

# Kinetic Architecture: New Technologies in Building Skins

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Digital technology, controls, and sensors have radically altered our lives, bringing automation and connectivity to nearly every aspect of our daily existence. Increasingly, this technology is finding itself used in the design and construction of buildings, most notably in a variety of expressed elements as part of building enclosure systems. From experiments in dynamic building systems in the early part of the 20th Century to the latest transformable façade that opens and closes based on algorithmic controls tied to solar position and climate data, an era of dynamic, responsive architecture is quietly emerging throughout the world. This lecture seeks to define the terms that govern this field, one that must by its very nature combine an expanded team of architects, consultants, programmers, fabricators, and suppliers to act upon the skin of architecture. This new focus on building skin performance and kinetic components chiefly benefits us through improved energy efficiency, since a building that dynamically responds to its environment can reduce peak loads without impacting related issues like daylight availability and glare control or natural ventilation provisions during non-peak periods.

Drawing on nearly two years of research as part of the preparation for the 2014 book, *Kinetic Architecture: Design for Active Envelopes*, this lecture includes historical assessments of kinetic façade evolution and experimentation, the emergence of new technologies and design tools that are enabling this rapid development, and the review of recent international case studies of these façade systems. The lecture will relate the technical performance criteria of individual components, design concepts and drawings, performance benefits of the systems, and aesthetic opportunities. Ultimately, if we are to address climate change and resource scarcity, we must understand how to take advantage of emerging technologies to begin to layer dynamic performance into envelope solutions, meet national goals for net zero energy by 2030 for new buildings, and improve occupant satisfaction and health in all buildings.

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### *Objectives*

1. Define the term “dynamic facade” and identify some of the typical components in such a building-envelope system.
2. Discuss some of the challenges faced by project teams trying to implement buildings with dynamic facades.
3. Discuss important variables in building-envelope design, such as heat gain and glare, and explain how dynamic facades can help control such factors.
4. Explain how integration of a dynamic facade with a building’s systems for cooling, ventilation, and lighting can increase energy efficiency and enhance thermal comfort.

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