Unit 3.1 Commercial Building Systems

Content Area: **Science**
Course(s): **Civil Eng & Arc**
Time Period: **Semester 2**
Length: **3 weeks**
Status: **Published**

Standards

HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
ED	Engineering Design
	Engineering design is a complex process in which creativity, content knowledge, research, and analysis are used to address local and global problems. Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps that may involve redesigning for optimization.
8.2.12.ED.1	Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
8.2.12.ED.2	Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
8.2.12.ED.3	Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
8.2.12.ED.4	Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.
	Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints.
8.2.12.ED.5	Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
8.2.12.ED.6	Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
	Engineers use science, mathematics, and other disciplines to improve technology. Increased collaboration among engineers, scientists, and mathematicians can improve their work and designs. Technology, product, or system redesign can be more difficult than the original design.
8.2.12.NT.1	Explain how different groups can contribute to the overall design of a product.
8.2.12.NT.2	Redesign an existing product to improve form or function.
ETW	Effects of Technology on the Natural World

	Development and modification of any technological system needs to take into account how the operation of the system will affect natural resources and ecosystems. Impacts of technological systems on the environment need to be monitored and must inform decision-making. Many technologies have been designed to have a positive impact on the environment and to monitor environmental change over time.
8.2.12.ETW.1	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.

Enduring Understandings

- Commercial building systems differ from residential building systems in many significant ways.
- Codes and building regulations define and constrain all aspects of building design and construction including the structure, site design, utilities, and building usage.
- Zoning regulations are used to control land use and development.
- Wall, roof, floor, and framing systems for commercial facilities are chosen based on many factors.

Essential Questions

- How do Land Use and Development regulations help or hinder development in a community?
- Why are building codes important in the construction of buildings?
- How does commercial building design and construction differ from residential building design and construction?
- What factors influence the choice of commercial construction materials?
- How do sustainable design alternatives, such as a green roof, impact the environment and quality of life?

Knowledge and Skills

- Identify the pros and cons of the use of a green roof in a commercial building design.
- Identify applicable building codes and regulations that apply to a given development.
- Classify a building according to its use, occupancy, and construction type using the International Building Code.
- Research Land Use regulations to identify zoning designations and allowable uses of property.
- Comply with specifications, regulations, and codes during a design process.
- Compare a variety of commercial wall systems and select an appropriate system for a given commercial application based on materials, strength, aesthetics, durability, and cost.
- Compare a variety of commercial low-slope roof systems and select an appropriate system for a given commercial application based on materials, strength, durability, and cost.

- Identify the pros and cons of the use of a green roof in a commercial building design.
- Incorporate sustainable building practices, especially a green roof, into the design of a commercial building.
- Use 3D architectural design software to incorporate revisions for the redesign of a building.
- Use 3D architectural design software to create appropriate documentation to communicate a commercial building design.
- Calculate the structural efficiency of a structure.
- Use load-span tables to design structural elements.

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit

Resources

- 3.1.KT CommercialBuidlingSystems.doc
- 3.1.1.P KeystoneLibraryRenovation.doc
- 3.1.1.P.RU KeystoneLibraryRenovationRubric.doc
- 3.1.2.A LandUseAndDevelopment.doc
- 3.1.2.A LandUseDevelopmentRegulations.ppt
- 3.1.2.A.SRb NoblesvilleZoningMap.pdf
- 3.1.2.A.SRc KeystoneLibrarySiteLocationMap.pdf
- 3.1.2.A.SRd SelSecNoblesvilleCodeofOrdinance.docx
- 3.1.3.A CommercialWallSystems.doc
- 3.1.3.A CommercialWallSystems (Green).ppt
- 3.1.4.A CommercialRoofSystems.doc
- 3.1.4.A CommercialRoof Systems.ppt
- 3.1.5.P StructualEfficiency.doc
- 3.1.5.P.RU StructuralEfficiencyRubric.doc
- 3.1.5.P Commercial Framing Systems.ppt
- 3.1.6.A CommercialFloorSystems.doc
- 3.1.6.A CommercialFloorSystems.ppt
- 3.1.6.A Keystone2ndFloorFramingHollowCore.pdf
- 3.1.6.A Keystone2ndFloorFraimingHollowCore.dwfx
- 3.1.6.A.SRa CompositeFloorDeckLoadSpanTable.docx
- 3.1.6.A.SRa CompositeFloorDeckLoadSpanTable.pdf
- 3.1.6.A.SRb Keystibe2ndFloorFramingCompositeSlab.dwfx
- 3.1.6.A.SRb Keystone2ndFloorFramingCompositeSlab.pdf