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Weathering the Storm:
Evolving Legal Standards Resulting from Climate Change

I. EFFECTS OF CLIMATE CHANGE

While the *cause* of climate change is an oft-debated topic, the *fact* of it is largely undeniable. For example, reputable studies conclude that:

- By the 21st century, the earth's global surface temperature likely to rise from .3 to 1.7 °C (.5 to 3.1 °F) to 2.6 to 4.8 °C (4.7 to 8.6 °F), as result of greenhouse gas emissions and related causes;
- Sea levels are expected to rise of 7.5' predicted per 1° C of warming;
- By 2100, 182 out of 365 days will constitute "high tide flood events";
- Increases in severe storms, wind speeds, rainfall, etc. will be "routine."

Thus, the standards of care and legal requirements applicable to design professionals, contractors, and others involved in the construction industry resulting from climate change and other naturally induced events will need to be taken into consideration as part of the overall construction process.

II. EFFECT ON STANDARD OF CARE

A. Reasonably Prudent Conduct

In most states, general legal standards governing the conduct of professionals mandate that they are obligated to use the watchfulness, attention, caution and prudence that a reasonable person in the circumstances (i.e., practicing in the same discipline/locality) would exercise. (*See,* Restatement - Torts §282.)

B. Novel considerations for designers:

Although axiomatic that a failure to meet the professional standard of care is negligence and any damages resulting therefrom may be claimed in a lawsuit by the injured party, the reality is that the standard of care is not static. Accordingly, it is expected that construction professionals will be expected to improve their designs as greater experiences are accumulated involving such climatically influenced events as: Excessive rains/flooding; Rise in sea level; High winds; and Extreme heat/cold/more snow/larger hail. In addition, new technologies can influence the situation and require additional design considerations (think fracking-induced earthquakes), and events such as Sandy, Katrina, Fukushima have also taught us that the “foreseeability” of catastrophic events constitutes an ever expanding universe.

III. MITIGATION MEASURES TO CONSIDER

A. Updated assessment of actually present conditions

The jumping off point in terms of considering design and construction modifications relating to natural/weather events involves a review of such incidents which may be endemic to the area in question, both historically and recently. Accordingly, it would be sound advice for a design professional to review, at a minimum, the following types of information when planning a new project:

1. -Are flood maps current (FEMA outdated)
2. -Are seasonal rainfall and tidal events likely to change
3. -Do anticipated wind speeds need to be recalculated (up to >140mph)
4. -Is a 1000 year storm now 100, 100 now 10, etc.
5. -Any possible design changes (structural/specs (windows)/MEP:
6. -Is elevation of structure to be increased/flexible connections added,
7. -Are any water related accommodations necessary
    a. Are rain gardens to capture water and release slowly needed
8. -Should there be differential location of key components
    a. servers, equipment, generators, pumps, etc. on higher floors
9. -Disease/Pandemic Accommodations/Considerations
10. -Any new seismic information (including caused by human agency)

IV. LOCATION DEPENDENCY

Of course, the standard of care for construction projects is extremely site dependent as demonstrated by the following:

-Hurricanes: Miami, New Orleans, Houston, Cape Hatteras, etc.

-Earthquakes: San Francisco, Los Angeles, Anchorage, and fracking zones

-Other: wind speeds, snow loads, extreme heat/cold, corrosion

-Soil conditions: compressible peat, expansive clays, sands, etc.

Accordingly, the particular types of weather and other natural conditions to which the site/project may be exposed require careful and critical consideration. Further, the nature of the structure(s) in question need(s) to be carefully considered. For example, the standard of care for a lumber warehouse will differ dramatically from that of an essential facility (hospital, power generation, government service building, utilities plant) where the continuity element is critical. Finally, each territorial jurisdiction can have its own codes (city, county, state, federal contracting, etc.) and the professional will need to have significant facility with same.

It is worth noting, however, that simply complying with a code is typically not a complete defense to a negligence count. Rather the codes typically embody the minimum standards and particular circumstances may require more.

V. RESILIENT DESIGN

Finally, a new movement that has emerged from the impacts of climate change in the field of construction involves resilient design. As noted above, hurricanes, floods, tornadoes, wildfires—natural disasters impacting the world's natural and built environment with devastating effect are occurring more frequently and with greater impact. These occurrences can cause significant damage to building envelope and structures, roads, bridges, harbors, power and communication systems, and other critical elements of the built environment. Extensive economic loss and disruption of essential services and basic living conditions follow.

In terms of evaluating the duties of engineers, architects, environmental consultants, and other design professionals in their roles as protectors of the health, safety, and welfare of the general public, resilient design is one way to minimize the damage these events cause and aid in subsequent recovery. It is therefore important for design professionals to be familiar with the principles and strategies of resiliency in design as an evolving subject that has the potential to expand the standard of care.

A. Discussion of Concept

Resilience is defined as "the capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance" (Resilient Design Institute). In applying resilience to the built environment, the International Code Council describes four primary components of resilience in their 2018 publication Building Community Resilience through Modern Model Building Codes:

1. Efficient disaster mitigation and recovery
2. Ensuring mental and physical health and well-being
3. Improving building life cycles, and
4. Creating a sustainable community

Resilient design strategies straddle sustainability and energy efficiency and are applied at all levels of development: buildings, infrastructure, and communities. At the building level, the focus starts with creating a building that has the ability to withstand extreme weather and remain habitable in the event of power loss and storms, including the consideration of self-sufficient strategies such as renewable energy, compostable toilets, and rainwater harvesting. For the community, the focus begins with managing stormwater, protecting aquifers, implementing wildfire mitigation measures such as defensible spaces, and reducing the urban heat island (UHI) effect. These issues are just the start for a robust conversation on what and how to consider anticipated impacts of changes in our environment.

There are a number of non-binding standards that describe new guidelines for resilient design and considerations. The U. S. Green Building Council has launched the RELi 2.0 Rating System, in a format similar to LEED, for socially and environmentally resilient design and construction criteria for neighborhoods, buildings, and infrastructure. The American Society of Civil Engineers' Adapting Infrastructure and Civil Engineering Practice to a Changing Climate is a comprehensive document which examines climate science, risk assessment, and principles for incorporation in buildings as well as infrastructure. In Canada, the non-profit Engineers Canada has published a similar document, called Principles of Climate Change Adaptation for Engineers. These and other resources are listed at the end of this article. They are excellent guides to issues and impacts to consider when designing for resiliency. However, be aware of the legal ramifications that may result when referring to them. That is, how is knowledge of these issues going to affect the current standard of care.

B. Standard of Care Issues

In terms of using resilient design to address the standard of care issues discussed above, the adoption of a comprehensive building code with amendments that define factors of extreme weather events will provide a solid foundation for a community to better address these evolving climatic conditions. In fact, according the National Institute of Building Sciences, designing new buildings in excess of select requirements of the 2015 model building code provisions can save $4 for every $1 spent. While federal and state agencies have varied in increasing or even just maintaining their regulations, many cities and counties have stepped up their efforts at the local level.

However, as noted above, mere compliance with local codes does not preclude liability to the design professional if comparable buildings are being designed and built to a higher standard. This is how the standard of care can get stretched for a learned profession that is expected to have a high degree of technical knowledge.

Design professionals, particularly engineers and environmental scientists, must strike a delicate balance when addressing resiliency factors on their projects, giving consideration to their clients' specific needs, local community expectations, and industry aspirations. It is at this intersection where potential liability concerns are envisioned. Here are several recommendations for managing the risk that accompanies resilient design.

First, anticipate code and practice standards updates and upgrades due to climate change. For example, if the current code basis for storm-water management is to design to for a 100- year flood, promote design for a 500-year flood. Milestone floods are happening more often, In fact, Hurricane Harvey's flooding effect in Houston was the city's third "500-year" flood in the three years. Since you are recommending design beyond code minimums, balance the level of enhanced design with the function and exposure of the project. For example, an office building may not need to be as vigorously resilient as a hospital, water treatment plant, or other critical care facility or infrastructure component. A major highway along a coastal waterway will likely have more stringent criteria than an inland arterial road. Consideration of applicable climatology models, reports, and robust studies demonstrates a recognition of the importance of enhanced information to guide project criteria in site design.

Next, design structure, enclosure, energy services, and storm-water management components with additional safety factors not yet memorialized in building codes that address the likelihood of increasing wind and rain due to more intense storms. These components may include sea walls, retaining walls, bridge and power line supports and abutments, building foundations and structure, envelope and enclosure (roofing and roof structures, walls, and windows), flood plain areas, retention and detention ponds, spillways, and piping.

Further, a design professional should discuss with its client why it is recommending these increased factors of safety for resilient design. If they direct otherwise, such as to design only to minimum (current) code requirements, document such owner's directives in letter form to them and store this correspondence in your project files. This issue will be of greater concern when working with private developers who may not have a long term view of the project lifespan. For example, a developer planning out a residential subdivision design may not want to pay for enhanced storm water retention. Compare their motivation to governmental agencies, such as the Army Corps of Engineers, which designs and constructs coastal protection systems with enhanced standards to address increasing impacts of climate change. We expect that more local and state agencies will adopt a similar perspective of the value of additional investment in resiliency— some already have (e.g., Florida after Hurricane Andrew in 1992).

By appreciating the dramatic effects of climate-related changes and adapting their approaches and processes accordingly, designers and other construction professionals can create better and longer-lasting projects and also help avoid liability in the future.