

Mechanical energy systems for buildings

Common Mechanical Systems

The impact that mechanical systems and equipment have directly on building performance and energy consumption varies based on the details of the building. Function, size, orientation, material selection and building location all play a role in performance. The heating and cooling equipment is a significant source of energy consumption, specifically if a building is air-conditioned. Buildings located in cooler environments, such as the Canadian climate, will use the bulk of their energy for heating during the winter and autumn seasons. Design teams must collaborate early in the project to provide highly efficient design solutions that combine high-performance mechanical equipment and sophisticated electrical and envelope systems to meet various efficiency goals.

Historically, engineers have utilized traditional-style mechanical equipment that relies heavily on higher levels of natural gas. With higher energy standards, the requirement to meet various energy targets and a push to reduce greenhouse gas emissions, the need to incorporate more electrically driven equipment has increased. One option to increase a mechanical system's efficiency and level of sustainability is utilizing air-source heat pumps. These systems use the ambient air outside as a source of energy to heat and cool buildings, with the major benefit being significant energy reductions and reduced greenhouse gas emissions, in comparison to traditional gas-fired furnaces and boiler equipment.

Many provinces are adopting new sustainability targets and policies to increase the energy efficiency of new construction projects. For example, several municipalities in British Columbia are adopting the BC Energy Step Code, incorporating a level of efficiency that goes well above the requirements of the standard BC Building Code. This Energy Step Code provides requirements for developers to design buildings that better align with the province's target of all new buildings being net-zero energy ready by 2032, effectively positioning British Columbia as a leader in climate responsibility and action.

As the need for sustainably designed infrastructure continues to grow, we must adapt the way we think about energy use and building efficiency. Although mechanical systems are a significant source of energy use, achieving high building performance does not rely on just one component of design or equipment. An integrated design approach is critical to ensuring the architectural, electrical, structural, and building envelope components also achieve or surpass energy targets. Williams Engineering collaborates internally with our multi-disciplinary experts to ensure our clients are provided with efficient and effective design solutions that allow them to proactively maintain and manage their assets.

We acknowledge that Williams Engineering Canada operates on the traditional and unceded territory of the Indigenous peoples who, since time immemorial, have lived on, been part of and stewarded this place now known as Canada. We recognize that this is still home to Indigenous peoples from across Turtle Island and we



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are grateful to have the opportunity to work and live on this land.

- 1. Introduction to MEP systems in high-rise buildings
- 2. Understanding the unique challenges of designing MEP systems for high-rise buildings
- 3. Importance of collaboration between architects, engineers, and contractors
- 4. HVAC design considerations for high-rise buildings
- 5. Electrical system design and distribution challenges
- 6. Plumbing and fire protection systems in high-rise buildings

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