Moving Forward: Findings and Recommendations from the Consultative Council

An Authoritative Source of Innovative Solutions for the Built Environment

2014
Moving Forward
Findings and Recommendations from the Consultative Council, 2014

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 resilience\(^1\) 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. The United States needs hazard resistance assessment tools that enable building designers

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\(^1\) 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.”
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.

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2 The BSSC brings together seismologists and earthquake researchers with building scientists to discuss advancements in earthquake science, impacts on buildings and potential updates to building codes and standards.
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.3

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.

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.

3 The 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.
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.  

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 life-cycle 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.

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

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4 The 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.
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.\(^5\) 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.\(^6\)

**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

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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.7

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, financers and insurers can the nation realize the high-performance goals set for buildings across their life cycle.

7 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.
About the Consultative Council

The Consultative Council assembles high-level building community representatives to make recommendations on behalf of the building community directly to the executive and legislative branches of government to improve our nation’s buildings and infrastructure.

Council Members

ASTM International
American Institute of Architects
American Society of Civil Engineers
ASHRAE
American Society of Plumbing Engineers
Associated General Contractors of America
Building Owners and Managers Association
Center for the Built Environment
Construction Specifications Institute
ESCO Institute
Estime Enterprises, Inc.
Extruded Polystyrene Foam Association
Glass Association of North America
Green Building Initiative
Green Mechanical Council
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HOK
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Ingersoll Rand
International Association of Lighting Designers
International Association of Plumbing and Mechanical Officials
International Code Council
Laborers’ International Union of North America
NEBB
National Insulation Association
National Opinion Research Center at the University of Chicago
United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry

For more details on the Council, visit: http://www.nibs.org/CC.