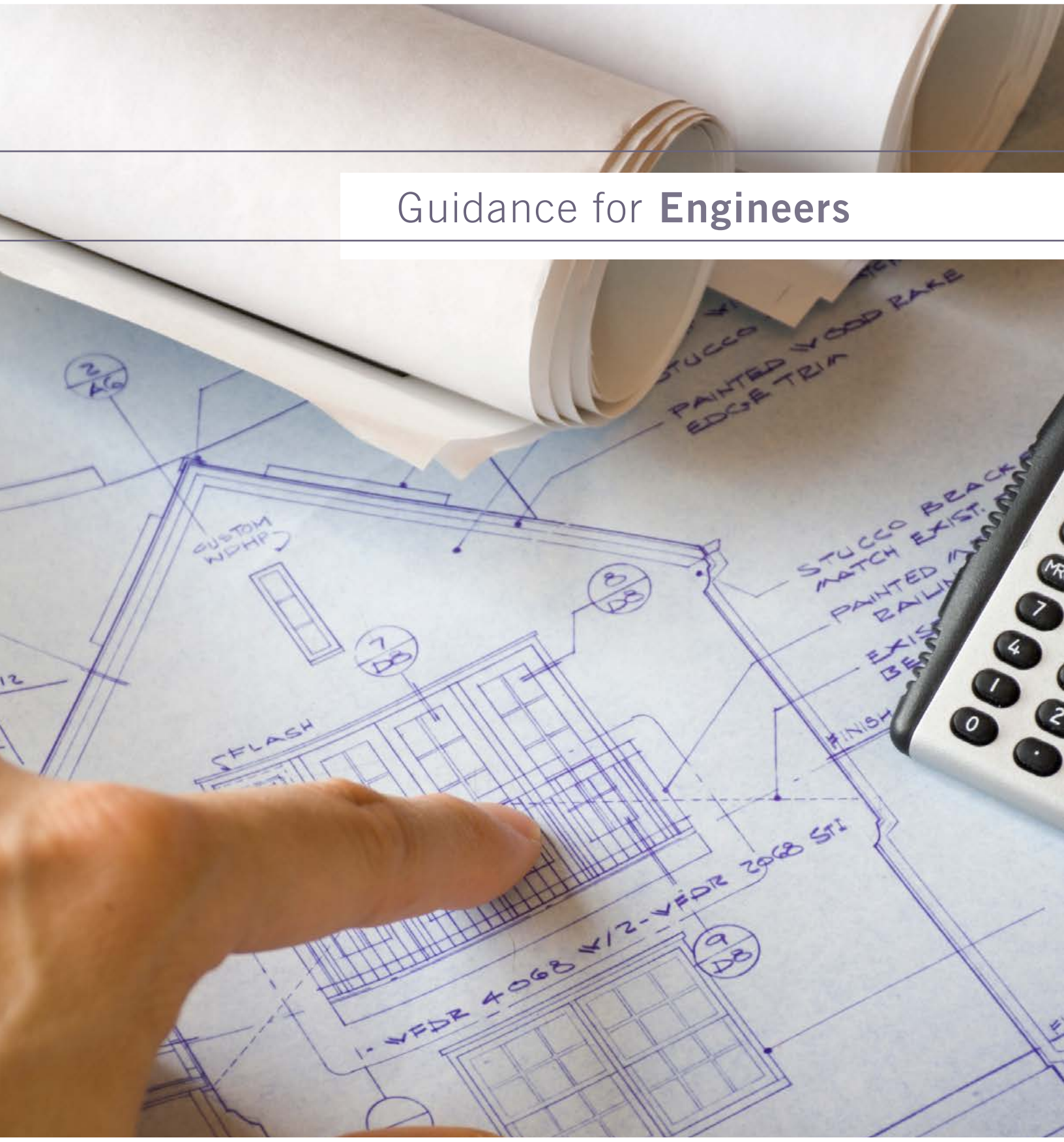
Guidance for **Engineers**



This is a section of the document "CEC. 2015. *Improving Green Building Construction in North America: Guide to Integrated Design and Delivery.* Montreal, Canada: Commission for Environmental Cooperation. 84 pp." The full document is available at: http://www3.cec.org/islandora/en/item/11661-improving-green-building-construction-in-north-america-guide-integrated-design.

Role to Play in an Integrated Approach

Building engineers design the systems and are responsible for the technical aspects of a project. In an integrated project, these experts translate the expressed values of the project, such as sustainability, into systems that will achieve those aspirations. Engineers have to ensure that the components of a high-performance building integrate together well.

Key Responsibilities:

- **Integrate systems**
- **Translate values into high-performing systems**

Opportunities

Most engineers understand that deep collaboration with architectural designers is essential if the building's form is to fulfill its function. Integrated design and delivery allows engineers to work concurrently with the architects as strategies emerge. This is especially important for sustainability strategies, which often depend on efficient mechanical systems integrated into complementary envelope and structural designs.

Key Points:

- **Be on a level playing field with architectural designers.**
- **Work with the architects and contractors to achieve form meeting function.**
- **Collaboratively explore design options that can achieve high-performance green goals in cost-effective ways.**
- **Receive constructability input from the contractor and trades.**
- **Save the project money by passing schematics to the contractors and letting them work out the details in the shop drawings.**

Overcoming the Learning Curve: Co-learning and Joint Decisions

Integrated design and delivery has a steep learning curve, but from existing case studies it is clear that once a team successfully completes one integrated project, that team will become successively much more efficient on others (case study: Lion's Gate Wastewater Treatment Plant, p. 59). It is the engineer's role to foster a culture of collaboration and to be persistent in engaging all participants. For the team members, adjusting from being "the expert" to being a "co-learner" will only be possible in an environment of collaboration, where suggestions and openness are encouraged.

Key Points:

- **Teams that have done one or more truly integrated project(s) are likely to be successively more efficient on others.**
- **Learning how to make joint decisions is a skill.**
- **Fostering a spirit of collaboration requires active effort.**

> **“The engineer is responsible for roughly half of the sustainability features of the building. If there is a disjointed process between the architectural drawings and the engineering, then sustainability becomes much more of an add-on feature.”**
>
> – Peter Rumsey, Point Energy Innovations

Taking the Role of Educator

As seen in steps 1 and 2 of this Guide, integrated projects are structured to deliver on the values and goals that the project team establishes. If sustainability objectives are not discussed, the engineer might have to educate the team about those benefits. Associating green features with operational costs reduction and reduced time to market may help make sustainability part of the conversation. The authors of *The Integrative Design Guide to Green Building* (7group and Bill Reed 2009) suggest that discussing “nested systems” during step 2 of the Guide helps bring sustainability objectives to the surface. Examining how a project affects the primary systems within the whole of the environment—defined as habitat, water, energy, and materials—reveals the relationships between smaller and larger systems.

Key Points:

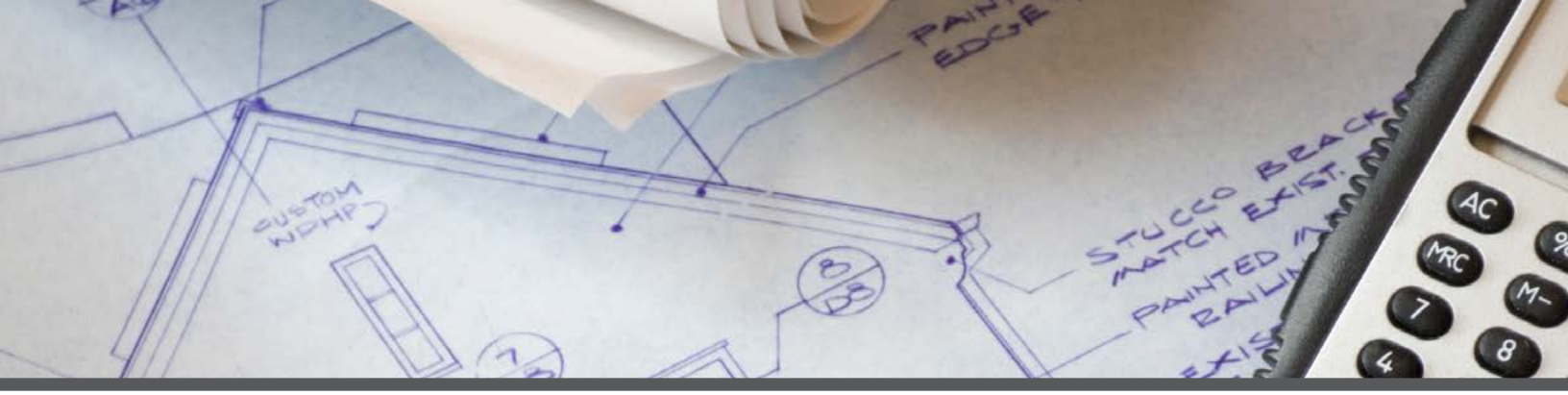
- **Integrated projects will only deliver on the values and goals that are expressed.**
- **If sustainability goals are not already a focus, you as the engineer might have to serve in the role of educator to bring those goals to the surface.**

Utilizing BIM

Over 67 percent of engineers used Building Information Modeling tools in 2012, according to a McGraw-Hill Construction report (Smart Market Report 2012), though adoption has lagged behind the rate of architects and contractors. This may be partly because data for technical systems is more rare and manufacturers are just beginning to provide information that is searchable and able to be indexed. Nevertheless, engineers who use BIM rate it as highly valuable (Smart Market Report 2012) and architects are beginning to demand those skills as part of team selection. Sharing BIM models brings the highest rewards by allowing for the seamless integration of systems and ensuring that systems get installed as intended. With the development of cloud-based open BIM, multiple users can access a BIM model and changes made will appear for the other users in real time.

Key Points:

- **Sharing a model with architects allows for seamless integration of systems.**
- **If developed appropriately, BIM can reduce the effort needed to simulate building performance, therefore allowing the team to iterate more rapidly through design options to achieve the most cost-effective and greenest solutions.**
- **Clash-detection features help ensure that systems get installed as designed.**



Commission for Environmental Cooperation
393, rue St-Jacques Ouest, bureau 200
Montreal (Quebec)
H2Y 1N9 Canada
t 514.350.4300 f 514.350.4314
info@cec.org / www.cec.org