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# Forensic Engineering: Risks of Performance-Based Engineering for Sustainability or Resilience

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## Abstract

Professional engineers in the US may be found negligent and therefore liable for damages arising from failure to exercise a level of care, diligence, and skill exercised by other reputable practitioners in similar circumstances. If the professional engineer has accepted the obligation to design for sustainability or resilience, where those terms or performance levels are ill-defined or open to interpretation depending on assumptions or outcomes, the professional engineer may be accepting an extreme or uninsurable risk.

This paper describes the standard of care, which is the measure of a practitioner's performance as it relates to professional negligence. It examines the relationship between the standard of care and design for sustainability or resilience. The paper addresses 1) a discussion of the sources of the practitioner's responsibility to design for sustainability or resilience, 2) an explanation of the concept of the standard of care, and 3) the professional liability pitfalls inherent in that design effort. The subject may be unique to professional practice in societies where litigation is used to allocate responsibility for damages, but it may also be universally relevant for practitioners wishing to understand professional responsibilities for such designs.

**Keywords:** Professional negligence; standard of care; sustainability, resilience.

## 1. Introduction

Sustainability and resilience of the built environment are currently seen as desirable design goals [1]. Achieving sustainability may reduce the deleterious effects on the social, economic, and natural environment of building, using, maintaining, repairing, and decommissioning features of the built environment. Imparting resilience in features of the built environment may allow those features to be easily returned to service after being exposed to infrequent, extreme, or unanticipated demands.

An engineer who designs a feature or facility with the intent of satisfying a design goal of sustainability or resilience may be thought of as failing to do so if the feature or facility is perceived to have not achieved those intended goals. In societies where an engineer can be held personally responsible for damages caused by the engineer's negligent errors, such a failure may result in significant liability on the part of the engineer.

It is important for an engineer to understand the responsibility to design for sustainability or resilience. It is also important the engineer appreciates the risks to the engineer's own liability exposure, and to the engineer's reputation and livelihood, arising from that responsibility. Where the definitions of sustainability or resilience are not acknowledged and accepted by all stakeholders, or where the goals of sustainability and resilience are in conflict with each other, or where the

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