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November 7, 2019

The Honorable Kathy Castor, Chair
The Honorable Garret Graves, Ranking Member
U.S. House of Representatives
Select Committee on the Climate Crisis
H2-359 Ford Building
Washington, D.C. 20515

RE: ASCE's Response to the Select Committee on the Climate Crisis' Request for Information

Dear Chair Castor and Ranking Member Graves:

We thank you for giving the American Society of Civil Engineers (ASCE) the opportunity to respond to your Request for Information (RFI) with our recommendations for how to address the infrastructure challenges faced by climate change.

Background

Our nation faces significant deferred maintenance backlogs for aging infrastructure that leave our systems vulnerable to failure. ASCE's *2017 Infrastructure Report Card* rated the overall condition of the nation's infrastructure a cumulative grade of "D+" across sixteen categories, with a mounting investment gap of $2 trillion.

Additionally, ASCE's independently commissioned 2016 economic study, *Failure to Act: Closing the Infrastructure Investment Gap for America's Economic Future*, found that our nation's deteriorating infrastructure and growing investment deficit has a cascading effect on our nation's economy, impacting business productivity, gross domestic product (GDP), employment, personal income, and international competitiveness; in fact, our failure to act by 2025 carries an enormous economic cost to the tune of nearly $4 trillion in lost GDP, which will result in a loss of 2.5 million jobs in 2025.

As natural hazards become more frequent and severe, investment in our nation's infrastructure is critical for safeguarding communities, maintaining healthy businesses, and strengthening the valuable assets we already have in place. Natural disasters cost the U.S. $91 billion in 2018, according to a report[1] from the National Oceanic and Atmospheric Administration (NOAA). Oftentimes, these incidents cause long-term economic, social, and environmental effects to

[1] NOAA National Centers for Environmental Information (NCEI), U.S. Billion-Dollar Weather and Climate Disasters (2019), https://www.ncdc.noaa.gov/billions/

communities, thus magnifying the damage and driving up the ongoing burdens taxpayers must bear.

Infrastructure is a key component for socioeconomic resilience measured by an economy's ability to minimize the impact of asset losses on wellbeing (measured by welfare loss) from phenomena such as climate change. Socioeconomic attributes are vital for a systemic, iterative and multi-hazard approach to resilient infrastructure planning.

Civil engineers work to harden existing and build new infrastructure to better withstand challenges from a changing climate, operating under the assumption that hazard events will continue with increasing regularity and severity. Plainly put, our future depends on resilient infrastructure and – as civil engineers – we think about building infrastructure that will sustainably last for 50 or 100 years or more to maximize lifecycle benefits.

According to the 2018 U. S. Bureau of Census, the value of construction put in place in the United States is about $1.3 trillion. These new investments are generally not designed to account for a changing climate. This challenge is global. Natural disasters are occurring with greater regularity and with greater quantifiable costs to infrastructure. According to the United Nations Office for Disaster Risk Reduction (UNDRR), between 2005 and 2014, natural disasters worldwide caused over $1.4 trillion in damage, affected 1.7 billion people and killed 700,000. Other countries typically follow the lead of the United States.

In addition to anticipating what hazards and conditions roads, bridges, drinking water pipes, wastewater treatment plants, airports, and energy lines must withstand, engineers are also thinking through how technology, population shifts, and other trends will change communities' needs. In summary, an integrated systems approach is needed to tackle resiliency. The following paragraphs summarize current ASCE initiatives that address climate change and provide our feedback on related U.S. Congressional actions as requested.

ASCE Manual on Climate-Resilient Infrastructure

Responding to this urgent and global need to address climate change, ASCE released in 2018 the Manual of Practice 140, *Climate-Resilient Infrastructure: Adaptive Design and Risk Management*, which provides guidance for and contributes to infrastructure analysis/design in a world in which risk profiles are changing due to climate change per the Fourth National Climate Assessment[2]. The approaches in the manual address both new and existing infrastructure. For new infrastructure, they are focused on identifying and analyzing low-regret, adaptive strategies to make a civil engineering project more resilient and adaptable to the climate. The manual also covers technologies for making existing infrastructure climate-resilient by including illustrative engineering techniques and best practices.

Additional research and development towards changing engineering practices and standards are necessary. Allocating appropriate levels of attention and resources will help to expeditiously meet

[2] NCA4; issued in 2018 by the U.S. Global Change Research Program, https://www.globalchange.gov/nca4

these needs.

ASCE's Sustainable Infrastructure Standard

ASCE is currently in the process of developing a performance-based sustainability standard meeting American National Standards Institute (ANSI) criteria with an anticipated publication in the Fall of 2020. The standard includes chapters on:

- Utilizing Lifecycle Cost Analysis (LCCA);
- Preserving natural resources, reducing construction impacts, and abating pollution;
- Resource allocation outcomes focused on optimizing energy, water, and raw materials inputs while supporting recycling, reuse, and renewables;
- Fostering effective leadership, commitment to sustainability, and accountability;
- Quality of life outcomes such as well-being, community needs, safety, noise, wayfinding, historic and cultural resources, and public space; and
- Ensuring climate-friendly and resilience outcomes, including minimized net embodied energy and greenhouse gas emissions.

Building Resilience Into Infrastructure

Resilience is critically important to the overall health of our nation's infrastructure network and is one of the eight key criteria used for assessment in our Infrastructure Report Card. ASCE's *2017 Infrastructure Report Card* also emphasizes the importance of preparing for the future by utilizing new approaches, materials, and technologies to ensure our infrastructure is more resilient and sustainable. This goal can be achieved by:

- Developing active community resilience programs for severe weather and seismic events to establish communications systems and recovery plans to reduce impacts on the local economy, quality of life, and environment;
- Considering emerging technologies and shifting social and economic trends – such as autonomous vehicles, distributed power generation and storage, and larger ships – when building new infrastructure, to assure long term utility;
- Improving land use planning at the local level to consider the function of existing and new infrastructure, the balance between the built and natural environments, and population trends in communities of all sizes, now and into the future; and
- Supporting research and development into innovative new materials, technologies, and processes to modernize and extend the life of infrastructure, expedite repairs or

replacement, and promote cost savings.

Building infrastructure that is designed to meet future needs and withstand future hazards often comes with a higher initial price. However, it is a worthwhile investment that pays for itself down the road. In January 2019, the National Institute of Building Sciences (NIBS) issued the *Natural Hazard Mitigation Saves: 2018 Interim Report*[3]. The 2018 Interim Report highlights the significant savings that result from implementing mitigation strategies found in up-to-date building codes, in terms of safety, and the prevention of property loss and disruption of day-to-day life. The NIBS project team looked at the results of 23 years of federally funded mitigation grants provided by the Federal Emergency Management Agency (FEMA), the U.S. Economic Development Administration (EDA) and the U.S. Department of Housing and Urban Development (HUD) and found mitigation funding can save the nation $6 in future disaster costs for every $1 spent on hazard mitigation.

By becoming a more resilient nation, we can ensure our infrastructure is built for the future and our nation's limited federal resources are spent wisely, with mitigation and preparedness in mind.

Lifecycle Cost Analysis

ASCE supports the appropriate use of Lifecycle Cost Analysis (LCCA) principles in the planning and design processes to evaluate the total cost of projects. ASCE believes that Congress should require all projects greater than $5 million that receive federal funding use LCCA to reduce lifecycle costs and develop a plan to comply with said budget for the entire project lifecycle. The LCCA should include all planning, funding, design, construction, operation, maintenance, and decommissioning costs, including those associated with innovation, resiliency and sustainability as well as regulatory, environmental, safety, and other costs, whether borne by the project owner or other stakeholders. Overall lifecycle costs are one of the most significant considerations in evaluating project alternatives during the planning and design of infrastructure to optimize the ensuing solution.

ASCE has embarked on an initiative to ask engineers from all backgrounds and at every career stage to implement performance-based standards, resilience, innovation and LCCA in all projects. The goal is to significantly enhance the performance/value of infrastructure projects and to foster the optimization of infrastructure investments for society. A renewed focus on LCCA allows engineers and planners to assess not just the upfront cost of a project, but also the operation and maintenance costs, and the cost of retiring an asset. In many cases, evaluating the total cost of ownership of a project leads to different design decisions among competing alternatives, enabling greater resilience.

[3] https://cdn.ymaws.com/www.nibs.org/resource/resmgr/mmc/NIBS_MSv2-2018_Interim-Repor.pdf

Greater Adoption of Industry Codes and Standards

ASCE supports the development, adoption, and enforcement of a national model code as a key method of minimizing climate impact and creating disaster resilience in communities to protect and improve public health, safety, and economic vitality. The following ASCE documents offer a sound basis upon which such a model code can be developed:

- ASCE 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE/SEI 7-16), currently an integral part of U.S. building codes, describes the means for determining soil, flood, tsunami, snow, rain, atmospheric ice, earthquake, and wind loads, and their combinations for resilient structural design;

- ASCE 24, *Flood Resistant Design and Construction*, prescribes a standard for cost effectively increasing resiliency by reducing and eliminating risks to property from flood hazards and their effects;

- ASCE 41, *Seismic Evaluation and Retrofit of Existing Buildings*, standardizes methods for the retrofit of existing buildings to increase resiliency in communities after a seismic event; and

- ASCE Manual of Practice 140, *Climate-Resilient Infrastructure: Adaptive Design and Risk Management*, provides guidance for and contributes to infrastructure analysis/design in a world in which risk profiles are changing due to climate change per the Fourth National Climate Assessment.

Appropriators should provide robust funding to those federal agencies whose missions includes the following activities:

- Preparing and implementing a national model code addressing climate change; and

- Promoting national incentive programs encouraging state and local agencies to adopt said national model code.

In the wake of Hurricane Harvey, the City of Houston voted to require all new construction in the city's floodplains be built two feet above the 500-year floodplain. Florida, meanwhile, has made a series of updates to their building codes over the past twenty years, including the mandated use of stronger nails, relocation of vents, and more thorough inspection processes. These are strong examples of how codes can be modernized and ASCE standards can be incorporated to strengthen a city or state's resilience.

Responsible design/construction are essential to improve the quality of life, assure safety and durability, and reduce vulnerability of the nation's infrastructure. The purpose of a model code is to expand upon minimum requirements necessary to protect/improve public health, safety and welfare in the face of changing climate conditions.

Research and Development on Climate Resilience

Increased funding for infrastructure improvements are necessary but must also be matched with a robust research and development program (R&D) that can lead to new approaches, materials, and technologies to ensure our infrastructure is more resilient – to more quickly recover from significant weather and other hazard events – and sustainable, or improving the "triple bottom line," with clear economic, social, and environmental benefits.

ASCE supports basic and applied R&D programs, coupled with demonstration and commercialization programs, structured to meet needs for:

- Revitalizing the nation's public works infrastructure to protect citizens by improving function and reducing life-cycle costs;
- Enhancing environmental quality and fostering sustainable development;
- Increasing the application of identifying, proving, and fielding emerging technologies, materials and processes to improve security, durability, disaster resilience, sustainability, and performance of engineered systems;
- Advancing the business performance of the practice of civil engineering and the industries supported by civil engineering services through Quality Based Selection (QBS) to improve the nation's competitiveness; and
- Enhancing the security, safety and resilience of critical infrastructure to protect the safety and economic vitality of the nation against natural and man-made hazards.

Enhancing Grid Resilience

Earlier this year, ASCE responded to the U.S. Department of Energy's request for information entitled *Codes, Standards, Specifications, and Other Guidance for Enhancing the Resilience of Electric Infrastructure Systems Against Severe Weather Events.* As noted earlier, ASCE 7 is a highly recognized standard used in building codes and is adopted by many infrastructure owners to define loads and requirements for infrastructure, including power generation/grid systems. As mentioned previously, ASCE is also the de facto author of numerous Standards (Std) and Manuals of Practice (MoP) to establish minimum reliability, loading, and strength of structures used in substations and transmission/distribution/communications systems covering all aspects of climate and weather-based hazards.

Legislative Solutions

ASCE supports legislative solutions to our infrastructure crisis, including initiatives that promote more resilience. By becoming a more resilient nation, we can ensure our infrastructure is built for the future and that our nation's limited federal resources are spent wisely, with mitigation and preparedness in mind. Therefore, we urge Congress to support and include resiliency goals in all

infrastructure related legislation to ensure we are preparing for the future and limiting our long-term costs. We ask that Congress make these investments as a way to minimize future economic, environmental, and social risk.

Federal Flood Risk Management Standard

ASCE supports the Federal Flood Risk Management Standard (FFRMS), which considers and mitigates flood disaster risks for federally funded development in flood prone areas. Considering that the nation has experienced $750 billion in losses from flood-related damages between 2000 to 2017, and with more than half of the nation's population living within 50 miles of a coast, the risk-management approach taken by the FFRMS is critical. Unfortunately, President Trump rescinded the FFRMS in an August 2017 Executive Order. ASCE supports the federal mitigation of risk and especially pre-disaster mitigation.

ASCE believes that the FFRMS takes a fiscally responsible, common sense approach of mitigating flood disaster risks and should be a part of any sustainable agency and organizational planning. Implementation of this kind of standard is simply good resource management. We urge Congress to develop a federal flood risk standard to safeguard our nation's infrastructure, protect businesses and communities, and conserve taxpayer resources.

Resilience Revolving Loan Fund Act, H.R. 3779

Across all levels of government, the current paradigm for disaster spending is to catalyze funds only after a disaster has occurred. As such, disaster spending is characterized by response and recovery instead of mitigation, preparedness, and resilience. Catastrophes around the U.S. are costing regions up to 8% of their economy, with some states such as Florida sustaining over $150 billion in losses since 2005.

The ongoing impacts from disasters will multiply the existing infrastructure investment gap and economic risks we face as reported in ASCE's *Failure to Act* series. These threats signal a breakpoint – investments must be made in resilient infrastructure. However, as noted earlier, spending on resilience and mitigation projects prior to disasters pay back taxpayers more than $6 for every $1 that is invested.

While grant funding opportunities for mitigation activities exist, the need for more funds is growing to a crescendo that demands a mechanism for providing cities and states a way to prevent the loss of life and property, which is why ASCE supports H.R. 3779, the Resilient Revolving Loan Fund Act. This bipartisan legislation authorizes a funding mechanism that would provide states with revolving, low-interest loans for projects that minimize the risk of disasters and decrease loss of life and property, costs of insurance claims, and federal payments in the wake of emergencies. Loans would be available to eligible cities, townships, and counties with the intent to protect against:

- Wildfires
- Earthquakes

- Flooding
- Storm Surges
- Chemical Spills
- Seepage resulting from chemical spills and flooding
- Any other event deemed catastrophic by FEMA

Disaster Recovery Reform Act

In 2018, Congress enacted the Disaster Recovery Reform Act, legislation that places 6 percent of annual disaster spending into a new national Pre-Disaster Mitigation account. The account allows states and communities to apply for funding for proactive mitigation activities that produce a measurable reduction of risk. Notably, the 6 percent becomes additional funding on top of what is spent each year from the Disaster Relief Fund account. FEMA is using this funding to create a new program, the Building Resilient Infrastructure and Communities (BRIC). ASCE urges Congress to continue its oversight of FEMA to ensure that BRIC adheres to its stated goals of utilizes the latest building codes when awarding grants.

Conclusion

ASCE hopes this response to the Committee's RFI is informative and illustrates our members' commitment to develop resilient solutions to the climate challenges facing our nation's critical infrastructure. One of the best tactics we have to address climate change is to use the best available information and industry standards to strengthen our infrastructure systems and to plan for the future. We stand ready to support robust actions by Congress to reduce further impacts on climate and to implement cost-effective, prudent resilience measures that will enable future generations to thrive (as opposed to survive). The U.S. needs to maintain a leadership role so that other nations have a solid basis upon which to follow. Thank you for taking our recommendations into consideration, and we look forward to working with you.