

AREAS OF EXPERTISE

- Natural Hazard designs
 - Floodproofing
 - High Winds
- Building evaluations
- Structural engineering for buildings

EDUCATION

M.E. / 1999 / Structural Engineering – University of Virginia

B.S. / 1968 / Civil Engineering – Virginia Tech

PROFESSIONAL HISTORY

Applied Technology Council, 2008 – Present, Director, Wind and Flood Hazard Mitigation

Coulbourne Consulting, 2007 – Present

University of Delaware, 2007 – Present, Dept. of Civil and Environmental Engineering, Off-campus Faculty

URS, 2000 - 2008
Department Head, Manager, FEMA Special Programs

Greenhorne & O'Mara, Inc., Department Head, Natural Hazards Engineering, 1995-2000

Structural Engineering Consultant, 1992-1995

Vision Builders, Inc., and Consumer Energy Savers franchise Owner, 1983-

REPRESENTATIVE EXPERIENCE

Mr. Coulbourne has 41 years of experience as an engineer and manager. His expertise includes building design, methods, materials, and codes. He is experienced in hazard-related design and construction of wind- and hurricane-resistant structures. He has performed structural inspections and building investigations on thousands of structures to assess past or future performance during a natural hazard event. Mr. Coulbourne has provided professional expertise to national insurance companies in the identification of major structural defects and has served as an expert witness for a variety of residential construction issues.

Mr. Coulbourne is the part-time Director of Wind and Flood Hazard Mitigation for the Applied Technology Council. ATC is a non-profit organization whose mission is to bring research on natural hazards to the practicing structural engineer. Part of that mission is to provide outreach to engineering groups on methods used to reduce losses from hazard events.

Mr. Coulbourne has made nearly 100 presentations and taught more than 50 courses and workshops on subjects related to designs and regulatory requirements for natural hazards including teaching courses and webinars for ASCE since 2006. Audiences for these presentations and classes have included architects, engineers, planners, building officials, coastal zone management experts and regulators, and citizens. He teaches a building design course to Senior Civil Engineering Students at the University of Delaware as an off-campus faculty member.

Mr. Coulbourne actively participates in engineering standards development by working on the American Society of Civil Engineers (ASCE) standards ASCE 7, *Minimum Design Loads for Buildings and Other Structures* and ASCE 24, *Flood Resistant Design and Construction*.

Critical Facility Vulnerability Assessments, Texarkana, TX

Consultant to hazard mitigation planning contractor conducting high wind vulnerability assessments on 6 local buildings considered critical to the continued operation of city government before, during and after a tornado.

Technical Reviewer, Coastal Construction Manual Update, Washington, DC

Provide technical review of all the content in the newly

1992

Proctor & Gamble
Engineering Division and
Manufacturing Company,
Manufacturing Engineering
Manager, 1968-1983

REGISTRATIONS

Professional Engineer:
Maryland, 1975 (9419);
Virginia, 1993 (024462);
Delaware, 1993 (9492)

Certified Structural
Engineer (1866-1105)

Certified Building
Inspection Engineer (No.
35)

AFFILIATIONS

National Society of
Professional Engineers

Virginia Society of
Professional Engineers

National Academy of
Building Inspection
Engineers – Director and
Treasurer

Association of State
Floodplain Managers

American Society of Civil
Engineers

Structural Engineering
Institute (ASCE), Charter
Member

Accreditation Board of
Engineering and
Technology (ABET),
Commissioner for
Engineering Accreditation
Commission

AWARDS

ASFPM – John R. Sheaffer

revised FEMA 55-Coastal Construction Manual as a
subcontractor to URS.

Flood Elevation Consultation, Newport, RI

Consultant to local engineering firm on interpreting flood
elevations required for commercial building intended for
military use.

Floodproofing Design Consultation, Hilton Head, SC

Consultant to local engineering firm providing design
guidance on methods required to dry floodproof a
commercial building.

Flood audits, Prince George's County, MD

Consultant to local prime contractor conducting flood audits
on over 20 flood-prone buildings for both public and private
owners.

ATC Wind Design Guide, Redwood City, CA

Led effort to complete ATC Wind Design Guide for Low
Rise Buildings. The guide is intended for practitioners and is
expected to help fill the knowledge gap about why low-rise
wind provisions have been developed and how these
provisions might be interpreted in practice.

Hurricane Hugo – 20 Years Later; Building Safer and More Disaster Resilient Communities, Charleston, SC

Organized and led a 2-day workshop on issues important to
wind and flood experts in hurricane mitigation. Workshop
included 26 speakers including plenary sessions and panel
discussions.

Shelter Evaluations, DEMA, State of Delaware

Provided technical expertise and training for engineering
consulting team responsible for evaluating nearly 60 shelters
throughout the state that are expected to be used for
hurricane, flooding, ice and snow and technological events

Flood proofing and wind engineering consultant, LAHouse, LSU Campus, Baton Rouge, LA

Provided technical expertise to LSU Ag Center on methods
of flood proofing a demonstration house on the LSU campus.
Provided wind engineering design support and training
information on wind design that could be used as outreach
material by LAHouse.

Flood design consulting, Private developer, Newport, RI

Provided V Zone flood design criteria for multi-story

Excellence in
Floodproofing - 2009

building to be built in downtown Newport, RI and discussed the design with local building officials to gain concurrence of design

Campus-wide Vulnerability Assessment, Eckerd College, St. Petersburg, FL

Provided a wind and flood vulnerability assessment for key campus buildings that the college would deem to be critical in returning campus to normalcy after a hurricane. The buildings included dormitories, classrooms, laboratories and utilities and the proposed methods including high wind retrofitting, dry flood proofing, floodwalls and relocations.

Sea Level Rise Vulnerability Assessment, Somerset County, MD

Provided a vulnerability assessment of the county based on 3 sea level rise scenarios that were developed by others. The assessment included likely damage to and mitigation options for county infrastructure and critical facilities that could be pursued to minimize the impact from sea level rise.

Prescriptive foundations for raised-floor systems, Southern Forest Products Association, Kenner, LA

Developed prescriptive masonry pier foundation designs for 90, 100, and 110 mph wind speeds for piers ranging in height from 2 ft to 8 ft. Designs were presented for builders in easy to follow graphics and tables to facilitate the building of wood raised-floor systems.

Hospital Vulnerability Assessment, Jacksonville, FL

Provided technical expertise to determine vulnerabilities and mitigation projects in required to provide shelter to special needs population in Jacksonville. The buildings included a hospital and a developmentally challenged rehab center.

Tornado damage investigation, FEMA, Greensburg, KS

Led technical evaluation team for purpose of providing rebuilding guidance to the community and to evaluate the Enhanced Fujita scale Degree of Damage scales using examples from the tornado damage.

Shelter Evaluation, FEMA, Lucedale, MS

Provided technical expertise to determine if a 25,000 sf commercial building could be used as a hurricane evacuation shelter for people who might be displaced from the Mississippi coast during an evacuation warning.

Hurricane Katrina Mitigation Assessment Team, FEMA,

AL, MS, LA

Program Manager responsible for the reconnaissance work and development of recommendations for reconstruction in the areas affected by the storm. Provided numerous project briefings and presentations to groups nationwide interested in the results of the studies.

Pre-Disaster Mitigation Technical Review Program, FEMA.

Program Manager responsible for the technical review (engineering, environmental, and benefit/cost) of over 300 projects presented by grant applicants from across the nation. The reviews were conducted within a 4-week period with a team of nearly 80 professionals from several firms including URS. The reviews involved several levels of internal review culminating in a short technical report for each project providing the technical evaluation of the project.

Homestead, FL AFB Hangar Vulnerability Assessment

Project Manager and structural engineer responsible for conducting a high wind and flood vulnerability assessment of an air force hangar being studied for adaptive re-use by FEMA.

Red Cross ARC 4496 Technical Evaluation

Assisted Red Cross as an expert panel member to evaluate ARC 4496 shelter assessment tool and to make recommendations for improving the assessment methodology. Other panel members included shelter, high wind, evacuation and building design experts from across the country.

TARC Contract, FEMA, Nationwide

Program Manager for BESTT Joint Venture. Contract provides expert engineering and publication experience for nationally applicable design and study tasks. Some studies are forensic in nature conducted after disasters, and others are problem-focused studies that will help reduce the costs of future disasters. Recently led the Mitigation Assessment Team efforts for Hurricanes Charley, Ivan and Katrina.

Smithsonian Institution Vulnerability Assessment, Americas

Structural engineer that was part of a team to perform vulnerability assessments for natural and manmade hazards for Smithsonian buildings nationwide and in Panama. These assessments were conducted using FEMA 452 methodology.

The buildings were usually multi-story, were potentially impacted by several different hazards and involved numerous building systems.

Montclair Flood proofing Study, Montgomery County, MD

Structural engineer and flood proofing expert responsible for site visits to several homes that county wanted to provide flood proofing services for to reduce flood damage. Study included cost estimates and technical feasibility assessments.

Wind and Snow Design Parameter Study, Department of State, Worldwide

Developed methodologies for determining wind and snow loads that should be used for design purposes for Dept. of State posts located all over the world (except the US). Developed methods so calculations for wind speeds and snow loads could be done using a web-enabled tool.

Wind Evaluation Study, Texas Medical Center, Houston, TX

Technical evaluator of several buildings on the Texas Medical Center campus to determine the likely damage to those buildings from either a design wind event such as a hurricane or from a man-made event such as a bomb blast. Provided a mitigation plan to the client as part of the report.

Floodproofing Design Study, Home Depot, MA

Project Manager for a floodproofing evaluation performed by Home Depot's structural engineer for a building to be located in the floodplain. The evaluation included an analysis of the adequacy of the design and provided the client with some additional considerations in the operation of the building during a flood event.

Hurricane Mitigation Study, Southeast Region, GSA.

Program Manager responsible for conducting an evaluation of 120 government-owned buildings to determine how the buildings would respond to hurricanes and to develop mitigation measures to improve building performance.

Lake Murray Dam Evacuation Study, South Carolina.

Project Manager responsible for coordinating the development of an evacuation study of an area near Columbia, SC that would be affected if a nearby dam were to fail.

Elderly Housing Building Evaluations, Nationwide, Department of Housing and Urban Development (HUD).

Project Manager responsible for coordinating the building evaluations and preparing a report for HUD summarizing results and recommending changes to the elderly housing program.

Building Performance Study, World Trade Center Disaster, New York City, Federal Emergency Management Agency (FEMA). Structural Engineer involved in the joint FEMA/ASCE study of how the building collapses occurred and in the recommendations for additional study. Study included the effects fire had on the structural systems, the structural redundancy required to resist or delay eventual collapse, and the potential requirement that similar catastrophic events should be a part of building design criteria.

Hospital and Nursing Home Natural Hazard Evaluations, Aegis Solutions, Calcasieu Parish, LA. Performed building inspections to determine how the buildings would likely perform during a design hurricane event. Made building retrofitting recommendations to the client to improve the building's performance during these events.

enr-online, Nationwide. Responsible for development of an Internet-based engineering design tool that utilizes existing technology and engineering design tools to deliver solutions to engineering problems in almost real time.

TR83B, Florida Tornado Booklet, State of Florida Department of Community Affairs. Provided technical content and review of this tornado shelter space guidance document for school administrators and design professionals.

Garnet Patterson Elementary School, USACE, Washington, DC. Provided structural engineering design support and review to URS Hunt Valley office for the rebuilding of a gymnasium/locker room complex at this facility. Provided wind design and specifications for the building materials and methods.

Building Performance Assessment, Hurricane Georges in Puerto Rico, Federal Emergency Management Agency (FEMA). Project Manager of building performance assessment team that investigated flood and wind damage to buildings across Puerto Rico after Hurricane Georges. Managed preparation of FEMA Publication #339 - Hurricane Georges in Puerto Rico, which discussed damage observed and made recommendations to the government of Puerto Rico, via FEMA's-Mitigation Directorate, to adopt a new building code and review the existing regulation and

permitting process that enforced both Planning Regulation 7 (building code) and Planning Regulation 13 (floodplain management).

Building Performance Assessment, Hurricane Georges in the Gulf Coast, FEMA, FL, AL, MS. Project Manager of building performance assessment team that investigated flood and wind damage to buildings in the Gulf Coast region after Hurricane Georges. Managed preparation of FEMA Publication #338 – Hurricane Georges in the Gulf Coast: Building on Success, which discussed the impact of the storm in the region, as well as documented the mitigation successes observed.

Building Performance Assessment, May 3, 1999 Tornadoes in Oklahoma and Kansas. Project Manager of team that investigated damage due to this tornado event. Managed preparation of FEMA publication that discussed the meteorology of the event, the damage it caused, and mitigation measures that can be taken to reduce building damage and provide safer structures during these severe wind events.

Hurricane Marilyn, FEMA, St. Thomas, U.S. Virgin Islands. Performed damaged building assessments, and prepared structural designs for new and existing buildings that mitigate future damage from a significant wind or seismic event.

Beebe Medical Center, Lewes, DE. Assessed this coastal hospital's ability to withstand a major storm. The study and report included an analysis of the structural adequacy of the facility and the likelihood of a significant event in this coastal area. A presentation for the hospital and community was prepared.

Code Compatibility Study for Coastal Construction in the State of Florida, FEMA. Coordinated federal, state, and local input into a study of the conflicts between the NFIP and the State of Florida code requirements for coastal construction.

Manufactured Home Foundations, FEMA, Nationwide. Reported on standardized foundation designs that can be used in certain flood situations for manufactured home foundations. An analysis of flood depths, velocities, and foundation types were included in the report.

Coastal Construction Manual, FEMA. Project Manager responsible for rewriting this 3-volume, 1000 page manual (FEMA 55 3rd Edition) to be used by engineers, architects,

and building officials. This work also included the development of an interactive CD-ROM.

In-Home Shelter Design, FEMA, Nationwide. Prepared report (FEMA 320) on design criteria, including wind speeds that should be considered in the design and installation of an in-home shelter that will act as occupant protection from extreme winds.

Inland Wind Damage Analysis for Hurricane Opal and Hurricane Fran, FEMA, Florida, Alabama, Georgia, and North Carolina. Performed a study of the effects on structures of the Hurricane Opal and Hurricane Fran inland winds. Included were recommended mitigation measures and maps of actual inland winds compared to an inland wind model.

Inland Wind Damage Analysis for Hurricane Fran, FEMA, North Carolina and Virginia. Performed a study of the effect on structures of Hurricane Fran inland winds. Included were recommended mitigation measures and maps of actual inland winds compared to an inland wind model.

South Carolina Schools, FEMA, South Carolina. Presented a one-day workshop in three locations to engineers and architects employed by the State Board of Education on the natural hazards likely to occur in the state and on ways to mitigate damage from these hazards.

Instructor, "Engineering Principals and Practices For Retrofitting Flood Prone Residential Structures," and the "Coastal Construction Manual" for FEMA. Provides instruction at the National Emergency Training Center and at field locations.

Critical Facilities Evaluation, Hernando County, FL. Performed structural analysis of Emergency Operations Center to determine the impact a major hurricane would have on the structure. Recommended mitigation measures for the building and presented the findings to Hernando County officials.

Basement Performance Assessment, Red River Flooding, Fargo, ND. Performed a study and prepared a report on the effects of the 1996 Red River Valley floods on how basements performed structurally and how much dollar loss was incurred.

Shelter Evaluations, State of Florida. Project Manager responsible for evaluating more than 350 shelters used for hurricane evacuation throughout central and south central

Florida.

Shelter Evaluations, State of Delaware. Project Manager responsible for evaluating 40 buildings used as hurricane evacuation shelters.

Shelter Evaluations, State of North Carolina. Project Manager responsible for evaluating 17 buildings used as hurricane evacuation shelters. These buildings are located along the NC coast.

Luzerne County, PA Flood Mitigation Plans. Project Manager responsible for development of flood mitigation plans for over 40 communities along 150 miles of watershed. These plans included the management of several subcontractors involved in over 200 meetings with communities and work groups preparing these plans.

West Virginia Community Assistance Visits/Floodplain Training. Project Manager responsible for 12 Community Assistance Visits in the state prepared for FEMA Region III.

State of Delaware, Flood Mitigation Plans. Project Manager responsible for development of flood mitigation plans in 2 counties and 4 communities. These plans have already provided the impetus for changes in floodplain ordinances in several communities.

Lewes, DE Vulnerability Assessment. Project Manager responsible for a multi-hazard assessment of this community's vulnerabilities to those hazards. The plan included mitigation projects including cost estimates and benefit/cost ratios.

Milford, DE Vulnerability Assessment. Project Manager responsible for a multi-hazard assessment of this community's vulnerabilities to those hazards. The plan included mitigation projects including cost estimates and benefit/cost ratios.

Design & Construction Guidance Manual for Community Shelters, FEMA. Project Manager responsible for development of this "first of its kind" design manual (FEMA 361) on the concepts important to the engineering for shelters used for large numbers of people.

Whole House Revitalization, NWC Crane, IN. Structural Engineer for the revitalization of all family housing at this Center. Coordinated field investigation and prepared design plans and specifications.

Whole House Revitalization Forrestal Village Phase VI and VII, Naval Training Center, Great Lakes, IL.

Structural Engineer for this project included field investigation, schematic design and working drawings for 132 units in 38 buildings. Also included the assessment of existing conditions of several types of units including duplexes and quadraplexes. Design solutions were developed to address the identified deficiencies and construction cost estimates prepared.

Brick Row Historical District, Chicago, IL. Structural Engineer for the revitalization of historical quarters. Coordinated field investigation and preparation of design plans and specifications.

Redskins Stadium, Redskins Stadium, Inc., Raljon, MD. Provided building investigation on building to be relocated on the site.

Criterion-Hare Engineers, Laurel, MD; Criterion-Low Engineers, Richmond, VA; and Warren-Wolfe Associates, Dover, DE. Inspected residential and commercial structural failures in foundations and framing systems. Resident types included single and multi-family structures. Commercial types included warehouses and one- and two-story office buildings. Provided inspection reports, sketches, design repairs, and specifications for the damaged structures.

Special structures and design conditions included retaining walls, slope stability, poor drainage conditions, and severely separated house foundation walls on a failed slope. Provided designs, specifications and drawings for new residential structures including one- and two-story additions.

Inspections and designs have included:

- · Roof replacement in-progress inspections for built up and flat roofs totaling 35,000 sf
- · Deteriorated concrete balcony repairs for 30-unit condominium building
- · Office condominium pre-purchase inspections
- · Housing inspection for Arlington Housing Corporation
- · Four condominium association inspections (for approximately 600 units) and 15-year capital reserve analysis including reports, computer analysis, cost estimates, and presentations

Built custom homes and additions at \$3 million to \$4 million annual volume. Operated energy improvement and weatherization franchise focused on residential and light

commercial property. Used blower door technology to find air leaks and reduce energy consumption.

Managed many multi-million dollar production facility improvement projects. Managed plant production departments, including a three-shift chemical processing operation, a 120-employee warehousing operation, and a high-speed packaging department. Developed and taught project and management training programs for other plant management personnel.

**PUBLICATIONS AND
PRESENTATIONS
(PARTIAL LIST)**

Manufactured Home Foundations, A Summary of Current Studies, Association of State Floodplain Managers (ASFPM) Conference, 1996

Engineering Inspections for Natural Hazards, National Academy of Building Inspection Engineers (NABIE) Conference, 1998

Taking Shelter From the Storm, Building a Safe Room in Your House, FEMA, 1998. Primary author on this first design guide for building a safe room in a house. This guide included plans and specifications for the design of these safe areas.

Coastal Construction Manual, FEMA, 1999. Primary author for this 3-volume, 1000 page, engineering manual (FEMA 55 3rd Edition) on the design and construction issues important to the building of coastal buildings.

Promoting Multiple Floodplain Management Objectives Through FEMA's New Coastal Construction Manual, ASFPM Conference, 2000

Design Guidelines for Sheltering from Extreme Winds, America's Conference on Wind Engineering, 2001

Designing Hurricane Evacuation Shelters, ASCE Solutions to Coastal Disasters Conference, 2002

The New Coastal Construction Manual, ASCE Solutions to Coastal Disasters Conference, 2002

Design Guidelines for Community Shelters for Extreme Wind Events, Journal of Architectural Engineering, Volume 8, Number 2, June 2002

Lessons Learned, Building for Extreme Events, Structure Magazine, August 2006

Evaluation of the National Flood Insurance Program's Building Standards, American Institute of Research, Primary

author – Christopher P. Jones, other contributing authors –
Jamie Marshall, Spencer M. Rogers Jr., October 2006

Wind Speed Analysis of Greensburg, KS Tornado,
Structural Engineering Congress, December 2007

Hurricane Hugo and 20 Years of Hurricane History,
NABIE Annual Conference, 2008

Engineering Reports – or how to know the real story,
National Flood Conference, 2008

Planning for Climate Change in Coastal Delaware,
Delaware AIA Meeting, 2008

*Prescriptive Masonry Piers Designs for Raised Wood
Floors*, APA Workshops, 2008

Pier Construction for Wind and Flood Loads, LA Home
Builder Workshops, 2009

ATC Wind Design Guide, Hurricane Hugo – 20 Years Later
Workshop, 2009

*Guide to the Use of the Wind Load Provisions of ASCE 7-
05*, ASCE Press, 2009

ATC Wind Design Guide 2, Applied Technology Council,
2010

Wind Vulnerability Assessments for Structural Frames,
Structural Engineering Congress, January 2011

ASCE 7-10 Changes to Flood Load Provisions, Structural
Engineering Congress, January 2011

ASCE 7-10 Wind Changes and Approach to Forensics,
Structural Engineering Congress, January 2011