection) analysis & design; NM
- Facility Wide (320 buildings) Radio fire alarm system — CCA; RA/A; EDP; Study and system design. Integrate all 320 buildings, involving over 18 different alarm manufacturer's control panels into a single; Radio Fire Alarm system reporting to dual alarm consoles located at the Central Fire Department headquarters building, and the Security Command Center, Rockwell Hanford Operations, Richland, WA
- Nuclear Processing Facility; CCA; RA/A; E/SS; S&V/R; FPA; HEC; EDP; Various occupancy & warehouse structures—fire suppression, & Alarm / Detection system -- analysis & design. Rocky Flats, Jefferson County, CO
- Rocky Flats (Building 71) — Plutonium Fire Cause & Effect Forensic Engineering Analysis; Jefferson County, CO
- Texas Municipal Power Authority, Nuclear Power Plant -- Comanche Peak Station: CCA; RA/A; EDP; fire protection (Suppression [water/gas], alarm & detection) for various structures/ control & cable spreading rooms-- analysis & design; Texas
- Public Service Company of Colorado — Fort St. Vrain Power Plant (Light Water Reactor); CCA; RA/A; S/R; EDP; Control and Cable Spreading Rooms and Cable Trays; Halon Suppression and Detection System-- analysis & design; Fort St. Vrain, CO

Petroleum / Petrochemical / Chemical and Gas Facilities

- 25 Hydrocarbon Facilities & Refineries: Various CCA; RA/A; FPA; HEC; EDP; fire protection (Suppression Alarm & detection) analysis / design / retrofit projects.
- Amoco Production Co. Oil Refinery: CCA; RA/A; EDP; deluge water-spray & fire supp., alarm / det. Systems— analysis & design. Houston, TX
- Amoco Gas Processing Plant: CCA; RA/A; S&R/R; EDP; deluge water suppression and gas detection system design; Wattenberg, CO
- ARCO: Kuparuk Central Gas Production Project: CCA; RA/A; FPA; HEC; EDP; Inside Modules & Outside Vessels, including. Utility Areas & Treatment Plants: Water dist. & pumping systems, foam fire Supp. & alarm / systems— analysis & design. North Slope
- Chevron: Truck Loading Rack – CCA; RA/A; EDP; retrofit foam- sprinkler suppression & det. systems, and upgrade water supply mains for foam system and monitor nozzles---analysis, design, supervision, & acceptance testing, Richmond, CA
- Colorado Interstate Gas: Gasification plant- CCA; RA/A; S&V/R; EDP; Deluge fire supp., alarm / det. systems— analysis & design. CO
- Conoco Oil Co. Refinery: CCA; RA/A; HEC; EDP; Fuel Storage Tanks foam fire suppression system, & area water distribution and pumping system --analysis & design. Commerce City, CO
- Diamond Cubic Corp., Polysilicone Plant B: CCA; RA/A; Fire Prot. Sys (supp., alarm & det.) & Safety Analysis; Oceanside, CA
- DOE: Solvent Refined Coal Demonstration Plant: CCA; RA/A; EDP; Fire Suppression, Alarm & Detection System analysis & design. CO
- DOE: Gasifier Pilot Plant: CCA; RA/A; S&V/R; HEC; EDP; Fire Suppression, Alarm & Detection Sys.--analysis & design, and acceptance testing. CO

PROJECT EXPERIENCE INFORMATION cont'd

Petroleum / Petrochemical / Chemical and Gas Facilities cont'd

- El Paso Energy Corp. division of El Paso Gas, Houston, TX: — Sulfur Brill Pellet Processing Facility,
- CCA; RA/A; E/SS; D/R; FPA; HEC; EDP; Analysis & Design for the entire underground fire service water distribution system and fire pumps; Pier- side fire protection piping and hydrant system. Fire suppression (open water spray nozzles and line-type (thermister) detection for the entire dock loading / unloading & overland material handling system conveyors, incl. underground reclaim conveyors located beneath the storage dome. Fire suppression (water oscillating monitors) and alarm / detection system's for the enclosed concrete Storage Dome (450' [137 m] dia. x 200' [61 m] high), System design also included E/SS for the exhaust systems in the reclaim tunnels. Island of Aruba.
- Exxon Chemical Company -- Low Density Polyethylene plant: CCA; RA/A; S&V/R; FPA; HEC; EDP; 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: CCA; RA/A; S&V/R; EDP; 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 & dockside pier facilities' fire protection — CCA; RA/A; Interior water distribution and fire pump systems; Facility-wide fire protection [Foam suppression systems and alarm / detection sys.]-- analysis and design. North Slope, AK
- Mobil Oil: Low Density Polyethylene Plant: CCA; RA/A; V/R; FPA; HEC; EDP; 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- CCA; RA/A; V/R; EDP; fire service water dist.& pumping systems; various structure & gas Storage tank's fire suppression, alarm & detection systems--analysis & conceptual design. Los Angeles Harbor, CA
- Phillips Petroleum -HDPE Plant Expansion: CCA; RA/A; V/R; FPA; HEC; EDP; 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
 - Forensic Engineering - Cause & Effect Investigation, Analysis and Report addressing 350 ft. dia. (107 m) crude oil storage tank explosion & fire.
 - Analysis of the oil field area's fire department stations, firefighting equipment and manpower capability, along with recommendations for equipment and manpower upgrade/training, and development of specifications for equipment upgrade.
 - Analysis and retrofit design; preparation of International Tender -- Hassaka & Jebessa oilfields; CCA; RA/A; SV/R; EDP; fire service water distribution & pumping systems; various structure's (Control buildings and Electrical Control Center's fire suppression [Halon total flooding, alarm & detection systems]; Storage warehouses [sprinkler systems, and detection systems for alarm only); tank farm –internal tank and floating roof seal foam systems; automatic external water-curtain tank shell cooling system protection; berm area automatic foam protection; and area-wide hydraulic oscillating monitor nozzles. Fixed local application dry chemical protection systems with rate compensated thermal detection provided for remote pumping stations. Loading / Unloading dockside fire protection provided for the Port of Latakia. Syria
- Texas Instruments: PDP 3 Plant- CCA; RA/A; V/R; EDP; fire service water dist.& pumping systems; various structure fire suppression [foam on our/ water], alarm & detection sys.--analysis & design. Houston, TX
- Union Oil Company: Oil Shale Recovery Facility- CCA; RA/A; EDP; 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: CCA; RA/A; EDP; Analysis of existing fire service water distribution system, including fire pump systems; hydrant / valving and foam monitor nozzle layout, and tank foam suppression systems; and Loading / Unloading dockside fire protection retrofit design. Valdez, AK

Transportation

• Aviation

See also - Aerospace, Military- AF, COE, Navy and Air National Guard for additional Aviation Projects

- B1 Bomber Hangars - Grand Forks, North Dakota
- Fort Carson-Base wide multiple occupancy, Control Tower & Terminal. CO
- C-130 Hangar Project - Cairo, Egypt
- Homestead Air Force Base – Hangars, FL
- Willow Grove Naval Air Station-Aircraft & Helicopter Hangars, Control Tower, & Terminal, PA
- Glenview Naval Air Station-multiple occupancy, Control Tower & Terminal, IL
- Utah Air National Guard Base, UT
- Jefferson County Airport, CO: Fuel Storage Facility; CCA; EDP; analysis & design of foam fire suppression / alarm & detection, including replacement of fire pumps
- Imperial Palace Air, Ltd., Clark County Airport, Las Vegas NV: CCA; RA/A; HEC; SV/R; EDP; analysis and retrofit upgrade design for Hangar - Foam Suppression; Alarm / Detection systems, emergency notification system; and Fire Pump, including pump room.

PROJECT EXPERIENCE INFORMATION cont'd

Transportation cont'd

- **Aviation cont'd**

- McLaren International Airport, Las Vegas, NV: CCA; RA/A; S/R; EDP: Fire Protection and Life Safety Code analysis for new airport Terminals. Designed fire suppression and fire alarm/detection systems, including both Emergency Communication and Mass Notification.
- Nellis Air Force Base hangars: CCA; RA/A; HEC; SV/R; EDP; analysis / review and retrofit design; Foam fire suppression, UV / IR detection systems, and emergency evacuation system. Las Vegas, NV
- Oakland, CA International Airport Expansion Project: CCA; RA/A; S/R; EDP; Fire Protection water supply and fire pump analysis and design upgrade; new Terminal-wide fire Suppression, alarm / detection & emergency notification Systems; and Life Safety Analysis & Design.
- O'Hare International Airport, Chicago, IL: Consulting, CCA; EDP; analysis and design for an airport wide Radio Fire Alarm Reporting System, integrating all existing individual building's Fire Alarm and Detection systems.
- Phoenix Sky Harbor International Airport, Phoenix, AZ: CCA; RA/A; S/R; EDP: Fire protection and Life Safety Code analysis and design for Passenger Terminal and Concourse- pre-action and standard wet pipe sprinkler systems, and fire hose standpipes; combination thermal/photoelectric and aspirating smoke detection systems, except where rate-compensated thermal detectors were used. Fire alarm system incorporated both Emergency Communication and Mass Notification.

- **Shipping**

See also Military: Air Force & COE; Petroleum & Petrochemical, and Utility for Shipping Projects

- Automated Bomb Detoxification facility: off- ship MHS and dockside pier fire protection-Johnston Island, Atoll Pacific Ocean
- Commonwealth Edison: material handling system (Rail) & Pier Loading / Unloading and dockside pier fire protection. IL
- Defense Fuel Supply Point: Pier fire protection-Melville, RI; Cutler, ME; & Casco Bay, ME
- El Paso Energy-material handling system & Pier Loading / Unloading facility and dockside pier fire protection-Island of Aruba
- Gulf Oil-Parsons Lake: Pier Loading/Unloading facility and dockside pier fire protection. North Slope
- Syrian Petroleum Co, Port of Latakia: Pier Loading / Unloading facility and dockside pier fire protection. Syria
- Veco-Alaska - Pier Loading / Unloading facility and dockside pier fire protection. AK

- **Rail**

See also Industrial & Utility for additional Rail Projects

- Burlington Northern Santa Fe (BNSF) Railroad, Rail Loading / Unloading Facility, Richmond, CA
- Commonwealth Edison: material handling system (Rail) & Pier Loading / unloading (Shipping) and dockside pier fire protection. IL
- Public Service of CO / Public Service of New Mexico; & Utah Power & Light: 120 car Unit Train Loading & Unloading Facilities. Pueblo, CO, Four Corners, NM, & Huntington Canyon, UT
- Denver Light Rail System: Consulted on CCA; S/R; EDP; design of Control Center fire protection (gas suppression and air sampling detection systems) and Light Rail Vehicle Repair Facility (underground water supply, sprinkler & smoke detection, and emergency evacuation systems).
- Mexico City Subway System: Performed CCA; RA/A and consulting on engineering design for wet-water foam fire suppression, and smoke and UV IR detection systems for protection of tram rubber tires.
- New York transit Authority Subway System Car Barn Maintenance and Repair Shops: CCA; EDP; Fire protection Analysis and retrofit design, Brooklyn, N Y

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

See also Nuclear

- **Fossil plants listed below, include fire protection for both the Material Handling systems and Cooling Towers (multi-cell, wood or metal construction with combustible fill material)**
- Retrofit Fire Protection & Life Safety retrofit design projects for various plants: 60 coal- gas & oil- fired power plants ranging in size from 75 MW to 650 MW. Protection and type systems provided were based on Code Compliance & facility / equipment Hazard Analysis. RA/A; DS/R; E/SS; D/R; HEC; FPA; EDP; underground fire service water distribution & pumping systems, and water supply facilities (open bodies of water; new and existing reservoirs, and both above and below ground storage tanks); Structures: Administration buildings; Maintenance (Vehicle / Equipment) Facilities; Turbine Bays; Control Rooms / Cable Trays; Electrical Equipment Rooms; Storage Battery Rooms/ Buildings; Cable Spreading Rooms (sprinkler, water-spray, total flooding [Halon / CO²], and local application Dry Chemical systems) and associated alarm / detection systems). Equipment: Turbine Generator bearing & Lube Oil system (sprinkler, water-spray, CO² & Dry Chemical systems [manual / automatic] and associated alarm / detection systems); Burner-front fire suppression; Pulverizers (internal manual steam inerting or water deluge protection); enclosed Coal Storage Facilities, Silos, and conveyor systems (sprinklers, deluge, manual water-flooding systems, explosion suppression systems, along with appropriate detection systems); Bag Houses, Dust Collectors, Cooling Towers & Precipitator's - fire suppression and alarm / detection systems. Emergency Lighting and Egress systems (structures, and coal conveying systems) and Emergency evacuation and notification systems,

PROJECT EXPERIENCE INFORMATION cont'd

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

including involved system's acceptance testing and commissioning. Protection also included Manual Fire Hose & Standpipe systems, and both portable & wheeled CO² / Dry Chemical fire extinguishers. CO, ID, NM, Utah, & WY

• **New coal and gas-fired Plant Design**

Conceptual through final design, and construction. Fire protection & Life Safety design, as described under Retrofit power plants projects addressed above, was based on Code Compliance and hazard risk analysis. Installation supervision, acceptance testing and commissioning was also performed.

- Arizona Public Service
 - Four Corners Units - 3 & 4 (200 MW / each)
- Public Service of Colorado. Haden plant
 - Cherokee (380 MW)
 - Craig Station (165 MW)
 - Comanche Peak Units 1 & 2 (550 MW / each)
 - Haden (275 MW)
 - Pawnee Unit 1 (550 MW)
- Public Service of New Mexico
 - San Juan Station Units -3 & 4 (555 MW / each)
- Utah Power & Light
 - Huntington Canyon - Units I & II (450 MW /each)
 - Hunter Units - 1 & 2 (550 MW / each)
- 10 Scrubber projects: CCA; EDP; Fire Suppression and Alarm/Detection Sys. Analysis & Design; AZ, CO, NM & WY
- Coal conveying systems: 120 car Unit Train Rotary Car Dump, enclosed Coal Storage Facilities: CCA; RA/A; EDP; 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 system design. Utah, NM & CO
- Cogeneration plants (gas & oil,): The following Plants were reviewed for compliance with the Calif. State required Fire Protection for Permitting/ Construction; CCA; RA/A; as well as QA Review during Construction- Pico, Tracy and Silicon Valley Power (Combined Cycle). CA
- Commonwealth Edison-- Coal Fired Power Plant: CCA; RA/A; D/R; HEC; RDP; Fire Protection Analysis & Design Upgrade-Plant Wide: fire service water dist. & pumping systems; coal conveyor fire suppression, alarm & detection system --analysis & retrofit design; Chicago, IL.
- Commonwealth Edison--Coal transportation (rail and river barge), and Enclosed Storage Facilities: CCA; RA/A; D/R; EDP; fire service water distribution & pumping systems; dockside and rail terminal Loading / Unloading facilities, various structure & coal conveyor fire suppression, alarm & detection sys.—analysis, feasibility studies and conceptual design. IL
- DOE [Solar 1] - 10 MW solar power pilot plant: CCA; RA/A; FPA; HEC; EDP; fire service water distribution & pumping system, various structure fire suppression, alarm & detection system—analysis, design, and acceptance testing. Barstow, CA
- DOE --Wind Turbine Facilities: CCA; EDP; fire service water distribution.& pumping system; various structure fire suppression, alarm & detection sys.--analysis & conceptual design. CA, CO, WY
- Pacific Gas & Electric-- Gas Storage/Distribution Facility: CCA; RA/A; EDP; Gas Alarm and Detection systems—analysis, design, and acceptance testing. San Diego, CA
- Peat Fired Boiler and Feeding Conveyors: CCA; EDP; Fire Suppression & Alarm/Detection Systems—Analysis & design. Hilo, HI
- Public Service of CO, Coal Unit Train Loading & Unloading Facilities including Unit Train Rotary Car Dump, enclosed Coal Storage Facilities and entire Coal Conveyor system: CCA; RA/A; FPA; HEC; S/R; EDP; fire suppression, alarm & detection systems, incl. under/above ground fire service water dist. & pumping systems—Analysis, design, acceptance testing. Also, Design of Material Handling System's Life Safety Emergency Egress system. Pueblo, CO
- Public Service Co of NM-- Four Corners & Utah Power & Electric-- Huntington Canyon Power Plant: CCA; EDP; Turbine Generator bearing fire protection [CO / Automatic Water spray] & Alarm/Detection Systems--Analysis & Design. NM
- Pulp dryer fuel conversion project: CCA; HEC; EDP; Fire Suppression and Alarm/Detection Systems' Analysis & Design. WA
- Precipitator Retrofit Projects-- CCA; EDP; Fire Suppression and Alarm/Detection Systems' Analysis & Design. AZ, CO, NM & WY
- Tucson Gas & Electric -Fuel Oil Tank Farm: CCA; HEC; EDP; Underground fire service water distribution & pumping system, Foam Fire Suppression & Detection Systems--Analysis and Design. Tucson, AZ
- Utah Power and Light- Huntington Canyon Power Plant (Units I and II): CCA; EDP; Coal Pulverizers: Internal Manual Water spray Fire suppression and Automatic Detection Systems -- Analysis & Design. Utah
- Utah Power & Electric— Huntington Canyon Power Plant: CCA; EDP; Turbine Generator bearing fire protection [CO² / Automatic Water spray] and Alarm / Detection Systems -- Analysis & Design. Utah
- Waste-to-Energy Projects: CCA; RA/A; V/R; HEC; EDP; Fire Suppression and Alarm/Detection System Analysis & design. AZ, CA, CO, HI, NM & WY

PROJECT EXPERIENCE INFORMATION cont'd

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 Pre-heater 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	Public 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 Air Force Base, FL

Expert Witness

Note: Various other Cases are not listed, due to confidentiality Agreements with Clients represented.

- **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.
 - **Raytheon v. XCEL Mechanical Systems, Inc.** -- Helicopter crash occurred during heavy lift operation involving removal of HVAC equipment off roof of Office/Laboratory Building, resulting in water / fire and smoke damage.
 - **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 URS Corporation)

- **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.
 - **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.

PROJECT EXPERIENCE INFORMATION cont'd

Expert Witness cont'd

- **Commercial cont'd**
 - **GSA v. Pepper Construction Group, LLC** -- Construction claim regarding alleged change in Scope of Work, involving retrofit design of 10 story Federal Office Building (Cincinnati, OH) --Sprinkler System, Multiplex-Alarm / detection, and Emergency Evacuation & Voice Notification Systems.
- **Education**
 - **Smith Electric v. Pyro-Comm Systems, Inc.** -- Construction damages resulting from subcontractor's failure to submit Shop Drawings according to the Contract stipulated timeframe. Three Fire Alarm System Upgrade Projects involved, consisting of six individual school campuses & the District Office for a Central California School District.
- **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.
 - **Dunne v. Chu** -- Sprinkler activation, within a unit in a 52-story luxury high-rise condominium, located in San Francisco, CA., via Microbiological Influence Corrosion (MIC) with water damage and resultant personal injury.
- **Residential**
 - **Rifkin Residence** – Sprinkler system activation with extensive water damage to artwork.
 - **Lutzker Residence** – Sprinkler system activation with extensive water damage.

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 Magazine.
- "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, Amsterdam, The Netherlands.
- "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

- Various individual and multiple subject Seminars presented to A/E. and Design Firms, Military; Petroleum & Petrochemical; and Chemical Companies' Fire Protection and Safety Engineering staffs covering: Fire Protection & Life Safety and related systems-(Alarm, Detection, Emergency Notification / Evacuation); Hazardous Process suppression and detection systems; Fire Proofing and other related subjects, as referenced in the following Naval Seminar.
- 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 Base, PA

Seminar addressed: Selection of all forms of Fire Suppression Systems, based on the hazard requiring protection and design —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 temperature. /rate-of-rise / continuous line / thermister); Smoke (Ionization / photoelectric / beam / sampling); and Optical (UV/IR and combination). Fire Alarm & Reporting systems-selection and design-Hard-wired (conventional and multiplex) and Radio System 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 (Emergency Notification & Evacuation); Fire Wall and Partitions use and design, Fire- proofing (walls / columns / beams, & cable trays); Penetration Sealing; Smoke Management & removal Systems, incl. Fire / Smoke and combination Dampers and Smoke; and Heat Venting- evaluation & design approach.