



Construction Industry Institute®

Sustainable Design and Construction in Industrial Construction

Construction Industry Institute

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Sustainable Design and Construction in Industrial Construction

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Sustainable Design and Construction in Industrial Construction
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Executive Summary

The increasing importance of sustainability is making it imperative for organizations in the industrial sector to include environmental and social considerations in the construction of capital projects. These considerations include increases in societal awareness, carbon footprints, and potential cost increases; productivity savings in construction and in operations and maintenance; increasing governmental regulations and incentives; corporate reputation; and business advantage in a competitive market. Uncertainty in the economic return of embracing sustainability will require new methods of quantifying the added value of sustainability implementation. These factors will require those in the industrial sector to increase their efforts towards sustainability on both a corporate and project level.

Some are currently addressing these issues through corporate sustainability programs, the use of a variety of existing tools and metrics, and project-level sustainable design and construction methods. Regarding a comprehensive sustainability metric for industrial construction, none currently exist for industrial construction; thus, more research is necessary to fully address this challenging topic.

This research summary includes a review of the research by the CII Sustainable Design and Construction in Industrial Construction Research Team (RT 250), including definitions of sustainability, governmental and corporate trends, corporate-level efforts, benefits and barriers, and recommended paths forward for the industry regarding sustainability.

RT 250 produced three other publications in addition to this research summary. Readers are encouraged to obtain *Sustainable Design and Construction for Industrial Construction: A Primer* (IR 250-2). Implementation tools developed by the team, including a checklist, a quick start guide, a maturity model, and a proposed metric can be found in IR 250-3. The team's research report (RR 250-11) is an in-depth reference on the research performed.

Introduction

Background

The CII Breakthrough Strategy Committee issued a 2006 white paper identifying “design for sustainability” as an area where CII could have a larger impact on industrial construction areas. A great deal of literature on sustainability in the buildings sector has been written. Although many of these principles and ideas can be applied to industrial capital assets, more needs to be done to define and then implement design and construction strategies in the industrial sector, which would enable firms to fulfill and demonstrate their contributions to sustainability beyond the products and services they provide the world. CII formed the CII Sustainable Design and Construction in Industrial Construction Research Team to:

- investigate trends in sustainability to determine their effects on the capital projects of industrial companies.
- explore existing and potential approaches to addressing these trends through the design and construction of these projects.
- inform the industry on this topic and provide resources to assist decision-making.

Research Objectives

The research by RT 250 had the following specific objectives:

- Define sustainability as it applies to design and construction in the industrial construction sector.
- Identify current and potential sustainable practices in industrial construction.
- Determine benefits and barriers to sustainable practices on industrial construction projects.

- Provide a framework to advance the understanding and implementation of sustainability practices.
- Suggest a metric for the industrial construction industry to use for assessing sustainability practices and to assist in making decisions on the basis of objective, quantifiable data.
- Write a primer on sustainability applicable to the design and construction of capital investment projects in the industrial sector.

Method/Approach

The primary focus of this research is on the following industrial construction sectors: manufacturing, mining and metals, petrochemical, pharmaceutical, power, pulp and paper, and utilities.

The research team first sought to address high-level and international trends in sustainability through a comprehensive literature review, in order to inform the industrial capital project decision-makers of global trends that will likely affect the way they design and construct their projects. The literature search was then narrowed in focus to address corporate-level approaches to sustainability by companies in the industrial sector. Questionnaires were sent to industry partners to gather information on current corporate- and project-level trends in addressing sustainability. The research team developed several suggested tools and metrics based on the research.

Assumptions/Constraints

Numerous research projects and metrics address sustainable design and construction in building projects (residential, commercial, institutional). The U.S. Green Building Council developed the Leadership in Energy and Environment Design (LEED®) rating system, the primary standard for certifying building construction projects. However, neither LEED nor the majority of research on the topic of sustainable design and construction addresses the unique challenges of industrial construction. This research assumes that LEED would likely be used as a part of an overall program

if sustainability is desired on an industrial project with more typical administrative facilities, such as an office building.

A true sustainable approach to a capital project would require “cradle-to-cradle” thinking throughout the project life cycle from front end planning to ultimate end of facility life, including the operational processes of the plant (e.g., planning, process and facility design, procurement, construction, operations and maintenance, and deconstruction). The concept of cradle-to-cradle is used to imply the next use or next generation of resources after building deconstruction, as contrasted with the finite use of resources implied by the more conventional notion of cradle-to-grave.

As all firms become more adept at incorporating sustainability approaches into their work, the process of applying principles from project conceptualization and financing through end-of-life consequences will be more effective. Efforts by CII’s membership of owners, suppliers, and contractors to work together to apply each firm’s expertise in a sustainable way is likely to result in greater incorporation of sustainability in the marketplace.

Definition: What Is Sustainability?

The term *sustainable development* was first used in 1987 in "Our Common Future," a report by the World Commission on Environment and Development, also known as the Brundtland Commission. In that document, sustainable development was defined as "development that meets the needs of the present, without compromising the ability of future generations to meet their own needs."

The CII Breakthrough Strategy Committee white paper "Design for Sustainability" cited the Brundtland Commission's recommendation for a new approach to design and production, setting out terms for "a production system that respects the ecological base" and "a technological system that searches continuously for new solutions." Many others have expanded these simple depictions of the concept to include ecological health, social justice and expanded economic opportunity for all, participation in decision-making by those affected, improved productivity of resources, and economic growth without net harm to people or the environment.

In discussions of sustainability at the corporate level, an increasingly accepted concept is the "triple bottom line," a phrase coined by John Elkington of SustainAbility. He described the need to include environmental and social performance as well as financial performance, adding accountability to stakeholders in addition to shareholders in recognition that firms have obligations beyond those of a fiduciary nature. Businesses now use this term in examining their sustainability activities. The point is that all definitions require the simultaneous thinking of the three interrelated aspects—economic, environment and social—for sustainable results (see Figure 1, which is provided courtesy of the International Petroleum Industry Environmental Conservation Association).