Buildings and their related infrastructure are complex. High-performance buildings optimize numerous attributes to achieve the buildings people need and the characteristics they desire. Bringing complex buildings in line with these characteristics, while avoiding unintended consequences, requires a robust and comprehensive research program. The National Institute of Building Sciences Consultative Council has identified several key elements of such a program.
consultative council on: research needs

Given the importance of buildings to the nation's economy and its citizens, the federal government has a significant role in supporting this research. Federal agencies already have high-quality institutions, including the U.S. Department of Energy (DOE) National Laboratories and the National Institute of Standards and Technology (NIST), that can inform and conduct such research. The National Science Foundation also can provide a mechanism to examine cross-disciplinary issues.

While research and development needs can be identified within every building discipline, the Consultative Council has identified the cross-cutting research needs that represent key hurdles in the advancement of the built environment. Providing the body of knowledge and tools to improve high-performance building and infrastructure practices requires substantial, comprehensive and sustained programs of research, development, and demonstration (RDD). Policymakers and the building community need mechanisms to coordinate and advance the programs of the numerous public agencies, private foundations and private industries that fund RDD for high-performance buildings and infrastructure. It is imperative that agencies consider what interdisciplinary, multi-sponsored research is needed, with clear indications of what benefits are to be achieved, and stimulate the necessary funding.

The Council and its member organizations strongly encourage policymakers, foundations, and research institutions to provide financial, political, and technical support for research in the following areas:

- Developing more widely accepted metrics to demonstrate payback periods for energy and water-efficiency code provisions, as well as better methods to convey that code updates incorporate the latest knowledge and experience to protect public safety. Municipalities are delaying the adoption of updated model codes due to the perception that updated codes increase construction costs without providing a clear return on investment.

- Gathering, collating and understanding data on current energy and water usage in buildings. This information would foster better decision making regarding the most cost-effective technologies to deploy in various building types and in different regions of the country. Having a better understanding of water usage in buildings helps decision makers to properly size water pipes and assists them in balancing the needs for energy and water efficiency with the need to maintain residual pressures for safety and other performance concerns. Knowledge of load profiles for various systems allows them to develop and select the most efficient equipment. Advanced metering and sub-metering technologies including less invasive water sub-metering technologies can be employed to better understand complex water use patterns associated with various building types.

- Health and environmental impacts and appropriate water quality requirements of non-potable water usage to protect public health and safety. The lack of information on the public health impacts of non-potable water use impedes the acceptance of the practice by public health officials. Having this data will assist the Environmental Protection Agency in setting uniform national non-potable water quality standards, along with permissible utilizations of non-potable water. For irrigation related uses, such information needs to include the impact of non-potable water on soil hydrology, long-term plant health, and microbiological constituents.

- Identifying procedures for decentralized water quality management. The use of decentralized systems, which places treatment in multiple locations, dramatically complicates efforts to regulate water quality management and ensure its proper operation to protect public health.

- Developing an improved understanding of the complex relationship between energy and water, including water usage needs in the production of energy, and energy usage needs in the treatment of drinking water and wastewater, the distribution of drinking water and the various uses and heating of water.

- Quantifying the potential energy and water savings associated with increasing the use of pipe insulation.

- Defining the extreme environments for which facilities should be designed, constructed, operated, maintained or renovated, and facilitating development and implementation of standards, practices, and regulations to support adaptation of the built environment to a changing climate. While climate scientists have identified the likely effects of a changing climate in order to protect the health and safety of people in these altered environments, designers, owners and regulators need guidance on how buildings should be designed and maintained to address these concerns.

- Developing and disseminating model practices for public involvement for specific building types and infrastructure projects. Public involvement throughout the life cycle of a building or infrastructure system is needed to assure that the facility contributes to, and is perceived by stakeholders to contribute to, the sustainability of the affected communities.

- Establishing and demonstrating model processes to streamline regulation for important classes of building and infrastructure projects. Streamlining means meeting regulatory intents through coordinated efforts of regulatory authorities, project proponents and stakeholders. Where needed, the statutory authorities of regulatory agencies should be modified to enable participation in streamlined processes.

- Investigating the current code enforcement and verification process relative to the actual achievement of code requirements. Such an effort should include examination of the role building information modeling (BIM) and other technologies play in assisting efficient achievement of regulatory requirements.

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