

Unit 06: Low-Rise Commercial Buildings

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 3**
Length: **3 weeks**
Status: **Published**

Summary

Students will explore the dynamics of a strip shopping center with parking. Students will explore the factors that affect the placement of the structure, signage, universal design, etc. Students will design a strip center which will have a spot for a future interior design project.

Revision Date: July 2021

MA.A-SSE	Seeing Structure in Expressions
LA.RH.11-12	Reading History
MA.A-SSE.A	Interpret the structure of expressions
	Key Ideas and Details
MA.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
LA.RH.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of primary and secondary sources, connecting insights gained from specific details to develop an understanding of the text as a whole.
MA.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
LA.RH.11-12.2	Determine the theme, central ideas, information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary of how key events, ideas and/or author's perspective(s) develop over the course of the text.
LA.RH.11-12.3	Evaluate various perspectives for actions or events; determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.
LA.WHST.11-12	Writing History, Science and Technical Subjects
	Text Types and Purposes
LA.WHST.11-12.1	Write arguments focused on discipline-specific content.
SCI.HS-ETS1	Engineering Design
SCI.HS.ETS1.A	Delimiting Engineering Problems
	Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
SCI.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.
	Using Mathematics and Computational Thinking
SCI.HS.ETS1.B	Developing Possible Solutions
	Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running

simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.

CS.9-12.8.2.12.EC.1	Analyze controversial technological issues and determine the degree to which individuals, businesses, and governments have an ethical role in decisions that are made.
CS.9-12.8.2.12.EC.2	Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded.
CS.9-12.8.2.12.EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.
CS.9-12.8.2.12.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.
CS.9-12.8.2.12.ED.2	Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
CS.9-12.8.2.12.ED.3	Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
CS.9-12.8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
CS.9-12.EC	Ethics & Culture
CS.9-12.ED	Engineering Design
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step

in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

SCI.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.
SCI.HS-ETS1	Engineering Design
SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
SCI.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.
SCI.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.
WRK.9.2.12.CAP	Career Awareness and Planning
WRK.9.2.12.CAP.1	Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.
WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.1	Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
TECH.8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.1.12.F.CS1	Identify and define authentic problems and significant questions for investigation.

TECH.8.1.12.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.A.1	Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation.
TECH.8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
TECH.8.2.12.A.CS1	The characteristics and scope of technology.
TECH.8.2.12.A.CS2	The core concepts of technology.
TECH.8.2.12.A.CS3	The relationships among technologies and the connections between technology and other fields of study.
TECH.8.2.12.B.4	Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.
TECH.8.2.12.B.5	Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review.
TECH.8.2.12.B.CS4	The influence of technology on history.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.C.1	Explain how open source technologies follow the design process.
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
TECH.8.2.12.C.CS1	The attributes of design.
TECH.8.2.12.C.CS2	The application of engineering design.
TECH.8.2.12.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.12.D.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
TECH.8.2.12.D.CS1	Apply the design process.
TECH.8.2.12.D.CS2	Use and maintain technological products and systems.
TECH.8.2.12.D.CS3	Assess the impact of products and systems.
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or

	practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.CT.3	Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
TECH.9.4.12.CT.4	<p>Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.</p> <p>Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.</p> <p>An individual's income and benefit needs and financial plan can change over time.</p> <p>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.</p> <p>Career planning requires purposeful planning based on research, self-knowledge, and informed choices.</p> <p>Innovative ideas or innovation can lead to career opportunities.</p> <p>There are strategies to improve one's professional value and marketability.</p> <p>Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints.</p>

Essential Questions/Enduring Understandings

Essential Questions:

How do we use CAD to communicate solutions to complex problems?

How do we use the design loop to solve complex problems?

How do we reapply knowledge to solve problems?

How do we communicate engineering solutions to technological problems with CAD?

Enduring Understandings:

CAD is used to create drawings that for different audiences. Understanding the audience's needs guides what will be contained in a drawing.

Specific strategies can be used to make creating drawings more efficient.

The design loop is a time-efficient iterative process that effectively yields successful solutions.

Building designs are more often the product of evolution.

Objectives

Students will know:

Unit vocabulary, i.e. footprint, bay, steel column, built-up roof, strip mall, strip center, ADA, universal design, compartmentalize, fire-rated, demising wall.

Landscaping elements can be used as a buffer.

Parking lots can be arranged to make pedestrians safer.

Parking lot arrangements must comply with the ADA.

Single story buildings must address means of egress requirements.

Setbacks and other zoning considerations affect the design of the building and parking.

Students will be skilled at:

Developing plans, sections and elevations of a building with parking.

Applying knowledge about steel systems, historical precedent and civil engineering to create a building and parking plan.

Applying strategies to solve complex problems.

Creating presentations in a digital portfolio.

Learning Plan

Preview the essential questions and connect to learning throughout the unit.

Guiding Questions: Provide students with images of a strip mall and answer the following questions: Why are the handicapped spaces located where they are? Why aren't there more cars parked in the parking lot?

Why is the entrance to the parking lot located where it is? Why are there trees in the parking lot? Would this parking be a safe place for a parent to unload with several children? If you were in a wheel chair, what issues would you contend with to enter the store? Why are the signs on the mall so small? Why aren't the signs moving? What is the canopy? What are the components, and what are their spatial requirements? Where is the structure that holds the building up located? What is the shape of the column holding the building up?

Lecture and discussion of the Strip Mall and Parking project, discussion of rubric and student involvement in developing grading criteria.

Lecture and review: parts of a strip mall and parking.

Demonstration on how an architect would approach the problem.

Formative assessments will be conducted throughout the design process.

Summative assessment will be conducted by the student and teacher using a rubric specific to the design

problem.

Unit test or quiz.

Writing prompt.

Assessment

Formative assessments

will be made throughout the design process through teacher feedback and class discussion

Teacher feedback on student log

Summative assessment:

Answer the essential questions.

Design a strip mall with parking and draw it using CAD. The site will be on the student's site plan. Design and create presentation drawings for a strip mall and parking that demonstrates understanding of means of egress, curtain wall and steel construction. The presentation will include a written description that describes the technical aspects of the proposal. The project will be evaluated with a rubric.

Demonstrate the ability to use software and technical drawing conventions to communicate a design.

Written quizzes and tests about subject materials.

Student will maintain a log to demonstrate how the design loop was use

The presentation will be evaluated using teacher and student designed rubrics.

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Maintain a log to explain how the design evolved, including sources of information and criticism.

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The presentation will be included in an electronic portfolio.

Write a response to one or more writing prompts. Possible prompts: Reflecting upon the strip mall project, what parts are new, and what parts review? What is universal design, and how can concepts be employed in the design of a strip mall?

Benchmark Assessment:

Final Exam

Alternative Assessment:

Presentation of Design Log

Materials

The CADD LAB-computers equipped with up-to-date AutoCAD and/or other design and drafting software, presentation software, productivity software, a scanner and printers/plotters.

Traditional drafting equipment and supplies-vellum, colored and graphite pencils, pen and ink, drawing boards, tape, scissors, t-squares, triangles etc.

Chip-board, X-acto knives and other model making supplies.

A computer with INTERNET based presentation software (i.e. Prezi and Google Slides) and Microsoft Powerpoint.

Smartboard for demonstrations by the teacher and presentations by students.

Integrated Accommodation and Modifications Spec Ed, ELL, At-Risk, G&T, Career Education, 504's

See the linked document for Integrated Accommodation and Modifications, Special Education, English Language Learners, At-Risk, Gifted and Talented, Career Education and 504s.