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Letter to the President

Dear Mr. President,

For the past 40 years, the National Institute of Building Sciences has served as the source of authoritative guidance and advice that the legislators who worked to found the organization envisioned.

When President Gerald Ford signed the Housing and Community Development Act into law on August 22, 1974, the nation was facing a difficult time. President Richard Nixon had just resigned two weeks before. The United States was in an oil crisis. The Vietnam War was ongoing. Three model code organizations were developing codes. The nation was facing a housing crisis.

Ten years before, President Lyndon Johnson had launched a War on Poverty. In 1967, as part of that effort, he appointed the National Commission on Urban Problems to study building codes and technology; zoning and land use; federal and local taxes affecting housing and urban growth; housing codes; development standards; and ways to increase the supply of decent housing for low-income families. Chaired by Senator Paul Douglas (D-IL), the body became known as the Douglas Commission. A distress signal to the nation, the resulting report stated, "...alarms sounded over the past years about the building code situation have been justified. They showed that, while the national model codes were reasonably up to date, the lack of uniformity and modernization at the local level was serious. This situation calls for a drastic overhaul, both technically and among various levels of government."

The report’s recommendations identified a number of ways to address the problem areas, among them the establishment of a new body, a National Institute of Building Sciences. Sen. Jacob Javits (R-NY), when introducing an initial bill to form the Institute, said, "The absence of a national source on new housing technology has been a great obstacle to the efforts to meet the goals set forth in the 1968 Housing Act. Moreover the lack of a system of uniform building code standards increases the cost of construction and inhibits innovation in building techniques."

Since its founding in 1974, the Institute has created dozens of councils and committees; developed hundreds of projects and reports for federal agencies and private-sector organizations; and brought together thousands of representatives from government, the professions, industry, labor and consumer interests to focus on the identification and resolution of problems and potential problems that hamper the construction of safe, affordable structures for housing, commerce and industry throughout the United States.

Since the Institute issued its first report, The Insulation Situation, in 1978, the organization has engaged in numerous studies that have improved the built environment and addressed significant problems plaguing our society. Publications by the Institute have covered a plethora of topics addressing housing and health concerns, from Rehabilitation Guidelines (1980); Toxicity Effects in Building Fires (1983); and Asbestos in Schools and Public Buildings (1984) to Indoor Sampling Guidelines for Termiticides (1986); Radon Gas: Practical Responses (1987); and Lead-Based Paint Testing, Abatement, Cleanup and Disposal Guidelines (1989). The Institute has also been on the cutting edge of the big-picture issues, such as the Moisture Control in Buildings Manual (1994); National Earthquake Hazards Reduction Program Guidelines for Seismic Rehabilitation of Buildings (1994); Natural Hazard Mitigation Saves (2005); Assessment to the U.S. Congress and the U.S. Department of Energy on High Performance Buildings; and the NIBS Guideline 3-2012: Building Enclosure Commissioning Process (2012). These projects and others are the result of the work of the Institute’s Councils and Committees. Consisting of volunteer experts from all corners of the building industry, they have provided their skills and time throughout the Institute’s history. Their efforts have greatly improved the health, safety and security of our nation over the past four decades.

We are proud to present this Annual Report, which provides a glimpse into the work of the many Councils and Committees of the Institute, and highlights their efforts to advance building science that aids in the implementation of new innovative solutions to improve our built environment. The Institute continues to address similar issues to those identified in the enabling legislation, working with industry associations to improve school safety; adoption and administration of codes; workforce needs; and a host of other continuing challenges to achieve a safer and more resilient nation.
Also included in this report is the Moving Forward Report, issued by our Consultative Council. Developed with input received from across the building industry, the report offers a number of recommendations each year. One such recommendation from the 2013 report served as the basis of a bill from the U.S. House of Representatives. On June 23, 2014, the House passed H.R. 4801, the Thermal Insulation Efficiency Improvement Act. This bi-partisan legislation, introduced by Reps. Adam Kinzinger (R-IL) and Jerry McNerney (D-CA), called for the U.S. Department of Energy to examine potential energy and water savings from expanded use of thermal insulation. The Consultative Council itself was designated in the Institute’s enabling legislation, and the Council’s report is in keeping with the original legislative intent to provide guidance and recommendations on improvements in the built environment. The 2014 Moving Forward Report begins on page 43 of this Annual Report.

Throughout its history, the Institute has worked to improve resilience and disaster preparedness. In 2014, the Institute joined with more than 20 design and construction sector associations to issue a statement promoting resilience planning across the building industry. In May, the chief executive officers of those associations (that have a combined membership of more than 750,000 professionals and are responsible for generating almost $1 trillion in gross domestic product) held a press conference at the National Building Museum, where a major exhibition, Designing for Disaster, had just opened. The CEOs committed their organizations to significantly improving the resilience of the nation’s entire built environment through research into new materials, construction procedures and other methods to improve the standard of practice.

Continuing to address the issues identified in its founding legislation, the Institute also collaborated with the International Code Council in 2014 to conduct a survey of code officials. The survey results contained some astonishing data. Nearly 85 percent of the survey respondents are currently over the age of 45. Of even greater significance, more than 80 percent of the existing code professional workforce is planning to retire in the next 15 years, and more than 30 percent will retire in the next five years. This leaves a tremendous gap in the code administration profession that will hamper public safety if something is not done to replenish this vital segment of the workforce. Yet, a workforce exodus is not only a concern for building safety departments. An aging workforce is a concern across the construction sector. Training and educating the next generation of building professionals is becoming an increasingly high priority.

The Institute’s efforts to inspire young people to enter into the Science, Technology, Engineering and Mathematics (STEM) fields are kicking into high gear. Partnering with the Total Learning Research Institute and NASA, the Institute has developed a new module for the existing Mars City program called the Mars City Facility Operations Challenge, which focuses specifically on the operations and maintenance of the virtual city. In 2014, the program’s Curriculum Development Subcommittee outlined a curriculum, and a team of professional designers developed a building information model (BIM) of the Mars City facility. The program, which is geared towards introducing high school and community college students to building sciences, is expected to begin rolling out in fall 2015.

The Institute, which is addressing education in several of its program areas, also co-hosted the ASTM/NIBS Workshop on Building Science Education in North America. This workshop looked at building science education as it currently exists in North America and offered a critical review of the building science curricula currently available at the graduate level in order to more effectively educate architects, engineers and construction professionals. Speakers representing universities in Canada and the United States made presentations and examined the nature of building science and its impact on the design and construction of building enclosures.

Over the past two years, the Institute has worked with the U.S. Department of Energy to develop the Better Buildings Workforce Guidelines and the Institute established the Commercial Workforce Credentialing Council in 2013 to lead the development. This critical effort will impact the operational performance of the nation’s offices, schools, hospitals and other commercial buildings because it sets the skills and qualifications of the workers who are responsible for energy savings and operations. Through the Better Buildings Workforce Guidelines, the building industry will have national guidelines from which to develop high-quality and nationally recognized training and certification programs, the better to address the current challenges in the energy efficiency workforce to ensure quality, consistency and scalability across the industry.

As noted, over 40 years ago, the enabling legislation recognized that codes and standards are essential to public safety and provide the foundation for resilience in our built environment. In 2014, the Institute moderated a forum focused on the adoption and updating of codes in the United States. This forum provided insight into the need to encourage states and communities to keep current in the application of codes and standards to provide for the safety of the public.

Emphasizing safety in the built environment, the Institute, as part of its 40th Anniversary celebration, held a round table discussion during Building Safety Month to discuss the future of the Institute and the merits of a safe environment. During the discussion, Board Members outlined their vision of the Institute’s future role and identified areas of interest for investigation and study to further the Institute’s mission. The conversation covered a range of topics, such as the reuse of existing buildings; the challenges of ensuring safety in small rural communities; whether codes should be more science-based; the importance of codes keeping pace with technology; and the need for more disaster-resistant buildings.

Building on that topic, the Multihazard Mitigation Council worked this year to identify the impediments to achieving resilient communities, and specifically how life-cycle performance intersects with the construction of resilient buildings and communities. The Council, expanding on the Mitigation Saves Report issued nearly ten years ago, developed a proposal to look at how the private sector can save money by investing in resilience. The previous report, which identified how the government saved by investing in resilience and mitigation, is often cited, “...a dollar spent on mitigation saves society an average of $4.” Events such...
as Hurricane Sandy and western wildfires, as well as other social issues, such as the expanding number of disaster declarations, bring this discussion to the forefront. The proposed report would identify ways private investment in resilience can reduce losses in revenue, decrease recovery time and minimize lost productivity.

At the beginning of the year, more than 700 attendees participated in Building Innovation 2014: The National Institute of Building Sciences Second Annual Conference & Expo. The conference had the theme Advancing Life-Cycle Performance, and the Institute’s programs, workshops and symposia carried that theme through their discussions.

Each year, the Institute honors those who work tirelessly to improve the nation and our built environment. The 2014 Institute Honor Award went to Mohammed M. Ettouney Sc.D., P.E., M.B.A., F.A.E.I., Dist. M.ASCE, in recognition of his dedication to creating a safer environment through the development of such tools as the Advanced Materials Database, Owners Performance Requirements Tool, Integrated Rapid Visual Screening Tool (IRVS) and IRVS for Schools. The Institute’s Member Award went to the STEM Program’s BIM Development Team in recognition of its work to develop a BIM for the Mars City Facility Ops Challenge. (The model serves as the backbone of the simulation.) The Institute’s Highest Award, the Mortimer M. Marshall Lifetime Achievement Award went to Earle Kennett, Senior Vice President and Chief Operating Officer of the National Institute of Building Sciences in recognition of his long and successful career of 26 years with the Institute. Kennett managed and directed projects for numerous federal agencies. He has served as the guiding force for many of the Institute’s initiatives, many of which have served to enrich the building industry and the built environment.

Forty years after its founding, the Institute continues to “…serve the nation and public interest by supporting advances in building science and technology to improve the built environment.” As this Annual Report will attest, 2014 has been a successful year for the Institute. Thank you for this opportunity to apprise you of our efforts.

It is our distinct honor to present this report to you for your consideration. We look forward to continuing to serve the nation in 2015.

James "Tim" Ryan, CBO
Chairman, Board of Directors

Henry L. Green, Hon. AIA
President

About the Institute

Four decades ago, the U.S. Congress set in place the structure for an organization, the National Institute of Building Sciences, to serve as an authoritative source for both the public and private sectors to create a safer, healthier built environment across the United States.

Since the early days, building industry advocates and practitioners have come together through the Institute’s Councils and Committees to use their collective knowledge and skills to address a variety of building-related concerns, and though they have accomplished much in that time, their work still continues today. As Americans strive to create high-performance facilities and respond to the need for safer, more resilient communities, the Institute is here to facilitate the discussion and assist in achieving the needed outcomes.

The Institute’s 21-member Board of Directors is composed of 15 elected members and six members appointed by the President of the United States subject to the approval of the U.S. Senate. Headquartered in Washington, D.C., the Institute’s professional staff provides technical, managerial and administrative support for the Institute’s programs.

Led by the Board and supported by the staff, the National Institute of Building Sciences stands ready to seek solutions based on sound science, using the collective knowledge and skills of its members and the building industry. We look forward to the next 40 years.
The Institute Board of Directors

The Institute Board is comprised of 21 members. Six members are appointed by the President of the United States, with the advice and consent of the Senate, to represent the public interest. The remaining 15 members are elected and can represent either public interest or industry voices. The Board representation includes architects, builders, building owners, building standards developers, consumers, contractors, educators, fire safety professionals, local agency officials, product manufacturers, professional engineers, state agency officials and others. However, the majority of board members are required to come from the public interest category.

In 2014, the Board’s Executive Team included James “Tim” Ryan, CBO, the code administrator for the city of Overland Park, Kansas, as chair; Stephen Ayers, FAIA, the Architect of the Capitol, as vice chair; John P. Kelly, the retired executive vice president of Ryan Companies US, Inc., as secretary; and Wally E. Bailey, director of development services for the city of Fort Smith, Arkansas, as treasurer.

In addition, three new members were elected to the Board in 2014. Eric Lamb is executive vice president of DPR Construction, a national commercial contractor and construction management company. Brian Larson, PE, is vice president at Stantec Consulting Services, Inc., where he leads the Quality Assurance program in the firm’s U.S. practice, focusing on best practices, client satisfaction and predictable technical outcomes. Jerry Shaheen, LEED AP BD+C, is a project executive at the Gilbane Building Company, where he is the Regional Lean Champion and Regional BIM [building information modeling] Execution Champion. In addition, Charles W. Steger, PhD, FAIA, president emeritus of the Virginia Polytechnic Institute and State University (Virginia Tech), returned to the Board for a second term.

Honored, upon completing their Board service in 2014, were: Susan S. Klawans, director of operational excellence and planning at Gilbane Building Company; Edward L. Soenke, FCSI, AIA, CCS, NCARB, principal of The Design Partnership, an architectural practice based in West Des Moines, Iowa, who served as immediate past treasurer; and RK Stewart, FAIA, NCARB, Hon. FRAIC, Hon. JIA, Hon. RAIA, LEED AP, who served as vice chairman from 2010 to 2011, chairman from 2012 to 2013, and is immediate past chair.

2014 Board of Directors

Chair: James “Tim” Ryan, CBO, Overland Park, Kansas
Vice Chair: Stephen T. Ayers, Architect of the Capitol, Washington, DC
Secretary: John P. Kelly, Ryan Companies, U.S. Inc. (ret.), Minneapolis, MN
Treasurer: Wally Bailey, CBO, City of Fort Smith, AR
Carl F. Baldassarra, PE, FSFPE, Arlington Heights, IL
Cindy L. Davis, Virginia Department of Housing and Community Development, Richmond, VA
Joseph B. Donovan, Beacon Capital Partners, Arlington, VA
Cheryl R. English, FIES, LC, Acuity Brands, Conyers, GA
Timothy H. Haahs, PE, AIA, Timothy Haahs & Associates, Blue Bell, PA
Richard Hayter, PE, Kansas State University, Manhattan, KS
Eric Lamb, DPR Construction, Redwood, CA
Brian C. Larson, PE, Stantec Consulting Services, Inc., Endicott, NY
Susan A. Maxman, FAIA, Green Cove Springs, FL
Thomas L. Mitchell, Jr., CFM, IFMA Fellow, FMIS Associates, LLC, Universal City, TX
Joy Marshall Ortiz, AIA, The Marshall Group, Reston, VA
Dwight “Sonny” M. Richardson, Jr., Richardson Home Builders, Tuscaloosa, AL
Jerry Shaheen, LEED AP BD+C, Gilbane Building Company, Philadelphia, PA
Charles W. Steger, PhD, FAIA, Virginia Tech, Blacksburg, VA
James Timberlake, FAIA, KieranTimberlake, Philadelphia, PA
Mary B. Verner, MES, JD, Washington State Department of Natural Resources, Olympia, WA
Steven R. Winkel, FAIA, PE, The Preview Group, Inc., Berkeley, CA
2014 Annual Institute Awards

Each year, the National Institute of Building Sciences recognizes individuals and organizations that have provided outstanding service to the Institute, the building community and the nation. The 2014 nominees include: Dr. Mohammed Ettouney; the Building Information Model (BIM) Development Team of the Institute's Science, Technology, Engineering and Mathematics (STEM) Education Program; and Earle Kennett.

The Institute Honor Award goes to an individual or organization that has made an exceptional contribution to the nation and the building community. The 2014 Honor Award recognizes Mohammed Ettouney, Sc.D, PE, PhD, MBA, F.AEI, Dist. M.ASCE, a principal at Weidlinger Associates, Inc.

Dr. Ettouney developed several multi-hazard engineering assessment and resilience management methods that consider both natural and man-made hazards and their interactions in order to enable objective assessments of new construction and retrofit schemes. The methodologies are meant to aid decision makers in the optimal selection of projects and options. Working first with the Federal Emergency Management Agency (FEMA) and later the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T), Dr. Ettouney’s work (in which the Institute also was involved) led to a series of publications and a collection of software tools for planning and evaluating buildings, mass transit stations and tunnels. He is a primary designer of the Advanced Materials Database (AMD) to advance research and development in better performing materials; the Owners Performance Requirements (OPR) Tool to simultaneously model risk, resilience and operational performance for a full range of natural and man-made hazards; and the DHS Integrated Rapid Visual Screening (IRVS) Tool.

The Institute Member Award goes to a member of the Institute or affiliate council who has made a substantial contribution in support of the mission, goals and objectives of the Institute. The 2014 Member Award recognizes the STEM Education Program’s BIM Development Team, which consists of representatives from KieranTimberlake, Gilbane Building Company, Alderson Engineering and the Total Learning Research Institute (TLRI).

The National Institute of Building Sciences, the National Aeronautic and Space Administration (NASA) and TLRI partnered to establish the STEM Education Program. The first initiative under the program is the Mars City Facility Operations (Ops) Challenge, which utilizes TLRI’s Mars City concept to introduce building sciences to high school students. Through a team-based simulation exercise, students will be responsible for operating the virtual Mars base using the same tools as facility managers. The simulation will be based on real-life scenarios and linked to a building information model (BIM), complete with systems, spaces and data.

The BIM Development Team developed the BIM on a compressed schedule and solely through volunteer time. The model provides the essential building information that will be loaded into the computerized maintenance management system (CMMS), which ultimately becomes the interface for the student simulation. The team made use of the Construction Operations Building Information exchange (CObine) to streamline populating the CMMS. The resulting model will serve as the backbone of the Facility Ops Challenge.

The Mortimer M. Marshall Lifetime Achievement Award, the Institute’s highest honor, goes to someone who has demonstrated a lifetime of dedication to the mission and goals of the Institute. Established in 2011 and named after the first member of the Institute, this award is bestowed upon those who exhibit the passion upon which the Institute is founded. The 2014 Mortimer M. Marshall Lifetime Achievement Award salutes Earle Kennett, Senior Vice President and Chief Operating Officer of the National Institute of Building Sciences, in recognition of his long and successful career and his retirement after 26 years of service with the Institute.

In his position, Kennett has managed and directed hundreds of projects for federal agencies in architecture and engineering research and science. He also initiated many Institute programs, among them the WBDG Whole Building Design Guide®, buildingSMART alliance®, United States National CAD Standard®, National BIM Standard–United States®, ProjNet®, Total Building Commissioning, High Performance Building Council (HPBC), Facility Maintenance and Operations Committee (FMOC), National Mechanical Insulation Committee (NMIC), Low Vision Design Committee (LVDC) and Academy for Healthcare Infrastructure (AHI), as well as the Building Enclosure Technology and Environment Council’s BEST Conference Building Enclosure Science & Technology™.

Each year, the Institute issues a call to industry for nominations to identify potential award recipients. In the summer of 2014, the Awards Committee reviewed the submissions and selected winners from the nominees based on how their work meets the mission, objectives and goals of the Institute. The Awards Committee will solicit nominations for the 2015 awards in late spring of 2015, with nominations due in July.

The Institute will celebrate its 2014 award winners at an Annual Reception and Awards Dinner, to be held January 8, 2015, during Building Innovation 2015: The National Institute of Building Sciences Annual Conference and Expo.

Award Recipients

Institute Honor Award:
Mohammed Ettouney, Sc.D, PE, PhD, MBA, F.AEI, Dist. M.ASCE

Institute Member Award:
STEM Education Program’s BIM Development Team

Mortimer M. Marshall Lifetime Achievement Award:
Earle Kennett, Senior Vice President and Chief Operating Officer of the National Institute of Building Sciences
Coordinating Council

The challenge of any organization with as many active Councils and Committees as the National Institute of Building Sciences is making sure the different groups are aware of what each other is doing. That is the specific purpose of the Coordinating Council. This Council is the venue where the Institute’s Councils and Committees meet to share information and coordinate efforts.

Comprised of representatives from each of the Institute’s standing programs, the Coordinating Council convenes in tangent with meetings of the Institute’s Board of Directors throughout the year to update the collective group on its activities.

Such a convergence of the Institute’s volunteer leaders serves an important function. The Coordinating Council provides the perfect environment for the chairs to build on program initiatives. By sharing information, the chairs often find possibilities to expand activities, whether collaborating on research, sharing expert resources or providing input on reports. When the members of the Coordinating Council convene, it is their opportunity to highlight new projects, discuss upcoming events and brainstorm on opportunities for collaboration and teamwork.

The Coordinating Council also provides the Board of Directors with an update on how their programs are responding to the strategic direction set by the Board.

In 2014, the Council continued to serve as a forum for discussion and collaboration.

Looking Ahead

In 2015, the Coordinating Council will continue to convene throughout the year to share updates on program activities and discuss opportunities for collaboration among program areas.

Learn More

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Coordinating Council

Chair: Stephen Ayers, Architect of the Capitol
Neil Blais, Blais Associates, Inc.
Chris Bogen, U.S. Army Corps of Engineers
William Brodt, NASA
James R. Cagley, PE, SE, Cagley & Associates, Inc.
Mariangelica Carrasquillo-Mangual, U.S. Army Corps of Engineers
Greg Ceton, Construction Specifications Institute
Deane Evans, New Jersey Institute of Technology Center for Building Knowledge
Benjamin Goldstein, U.S. Department of Energy
George Gosieski, Business EcoSystems
Ron King, National Insulation Association
Susan Klawans, Gilbane Building Company
Bryan Koon, Florida Division of Emergency Management
Jerry Mallory, Johnson County, Kansas
R. Christopher Mathis, Mathis Consulting Company
Stephen F. Mawn, ASTM International
Sherri McMillion, NAVFAC Engineering Innovation and Criteria Office
Get W. Moy, AECOM
Judd A. Peterson, Judd Allen Group
Joe Powell, Academy for Healthcare Infrastructure
Doug Read, ASHRAE
Jim. W. Sealy, Architect/Consultant
Andrew Smith, Bentley Systems, Inc.
Ryan Smith, University of Utah
Leanne Tobias, Malachite
Cynthia Wilk, State of New Jersey (ret.)

During a meeting of the Coordinating Council, Institute Program Director Deke Smith (right) and Benjamin Goldstein of the U.S. Department of Energy (second right) discuss the activities of the Commercial Workforce Credentialing Council.
Consultative Council

More than 40 years ago, the enabling legislation of the National Institute of Building Sciences established the Consultative Council. The Council, which was reconstituted in 2011, consists of representatives from across the building industry to provide insight on current issues in need of resolution. It now features more than two dozen organizations, representing all aspects of the building life cycle. The Council’s main responsibility is to develop the Moving Forward report, which contains findings and recommendations for inclusion in the Institute’s Annual Report to the President and Congress.

In 2014, the Consultative Council, continuing its role of bringing the buildings industry together to identify findings and recommendations to advance the built environment, worked to develop the latest edition of the Moving Forward report. The 2014 report of findings and recommendations (included in this Annual Report) was developed through a broad request made to the entire building industry to find out the issues industry deems important. The request resulted in numerous submissions, which were broadly organized into three main issue areas—the buildings-related workforce; resilience and a changing climate; and the need to align government and business to deliver a cost-effective, high-performance built environment. These categories served as the main topics covered within the report.

Looking Ahead

In January 2015, the Consultative Council will release its 2014 Moving Forward report during Building Innovation 2015, as well as prepare the report for inclusion in the Institute’s Annual Report. Following the release, the Council will begin work on the 2015 report, starting with issuing a call to the industry to identify the major issues of concern. The Council also will identify opportunities to implement the recommendations from the 2014 report, either through the Institute or by the High-Performance Building Congressional Caucus Coalition’s Policy Committee.

Learn More

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The National Institute of Building Sciences established the Council on Finance, Insurance and Real Estate (CFIRE) in 2011 to assure that the needs and concerns of these industry segments are addressed as the nation moves toward achieving high-performance buildings and communities. The Council serves as an important link between the design, construction and operations community and the finance, insurance and real estate community. It also provides a mechanism to advance guidance, policy, research and education, and training within these diverse audiences.

By focusing specifically on the role finance, insurance and real estate play in achieving high-performance buildings, CFIRE has established itself, in a relatively short time, as a hub of expertise. In 2013, the Council co-hosted a workshop with the U.S. Department of Homeland Security on “The Role of Insurance in Community Resilience.” In 2014, CFIRE focused on developing a report to address the challenges and opportunities of financing energy-efficiency retrofits in small commercial buildings, which make up the majority of the nation’s building stock. The report, which will be released in January of 2015, identified small commercial buildings as a largely untapped source of significant energy savings. However, multiple barriers exist on the demand and supply side for retrofit financing. The report includes recommendations to overcome these barriers.

Looking Ahead
CFIRE will release its first report, Financing Small Commercial Building Energy Performance Upgrades: Challenges and Opportunities, during Building Innovation 2015: The National Institute of Building Sciences Conference & Expo. Following the release, the Council will host a number of outreach activities, including webinars, Congressional briefings and presentations at conferences, to promote the report and encourage implementation of its recommendations. In addition, CFIRE will collaborate with the Multihazard Mitigation Council on private sector-based incentives for mitigation and the utilization of public/private partnerships to advance high-performance building and community goals.

Learn More

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CFIRE Board Leadership

Chair: Leanne Tobias, Malachite LLC
Vice-Chair: Andrew Dorchester, The Dorchester Group
Secretary: Lindene Patton, Zurich Financial Services
Debra Ballen, Insurance Institute for Business & Home Safety
Michael Erbesfeld, Building Owners and Managers Association International
George Gosieski, Broadcom
Erin Rae Hoffer, Autodesk
Jim LaRoe, LAROE Consulting Services
Over the course of the past two years, the National Institute of Building Sciences and the U.S. Department of Energy (DOE) worked to develop voluntary national guidelines, known as the Better Buildings Workforce Guidelines, to improve the quality and consistency of commercial building workforce credentials. In 2013, the Institute established the Commercial Workforce Credentialing Council (CWCC) to lead development of the guidelines.

The purpose of the Better Buildings Workforce Guidelines is to reduce the confusion and uncertainty around workforce credentialing; lower costs; and support better training and certification programs, better workers and better buildings. The Better Buildings Workforce Guidelines address four key energy-related jobs: energy manager, building energy auditor, building operations professional and building commissioning professional. A fifth commercial-building job, federal facility manager, was also evaluated with a focus on supporting DOE and U.S. General Services Administration (GSA) requirements under the Federal Buildings Personnel Training Act, but it was not developed into a BBWG job.

For each job title, a committee of subject matter experts nominated by the CWCC developed a job task analysis (JTA), outlining key duties, tasks, knowledge, skills and abilities. Based on the JTA, separate committees of subject matter experts then developed certification schemes (blueprints) for competency-based professional certifications and content outlines for training-based certificate programs.

The CWCC Board of Advisors and Board of Direction (BOD) reviewed the JTAs and certification schemes for each job during meetings in December 2014. At their meeting, the BOD voted to approve the JTAs and certification schemes contingent on minor modifications to be approved by the Scheme Committees.

Looking Ahead
In early 2015, the Institute will make the Guidelines available online for use by the U.S. commercial building industry, including professional certification bodies, labor union training funds and apprenticeship program sponsors; private training providers; and career and technical higher education programs, so that they can develop new or revised credentials that are high quality, industry endorsed and nationally recognized by DOE. The Institute will work with DOE and members of the CWCC to advance use of the Guidelines and their adoption by public and private sector organizations.
National Council of Governments on Building Codes and Standards

Building codes and standards; code departments; and code professionals play an important role in assuring the health, safety and welfare of communities. The National Council of Governments on Building Codes and Standards (NCGBCS) provides a forum to discuss important issues before the code profession and to promote technical findings; performance criteria and standards; and education and training on building regulations.

Originally established as an independent organization known as the National Conference of States on Building Codes and Standards (NCSBCS), the Council expanded its scope when it became a part of the National Institute of Building Sciences in 2011. That new scope recognized the role of all levels of government and the private sector in the development, adoption, administration and enforcement of building codes and standards; a change that was reflected in the Council’s name.

In 2014, NCGBCS (also known as the Council of Governments), developed a new resource, a Code Taxonomy. Now available on the WBDG Whole Building Design Guide®, this Code Taxonomy is designed to facilitate greater understanding of the building-related topics covered in codes; their relation to other guidance and criteria; and the departments and agencies at the federal, state and local level with jurisdiction on specific subjects. The Taxonomy will be continually updated as additional topics and related resources are identified.

During the year, NCGBCS also supported the Institute’s work on behalf of the International Code Council (ICC) examining the future of the code professional workforce. Through a first-of-its-kind demographic survey, the Institute found that 80 percent of the code professional workforce is planning on retiring within the next 15 years, with 30 percent retiring within the next five. This statistic is particularly disconcerting, as nearly half of the code departments that responded consist of nine people or less. As a follow-up to the survey and resultant report, the Institute conducted a Town Hall meeting during ICC’s 2014 Annual Conference to discuss strategies to overcome the issues identified in the survey.

Looking Ahead

In 2015, the Council of Governments will undertake a reorganization to reflect the evolving nature of code development, adoption, enforcement and administration. This restructuring will allow for greater participation by private sector organizations that play an important role in the codes process. The Council will also look to implement some of the recommendations identified in the reports developed for ICC.

Learn More

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NCGBCS Board of Direction

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Mike Unthank, State of New Mexico
Off-Site Construction Council

The Off-Site Construction Council (OSCC) serves as a research, education and outreach center for information on off-site design and construction for commercial and multifamily buildings. By engaging with industry designers and builders, the OSCC aims to increase productivity within the construction sector and promote knowledge sharing.

The National Institute of Building Sciences established the OSCC in 2013 in response to the growing focus on off-site construction as a means to achieve multiple building industry goals. Since then, the Council has actively recruited industry leaders to participate in the group and assist in developing a strategy to address identified knowledge gaps.

In 2014, the OSCC conducted an industry survey to better understand the current utilization of off-site construction techniques and technologies and the barriers to more widespread use. The Council received more than 300 responses to the survey, and expects to release the results in early 2015. In addition, the Council conducted a separate survey of university architecture and construction management programs to assess how off-site construction processes are being taught by academia. During the year, the Council began compiling resources for the OSCC section of the Institute website. The OSCC also developed a new resource page, “Off-Site and Modular Construction Explained,” which is now available on the WBDG Whole Building Design Guide®.

Looking Ahead

In 2015, focusing on the areas that the industry survey identified as the greatest need, the OSCC will begin developing an Off-Site Construction Implementation Guide to help industry better utilize off-site construction techniques and technologies. In addition, the Council will conduct a survey about the industry’s use of software tools in the off-site construction process.

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OSCC Board of Direction

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Stacy Scopano, Autodesk

Building modules take shape side-by-side on dual off-site assembly lines. Photo courtesy of Capsys Corp.
Science, Technology, Engineering and Mathematics 
Education Program

The building industry is increasingly recognizing that it will take a concerted effort, across all disciplines, to assure a robust workforce into the future. What the industry needs is a dynamic outreach mechanism with links to post-secondary education opportunities and eventual employment. The National Institute of Building Sciences, through its Science, Technology, Engineering and Mathematics (STEM) Education Program, is working to develop this pipeline of talent using a comprehensive approach that focuses on inspiration, engagement, education and employment.

The Institute began developing the STEM Education Program in 2012 to interest students in buildings-related careers. As its first initiative, the program teamed with the Total Learning Research Institute (TLRI) and the National Aeronautics and Space Administration (NASA) to develop the Mars City Facility Operations (Ops) Challenge. The Challenge requires students to manage a virtual base on Mars using the same software tools that facility managers currently use in the field. The Ops Challenge first familiarizes students with buildings, building systems and Mars through an introductory curriculum. In 2013, the STEM Program tested this introductory curriculum on students at Edison Academy in Fairfax, Virginia.

The STEM Program made significant progress in 2014. Through the volunteer efforts of KieranTimberlake, Gilbane Building Company and Alderson Engineering, a team of industry professionals completed a building information model (BIM) of Mars City. This BIM is an integral element in the development of the simulation because it will serve as both a physical representation of the base and the repository for information on building equipment. Using the Construction Operations Building information exchange (COBie) standard, the team then transferred information from the BIM into a computerized maintenance management system (CMMS) provided by TMA Systems. The CMMS will serve as the main point of interaction for students.

The International Facility Management Association (IFMA) Foundation also signed on as a supporter in 2014 and IFMA members helped to develop the simulated work orders, based on real-life situations, which the students will be responding to during each simulation. Once the program rolls out to schools, IFMA will provide a valuable outreach mechanism for mentors to participate in the program through its chapter network.

Through the course of the year, the STEM Program Committee also conducted more than a dozen interviews with industry representatives from multiple disciplines. The interviewees each talked about their job, educational background and professional experience, as well as why they chose their career path. These interviews will be available via an online STEM Career Center that also provides students with information on developing an educational plan and offers links to other career-related resources.

Looking Ahead

In 2015, the STEM Program will continue working to develop the Facility Ops scenarios and engage IFMA Chapters to provide expertise. The team will identify pilot schools, participating IFMA Chapters and associated community and four-year colleges. In addition, the STEM Program will test the finalized curriculum and validate the simulation tool for a rollout beginning in late 2015.

Learn More

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STEM Program Leadership

Lead Organizations:
National Institute of Building Sciences
Total Learning Research Institute
National Aeronautics and Space Administration

Technical Support:
Alderson Engineering
Gilbane Building Company
International Facility Management Association
Jacobs Engineering
KieranTimberlake
Onuma Inc.
TMA Systems
Tipps Architecture

STEM Platinum Plus Contributor:
IFMA Foundation
Low Vision Design Committee

In September 2010, the National Institute of Building Sciences hosted the seminal “Workshop on Improving Building Design for Persons with Low Vision,” sponsored by the U.S. General Services Administration (GSA). This workshop spawned the concept of a multidisciplinary committee consisting of a team of professionals from the design and medical professions that could explore, by integrating their disciplines, ways to improve the visual environment for all users. The Low Vision Design Committee (LVDC) would organize activities to help designers gain a better understanding of low vision persons’ needs, as well as clinicians’, to better understand lighting and accessibility.

The Committee, which is funded by generous support from the Hulda B. and Maurice Rothschild Foundation and the Jim H. McClung Lighting Research Foundation, brings together a dedicated group of architects, interior designers, engineers, lighting designers, researchers and medical professionals, many of whom, themselves, have low vision. This volunteer multidisciplinary group serves to “address the needs of all occupants of the built environment, including those with low vision, through improvements in designs and operational procedures for new and existing facilities to enhance the function, safety and quality of life.” The LVDC strives to fulfill its mission by identifying relevant knowledge (and research gaps) and sharing that knowledge through the creation and refinement of design guidelines and building standards. From its first meeting in November 2011, the LVDC began working to develop guidelines to accommodate persons with low vision in the built environment.

The Committee kicked off 2014 by hosting its second Low Vision Design Committee Symposium, with the theme, “Creating Flexible Environments for People with Low Vision,” as part of Building Innovation 2014: The National Institute of Building Sciences Annual Conference and Expo. During her keynote presentation, GSA Deputy Administrator Susan Brita emphasized GSA’s continuing commitment to leadership in the art and science of creating universally supportive environments. Researchers and students from the University of Idaho and Virginia Tech joined LVDC members in taking an active part in the event.

A goodly portion of the LVDC’s efforts in 2014 was devoted toward refining and finalizing its flagship publication, Design Guidelines for the Visual Environment. The publication underwent two rounds of public review in 2014, and was also reviewed by the Illuminating Engineering Society’s Lighting for the Aged & Partially Sighted Committee. The LVDC plans to publish the first edition of the Guidelines in early 2015.

During the year, the LVDC also contributed material to be considered for inclusion in the Facility Guidelines Institute (FGI) Guidelines for Design and Construction of Hospitals and Outpatient Facilities and Guidelines for Design and Construction of Residential Health, Care, and Support Facilities. LVDC members also successfully introduced changes favorable to persons with low vision to the Illuminating Engineering Society (IES) Committee/ASHRAE 90.1 – 2014. Development of Guidelines for Interior Illumination; and ANSI/IESNA RP28-07 (revisions): Recommended Practices for Lighting and the Visual Environment for Senior Living, which will be published in the first quarter of 2015.

Looking Ahead

The LVDC will convene in January during Building Innovation 2015. The Committee will work to finalize and publish the Guidelines. Following publication, LVDC members will form a subgroup to begin converting the Guidelines into a mandatory-language standard. The Committee also will continue to pursue low vision-friendly amendments to existing standards and guidelines, including the FGI Guidelines. During the year, the LVDC will accelerate its outreach efforts among membership associations. The Committee will make a presentation on the Guidelines in April at the Environments for Aging Conference, sponsored by the Center for Health Design. In May, the LVDC will make a presentation on designing for persons with low vision at the American Institute of Architects Annual Convention.

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LVDC Leadership

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Vice Chair: Stuart L. Knoop, FAIA
Institute Board Liaison: Cheryl English, Acuity Brands
The National Institute of Building Sciences established the Academy for Healthcare Infrastructure (AHI) in 2013 as a collaborative research program to bring leading healthcare professionals together to address industry challenges at a national level. Formulated to utilize the power of interdisciplinary collaboration, the Academy is focused on improving the processes to create and maintain the complex built environment required to support America’s healthcare mission. AHI serves as a collaborative network focused on exploring large, comprehensive ideas. By the end of its first year, the Academy had established its charter, selected Research Governors and begun the process of selecting appropriate subject matter experts to serve on each team. These small groups, called Interdisciplinary Research Teams, are looking to identify current best practices; envision the future of the healthcare infrastructure industry; and engage appropriate industry leaders to develop new approaches for solving critical problems.

In 2014, based on industry input, the Academy decided to streamline its initial areas of focus, reducing the number of Interdisciplinary Research Teams from ten to five to more effectively address the most critical priorities currently facing healthcare facilities. The structure of the teams has also changed. The academicians on each of the teams will now serve as facilitators, interviewing the leaders in the healthcare facilities industry and then developing the white papers to be published by the Institute. The five priority topics are: Owner Organization for Successful Project Outcomes; Developing a Flexible Healthcare Infrastructure; Speed to Market Strategies; Defining the Next Generation’s Focus; and Reducing Initial Capital Costs.

Looking Ahead

In 2015, the academicians on each of the AHI Interdisciplinary Research Teams will continue to interview leaders in the healthcare facilities industry and begin developing the first round of white papers to be published by the Institute. In January of 2016, each team will present its white paper during Building Innovation 2016: The National Institute of Building Sciences Annual Conference & Expo in Washington, D.C.

Learn More

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Cindy Beckham, Mercy (St. Louis, MO)
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Gregory Mohler, BJF Healthcare (St. Louis, MO)
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Frank Weinberg, MedStar Health (Columbia, MD)
Denton Wilson, Methodist Health System (Dallas, TX)
Col. Stephen Wooldridge, U.S. Army Medical Command, (Washington, DC)
Building Seismic Safety Council

In 1979, following the passage of the National Earthquake Hazards Reduction Act of 1977, the National Institute of Building Sciences established the Building Seismic Safety Council (BSSC) to address earthquake-resistant design and construction throughout the United States. For the past 35 years, the Council has supported the Federal Emergency Management Agency (FEMA) in its efforts, as part of the National Earthquake Hazards Reduction Program (NEHRP), to advance seismic-resistant techniques. In its role, BSSC developed the 1985, 1988, 1991, 1994, 1997, 2000, 2003 and 2009 editions of the NEHRP Recommended Provisions for New Buildings and Other Structures. The techniques and technologies contained in these resource documents are adopted in the American Society of Civil Engineers (ASCE) ASCE-7 Minimum Design Loads for Buildings and Other Structures, which is referenced in the model building codes developed by the International Code Council (ICC).

BSSC consists of more than 50 member organizations (MOs), representing a wide variety of building community interests related to seismic safety, and over 150 individual members.

In 2014, BSSC had a number of significant accomplishments:

NEHRP Provisions: Since the release of the 2009 Provisions, BSSC has been working to develop the 2015 NEHRP Recommended Provisions for New Buildings and Other Structures. Issue teams appointed by the BSSC Provisions Update Committee (PUC) drafted proposals for the three parts of the 2015 Provisions. These include: Part 1, which addresses proposed changes to ASCE 7-10; Part 2, which has changes to the ASCE 7-10 Commentary; and Part 3, which contains resource papers on special topics in seismic design. The PUC conducted two ballots on the proposals that were then assessed by the MOs. A third major MO ballot included proposals and voting on such topics as diaphragm and foundation strength design, steel grid frames and linear response history analysis. All of the ballot items approved by the MOs and the BSSC Board of Direction will be incorporated into the 2015 Provisions.

Design Examples and Training Materials: In addition to its Provisions development activities, BSSC also began developing new design examples based on the 2015 Provisions. Similar to FEMA P-751 Design Examples, which are based on the 2009 Provisions, the new design examples are geared towards experienced structural designers who are relatively new to the field of seismic design. The new design examples will explain the principles behind the updated Provisions.

Simplified Seismic Design Procedures: In 2014, BSSC began developing the publication, Seismic Design of Rigid Wall-Flexible Diaphragm Buildings: An Alternate Procedure, a proposed procedure for earthquake resistance of one-story buildings with stiff and strong concrete or masonry wall elements coupled with flexible roof diaphragms. The publication resulted from a study that demonstrated how design provisions narrowly directed at a single building type can be simpler and provide designs that more consistently meet expected performance objectives. It is anticipated that this methodology will be incorporated into future seismic design codes and standards. Until this occurs, some aspects of the alternate design method can be implemented within the context of current code procedures. BSSC held a workshop in September to support the development of the publication. The finalized publication is expected to be released by FEMA in the coming year.

Monitoring Code Changes: The responsibility of the Code Resource Support Committee (CRSC) is to monitor and support the U.S. code development process to ensure that the ICC’s International Building Code (IBC), International Existing Building Code (IEBC) and International Residential Code (IRC) remain substantially equivalent to the latest edition of the NEHRP Recommended Provisions. In 2014, the CRSC oversaw development of a critical study to address site factors in seismic design.

Looking Ahead

In 2015, BSSC will complete the last ballot of the development cycle and begin preparations to publish and disseminate the 2015 Provisions and supporting design examples. BSSC will hold a colloquium in February to present key outcomes and major updates in the 2015 Provisions, as well as future research needs. It will work with FEMA and the U.S. Geological Survey to coordinate hazard and engineering design value maps. In addition, the CRSC plans to address changes to seismic sections in the next code cycle.

Learn More

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BSSC Board Leadership

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Vice Chair: James R. Cagley, PE, SE, Cagley & Associates
Secretary: Melvyn Green, Melvyn Green & Associates
Multihazard Mitigation Council

The Multihazard Mitigation Council (MMC) serves to advance disaster resilience through whole building and community strategies. Founded by the National Institute of Building Sciences in 1997, the MMC spent its first decade performing contracts for the Federal Emergency Management Agency (FEMA) and the National Institute of Standards and Technology. One of its most recognized products during that period was the 2005 study, Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities, which gave the disaster community the oft-quoted axiom, “a dollar spent on mitigation saves society an average of $4.”

Hazard mitigation only works when implemented, and there are a number of real-world barriers to such implementation in the United States. In 2011, to address that concern, the Institute reconstituted the MMC as a broad group of volunteer experts for the purpose of expanding beyond the science and engineering into the realm of public policy and private property. The updated MMC recognizes that homeowners, commercial and industrial property owners, researchers, the public sector and many others need to collaborate in order to achieve these objectives. A large part of the reconstituted MMC’s mission is to identify how to reduce or eliminate barriers when developing the best possible mitigation strategies, measures and policies.

Incentives-Based Approach: In 2014, the MMC initiated an effort to develop an incentives-based approach to resilience, which is vital to ensuring implementation. For this incentives initiative, the MMC is working to develop messaging to the public and private sectors; bring together organizations with business and financial interests in enabling resilient communities; develop approaches to incentivization; build an incentives framework; promote incentivization to the private sector; and prepare a white paper on the topic.

Mitigations Saves Version 2.0: Celebrating a decade since the release of the Mitigation Saves study, the MMC submitted a proposal to FEMA in 2014 to develop a second, complementary work. The 2005 study did not examine the cost-effectiveness of private-sector investments. Although it is generally acknowledged that the private sector has received significant benefits from investing in disaster mitigation, the magnitude of these benefits, as well as their costs, has yet to be quantified on a comprehensive basis.

Resilience Framework: During the year, the MMC submitted a proposal to FEMA to build a framework for resilience-focused policies and programs. As losses from hazard events increase, the resilience framework is intended to set an overarching approach that recognizes the diversity of current activities, establishes a common understanding of goals and outcomes, and optimizes investment of resources.

Resource Clearinghouse: In 2014, the MMC initiated a Resource Clearinghouse of existing publications, materials and research related to mitigation best practices. The Clearinghouse is anticipated to become a key resource for mitigation-related information for policymakers, academic researchers and practitioners.

Starting the Conversation: The MMC started a conversation with both the public and the technical community, asking the question, “What kind of disaster performance do building owners and tenants want?” and inquiring what kind of protection their buildings currently have.

Mitigation Webinar Series: As part of an ongoing series, the MMC hosted four mitigation-themed webinars in 2014. In April the topic was “Safe Enough? How the Building Code Protects Our Lives but Not Our Cities.” In July, it was “Better Building Codes: Demanding Minimum Construction Practices—It’s the Least We Can Do!” In September, the webinar asked “Is My Building Earthquake-Safe? Obstacles to a Practical Earthquake Rating System.” And in October, the webinar looked at “Substantiating Mitigation – Florida’s Loss Avoidance Assessment Strategy.”

JNIBS Articles: The MMC provided a hazards-related article for the June 2014 issue of the Journal of the National Institute of Building Sciences (JNIBS). In addition, the MMC and the Building Seismic Safety Council coordinated the October issue of JNIBS. With the theme, “Best Practices in Preparedness and Recovery,” the edition contained five hazards-related articles.

Symposia: The Council planned and conducted the MMC Symposium, Life-Cycle Performance: Moving Forward to More Resilient Communities, held January 7, during Building Innovation 2014. The one-day event looked at barriers to mitigation in the nation’s local residential and commercial sectors, and how such barriers impact a community’s ability to respond to, and recover from, a disaster. Throughout the rest of the year, the MMC helped to organize the Security & Disaster Preparedness Symposium scheduled for Building Innovation 2015, as well as the Special Session: Ten Years after “Mitigation Saves,” to be held during the Conference.

Looking Ahead

Based on its 2014 research, the MMC will release a white paper in 2015 on incentivizing resilience in the public and private sectors. The Council will continue to seek funding for Mitigation Saves Version 2.0. MMC plans to schedule several resilience webinars during the year and continue its work to expand the mitigation clearinghouse. The MMC Public Expectations Subcommittee will conduct several surveys on building codes during the year.

Learn More

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MMC Board Leadership

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Vice Chair: Bryan Koon, Florida Division of Emergency Management
Secretary: Kevin Mickey, GISP, CTT+, The Polis Center, Indiana University Purdue University Indianapolis

SecuritY & Disaster Preparedness
Scientific Resolution Panel

The National Institute of Building Sciences established and began administering the Scientific Resolution Panel (SRP) process for the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) in 2010. FEMA uses scientific and technical data to develop Flood Insurance Rate Maps (FIRMs). If a community, tribe or political entity challenges the proposed FEMA flood hazard data depicted on FIRMs—proposed flood hazards may include the addition or modification of base flood elevations (BFEs), base flood depths, special flood hazard area (SFHA) boundaries or zone designations, or regulatory floodways—for a particular area, the community or FEMA may ask for an SRP to perform an independent review of the data in question.

SRPs are charged with providing a written decision and rationale that denies or accepts the alternative flood hazard data submitted by the community. Each Panel consists of five members selected from an independent cadre of technical experts in surface water hydrology, hydraulics, coastal engineering, and other engineering and scientific fields that relate to the creation of Flood Hazard Maps and Flood Insurance Studies throughout the United States.

President Obama signed legislation in 2012 that specifically made SRPs available, reduced the length of the Panel’s decision-making process and the number of decision options the Panel could make. Each Panel now has to deliberate and make a decision within 90 days and provide a decision that is either in favor of FEMA or the community. The law made the Panel decision binding for all parties (unless FEMA submits a written justification “not to enforce” within 60 days). In the latter case, a community retains its right to appeal a FEMA decision “not to enforce” in the appropriate Federal District Court.

In late 2014, the Institute received two new SRP requests, the first from FEMA’s Region I and the second from Region X.

Looking Ahead

In 2015, the two Panels will present their recommendations to FEMA and the communities. The Institute will continue to maintain its cadre of experts and convene SRPs as needed throughout the year.

Learn More

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Hazus Independent Verification and Validation Program

More than two decades ago, the National Institute of Building Sciences developed a geographic information system (GIS)-based software program for the Federal Emergency Management Agency (FEMA). Known as Hazus, the program, which is still in use today, employs state-of-the-art technology to estimate damage and loss from potential earthquake, flood, hurricane and coastal surge events. Emergency planners use Hazus as a forecasting tool to assess emergency mitigation strategies before a disaster occurs. The Institute developed updates for the software until 2009. Since then, the Institute has provided FEMA with independent validation and verification (IV&V) for Hazus Multi-Hazard (MH) as needed, directing oversight committees responsible for evaluating the development of the various Hazus-MH tools. In 2014, following five years of testing bug fixes and updating data and software platforms, the Institute concluded its testing of the Hazus program.

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Integrated Rapid Visual Screening

Integrated rapid visual screening (IRVS) is a methodology for assessing the risk and resilience of buildings, mass transit stations and tunnels to terrorist attacks and selected natural hazards. This accurate, rapid and easy-to-use tool, developed by the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) Resilient Systems Division (RSD) and public- and private-sector stakeholders involved in the design, operation and management of critical infrastructure, has been thoroughly tested and is in wide use. The National Institute of Building Sciences became the project manager for the IRVS program in 2011 and continues to support its operation. The IRVS tool and a complete report describing its methodology and use are available at www.dhs.gov/bips.

The IRVS for Buildings integrates the Interagency Security Committee (ISC) standards and best practices, including The Risk Management Process for Federal Facilities: An Interagency Security Committee Standard, published in August 2013. The Institute worked with DHS and other members of the IRVS team to add the ISC capability to IRVS and continues to support its ongoing availability. The latest version of the IRVS Plus ISC tool, which is networkable, covers child care centers and complies with the latest ISC standards. The IRVS ISC tools are available upon request to DHS or the Institute.


Throughout 2014, the Institute’s School Safety and Security Committee developed and reviewed a second draft of the IRVS for Schools manual. In addition, the Institute continued development of a new version of IRVS for evaluating safety and security of schools. Plans for preparing an automated version of the tool are in the works.

With the release of the latest version of the IRVS Plus ISC at the beginning of 2014, and its accreditation by the DHS ISC, DHS has determined that the IRVS tools are ready for transition. The Institute and DHS are in discussions on a plan that will continue the work of the IRVS tools within the Institute. The Institute will form a coalition with DHS, other federal agencies and the private sector to make the IRVS tools available and to continue their development.

Looking Ahead
In 2015, the Institute will continue to support the various IRVS modules and work with DHS on transitioning the program to the Institute.

Learn More
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Integrated Resilient Design Program

The National Institute of Building Sciences Integrated Resilient Design (IRD) Program develops integrated high-performance-based tools, educational materials and publications for dissemination to the United States building industry.

Launched in 2010 to help the U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate with activities of its High Performance & Integrated Design Resilience (HP&IDR) Program, the Institute’s IRD Program has produced a number of deliverables in the past five years to address risk, resiliency and performance analysis. Such products include: the Security and Information Exchange Database (SITE), available at www.site.org, which provides information on new technologies, materials and products to improve building safety, security and resilience; the Owners Performance Requirements (OPR) Tool (www.oprtool.org), to help owners integrate safety and security into their design objectives when planning new construction and renovation projects for building enclosures; and the Integrated Rapid Visual Screening (IRVS) Tool (www.dhs.gov/bips), a basic tool to assess the ability of buildings and infrastructure to resist the effects of manmade and natural hazards.

In 2014, The IRD Program continued to work with DHS on the IRVS Tool. More than 20 government agencies, covering thousands of buildings, have used the IRVS with Interagency Security Committee (ISC) module to determine risk levels for buildings that house federal government employees. An IRVS ISC Risk Management module and a new IRVS for Schools module are under development. (See the IRVS on page 19 for more information.)

Looking Ahead

In 2015, the Institute will continue its work on the IRVS Tool and related modules. The IRD Program also will seek opportunities to assist federal agencies, as well as industry, with assessment and management of resilience in buildings and infrastructure.

Learn More

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DHS National Critical Infrastructure Security and Resilience Research and Development Plan

The nation’s critical infrastructure provides the essential services that underpin American society. Presidential Policy Directive 21 (PPD-21), Critical Infrastructure Security and Resilience, released by the Obama Administration on February 12, 2013, tasked the U.S. Department of Homeland Security (DHS) with developing plans to strengthen the security and resilience of critical infrastructure against both physical and cyber threats. DHS established an Integrated Task Force and formed the Research and Development (R&D) Working Group to implement specific requirements in PPD-21 that focus on R&D to support physical infrastructure and its underlying cyber systems.

In September 2014, the program to actualize the National Critical Infrastructure Security and Resilience (NCISR) R&D Plan began. The R&D Working Group is comprised of government and non-government critical infrastructure and R&D community members, led by senior managers from the DHS Science and Technology Directorate (S&T). The National Institute of Building Sciences is assisting S&T in providing technical and subject matter expertise; procuring broad stakeholder engagement; and coordinating a national review, with a comment period on the draft plan, adjudication and coordination team member contributions, and drafting and final editing of the plan.

With its long history and extensive connections with the critical infrastructure community, the Institute is well-positioned to support the activities related to PPD-21. The Homeland Security Presidential Directive (HSPD-7), signed by George W. Bush on December 17, 2003, and released on June 17, 2004, mandated previous R&D plans. The Institute provided DHS S&T with technical and subject matter expertise on that plan’s development.

Looking Ahead

The NCISR R&D Plan is due to the President of the United States no later than February 12, 2015.

Learn More

NCISR Project Team:

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Critical Infrastructure Security and Resilience Risk Management Process

When it comes to achieving community resilience (the ability to withstand or bounce back quickly following major disruptions), ensuring that critical infrastructures have continuity of service—especially water, energy, transportation and communications lifelines; emergency services; and local governance—is crucial. Each of these systems is essential, yet they are also interdependent, so it is imperative to identify and address shared vulnerabilities.

In 2013, President Obama issued Presidential Policy Directive 21, which focuses on critical infrastructure security and resilience (CISR). The Directive and the subsequent National Infrastructure Protection Plan (NIPP) 2013: Partnering for Critical Infrastructure Security and Resilience, emphasize the individual and collective responsibilities of critical infrastructure owners; state and local governments; as well as metropolitan public-private partnerships, to advance CISR. Over the years, a variety of public and private entities at the global, national and local levels have recognized the need for competent risk and vulnerability analysis to address functions within their operations and their critical infrastructure in particular. Yet, to date, nearly all attempts to tackle this issue have focused on narrowly defined, sector- or agency-specific responsibilities.

In 2014, the Institute began working on a Critical Infrastructure Security and Resilience Risk Management Process (CISR-RMP) to design a business process to help multiple stakeholders manage their own risks, resolve issues across interdependencies and support the ability to aggregate risk for community-wide benefit/cost analysis. To resolve issues that arise from infrastructure interdependencies requires a degree of consistency and comparability across individual local infrastructure systems to consider a “system of systems,” usually on a metropolitan scale. Data must be consistent and comparable within each system in order to understand and analyze how each entity allocates scarce budgets and human resources to reduce risk and/or enhance resilience. To be effective long-term, these risk/resilience analytic methods must become fully integrated into the asset management and planning/budgeting business processes of each relevant entity.

Sponsored by the U.S. Department of Homeland Security Office of Infrastructure Protection, the CISR-RMP project builds on an approach already tested in a number of U.S. infrastructures and a U.S. metropolitan area. That test, which used an American National Standard, underscored the value of a durable business process that yields valid, consistent and comparable metrics of risk, resilience, costs and benefits within and across sectors to support single-system and metropolitan-level decisions. While the overall method and individual elements proved feasible in that test, the modeling of interdependencies required further refinement. The CISR-RMP project builds on that history to assess whether such a process is feasible and practical for nation-wide use.

The CISR-RMP project will characterize the current business processes used by critical system owners for managing their risk and resilience; evaluate whether the output of these processes is sufficiently consistent to support single-system and system-of-systems resource allocation decision-making; review tools sponsored by federal government agencies involved in lifeline infrastructures for design elements; and design a high-level business process to manage risk to advance infrastructure and regional security and resilience. In addition, the project team will describe a proven approach for motivating and organizing appropriate public-private secure information sharing and collaboration; and sketch an outline of R&D projects (including field developmental pilots) to refine and prepare for broad-scale application.

Looking Ahead
In 2015 the CISR-RMP project team will document current risk/resilience analysis methods; define design objectives and constraints for a common business process; describe a CISR business process that could be integrated into the routine business processes of the lifeline infrastructures, local governments and metropolitan public-private partnerships; and outline the next steps through projects and pilot tests to advance the CISR business process toward widespread use.

Learn More
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VA Facility Management Programs

The U.S. Department of Veterans Affairs (VA) maintains the largest integrated health care system in America. In 2014, VA served nearly 22 million Veterans in facilities across the United States and its territories, through three major organizations: the Veterans Health Administration (VHA), Veterans Benefits Administration (VBA) and National Cemetery Administration (NCA). VA provides health care, benefits and services, and memorialization within a network of 820 community-based outpatient clinics, 300 Vet Centers, 150 medical centers, 126 community living centers, 104 domiciliary residential rehabilitation treatment programs, 56 VBA Regional Offices, and 229 National and State Cemeteries. Since 2008, the National Institute of Building Sciences has assisted VA on a number of tasks to help the agency improve its facility management.

The VA Office of Construction and Facility Management (CFM) oversees projects that support enterprise-wide advances in life-cycle facility management, including planning, design, acquisition, construction, sustainment and decommissioning for all VA facilities. The Institute, which has served as the primary consultant and liaison between VA staff, consultant subject matter experts (SMEs), and public and private sector contributors during the CFM facility management projects, completed the initial work of the original VA Facility Management (VAFM) initiatives in 2014. VAFM launched programs, such as integrated planning, post-occupancy evaluation and project management, to implement life-cycle facility management across the Department.

Planning: The largest of the VAFM pilots, Integrated Planning began in 2011 and is now established as the Integrated Planning Program through the Office of Construction and Facilities Management (CFM).

Post-Occupancy Evaluation: The Institute conducted several Post-Occupancy Evaluation (POE) pilots in 2011, which led to development of CFM’s POE Program in VAs Fiscal Year (FY) 2013-14. The Institute continued to support the POE Program in 2014 by conducting POEs in seven recently completed VHA and NCA facilities.

VA Innovations Program: The Institute worked on two innovation projects for the VHA Innovations Program and CFM. (The VA Innovations Program, an additional ongoing program from the VAFM Initiative, is supported by the Office of the Secretary of Veterans Affairs.) The Institute completed the first, the Feasibility Study for Development of Standardized Modular Community-Based Outpatient Clinic Facilities, in 2013.

The second project addresses one of the agency’s primary goals: improve Veterans’ access to benefits and services. The Wayfinding Feasibility Study looks at wayfinding innovation for VA facilities using new technologies. To support VA’s commitment to patient-centered care, the primary goal of the Wayfinding Study was to improve access by providing tools that ease the journey of Veterans traveling to and through VA facilities. The Institute led a team of SMEs and VA staff on tours of six private healthcare facilities, three non-healthcare facilities and three VA facilities. Based on investigation and analysis of facilities comparable to VA, as well as research into current VA initiatives related to wayfinding, the project team drafted a report and proposed a wayfinding technology strategy for VA facilities that include best practices, methodologies for pilot projects and recommendations for enhancements to the VA Signage Design Guide. The Institute completed the project in mid-2014.

Looking Ahead

In 2015, the Institute will continue contracts with VA CFM. CFM is planning to develop new guidance in an Integrated Planning Guide and a Design/Build Manual. Additionally, the POE program is set to continue, adding more facility types each year. The Institute is working with CFM to update their BIM Manual in conjunction with revisions to their Program for Architect/Engineer (AE) Design Submissions, PG 18-15; this document is the foundation for AE and constructor (design-bid-build/design-build) procurement contracts.

Learn More

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Building Enclosure Technology and Environment Council

Building Enclosure Technology and Environment Council (BETEC) came into being. BETEC brings together public and private building community leaders to tackle the major energy-related regulatory and technical issues relating to the building envelope. For more than 30 years, BETEC has worked to optimize energy efficiency in the design, construction, operation and modification of new and existing buildings through the coordination of research, development and verification programs.

From mold and mildew to the science of window installation and sustainability, BETEC has addressed many building enclosure-related topics over the course of its three decades. In 2014, BETEC continued work on a number of important initiatives:

**BEST4**: In 2014, BETEC and members from the BEC-Kansas City Chapter continued preparations for the fourth **BEST Conference Building Enclosure Science and Technology** (BEST4), to be held in Kansas City in April 2015. The BEST4 Technical Committee developed the technical program and received the first drafts of papers for internal review. By the end of the year, a substantial number of sponsors and exhibitors had signed on to participate, and attendee registrations had started coming in.

**NIBS Guideline 3-2012**: The procedures, methods and documentation requirements in **NIBS Guideline 3-2012: Building Enclosure Commissioning Process** describe the application of the commissioning process to building enclosure systems for each building delivery phase, from pre-design through owner occupancy and operation. The completed **NIBS Guideline 3** was released in 2012 for use with **ASHRAE Guideline 0-2005: The Commissioning Process**. The same year, the Institute and ASTM signed a Memorandum of Agreement (MOA) to turn **NIBS Guideline 3** into a standard. In 2014, with active participation from the BETEC membership, ASTM released the resulting document, **ASTM E 2947 Standard for Building Enclosure Commissioning**.

**Building Envelope Commissioning Training**: BETEC, as part of its MOA with ASTM, has been working to develop a curriculum on building commissioning based on **ASTM E2947 Standard for Building Enclosure Commissioning**. In 2014, BETEC worked with those members in academia that represent building science programs and asked them to look at their curricula to identify any building enclosure core competencies that are not being met in current courses. From the results, BETEC completed a course task list for a building envelope commissioning (BECx) provider curriculum in anticipation of developing a five-day workshop. A one-day preview of the workshop, scheduled during BEST4, will give attendees a detailed overview of what topics will be addressed. The BECs will have the opportunity to offer the workshop at the local level, once finalized.

**JNIBS Articles**: In 2014, the National Institute of Building Sciences published two building enclosure design-focused issues of the **Journal of the National Institute of Building Sciences** (JNIBS). With the theme “Seeing (Infra)Red in Building Enclosures: Investigating Moisture Problems with Thermal Imaging,” the February issue contained five related articles. The August issue, containing four related articles, focused on “Balancing Building Enclosure Objectives: Aesthetics, Performance and Safety.”

**Looking Ahead**

With **Building Innovation 2015**, BEST4, the BECx Workshop Preview and roll-out of the five-day BECx Workshop all on the schedule for the first half of 2015, will be a busy year for BETEC. In addition, expanding on the conversation with its academic members, the Council will be planning a symposium on course development for university building science programs, to be held as part of **Building Innovation 2016**. BETEC, which is responsible for maintaining the Building Enclosure Design Guide portion of the WBDG Whole Building Design Guide® website, will be exploring funding to update the site’s building enclosure materials. The Council is also discussing potential development of a security glazing rating and certification system.

**Learn More**

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**BETEC Board Leadership**

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GSA Facilities Standards for the Public Buildings Service

The Facilities Standards for the Public Buildings Service (P100) establishes design standards and criteria for new buildings, major and minor alterations, and work in historic structures for the Public Buildings Service (PBS) of the U.S. General Services Administration (GSA). It contains policy and technical criteria to be used in the programming, design and documentation of GSA buildings. The performance-based P100 is an integral part of GSA’s ongoing Standards/Commissioning/Evaluation Process initiative, which links GSA programs to ensure that GSA standards are current, reflect GSA’s performance requirements and performance levels are documented and verified after occupancy.

Since 2011, employing a unique blend of problem-solving, communications and consensus-building skills and techniques, staff at the National Institute of Building Sciences has brought together federal agency representatives, subject matter experts and architecture/engineering (A/E) user groups to wholly recreate the P100.

During the tool’s planning stage, GSA expressed a desire for a building standard that was easy to use and could nimbly be updated as new knowledge becomes available. In response, the Institute led design and development of the P100’s matrix format to give GSA the ability to easily update individual portions of the standard as necessary without waiting for a new edition or publishing addenda.

To expand content, the Institute worked with GSA to develop an extensive “Workplace Productivity” section for P100, which includes tiers of performance levels and the criteria to meet performance levels. The Institute also provided assistance in developing performance levels for specific functional spaces, namely: offices, laboratories, warehouses, parking facilities and childcare spaces.

Based on more than 1,000 comments and suggestions from GSA and thought leaders in the field, the Institute revised and expanded the existing P100 content, both in traditional document format and in an innovative, performance-based electronic matrix that allows GSA as the building owner to determine individually tailored levels of building and system performance for each facility. Each level of performance on the matrix is linked to the particular reference standard that it mandates, as well as the necessary procedures for commissioning and post-construction verifications for achieving a particular level of performance. This performance-based living document, now published as the 2014 edition, establishes federal design standards and criteria that affects almost 10,000 GSA-owned or -leased facilities today. In March 2014, Version 1 was issued on the WBDG Whole Building Design Guide® website (www.wbdg.org) and the GSA.gov website.

Looking Ahead

In 2015, Institute staff will work with GSA representatives to create the first informational update of the P100. In part, this update will include links for GSA employees to access referenced standards through an existing web-based standards subscription. The document will receive updates on a regular basis, most likely semi-annually, thereafter. GSA also plans to launch the electronic matrix version of the document on its website in 2015. Additionally, the Institute will conduct a study comparing P100 with other high-performance standards and rating systems to identify differences, similarities, strengths and weaknesses, with a concentration on measurement and verification requirements.

Learn More

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National Mechanical Insulation Committee

The National Mechanical Insulation Committee (NMIC) for Building and Industrial Applications brings together federal agencies and the private sector to address the design, installation and maintenance of mechanical insulation. Established by the National Institute of Building Sciences in 2006, the NMIC works to identify, develop and disseminate information related to mechanical insulation in commercial and industrial applications. The Committee examines current procedures and practices; identifies research or testing needs; develops recommendations utilizing the best science and information available; and provides education and awareness programs about the merits and value of proper insulation systems. The NMIC also works to establish a roadmap to implement improvements in design, insulation system selection and application of best practices. The National Insulation Association (NIA) chairs the NMIC and NIA’s Foundation for Education, Training and Industry Advancement funds many of its activities.

For its first initiative, the NMIC developed an internet-based Mechanical Insulation Design Guide (MIDG) to be made available through the Institute’s WBDG Whole Building Design Guide® online portal. Launched in 2008, the MIDG has expanded through the years to include a number of mechanical insulation assessment and design tools to assist with common calculations used in the design and analysis of mechanical insulation systems. In 2013 NMIC added an e-learning course to the WBDG Continuing Education section. To date, more than one hundred participants have taken the e-learning course to better understand the role of mechanical insulation in commercial and industrial applications; the benefits of mechanical insulation for reducing energy consumption, emissions and operating costs; and its benefits for controlling condensation and processes, providing personnel protection, slowing the spread of fires and reducing noise. The course also helps participants learn mechanical insulation terminology; understand how insulation works and the various design objectives and design considerations for mechanical insulation; gain an appreciation for the importance of timely and proper maintenance of mechanical insulation systems; and find out about additional mechanical insulation learning resources.

In 2014, the NMIC continued working with the Energy & Water Topical Committee of the Institute’s Consultative Council, as well as other industry groups through legislative initiatives, to obtain funding for a potential study or extrapolation of existing data to determine the impact of thermal insulation on both energy and water use on potable hot water and other similar distribution systems, and to examine the business case and return on investment of that opportunity.

Looking Ahead

In 2015, the NMIC will continue to update and potentially expand the MIDG, work with the Consultative Council’s Energy & Water Topical Committee and examine the best approach by which to increase usage of the MIDG and e-learning courses, and disseminate information about the other mechanical insulation resources available.

Learn More

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ASHRAE
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U. S. Army Corp of Engineers (USACE)
U.S. Department of Energy (DOE)
U.S. Department of Veterans Affairs (VA)
U.S. General Services Administration (GSA)
U.S. Naval Facilities Engineering Command (NAVFAC)
Sustainable Buildings Industry Council

Initially established as the independent Passive Solar Industries Council in 1980, the Sustainable Buildings Industries Council became a part of the National Institute of Building Sciences in 2012. Since its beginnings, SBIC has been a leader in advancing high-performance building practices by promoting the need to use a whole-building approach to design, construction and operations, a concept the Council has coined going “Beyond Green™.” The Council focuses on highlighting ways that buildings can achieve high-performance attributes—particularly sustainability and resource efficiency—through education and training, outreach, publications and knowledge sharing.

SBIC develops two publications that promote these goals: the Beyond Green™ Guidelines for High-Performance Homes, now in its sixth edition, and the Beyond Green™ High-Performance School Buildings, currently in its third edition. In addition, the Council hosts an annual Beyond Green™ Awards program to recognize projects and programs across the United States that have incorporated high-performance and whole-building concepts. Each year, SBIC holds a luncheon during Building Innovation: The Institute’s Annual Conference & Expo to recognize Beyond Green™ Award winners. In addition, case studies of the winning projects are featured on the Institute’s WBDG Whole Building Design Guide® website.

In 2013, SBIC established an electronic submission process for the Beyond Green™ Awards and added several award categories. In 2014, building on those improvements, SBIC continued to evolve the awards program. The 2014 award categories expanded to recognize both the increasing importance of resilience and the role system- and community-level approaches play in advancing high-performance buildings and communities. The awards are now called the Beyond Green™ High-Performance Building and Community Awards and SBIC will recognize the 2014 winners during Building Innovation 2015.

In 2014, the Council also conducted a strategic planning session to examine opportunities to advance the concept of Beyond Green™ throughout the industry. Since SBIC’s founding more than three decades ago, the building industry has increasingly embraced ways to improve energy performance in buildings. Now that green building criteria has become mainstream, the Council is examining the key areas where industry improvements are still necessary.

Looking Ahead

On January 8, 2015, during a luncheon held at Building Innovation 2015, SBIC will recognize the winners of the 2014 Beyond Green™ Awards. During 2015, the Council will continue developing its strategic plan, which focuses on providing the industry with guidance and resources needed to drive advancement in high-performance buildings. The Council will issue a Call for Entries for the 2015 Beyond Green™ Awards in late spring, with an entry deadline of late-summer. Following the selection of a jury and a review process of the entries, the 2015 winners will be announced at Building Innovation 2016.

Learn More
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NAVFAC Design-Build Guidance Document Review

In 2011, the National Institute of Building Sciences began a project for the Naval Facilities Engineering Command (NAVFAC) to update its Design-Build Master (DBM) documents, associated performance technical specifications (PTS) and discipline-specific Unified Facilities Criteria (UFC) design guides.

With the assistance of an architecture-engineering team, the Institute completed the updates for roofing, energy and sustainability; the sustainable- and energy-related submittal process; and small project, sustainable and energy-related requirements in 2013, and then coordinated the updates with the Navy’s Unified Facilities Guide Specifications (UFGS) and UFC Technical Publications.

In 2014, upon posting the updated DBM document to the WBDG Whole Building Design Guide® website, the Institute completed the project.
High Performance Building Council

In 2007, the National Institute of Building Sciences established the High Performance Building Council (HPBC). The U.S. Secretary of Energy had assigned the National Institute of Building Sciences with conducting an assessment of the current voluntary standards and rating systems that define high-performance buildings, so the Institute organized the Council to perform the industry-wide research and analysis. Within its WBDG Whole Building Design Guide® website, the Institute had already defined high-performance buildings in terms of eight attributes: cost-effectiveness, safety and security, sustainability, accessibility, functionality, productivity, historic preservation and aesthetics. Referencing those attributes, the HPBC developed the report, Assessment to the U.S. Congress and the U.S. Department of Energy on High Performance Buildings, which it delivered to the Department of Energy (DOE) in 2008. Later, the Council went on to add a ninth performance attribute, resiliency.

Through the years, the HPBC has continued to refine its recommendations for high-performance building metrics and verification methods, as well as support new and developing performance initiatives from the public and private sectors. In 2011, the Council released its first matrix of high-performance standards, which it developed based on work the Institute had conducted for the U.S. Department of Homeland Security (DHS) Science & Technology Directorate (S&T) High Performance Based Design (HPBD) project. A year later, the HPBC issued a first draft of the National Performance Based Design Guide (NPBDG), which it based on the principles of the DHS HPBD project, combined with the Institute’s work for the U.S. General Services Administration Public Buildings Service to develop its GSA Facilities Standards for the Public Buildings Service (P-100) into a performance-based standard.

In May 2014, during a reception to celebrate High-Performance Building Week, the HPBC announced the release of the NPBDG Beta Version 0.5 as a free, online tool. (See the NPBDG on page 28 for more information.) Throughout the year, the Council also supported the Institute on work it is performing for the DOE Commercial Buildings Integration Group to develop a definition for zero-energy buildings.

Looking Ahead

In 2015, the HPBC will continue to work on the NPBDG and seek comments from industry organizations, with the goal of releasing the updated Guide in 2015. The Council also will continue to assist the Institute on its zero-energy buildings work for DOE.

Learn More

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HPBC Executive Committee Leadership

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Glenn Hourahan, Air Conditioning Contractors of America
Patrick E. Hughes, National Electrical Manufacturers Association
Sue Klawans, Gilbane Building Company, Representing Associated General Contractors of America

Institute President Henry L. Green highlights the delivery of high-performance buildings during his presentation at the World of Modular Conference.
National Performance Based Design Guide

In 2011, the U.S. General Services Administration (GSA) and the National Institute of Building Sciences, using the performance-based design principles developed by the Institute and the extensive facility design and construction standards already developed by GSA, began working to transform the GSA Facilities Standards for the Public Buildings Service (P100) from a prescriptive to a performance-based system.

In 2012, utilizing the framework it developed for the performance-based P100 and with permission from GSA, the Institute worked to create a draft performance-based building guide, called the National Performance Based Design Guide (NPBDG), for use by the building industry. In 2013, the Institute’s High Performance Building Council (HPBC) Executive Committee and several other organizations evaluated the draft document. Following a number of improvements, the HPBC released the NPBDG for industry use in 2014. The Institute used the relevant content from the P100 that applies to any public or private building project to initially populate the system. However, the baseline levels—as well as the higher performance targets—still need public review for compliance with industry practices.

As with the GSA’s performance-based P100 system, the NPBDG uses four levels of performance defined in matrices, in which “baseline” performance is the lowest permissible level. (Baseline is commensurate with the code-minimum standards that are generally accepted in building practices across the United States.) In addition, the NPBDG identifies three increasingly higher performance levels that are more rigorous, but voluntary.

Available through the Institute’s WBDG Whole Building Design Guide® website, the NPBDG provides building owners the opportunity to evaluate trade-offs required to achieve varying levels of building performance. It lets owners focus on how they want the building to perform (versus just the function the building will serve). The NPBDG also offers the design-construct team a reliable tool to identify and implement the best strategies to meet those goals.

Looking Ahead

In 2015, the HPBC plans to work with HPBC member organizations and GSA to make technical modifications to the NPBDG. An updated NPBDG is expected to be released in 2016.

Learn More

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Zero-Energy Buildings

In 2013, in an effort to help federal agencies, the private sector and regulators agree on what constitutes zero-energy buildings (ZEBs), the National Institute of Building Sciences began collaborating with the U.S. Department of Energy (DOE) on a national definition and metrics for ZEBs.

Creating a broadly agreed-upon definition requires participation from everyone who has a stake in the outcome. Federal government agencies, in response to regulatory mandates, and many state and local governments are beginning to move toward zero-energy targets. Large private commercial property owners also are interested in developing net-zero buildings to meet their corporate goals. However, there is little consensus on what it means to have a ZEB. Names and definitions differ from region to region and from organization to organization. As code officials, regulators, policymakers and voluntary recognition programs look to recognize and incentivize such energy-reduction activities, having a common and consistent definition becomes all the more important.

In 2014, through its High Performance Building Council (HPBC), the Institute developed a draft definition for ZEBs, with input from industry stakeholders. Part of the evaluation required determining what to specifically call such buildings: zero energy was chosen for its simplicity and alignment with other DOE programs. The definition, nomenclature, metrics and guidelines address how energy consumption is measured and what energy sources can and cannot be used in its determination. The description also addresses the issues of energy boundary and transportation, among others.

Looking Ahead

In January 2015, DOE will issue a call for public comments in the Federal Register, with a closing date of February 20. Once all stakeholders and interested parties have had the opportunity to contribute their perspectives and provide their input, the Institute and DOE will incorporate the feedback and publish a finalized definition, with accompanying nomenclature and guidelines. The goal is to achieve a commonly agreed upon ZEB definition that DOE, other government entities and industry can use to foster the developing demand and support implementation.

Learn More

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U.S. Department of Defense – Defense Health Agency

Through its Defense Health Agency (DHA), the U.S. Department of Defense (DOD) provides healthcare services to active duty members, retirees and their families. DHA supports the delivery of integrated, affordable and high-quality health services to the DOD Military Health System’s (MHS) beneficiaries. DHA’s primary function is to run managed care programs for the MHS portfolio of assets.

The National Institute of Building Sciences began working with DHA (formerly known as the Tricare Management Activity) in 2011 to provide program management advice for its Facility Life Cycle Management (FLCM) programs and to help DHA better evaluate its military healthcare facilities by improving its performance metrics analysis. In the area of FLCM, DHA has continued to promote the adoption and effective use of its Space and Equipment Planning System (SEPS) by creating an interface so the tool can be used via the Max.gov web-based platform. The Institute has been instrumental in providing training on the SEPS tools to DHA personnel, as well as U.S. Department of Veterans Affairs (VA) and Air Force employees.

In 2014, during Building Innovation 2014: The National Institute of Building Sciences Annual Conference & Expo, the Institute held a Healthcare Facilities Life-Cycle Workshop that included a panel discussion with senior management from several federal agencies. That discussion sparked a conversation among the federal agency facility managers and software vendors in attendance on how federal agencies can plan to leverage software and application vendor expertise to build a common Computerized Maintenance Management System (CMMS)/Computer-Aided Facilities Management (CAFM) system. From this dialogue, a number of federal facility managers and vendors decided to collaborate to develop Federal Integrated Facility Management (FED iFM), a suite of tools that federal agencies can use as a software “eco-system” or marketplace to address facility management issues. By the end of 2014, the Institute had provided DHA with a proof of concept for the FED iFM that included a functional work-order module.

Looking Ahead

In 2015, the Institute will conclude the initial DHA award contract and begin working on newly tasked items that advance DHA’s desire to collaborate and share facility data with multiple federal agencies. The Institute will help DHA on a Commissioning program and continue its work on the FED iFM initiative over the next fiscal year.

Learn More

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Commissioning Industry Leaders Council

The National Institute of Building Sciences has long advanced building commissioning as a means to support achievement of building performance goals. The Institute participated in the development of ASHRAE Guideline 0: The Commissioning Process to document the commissioning process. It also developed NIBS Guideline 3: Building Enclosure Commissioning Process BECx, which has been converted into an ASTM standard.

With the nation’s increased focus on building performance, building commissioning is an important process for delivering and operating high-performance buildings. Unfortunately, commissioning is not well understood by owners, designers and regulators. The Institute established the Commissioning Industry Leaders Council (CxILC) in 2013 to bring together relevant stakeholders to promote, in a collaborative manner, the use of whole building and building system commissioning to improve the performance of buildings. The Council provides a neutral forum for commissioning interest groups to share information and solidify the expert base of commissioning practitioners. The CxILC also serves as a resource for the building industry to learn about building commissioning through education and training, public outreach, publications and knowledge sharing.

The CxILC members spent 2014 engaged with other Institute programs, as well as through outside activities, to support increased understanding of the role of commissioning in the delivery and operations of high-performance buildings. Members of the CxILC worked with the Project Management Committee of the WBDG Whole Building Design Guide® to update the building commissioning content on the WBDG. In addition, CxILC members served as subject matter experts to the Commercial Workforce Credentialing Council as it developed accreditation criteria for the Better Buildings Workforce Guidelines, and, specifically, a job task analysis for the role of Building Commissioning Provider. The Council also monitored other commissioning-related activities in the industry, including standards development activities by the International Code Council and ASHRAE.

Looking Ahead

In 2015, the CxILC will continue to focus on opportunities to build understanding within the industry about the importance of building commissioning and advance the commissioning sector. The Council plans to conduct a dialogue that brings together commissioning-related organizations and representatives from the code professions to support the increased exchange of ideas and recognition of the roles and responsibilities of each discipline. The CxILC will also update existing WBDG pages on commissioning and develop new ones.

Learn More

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CxILC Leadership

Ray Bert, AABC Commissioning Group
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Tim Brooke, ASTM International
Ron Burton, Building Owners and Managers Association International
Gregory Cade, National Fire Protection Association
Yvonne Castillo, American Institute of Architects
David Collins, The Preview Group
Laverne Dalgleish, Air Barrier Association of America
Pete DeMarco, International Association of Plumbing and Mechanical Officials
Tami Dockendorf, 3QC
Wanda Edwards, RCI
Liz Fischer, Building Commissioning Association
Benjamin Goldstein, U.S. Department of Energy
John Hamilton, Testing, Adjusting and Balancing Bureau
Rita Harrold, Illuminating Engineering Society
Michael Johnston, National Electrical Contractors Association
Paul Karrer, American Institute of Architects
Suzanna Kelley, American Institute of Architects
Jerry Kettler, Facility Performance Associates
Dan Lemieux, Wiss, Janney, Elstner Associates
Dave Lowe, 3QC
Michael Luftred, Dewberry
Jim Magee, Facility Commissioning Group
Steve Mawn, ASTM International
Bill McMullen, Dewberry
Tom Meyer, National Environmental Balancing Bureau
Jim Page, Testing, Adjusting and Balancing Bureau
Stephanie Reiniche, ASHRAE
John Schulte, National Environmental Balancing Bureau
Dominic Sims, International Code Council
Billy Smith, American Society of Plumbing Engineers
Ken Sulka, Associated Air Balance Council
Mark Terzigni, Sheet Metal and Air-conditioning Contractors National Association
Melissa Wackerlie, American Institute of Architects
Stephen Wiggins, Newcomb & Boyd
Sara Yerkes, International Code Council
Building Research Information Knowledgebase

The Building Research Information Knowledgebase (BRIK) is a joint project of the National Institute of Building Sciences (NIBS) and The American Institute of Architects (AIA) to bring peer-reviewed building-related research to practitioners and support identification of long-term industry research needs. An interactive portal, BRIK offers research projects and case studies in all facets of building, from pre-design through occupancy and reuse.

The two organizations formally launched BRIK at Building Innovation 2013: The National Institute of Building Sciences Annual Conference and Expo. It has grown in the past two years to include some 1,500 research documents linked by issue, discipline and researcher, and collected from AIA and NIBS, as well as BRIK’s partner organizations.

BRIK’s user-friendly approach and power search engine empowers architects, engineers, researchers, clients and building occupants to pinpoint and explore the building research, information and knowledge they need to design, own and operate high-performance buildings. BRIK presents programs and products in three levels:

• Partners’ research, vetted under a Memorandum of Agreement with partnering non-profit associations, educational institutions, national labs and government agencies
• Contributors’ research, provided by firms and companies, that is reviewed before posting
• Individuals also may submit research that is peer-reviewed upon request

BRIK is governed by an appointed committee, known as the Building Research Council, which meets annually during the Building Innovation Conference.

In 2014, BRIK increased its research base to 1,500 entries. Part of that effort was comprised of a “database within a database” for the U.S. Department of Defense (DOD) Defense Health Agency (DHA), which offers research reflecting a specified mandate for topics pertinent to the agency. The DHA pilot program contained research highlighting not only design and construction of health-care facilities, but also cutting-edge studies on both ends of the life-cycle spectrum: programming/financing/procurement, as well as commission/activation, and operations and facilities management.

Also during the year, the BRIK team cemented collaboration with EBSCO Subscription Services that will completely revamp the BRIK database. Beginning in early 2015, BRIK will become a portal, not only to its own database, but as a gateway to three of EBSCO’s subscription services:

• Art & Architecture Complete (370 periodicals, including 220 books+ with full-text coverage dating back to 1937, as well as indexing and abstracts for an additional 230 books and 780+ academic journals, magazines and trade publications)
• Avery Index to Architectural Periodicals (index to 2,500+ U.S. and international journals)
• Sustainability Reference Center (indexing to several hundred industry-leading academic journals, magazines, books, monographs and trade publications)

This will substantively increase the amount of research at BRIK users’ fingertips, while allowing them the precision of the BRIK search engine.

Looking Ahead

In 2015, NIBS and AIA staff look forward to collaborating to expand the BRIK database exponentially with the addition of EBSCO services through the BRIK portal. A major recruitment effort is planned, beginning with a major marketing campaign at the AIA National Convention in Atlanta in May, to gain BRIK users by offering a six-month free trial period. The AIA and NIBS also will look to increase partnerships and collaboration with like-minded, research-oriented organizations. Site usage will be monitored closely throughout the year in order to assess the efficacy of the new portal structure.
The WBDG Whole Building Design Guide® is one of the largest, most comprehensive online resources in the building industry. This web-based portal provides government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria and technology from a whole building perspective.

Initially designed to serve U.S. Department of Defense (DOD) construction programs, the Naval Facilities Engineering Command (NAVFAC) Criteria Office first introduced WBDG in 1997, in collaboration with the Sustainable Buildings Industry Council (SBIC), then an independent organization, to assist the design community with integrating government criteria, non-government standards, vendor data and expert knowledge into a ‘whole building’ perspective. The National Institute of Building Sciences took over management of WBDG in 2000. In 2003, a DOD memorandum named WBDG the “sole portal to design and construction criteria produced by the U.S. Army Corps of Engineers, NAVFAC and U.S. Air Force.” Since then, WBDG has expanded to give all building industry professionals free, wide access to federal and other design, construction and performance criteria.

More than a decade later, WBDG continues to draw a huge number of visitors—a total of 6.7 million in 2014—looking for building-related information that is difficult or impossible to find elsewhere. To keep WBDG content fresh and relevant, committees of experts from both the government and private sectors convene each year to update design objectives and other key sections, as well as add new resource pages about leading-edge topics crucial to creating high-performance buildings.

The Latest Resources: In 2014, Universal Design and Visitability were among the new topics WBDG addressed for the first time. In addition, experts updated the content of the Accessible, Aesthetics, Historic Preservation, Secure/Safe and Sustainable Design Objective sections, along with the Project Management and Commissioning sections.

A number of new pages were added during the year, including: Active Shooter: Is There a Role for Protective Design?; Combined Heat and Power (CHP); Community and Site Planning for Green Residential Design; Corrosion Prevention and Control (CPC) Source; Fuel Cell Flexibility and Sustainability; Moisture Management Concepts; Moisture Management Strategies; NAVFAC Building Information Management and Modeling (BIM); Outcome-Based Pathways for Achieving Energy Performance Goals; Phyto-Purification Systems; The Residential Building Enclosure; and Resiliency of Stationary Fuel Cells and the Natural Gas Grid.

The WBDG also received updates to the following pages: Air Barrier Systems in Buildings; Best Practices for Accessibility Compliance; Construction Operations Building information exchange (COBie); Energy Codes and Standards; Landscape Architecture and the Site Security Design Process; Roofing Systems (BEDG); Sustainable Historic Preservation; Threat/Vulnerability Assessments and Risk Analysis; and UFC/ISC Security Criteria Overview and Comparison.

WBDG also added new case studies, all of which are winners of SBIC (now a program of the Institute) Beyond Green™ High-Performance Building and Community Awards. They include: DPR Construction Phoenix Regional Office; Retrofit Chicago; Building Envelope Enclosure Renewal; Chemeketa Community College Health Sciences Complex; The George D. Aiken Center at the University of Vermont; Indoor Air Quality Research; and SageGlass.

In addition, the WBDG became the site of the National Performance Based Design Guide, a tool that allows owners to evaluate trade-offs to achieving varying levels of building performance.

Continuing Education: WBDG’s Continuing Education (CE) program for design and maintenance facility professionals, which began in 2007, targets architects, engineers and other building professionals seeking continuing education credits as part of professional licensing requirements or certification programs. WBDG now offers more than 50 online WBDG and Federal Energy Management Program (FEMP) courses. More than 30 of these courses offer American Institute of Architects (AIA) Health, Safety and Welfare (HSW) Learning Units. 16 courses provide Green Building Certification Institute (GBCI) credits for Leadership in Energy and Environmental Design (LEED) Professionals and all FEMP courses now provide International Association for Continuing Education and Training (IACET) credits. Twelve new FEMP courses and one new WBDG course were added this year. In 2014, more than 18,000 people enrolled in the WBDG CE program.

WBDG Outreach: In 2014, WBDG staff continued to promote the resource in a number of venues. Staff made presentations to the U.S. Department of Commerce Special American Business Internship Training (SABIT) Program, the National Facilities Management & Technology (NFMT) 2014 Conference in Baltimore, the U.S. Department of State International Visitor Leadership Program and the U.S. Department of Agriculture Sustainable Buildings Work Group; wrote articles for Construction Executive magazine and the Associated Builders and Contractors’ Construction Executive magazine; as well as provided monthly “What’s on WBDG” updates in the Institute’s Building Sciences monthly e-newsletter. Starting in the October 2014 edition, staff began providing the Journal of the National Institute of Building Sciences (JNIIBS) with a glossary of WBDG links related to that issue’s articles, further tying in WBDG content with other Institute programs. WBDG staff continues to interact with and collaborate with other Institute programs throughout the year.
Looking Ahead

In 2015, WBDG staff plans a major update of the entire website to include new functionality; faster and more focused searches; and updates of several sections. WBDG will also add new Resource Pages, more continuing education courses and case studies in 2015. Staff will continue to promote and present WBDG at meetings and conferences, as well as through Twitter, LinkedIn and other social media, blogs and podcasts.

Learn More

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WBDG Board of Direction

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Bernie Deneke, Naval Facilities Engineering Command (NAVFAC)
Jon (Terry) Adsit, U.S. General Services Administration
Peter J. Rossbach, PE, U.S. Army Corps of Engineers
Lloyd Siegel, U.S. Department of Veterans Affairs
Rick Sinkfield, U.S. Air Force Civil Engineer Center

Advisory Committee Chair:
Sherri McMillion, NAVFAC Engineering Innovation and Criteria Office

FHWA Advancement of Bridge Information Modeling Standards

Over the past several decades, many industries have improved efficiencies by moving from document-based information exchanges to integrated data models. The construction industry, including buildings and heavy/highway, has lagged behind manufacturing industries for various reasons, driven by much lower economies of scale and with the larger numbers of industry participants, greater diversity of domain specialization and a higher level of detail that is project-specific and cannot be leveraged for future use.

The goal of the Federal Highway Administration (FHWA) Advancement of Bridge Information Modeling (BrIM) Standards project is to build on the progress the buildings sector has made in building information modeling (BIM) standardization, through the work of the National Institute of Building Sciences buildingSMART alliance®, the buildingSMART International and other industry participants, to advance the standardization of digital information for bridges in the United States. Developing industry consensus standards for BrIM and related data exchange protocols will provide a common tool to coordinate the various phases of bridge design and construction projects, as well as the ongoing maintenance and operation associated with asset management. What is needed is cradle-to-grave data sharing via common standards, schemas and digital definitions. The FHWA project, “Bridge Data File Protocols for Interoperability and Life Cycle Management,” began the development of open (non-proprietary) BrIM standards for electronic exchange of steel and concrete bridge engineering information. This project, which kicked off in October 2014, picks up on that work.

The Institute formed a team of experts in BIM using the buildingSMART Industry Foundation Class (IFC) model, and in bridge design and construction. The team began by researching existing modeling standards and efforts, such as AASHTOWare, LandXML, TransXML, OpenBrIM, Bentley iModel and IFC, in order to collect and consolidate information and prepare a gap analysis through detailed component modeling using the existing standards. The team also began evaluating bridge planning, design, construction and operations processes. During this project phase, the team will analyze the state of practice, identify a path to implementation and then issue a report to be shared with practitioners in transportation agencies, design firms and software companies in the bridge domain to validate and gain support for implementation.

Looking Ahead

In 2015, the project team will develop a detailed component model of a typical highway bridge to serve as a sample to exercise the available approaches and determine the capabilities and shortcomings of each. Once the schema analysis is completed for one common exchange, the team will evaluate design plans for bidding other selected exchanges, as well as extensions for different common bridge types. The research and analysis will then be shared with industry at webinars and workshops. Based on the outcome of the workshops, the team will conduct additional phases of the project to further develop needed schema extensions and formalize exchanges.

Learn More

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The primary goal of the buildingSMART alliance® is to help make the North American real property industry more efficient so property owners can better operate their facilities. One way the Council works to achieve this is by leading the creation of information standards and practice guidelines. Alliance committees develop and maintain two standards: one for computer-aided design (CAD), the United States National CAD Standard® (NCS), and one for building information modeling (BIM), the National BIM Standard–United States® (NBIMS-US™). These standards establish clear implementation guidelines, which cut down confusion, reduce potential errors, minimize change orders, lower overall life-cycle costs and provide better data to the facility manager. They also help create repeatable processes that can be improved over time.

In 2014, the Alliance concentrated on completing major updates for both the NCS and NBIMS-US™, which required a significant amount of time and resources (from staff and the volunteer committees) throughout the year to get the products delivered. When not focusing on standards development, the Alliance Board and staff directed much of their energy on budgetary concerns and opportunities to generate funds. As many standards developing organizations can attest, developing new standards is not always an immediate revenue generator, and the level of effort required in 2014 stressed the financial stability of the Alliance more than planned.

Standards Developer: The update of both the NCS and NBIMS-US™ created significantly more interest than was expected, and while great news for the products in general, the number of submissions delayed project production. The NCS Project Committee received more than 360 ballots for the NCS, and the number of submissions the NBIMS-US Project Committee received doubled the content of that standard. While the CAD standard was completed and delivered in 2014, the BIM standard had to be delayed for a 2015 delivery. (See the related sections on the NCS and NBIMS-US™ for details on those projects.)

BIM Educator: The Alliance hosted several events during Building Innovation 2014: the National Institute of Building Sciences Conference & Expo. Among them were the buildingSMART alliance® Challenge, which looked at the newest BIM information exchange standards being balloted in the NBIMS-US™; the buildingSMART alliance Symposium, which had the theme, “Improving Life-Cycle Performance with BIM;” and a BIM Academic Symposium that brought together educators and building professionals to advance BIM in the curriculum.

In the spring, the Alliance rolled out its first online course about the Construction Operations Building information exchange (COBie). “The Introduction to COBie” course explains the value and benefits of using information exchanges and describes the relationships among the COBie standard, facility management software and BIM authoring software.

During the year, the Alliance began making preparations for Building Innovation 2015, which will include an Information Resources & Technology Symposium, to be held January 7, as well as the BIM Academic Symposium, to be held in April 2015.

International Coordinator: The Alliance continued to work on the buildingSMART Data Dictionary (see the related section for details on that project) and coordinate those efforts with the international community.

Industry Team Builder: As an alliance of government agencies, associations, companies, educators, manufacturers, software vendors, individuals and others, the buildingSMART alliance® had 23 active Memorandums of Agreement (MOAs) in 2014. It also continued to coordinate with a number of different organizations on related projects throughout the year.

In the spring, the NBIMS-US™ 2021 Vision Task Force (VTF) issued a report to offer readers a glimpse into the not-too-distant future of the building industry. Available at www.nationalbimstandard.org/ vision2021, the report offers readers the opportunity to explore the design, construction and opening day of a fictional children’s care center in Springfield, USA and to meet the key players of the team that created the project.

Looking Ahead

In 2015, the Alliance will publish the NBIMS-US™ Version 3 and a new Strategic Plan. The Council will focus on re-establishing its financial footing and its role in the transformation of the facilities and infrastructure industries.

Learn More

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Alliance Executive Committee

Chair: Andy Smith, Bentley Systems
Vice Chair: Greg Ceton, Construction Specifications Institute
Secretary: David A. Jordani, Jordani Consulting Group
Immediate Past Chair: Thomas A. Gay, FM Global
buildingSMART International Product Room and buildingSMART Data Dictionary Management

The buildingSMART International (bSI) Product Room connects building product data and reference standards with Industry Foundation Class (IFC)-based building information models (BIMs). The bSI Product Room coordinates the buildingSMART Data Dictionary (bSDD), one of bSI’s core standards, to allow product information and other types of information (e.g. from knowledge systems or environmental information) to be shared among manufacturers, designers and operators. Together, they serve as a detailed language-independent framework that practitioners can use to create their own libraries for storing construction information.

The bSDD, which was founded in 2006 by Construction Specifications Canada (CSC), Construction Specifications Institute (CSI) in the United States, STABU Foundation (Netherlands) and buildingSMART Norway, became part of buildingSMART International (bSI) in 2012. In 2013, the buildingSMART International contracted with the National Institute of Building Sciences, whose council, the buildingSMART alliance® (bSa), develops the National BIM Standard-United States®, to support the bSDD and bSI Product Room. During the year, the bSDD application became fully operational and commercial providers are now deploying it as a web service.

In 2014, Institute staff led the bSI Product Room Steering Committee and bSDD Group in the creation of standard procedures for associating external content with IFC-enabled models. Overseers of the Product Room began developing a bSI standard for product data templates to help product manufacturers around the world use the IFC model and the bSDD to organize product data to integrate with openBIM. The new bSI standard will build on the work done in national standards development by Product Room members from Austria, France, Germany, Norway, the United Kingdom and the United States. Within the bSDD application, a newly developed table tool supports mapping between content collections and a duplicate checking and batch-uploading tool. During the year, content development on a project to add IFC4 entities and enumerated types significantly progressed; staff continued working on a pilot project to demonstrate cases for ceiling and HVAC products; and commercial and organizational implementation grew, with at least six applications that are or will be integrated with bSDD ready for deployment.

Looking Ahead

In 2015, Institute staff will continue to support the bSI Product Room to bring together bSa, CSI and the other organizations in the United States and around the world working on national and international projects. Efforts will focus on developing a new product template standard and supporting member projects that are utilizing, adding and deploying content libraries based on the bSDD in pilot projects and commercial applications.

Learn More

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United States National CAD Standard®

The National Institute of Building Sciences buildingSMART alliance® develops the nation’s leading computer-aided design (CAD) standard. The United States National CAD Standard® (NCS) helps architects, constructors and operators coordinate efforts by classifying electronic design data consistently and making information retrieval easier. It improves communication among owners and project teams; cuts or eliminates costs of developing and maintaining company-specific standards; and reduces the expense of transferring building data from design applications to facility management applications. More than 6,000 architectural, engineering and construction, owner, operator (AECOO) firms have voluntarily adopted the NCS in their workplaces.

The NCS consists of The American Institute of Architects’ CAD Layer Guidelines, the Construction Specification Institute’s Uniform Drawing Systems (Modules 1-8) and the Plotting Guidelines module developed by the National Institute of Building Sciences. The standard is developed using an open consensus process, coordinated by the NCS Project Committee. The NCS Steering Committee oversees the standard’s development.

Following a 15-month development cycle, the buildingSMART alliance® released NCS Version 6 on September 9, 2014. NCS Version 6 prescribes CAD layer names; drawing set organization and drafting; notation; and includes NCS-building information modeling (BIM) coordination and plotting conventions. With this edition, the NCS also provides needed direction on how to incorporate the NCS content within the BIM workflow.

Many public and private sector organizations either require or use the NCS, including the U.S. General Services Administration; U. S. Army Corps of Engineers; U.S. Department of Veterans Affairs; U.S. Coast Guard; U.S. Navy; U.S. Forest Service; U.S. Treasury – Internal Revenue Service; U.S. Department of State; U.S. Bureau of Reclamation; state, municipal and local agencies and authorities; and large U.S. and foreign multinational corporations.

Looking Ahead

In 2015, staff will coordinate with NCS Project Committee members to develop education programs and events to support adoption and implementation of the new version of the standard. In addition, the three organizational partners will roll out an NCS marketing campaign to promote the new edition.

Learn More

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NCS Steering Committee

Chair: Ed Lowe, Burgess & Niple, Inc.
Vice Chair: Michael Fate, Tetra Tech
Secretary: Greg Jordan, Dewberry
Jennifer DiBona, That CAD Girl
Steve Spangler, U.S. Army Corps of Engineers
Jason Sturniolo, RRMM Architects
Building information modeling (BIM) is a collaborative approach that allows facility project teams to work together to plan, develop, construct, operate and maintain facilities. The National BIM Standard-United States® (NBIMS-US™) serves to normalize the way practitioners use BIM so that they can easily pass information from one phase of the building process to another. Standards build trust; without a BIM standard, practitioners risk recreating a model at each phase of a project because it does not contain all of the information each practitioner needs. Because modeling is used in every phase of the building life cycle, it is especially important that representatives from all segments of the industry participate in the standard’s development to better address their specific requirements and concerns.

The National Institute of Building Sciences buildingSMART alliance® first determined a need for a BIM standard in 2005. The NBIMS Version 1-Part 1: Overview, Principles, and Methodologies for Public Use came out in 2008. The Alliance released NBIMS-US™ Version 2 in 2012. Since then, the primary focus of the Alliance’s NBIMS-US Project & Planning Committees has been development of NBIMS-US™ Version 3 (V3). In June 2013, the Planning Committee issued a call for ballots. By the September 2013 deadline, the Planning Committee had received 40 submissions, which they compiled for review by the Technical, Standard Practice and Terminology Subcommittees. The subcommittees approved 27 for submission to a full NBIMS-US™ membership vote. In mid-2014, the NBIMS-US Project Committee voted to approve the V3 ballot, which consisted of 6 information exchange standards, 11 reference standards, 4 standard practice documents and 6 terminology submissions. More than 91% of the NBIMS-US Project Committee members voted to approve the V3 submissions. (All 27 submissions on the ballot were approved by over two-thirds of the non-abstaining members who cast their votes.)

The approved updates, many of which were standards unto themselves, literally doubled the content of the NBIMS-US™. The Alliance originally expected to release the completed NBIMS-US™ V3 as both a free, online standard and a downloadable eBook version in the fall of 2014. However, due to the significant size of the updated standard, the project was pushed back to a 2015 release date.

Looking Ahead

In 2015, the Alliance plans to publish the finalized NBIMS-US™ V3 online, as well as to begin developing education programs and events to support adoption and implementation of the updated standard.

Learn More

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NBIMS-US Planning Committee

Chair: Chris Moor, American Institute of Steel Construction
Vice Chair: Jeffrey Ouellette, Nemetschek Vectorworks, Inc.
Secretary: Connor Christian, Kiewit Corporation
Paul Audsley, NBBJ, Alliance Board
Peter Cholakis, 4Clicks Solutions, Terminology Subcommittee Chair
John Fortune, Bullock Tice Associates, NCS BIM Ad-Hoc Task Team Liaison
John Grady, Epic BIM, Product Development Subcommittee Co-Chair
Susan Keenliside, buildingSMART Canada, Product Development Subcommittee Co-Chair
William T. Napier, Wisconsin Department of Administration, Division of State Facilities, Alliance Board
John Sullivan, Autodesk, Inc., Alliance Board
Facility Maintenance and Operations Committee

W hen designing a new building, maintenance and operations may not be the first thing to come to mind. Yet, 95% of a building’s total life-cycle costs come from operations. The Facilities Maintenance and Operations Committee (FMOC) makes operations and maintenance (O&M) issues its priority. Founded in 1995, the FMOC works within the industry to improve the performance and longevity of buildings and building systems through consistent, effective and proper facility maintenance and operations. The committee encourages the creation of well-maintained, high-quality facilities; promotes the sharing and integration of facility O&M procedures and information; and identifies and disseminates “best practices” for facilities.

In 2014, FMOC, as part of its support of the Construction Operations Building information exchange (COBie) and the Specifiers Properties information exchange (SPIe), participated in revising the OmniClass Products Table. The Committee joined in the discussion on Federal Integrated Facilities Management (FED iFM) and building information systems in conjunction with the Institute’s work for the U.S. Department of Defense (DoD) Military Health Systems Agency. FMOC arranged several sessions for the National Facility Management and Technology (NFMT) Conference in Baltimore, Maryland, held in March 2014, and also convened a Committee meeting there. During the year, FMOC continued to support the Institute’s Science, Technology, Engineering and Mathematics (STEM) Education Program, which is working on a Facility Operations Challenge as part of its Mars City Program. The Committee provided updates to the Facilities Operations and Maintenance Section of the WBDG Whole Building Design Guide®. The FMOC also is preparing a session on facility operations optimization to be presented during the Information Resources and Technology Symposium: Improving Facilities with the Power of Information, to be held at Building Innovation 2015.

Looking Ahead

On January 7, the FMOC chair will present a session during the Information Resources and Technology Symposium, as part of Building Innovation 2015. The Committee will lead several sessions for the NFMT Conference in March 2015. Throughout 2015, FMOC will continue to advance the dialogue with the federal community interested in sustainability and sustainable procurement, and expand on the concept of O&M information being part of the sustainable product procurement process and industry standard product specification tables. FMOC also is looking to establish several new subcommittees during the year, including a Design for Maintainability Subcommittee and a Critical Facilities Equipment Identification Subcommittee.

Learn More

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FMOC Leadership

Chair: William Brodt, NASA
Information Exchanges

Information Exchanges (IEs) are performance-based specifications for the delivery of the information required by contracts. Historically, this information has been provided in paper document form during facility handover. Through the use of IEs, that information is now being made available electronically for use by the project team during construction, as well as by the facility owner after handover. Properly configured building information modeling (BIM) software tools are available to support the use of this information.

NASA and the U.S. Army Corps of Engineers (USACE) began developing IEs in 2007 with the support of the National Institute of Building Sciences’ Facility Maintenance and Operations Committee (FMOC) and buildingSMART alliance®. From 2010 to 2012, USACE Engineer Research Development Center (ERDC) worked together with the Alliance to begin to define domain-specific IE standards.

The Construction Operations Building information exchange (COBie), the first IE to be developed, provides a compiled set of all managed assets across all systems. COBie was first submitted for inclusion in the National BIM Standard-United States® (NBIMS-US™) Version 2 (V2), in 2011. A year later, the United Kingdom mandated COBie for all large public projects. Since its publication in NBIMS-US™ V2, the COBie user community has requested three categories of enhancements. The first category of enhancements served to improve the precision of the underlying Industry Foundation Class (IFC) Facility Management (FM) Handover Model View Definition (MVD). The second category of enhancement served to add the exchange of environmental and safety related issues. This enhancement allowed European users of COBie to apply NBIMS-US™. The third category of enhancement served to improve mapping of the COBie data to Extensible Markup Language (XML).

In 2013, an updated version of COBie, COBie Version 2.4, was submitted for inclusion in the NBIMS-US™ V3 (V3). The NBIMS-US Project Committee approved the standard in 2014, which means COBie Version 2.4 will be part of NBIMS-US™ V3 when it is published in 2015.

The Project Committee also approved a number of related IEs to be included in NBIMS-US™ Version 3:

- The HVAC information exchange (HVACie) documents the modeling and data-exchange requirements of HVAC engineering design practice, following Information Delivery Manual (IDM) and Model View Definition (MVD) procedures defined by the International Organization for Standardization (ISO) and buildingSMART International.
- The Plumbing information exchange (WSie) extends the detail described in the IFC4 specification to cover plumbing practices in North America. Specifically, it describes how to represent domestic water systems and sewage systems where sourcing and treatment is provided by an external utility. It also describes how to detail physical connectivity of valves, pipes and fixtures.

Since 2008, facility management software vendors have been importing asset data using the COBie format. For the past several years, the Computerized Maintenance Management System (CMMS)/Computer Aided Facilities Management (CAFM) community has demonstrated that data gathered during the design and construction process can be successfully handed over to support operations and maintenance functions. As a result, in 2014, the Alliance formed the CMMS/CAFM Topical Committee (CCTC) to support further industry adoption of the standard.

The CCTC’s objective is to promote and support wider adoption of COBie, reach consensus on parameters for future COBie compliance tests (previously known as COBie Challenges), and presentations at public events such as the National Facility Management and Technology (NFMT) Conference.

Looking Ahead

The CCTC will continue its work setting up procedures and compliance tools for implementation of COBie in software products.

Learn More

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IE Leadership

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Alliance CMMS/CAFM Topical Interest Committee:

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Vice Chair: Mike Tardif, Building Life Cycle Information Group
ProjNet\textsuperscript{SM}

In 1998, the U.S. Army Corps of Engineers (USACE) Construction Engineering Research Laboratory (CERL) developed ProjNet\textsuperscript{SM} to help building owners manage the design review process. Now, 16 years later, the tool is assisting users in both the public and private sectors to improve efficiency, speed construction and lower costs at every stage of the construction process. This secure, integrated, cloud-based suite of construction design, communication and database tools allows all authorized project business partners to participate in the process, enhancing document exchange and examination, inquiry, comment, record storage and issue resolution.

The U.S. Department of State (DOS) was the first agency to begin using ProjNet\textsuperscript{SM} and both the DOS Real Property Management Section and Overseas Building Operations continue to use the tool today. The Architect of the Capitol, Federal Aviation Administration, National Aeronautics and Space Administration, Naval Facilities Engineering Command, U.S. Army Corps of Engineers, U.S. Department of Veterans Affairs and the U.S. General Services Administration also are federal users. In addition, a host of state, local, and private users, such as the Dormitory Authority of the State of New York; Maryland Transit Authority: Arlington (Virginia) Public Schools; Montgomery County, Maryland; AECOM; and Lend Lease utilize ProjNet\textsuperscript{SM} to streamline their construction responsibilities.

To date, ProjNet\textsuperscript{SM} has provided project reference material for 127,000 active accounts from government, contractor and customer organizations. The site has allowed more than 112,000 reviews by users, answered more than 263,000 bid inquiries, and had more than 6.3 million comments posted. The site has received more than 12.6 million evaluations.

CERL consolidated technical and customer service support for ProjNet\textsuperscript{SM} in 2013 to improve collaboration and better address user issues in a timely fashion. The hardware and software, network support staff, programmers and support activities are now in a single location, under a single contract with Riverside Research. The National Institute of Building Sciences continues to provide ProjNet\textsuperscript{SM} sales support, in addition to overseeing Riverside Research activities.

Riverside Research implemented a number of ProjNet\textsuperscript{SM} infrastructure and software upgrades in 2014 to improve performance and system availability, and continued its work collaborating with CERL on the development of the Construction Operations Building Information exchange (COBie) application. Efforts to form a Configuration Control Board (CCB) and to complete the Federal Risk and Authorization Management Program (FedRAMP) certification of the ProjNet\textsuperscript{SM} cloud service were put on hold to initiate an Army-mandated Federal Information Security Management Act (FISMA) system accreditation.

Looking Ahead

Once USACE receives an Interim Approval to Operate (IATO) from the Army (anticipated in early 2015), the ProjNet\textsuperscript{SM} team will correct any administrative deficiencies, with the goal of receiving a full ATO by mid-2015. The ProjNet\textsuperscript{SM} team plans to address improvements to the scalability and efficiency of ProjNet\textsuperscript{SM}, and comply with the White House’s “Cloud First” policy as part of its 2015 modernization plan. Bringing the baseline code into a current and relevant infrastructure will provide customers with the ability to customize their user experience and implement current industry best practices.

Learn More

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National Clearinghouse for Educational Facilities

The National Clearinghouse for Educational Facilities (NCEF) website, www.ncef.org, despite its archival status, still enjoys popularity as an important source for research and resources on the planning, design, funding, building and maintenance of schools from pre-kindergarten through university. The Clearinghouse’s more than 25,000 resources are used by teachers, administrations and state and local officials, in addition to architects, engineers, planners and builders. A heightened interest in school safety and security in recent years has been a major driver for NCEF use.

The U.S. Department of Education (ED) created the NCEF concept in 1997. The Institute, which has managed the NCEF program since 1998, successfully expanded, operated and maintained NCEF with funding through a series of ED grants from its inception through 2010. In 2010, ED changed its funding mechanism and switched support to another clearinghouse. The Institute was able to fund NCEF through September 2012, until lack of additional support dictated that the site be reduced to purely archival functionality. In 2013, ED awarded another competitor a three-year contract to maintain and operate a clearinghouse. Though NCEF functioned solely as an archival site in 2014, it continued to enjoy popularity as a rich resource on all facets of educational facility design.

Looking Ahead

In 2015, unless funding is restored, the NCEF website will remain open in its archive state for all users to access. The Institute will continue to forge alliances and search for funding sources to support NCEF, as well as for alternative uses of the archived materials.

Learn More

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2014 Annual Conference

Though weather delays and a slew of flight cancelations impeded arrivals at the beginning of the week, the Building Sciences Second Annual Conference and Expo, was an overall success. Held January 6-10, 2014, at the Marriott Washington Wardman Park in Washington, D.C., the event brought hundreds of building professionals together to focus on Advancing Life-Cycle Performance. With a final registration tally of 700-plus registrants; more than 120 speakers; 26 committee and council meetings; 22 exhibitors; 20 sponsors; 10 symposia; four keynote speakers; two workshops; two receptions; an educational session; a challenge; and a banquet, the week-long event was packed full of educational and networking opportunities. During the Conference, the Institute looked back on its 40 years of leadership and advocacy, and presented an informative agenda that highlighted its activities and programs for developing innovative solutions for the built environment.

Building Innovation 2014 began on Monday, with the Healthcare Facilities Life-Cycle Workshop: Moving Data through Early Planning into Design and Operations, where public and private sector professionals were shown how different federal agencies are integrating facility management (FED iFM) into their programs. Sam Brooks of the District of Columbia’s Department of General Services Energy and Sustainability Division delivered the keynote lunch sponsored by the National Insulation Association and spoke about the “game change” the District Government is making to reduce energy usage by 20% in 20 city buildings in 20 months. In the afternoon, the Cybersecurity of Buildings Workshop: OT and IT Convergence – A New Paradigm, provided attendees an opportunity to discuss what is happening in the way of standards, guidelines and tools to address cybersecurity in buildings.

On Tuesday, the Conference continued with the MMC Symposium—Life-Cycle Performance: Moving Forward to More Resilient Communities, which focused on the barriers to mitigation in the nation’s local residential and commercial sectors. The Information Exchange Working Group hosted its January 2014 buildingSMART alliance® Challenge, beginning the day with an introduction of the new information exchange (IE) standards and continuing through the afternoon with manufacturers demonstrating compliance verification at sessions for design and construction software. During the FEDCon® Luncheon sponsored by Lehigh Hanson, Dennis Milsten, Associate Executive Director of the Office of Program and Plans, Office of Construction & Facilities Management, U.S. Department of Veterans Affairs (VA) talked about how VA’s Facility Management (VAFM) Transformation Initiative is moving VA’s Construction Program into the 21st century. The Science, Technology, Engineering and Mathematics (STEM) Program demonstrated its Facility Operations program module during the day. In addition, the Exhibit Hall opened, with an evening Exhibitors Reception sponsored by GRAPHISOFT and the International Association of Plumbing and Mechanical Officials. The sold-out exhibit space gave networking attendees a first-hand look at the latest in building technologies and a chance to win a Nest Thermostat.

On Wednesday morning, the IRD Symposium: Measuring and Improving Resilience of Existing Facilities looked at ways to identify deficiencies in resilience and a path to their mitigation, with a particular focus on the safety of schools. At the SBIC Symposium: Beyond Green™: Guidance for Life-Cycle Performance sponsored by Legrand, panelists addressed ways to achieve high performance across a building’s life cycle and Beyond Green™ Award Winners provided their insights on putting high performance into practice. During the FMOC Symposium: Improving Life-Cycle Savings through Intelligent Building Data, attendees became acquainted with information exchange tools to improve facility maintenance and operations. At the Beyond Green™ Awards Luncheon sponsored by Virginia Tech, SBIC recognized the winners of the 2013 Beyond Green™ High-Performance Building Awards. The Plenary Symposium: Advancing Life-Cycle Performance brought together leaders from the Institute’s councils and committees to discuss ways to collaborate to achieve life-cycle performance.

In the evening, the Institute hosted its annual Awards Reception and Banquet, where the Institute distributed the Institute Awards, recognized new and retiring Board Members, and kicked off its 40th Anniversary Celebration. Chief Operating Officer Earle Kennett narrated his video presentation highlighting four decades of Institute activities.

On Thursday, the bSa Symposium: Improving Life-Cycle Performance with BIM covered the basics of BIM on through to international guidelines, informational exchanges and the benefits of thinking collaboratively. The Commissioning Symposium: Optimizing Performance through Commissioning, sponsored by the Building Commissioning Association, focused on the process of commissioning. Presenters at the BETEC Symposium: Building Enclosures for Life: Design,
Membership

More than 1,500 members work together to help the National Institute of Building Sciences on its mission to serve the building industry. Members from all aspects of the building community utilize their unique perspectives and collaborate on developing solutions. Through their dedication to the industry and the public interest, they volunteer their time and expertise to the Institute’s boards, councils and committees and work to develop and implement technical and procedural improvements to the building process. Institute members represent government agencies, design professionals, members of the construction industry, manufacturers, insurance representatives, software developers, educators, researchers and others. They actively play a vital role in the Institute’s ability to be an authoritative source on innovative solutions for the built environment. This Annual Report demonstrates their commitment and many accomplishments. The Institute is grateful for their support and contributions.

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Moving Forward: Findings and Recommendations from the Consultative Council

Introduction

Every year, the National Institute of Building Sciences (Institute) Consultative Council prepares, as outlined in the Institute’s enabling legislation, a report of findings and recommendations to the President of the United States and the U.S. Congress. The Council consists of representative organizations from the building industry that support the design, construction and operation of buildings. It focuses on developing recommendations to address policies and practices that, if implemented, would help to advance the industry and the nation in realizing myriad goals.

In a change from previous years, the Consultative Council reached out beyond its own membership and instead solicited input from the industry at-large to develop the 2014 Moving Forward Report. Industry participants were invited to identify those issues either important to their segment of the industry or to the industry as a whole. The industry’s responses overwhelmingly focused on three high-priority areas where action, coupled with measurable results, would drive advancement.

These areas include:
- The Buildings-Related Workforce,
- Resilience and a Changing Climate, and
- The Need to Align Government and Business to Deliver a Cost-Effective, High-Performance Built Environment

Despite the seemingly disconnected nature of these three areas of focus, they are strongly linked and require the implementation of holistic solutions. For example, incorporating resiliency or improving the existing building stock requires building professionals to have access to good science and dissemination through training, education, apprenticeship programs and sharing of information. Defining high-performance metrics and energy independence requires similar synergies.

While this year’s report focuses on these three areas, the recommendations from prior Council reports continue to be relevant to the industry and correlate well with many of the recommendations offered here.

The Buildings-Related Workforce

There is a symbiotic relationship between a competitive American workforce, with access to a competent technical/vocational education system, and a robust national economy. The success of the U.S. economy depends on an effective balance between such an available, skilled workforce and opportunity, specifically to meet long-term industry needs. Failure to establish that balance means America’s technical edge could whither or drift overseas, along with American jobs, American prosperity and our economic security as a nation.

The current challenge affecting the building industry is two-fold. First, the building industry is experiencing an aging of its skilled workforce across a wide range of professional categories. Second, the skills required by building professionals have changed drastically over the past few decades, yet the next generation of available labor does not have the necessary technical/vocational training to replace the skills of the workforce that is retiring.

The Graying Workforce and Economic Recovery

The American workplace has changed dramatically since the post-World War II boom era. As statistics have predicted, as we near the end of the Baby Boomer era, a big hole is emerging in America’s skilled workforce. This is becoming a major concern at the state and the local level throughout the nation. Virginia is a prime example. The average worker there is 55 years old and the state’s employment officials anticipate 18,000 workers will leave that state’s workforce by 2020.

Citing a survey of business owners, representatives of the State Chamber of Commerce in Nebraska recently told a local service club in the city of Gothenburg that the state’s future hinges on the quality and depth of its workforce. Of those surveyed, 55 percent said they had difficulty hiring qualified workers, while 25 percent said the lack of skilled labor is the number one issue limiting growth.

In Minnesota, the term that is used to describe the factor driving up unemployment at a time when job openings are increasing is “job skills mismatch.” The positions go unfilled waiting for skilled people to apply. Meanwhile, the percentage of Minnesota workers outside the Minneapolis-St. Paul metro region under the age of 55 shrank from 85 percent in 2000 to 79 percent in 2012.

Similar trends were cited in an article about employment in Ohio. A career center superintendent in Marion identified the task before community leaders and educators alike. “Every state, every community is trying to give away free land and dirt,” the superintendent said. “No one has a skilled workforce to provide. Why isn’t that the national crisis?”

Nationally, America has drifted greatly from its post-World War II status, when the United States produced more manufactured goods than the rest of the world combined and 25 percent of U.S. workers had manufacturing jobs. Today, the United States holds a 20 percent share of world production (the same as China) and less than ten percent of the U.S. population have manufacturing jobs. Moreover, a growing percentage of the American workforce moonlights or does freelance work to earn additional income.

Yet, experts point to new signs of a resurgence in the American economy. They see the abundance of natural gas cutting energy costs, the rise in auto sales, the increase in construction permits and other factors as signs that the American manufacturing industry is growing at its fastest pace in the past three years. The possible roadblock to a full resurgence and the improved job numbers that could result, experts say, is a lack of skilled workers.

The Value of Technical/Vocational Training

The Consultative Council, in its review of current trends involving skilled worker shortages, has found that America is underestimating the value of technical/vocational education. There is a clear need to raise the awareness of the American public, as well as the leaders of government and private institutions at all levels of society, about the value of vocational education. With the shift towards promoting college education, the technical/vocational track is not being adequately promoted to high school students and their parents. Such programs are one of the main, if not the primary, entryways into the buildings-related workforce, yet a number of vocational high school programs around the country
have shut down over the past decade due to reductions in enrollment and funding. It is imperative that we as a nation undertake efforts to reinvigorate this educational pathway.

Millennials are in touch with the tough reality that four-year college degrees do not provide the career security they once did for Baby Boomers. Statistics indicate that members of the Millennial generation do not expect to keep the same job for their entire careers; rather they expect to change jobs and career paths several times. This should be seen as an open opportunity to show young people how vocational options can be an important part of their lifetime career transitions. But are they getting that message from their counselors when they exit high school? Are their parents learning about the new opportunities in the workforce for their children’s generation and that the key to opportunity is vocational training? What is the opinion of their peers?

If the nation’s technical/vocational education keeps pace with changes in the jobs market, it becomes the on-ramp for young people to enter the workforce and for older people to retrain to get a better-paying job. Taking a technical/vocational training option does not need to be seen as a lesser path; rather it is a path leading to more and better opportunities. A job as a trained house framer could provide the base income for a Millennial to afford college and graduate degrees or it could lead to more training for an older person to learn how to own and operate a business or to become a city building official.

Changing attitudes about vocational training needs to start with educating young people and their parents, as well as their community and school leaders, about the career options available through technical/vocational training and how such training helps businesses and industries get the skilled workers they need to thrive. Technical/vocational training needs to be seen by everyone as a viable path to a valuable career, just as going to college or entering military service are paths. Young people need to be advised that they can reach productive destinations through multiple career paths, not just college.

Most importantly, there needs to be an increase in the visibility and public understanding of technical/vocational education, as well as registered apprenticeship programs. To be most effective, such a directive should be carried out as a unified effort by schools, professional organizations, trade associations and state and local governments. In addition, the U.S. Department of Labor (DOL) must continue its Registered Apprenticeship Programs; they play an important role in the development of long-term career opportunities and consistent competencies across the workforce.

As the Baby Boomer generation retires, the Millennials will redefine the American workplace and workforce for the next 30 years or more. Yet, we can still shape how they view technical/vocational education as a key to future growth. Now is the time for all of us to take part in shaping that vision.

Synching Job Growth and Employee Training

America is still recovering from the Great Recession, but the lack of skilled workers has the potential to slow down a full resurgence of the American economy. The toughest jobs to fill are those of skilled trades, such as electricians, welders and carpenters. As long as U.S. construction and manufacturing continue to face shortages in skilled labor, America’s economy is going to lag. This is not an isolated concern. It is everybody’s concern.

Recommendations:

- The DOL and the U.S. Department of Education (DOEd) should work with representatives of the building industry and other stakeholders involved in the built environment to develop a comprehensive national workforce plan.
- All members of the building industry, including skilled tradespeople, builders, contractors and code officials, should establish mentoring programs and reach out to their education community and to parents, teachers, business leaders and decision makers to support technical/vocational curriculum that meets the needs of today’s workplace and capitalizes on the skills and work experience of these industry experts.
- Employers, businesses, builders and manufacturers should engage in efforts to educate the public (nationally and at the community level) on career opportunities and the shortfall of skilled workers, as well as the availability of apprenticeship programs and other training programs.
- DOEd, DOL and other relevant federal agencies should work with national organizations, state leaders and educators to adopt more aggressive outreach to young people. The Administration’s efforts should shine the light on opportunities in the workplace via technical/vocational training for a more secure economic future.

Resilience and a Changing Climate

As hazard events increase in number and severity in the United States and around the world, the resilience1 of communities and the individual buildings within those communities is becoming of vital importance. The U.S. building industry has significant expertise to contribute to realizing national- and community-level resilience. While a long history of building codes has laid the foundation for addressing the impacts of natural and man-made hazards, changes in the frequency and severity of events have brought new challenges—challenges requiring the engagement and support of policymakers.

Incorporating Science and Uncertainty into Decision Making

The design, construction and operation of today’s buildings are largely based on the science and experiences of the past. Yet, the future requirements of buildings are likely to be vastly different. It is imperative that, with the support and engagement of government, the building industry develops tools and practices to facilitate decision making in order to better address the uncertainties associated with the demand for resilience to climate and weather extremes and the related building functions over the lifetime of buildings and infrastructure systems. Climate scientists indicate that the climate and weather patterns of the future will be very different than those of the past, but the specific differences and specific locations at risk are yet unknown. Buildings and infrastructure must be prepared to adapt and respond to these changes. Building codes, standards and guidelines should recognize these needs.

When it comes to the process for deciding which resilience strategies to implement, the ability to quantify the value of various options is extremely important. However, gaps exist in the current decision support methodologies used to evaluate the benefits of resilience measures for new and existing buildings.

1 As defined by the National Research Council in its 2012 report Disaster Resilience – A National Imperative and subsequently adopted by representatives of the building industry in the formation of the Alliance for a Resilient Tomorrow (see http://www.nibs.org/news/172768/CEOs-Announce-Major-Commitment-to-Promote-Resilient-Planning-and-Building-Materials.htm), “resilience is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.”
The United States needs hazard resistance assessment tools that enable building designers and owners to understand which hazard mitigation measures have the most beneficial economic and environmental impacts.

The built environment will play a significant role when it comes to changes in climate. It is essential that the nation's communities have information that is actionable and easily understood in order to prepare buildings before and in response to events. Establishing a long-term dialogue between climate scientists and building scientists would help bridge the gap between the current uncertainty in climate and the design criteria required by the building industry. The structure of the Institute's Building Seismic Safety Council (BSSC), which brings together experts from a number of different fields, can serve as a model. Such a dialogue would improve the relevance of climate modeling for use in the planning, design, operation, maintenance and renewal of the built and natural environment.

When confronted with a hazard event, the public's trusted advisor is often a broadcast meteorologist. While meteorologists provide valuable information on near-term preparations for a pending event, they rarely focus on the capability of a community to implement pre-event disaster mitigation strategies like building codes. Building codes serve as a built-in first line of defense in preparation for such hazard events. Communities need to understand their importance. Establishing a connection between meteorologists and local building departments would help building owners and the general public better understand steps they could take to reduce risk.

Recommendations:

- The U.S. Department of Homeland Security/Federal Emergency Management Agency (DHS/FEMA), U.S. Department of Housing and Urban Development (HUD), U.S. Department of Energy (DOE), Environmental Protection Agency (EPA) and the National Institute of Standards and Technology (NIST) should work with the building industry to develop decision support tools that incorporate future needs and current uncertainty into the design, construction and operation of buildings.
- DHS/FEMA, NIST, the U.S. Economic Development Administration (EDA), the Office of Management and Budget (OMB), the Institute's Multihazard Mitigation Council (MMC) and other industry stakeholders should work together to develop common metrics and methodologies to assist in the quantification of economic and environmental benefits of hazard resistance.
- The U.S. Global Change Research Program (USGCRP), National Oceanic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA), U.S. Geological Survey (USGS), FEMA and NIST, along with the Institute and other industry stakeholders, should support establishment of an ongoing program, modeled after the existing BSSC, which would bring together building scientists and climate scientists to facilitate the production of relevant modeling results that lead to effective decision making.
- The Institute and other building industry organizations should work with the American Meteorological Society to provide broadcast meteorologists with information on the role of building codes as a pre-event disaster mitigation strategy.

Building Code Adoption and Compliance

Building codes serve to establish a community's expectation of health, safety and welfare. They cover a broad range of issues important to communities, from basic life safety to energy efficiency and sustainability. The fundamental challenge for communities, in order to realize their established goals, is ensuring that what the building codes require is actually implemented during the construction process of each building. While the adoption and enforcement of codes is primarily the responsibility of jurisdictions at the state and local level, the level of compliance by individual building owners has a significant impact on the overall resilience of the nation and the ability to achieve national-level goals.

There are three complementary ways the federal government can support effective state and local implementation of codes to address these challenges: providing state and local government with the resources for additional staffing where needed; supporting the development of new technologies that can help state and local government officials to enforce codes more effectively; and supporting research to improve the application and outcomes of code provisions.

Levels of adoption and enforcement vary widely across the country—often due to a combination of factors, including the local political environment and limited funding for department administration, training and technical support. The federal government is in the unique position of being able to provide technical and financial support to communities to advance the adoption and enforcement of building codes. This is through both additional funding (possibly tied to achieving certain outcomes) and through technical support through tools and resources that facilitate compliance verification, such as the DOE-supported REScheck and COMcheck programs that support energy code compliance. Federally supported tools for other building-related codes beyond energy should also be developed.

In addition to supporting traditional methods of enforcement based on plan review and inspections, code development organizations, federal agencies and others should develop new methods for verifying the intended outcome that recognize the evolving nature of code departments. An outcome-based performance pathway for energy use is just such an approach. Federal agencies should continue to focus on the development of new techniques for verifying compliance outside the current framework. Such methods may help address the much-needed focus on existing buildings discussed further in-depth below. These approaches can be realized through support for needed research and analysis as a basis for these new code formats and criteria.

Recommendations:

- DHS/FEMA, HUD and DOE, working with industry partners, including insurance companies, should develop a collaborative program to support the adoption, administration and enforcement of building codes. Such a program should focus on providing scientific and economic data associated with the effectiveness of building codes and their impacts on communities, education and training for code professionals, technical assistance and evaluation tools for code department effectiveness.
Addressing the Existing Building Stock
As the United States looks to the goals of increasing resilience, reducing resource use and incorporating sustainability practices into the nation’s buildings, the current building stock will be a key part of the solution. Building codes and other requirements address new buildings; they do not normally focus on existing buildings except those undergoing major renovations. On average, only one to two percent of the U.S. building stock is under construction or renovation each year. Therefore, in order to achieve these significant goals, existing buildings must be addressed (particularly when it comes to implementing resilience strategies and improving energy and water efficiency). To date, communities have already implemented a variety of strategies, including incentives, competitions, benchmarking and reporting requirements, and audit and retrofit ordinances. Addressing existing buildings will require a combination of these kinds of incentives and regulation—finding the right balance and acceptance within the industry will require a consensus among federal, state and local policymakers; building owners; advocates and others. While any potential resolution may be contentious, the realization of national and community goals depends on addressing existing buildings.

Recommendation:
• Federal, state and local governments; building owners and other industry stakeholders should work collaboratively to address the challenges existing buildings present to realizing national resilience and sustainability goals. Given the importance of achieving these goals and the potential contention that may arise, such collaboration may require a White House-level dialogue, followed by establishment of an expert panel.
• DOE and NIST; with input from industry stakeholders, should develop metrics that can provide building owners of existing buildings with return on investment (ROI) metrics for updating outdated building systems with current energy- and water-efficient technologies.
• DOE should work with industry stakeholders to determine effective incentives for encouraging building owners to retrofit their buildings with modern water-efficient technologies. Many existing commercial and residential buildings are still using original plumbing fixtures (toilets and urinals), fixture fittings (faucets and showerheads) and commercial food service equipment. Retrofitting older water-guzzling equipment with new water-efficient technologies can pay big dividends in terms of both water and energy conservation, especially where hot water is used often (such as in hotels and buildings with food service equipment).

Addressing Water Efficiency Concerns while Ensuring Public Health
Existing building plumbing systems represent a major opportunity for building owners to realize savings in water use. Reduced flow rates at plumbing fixtures and reductions in the size of pipes that deliver water to the fixtures can provide significant savings, but their implementation must be weighed with the potential impacts on public health. Both the size of the water pipe and the temperature of the water going through it have a direct impact on the growth of bacteria and the potential for corrosion in a building’s plumbing system. Although the public’s interest in improved water efficiency is increasing, the nation’s building industry lacks the research necessary to appropriately balance the public health concerns. The pipe sizing criteria currently in use are based on research conducted by NIST in the 1930s and 1940s. Unfortunately, NIST’s plumbing research facility has since been dismantled and very little research has been done in this area.

The International Association of Plumbing and Mechanical Officials (IAPMO), the American Society of Plumbing Engineering (ASPE) and the Water Quality Association (WQA) began joint research in this area in 2009, with a particular focus on one and two-family residential buildings. This project is moving forward and the project organizers are hopeful to be able to submit change proposals to model plumbing codes for the 2018 code cycle. While IAPMO, ASPE and WQA have taken an important step, the building industry still needs government input, engagement and funding to drive research further and examine other building types.

To adequately address this problem in commercial buildings, data on water use in commercial buildings is necessary. DOE and EPA should work to address this data gap.

Recommendations:
• Congress and the White House should work with NIST to reopen its plumbing research facility and to once again provide leadership in plumbing-related research that has significant implications for efficient use of water and public health.
• DOE and EPA should work with building owners, plumbing-related organizations and other stakeholders to identify important water-related metrics and begin collecting regular data on water use in the nation’s building stock.

Building, Operational and Community-Level Guidance on Resilience
Establishing community resilience goes beyond implementing building codes; it is the ability for a community to prepare and plan for, absorb, recover from and more successfully adapt to adverse events. While building codes serve as the minimum requirements for life-safety in the building stock, basic life-safety protections do not fully address building performance requirements to achieve resilience. While the concept of resilience is becoming well-understood, the implementation is lagging. The nation’s designers, contractors, owners and operators need guidance on policies, practices and technologies in order to fulfill these needs.

The communities and building owners themselves must identify the levels of performance they expect various building types to achieve. Once such levels of performance are identified, codes and standards developers and others should develop guidance focused on implementing resilience practices during design, construction and operations, and at a community-wide level.¹

Recommendation:
• Building owners, community leaders, codes and standards developers and others must work together to implement resilience by identifying performance requirements and subsequently developing guidance to achieve such requirements.

¹The Institute has begun developing several such tools, including the Owner's Performance Requirements Tool (see oprtool.org) and the National Performance Based Design Guide (see npbdg.wbdg.org), working with the DHS Science and Technology Directorate and the General Services Administration respectively.
Addressing Resilience in the Electric Grid

While issues surrounding the electric grid are typically outside the scope of the Institute’s work, the focus on resilience and high-performance buildings reminds us that buildings are part of a larger interdependent system. The resilience of an individual building relies on the resilience of many other elements of a system within its community.

Increasing the efficiency of the power-generating sources on the grid will help buildings lower their carbon emissions. In addition, the nation’s power companies should work to improve resiliency of their systems by distributing power generation, including the increased application of energy storage technologies and the ability to utilize such distributed sources, in the event of grid disruption.

Recommendation:
• The nation’s power companies, in tandem with the DHS/FEMA, DOE, the Federal Energy Regulatory Commission (FERC) and state and local utilities commissions, should work to increase the energy efficiency and improve the resiliency of power-generation sources on the grid.

Aligning Government and Business to Deliver a Cost-Effective, High-Performance Built Environment

High-performance buildings bring benefits to building owners and the communities where they reside. To facilitate the most cost-effective delivery of such benefits will require the collaboration of building owners and industry participants, as well as government at all levels.

Driving to Performance

To achieve a truly high-performance building requires the integration and optimization of multiple building attributes—including safety and security, productivity, accessibility, functionality, aesthetics and sustainability. However, recent industry and government focus has trained primarily on only one or two of these attributes. The building industry, with the help of government, can drive a more holistic process by raising the understanding of the interconnections and synergies across these performance attributes, as well as their overall contributions to an owner’s goals and the performance of building occupants.

In addition to putting the emphasis on multiple performance attributes, the parties involved must shift methodologies for evaluating achievement of performance goals. Rather than measuring and evaluating actual operational and maintenance conditions and comparing them to pre-determined target levels of performance, the current methods of evaluation emphasize promised building performance, before occupancy, by subjectively rating certain design and construction features. Building performance is not static; it changes throughout the lifespan of a building. Each building performs acceptably, or not, during “normal” and “extraordinary” periods of operation. Assuring quality building performance requires continuous evaluation over time and any subsequent improvements to be made should focus on realizing desired performance levels. Government can support such a transition by focusing incentive and regulatory programs beyond just the anticipated results from a design: they should be directly tied to the actual, measured and verified results of an action.

Recommendations:
• Federal, state and local incentive and regulatory programs focused on the built environment should incorporate performance verification criteria based on actual, measured results.
• DOE, HUD, DHS, NIST, EPA and the Access Board, working through the Institute with the engagement of federal agency building owners (Department of Defense, Department of Veterans Affairs, NASA and GSA); state and local government; and building owners, designers, contractors and operators should develop a robust, scientific methodology for measurement, verification and documentation of actual building performance across all high-performance building attributes.
• All federally funded construction projects and operations contracts should include clearly enumerated performance requirements, including methods for verification and procedures, in order to rectify non-achievement of performance targets.4

Data to Realize High-Performance Goals

Today, the building industry has an unprecedented amount of building information at its disposal. This expanding availability of building data offers significant opportunities as well as challenges. Building information is generated throughout the design, construction and operations process. Unlocking the value residing in that information requires an effective information management process that allows its use by different parties at different points in the building lifecycle for different uses.

Being able to collect and analyze data across the building life cycle has a number of benefits. It can help the building owner by supporting the consistent evaluation of building performance, the development of cost-benefit analysis and the establishment of feedback loops to help advance the industry. However, to work effectively, there needs to be interoperability criteria for that data, both at the macro level, through international and national standards, and the micro level, at the individual project. DOE’s effort to support interoperable energy data through the Building Energy Data Exchange Specification (BEDES) can help the aggregation of national and international energy data, but the building industry still needs to implement similar efforts in other areas. The effective and efficient use of data across a building’s life cycle relies on the interoperability of information contained within a building information model (BIM). The Institute’s effort through the National BIM Standard—United States® (NBIMS-US™) is aimed at achieving that interoperability.

An industry-wide focus on the interoperability of data will help drive systematic improvements in performance, productivity, cost effectiveness and efficiency.

4The GSA has been incorporating such requirements in recent construction projects (including those funded under the American Recovery and Reinvestment Act) for some performance attributes. The results of these projects, the performance levels achieved, the savings associated with achievement of performance targets and the methods for incorporating such performance requirements into the design and construction process should be shared widely with the private sector to support widespread advancements in this area.
Recommendations:
- Federal, state and local government agencies with building authority should incorporate requirements for information interoperability throughout the building life cycle into their contracts and, to the extent practicable, provide building-level data in an accessible format to national, regional and local data sets. Government officials at every level should also actively participate in the development of such data to promote consistent information and support interoperability.
- Federal, state and local agencies with responsibility for the collection, storage or analysis of data should work together to develop standards for integration and interoperability across datasets, including protocols for data acquisition, storage and retrieval, as well as confidentiality.

Effective and Efficient Regulatory Systems
High-performance and sustainable buildings and infrastructure require the consideration and integration of numerous systems and practices, which are often regulated by different government entities using a number of different compliance verification processes. Regulatory efficiency and compliance with current and future building codes, as well as other government regulations, requires developing and implementing a streamlined system to support transparent, effective and efficient approaches that document and verify compliance. Regulatory streamlining strengthens both the effectiveness and the efficiency of the nation’s building regulatory system at each and every level of government.

The Alliance for Building Regulatory Reform in the Digital Age, in conjunction with The American Institute of Architects (AIA), the International Code Council (ICC) and Fiatech, have conducted surveys documenting that streamlining the regulatory process and applying information technology within the regulatory system would increase public safety while reducing by 40 to 70 percent the amount of time it takes to move a building through the permitting and construction approval process to occupancy. Indeed, the surveys documented that the single practice of electronic permit processing would save the construction industry millions of dollars annually.

At the national level, several different organizations are working on projects that provide new tools to improve both the effectiveness and efficiency of the building regulatory process. Such projects include: increasing the use of digital signatures and seals; wider adoption and use of criteria allowing replicable buildings; and the digital representation and use of codes. Other methods for ensuring compliance exist, along with formats for codes and standards that can foster increased compliance because they align better with alternative compliance methods.

Recommendation:
- The White House, through OMB and with the engagement of DOE, EPA, HUD, DHS, the Access Board and EDA, and working with industry stakeholders, should identify opportunities to align regulatory implementation and compliance requirements to support achievement of desired outcomes in the most cost-effective and efficient manner. Such a process should also be conducted at the state and local levels and, ultimately, across all three levels of government.

Development and Dissemination of Model Contracts and Delivery Mechanisms
Within the building industry, the implementation of technology, movement to measured performance, incorporation of collaborative processes and effective utilization of data has been slow. The multitude of small companies that make up the industry, along with an aversion to risk and change, has hindered large scale transitions. The availability of model contracts and delivery mechanisms, coupled with case studies on projects that have successfully implemented them, is necessary to support widespread transition of the industry.

Recommendations:
- All building industry participants, particularly federal, state and local agencies with building authority that have successfully implemented “non-traditional” contract or delivery mechanisms, are encouraged to share information on the process and the results with the industry at large to facilitate their potential utilization. The WBDG Whole Building Design Guide® may serve as a home for such information.

Conclusion
The Consultative Council is pleased to provide these findings and recommendations to the President and Congress and looks forward to working collectively to realize their implementation. Only through the collaborative efforts of federal, state and local governments and building designers, contractors, owners, operators, occupants, financiers and insurers can the nation realize the high-performance goals set for buildings across their life cycle.

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3 The WBDG Whole Building Design Guide® is one of the largest online resources of construction-related information in the world. Administered by the Institute with the cooperation of 11 federal agencies, the WBDG serves as a repository of information on the design, construction and operations process. See www.wbdg.org.
## 2014 Financial Statements

### Statements of Financial Position

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<tr>
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<th>September 30</th>
<th>2014</th>
<th>2013</th>
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# Statements of Activities

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<th>2013</th>
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| Change in Net Assets | $(432,710) | $(532,971) |

The accompanying notes of the Institute’s audited financial statements are an integral part of these financial statements. For a complete copy, write to: National Institute of Building Sciences, 1090 Vermont Avenue, NW, Suite 700, Washington, DC 20005–4950.
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Executive Assistant to the President

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