# Navigating the Sea-NC

How can CNC Machines be utilized to design digital and physical prototypes for the development of maritime products?

**Suggested Equipment Skill Level**

Intermediate User

**Equipment Skills**

Material properties
Tolerances

Lighthouse Engineer/Maritime Engineer

**Career & Skillset Connections**

-Attention to detail
-Spatial awareness
-Design

**Project Guiding Themes**

-Engineering design process
-Designing in 3D modeling software
-Designing a prototype that meets multiple constraints

**Suggested Software & Materials**

-3D Modeling Software
TinkerCAD, OnShape, Autodesk Fusion 360, Autodesk Inventor, Solidworks
-Carbide Create Software
-Clear Acrylic and Wood
-Finishing supplies (paint/sandpaper)

**Aligned VDOE CTE Course(s) and Competencies**

**Architectural Drawing and Design**
36-Weeks

**Materials and Processes Technology**
36-Weeks

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# Navigating the Sea-NC

CNC Intermediate Skill Level

How can CNC Machines be utilized to design digital and physical prototypes for the development of maritime products?

## Project Problem & Career Prompt

You are a lighthouse engineer and have been commissioned to work with a marine surveyor and Cost Guard officer design a lighthouse for a small island community that has been plagued by shipwrecks and maritime disasters for centuries. The locals believe that the waters around the island are cursed, and they have longed for a beacon of hope to guide sailors safely to shore. As you begin to research the island's history, you come across a story about a master carpenter who was tasked with building a bridge to connect the island to the mainland. The carpenter was known for his innovative designs, and he created a bridge that was not only beautiful but also incredibly strong and resilient. Inspired by the carpenter's ingenuity, you decide to design a lighthouse that incorporates a similar interlocking design. The sides of the lighthouse will be crafted from wood and acrylic, and they will fit together seamlessly to create a strong and stable structure that can withstand even the most violent storms.

## Project Background & Resources

Lighthouse regulations and function

Material properties

## Investigative Questions

What function does a lighthouse serve?

What regulations does a lighthouse need to follow to function properly?

## Project Criteria

-Consider the functionality of the lighthouse during the design process

-Lighthouse must be made up of 4 different parts

-Lighthouse parts need to be interlocking

-Final physical prototypes must be completed prior to project deadline

## Project Constraints

-CNC Machine must be used for all parts of the prototype

-Prototype must be constructed from wood and acrylic

-Prototype part(s) size cannot exceed the 8" x 8" x 3" cutting area

-Prototype must be held together solely from interlocking parts

## Suggested Pacing

1-2 Days of research and sketching ideas

3-4 Days of design

3-4 Days of constructing and finishing prototypes

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# Navigating the Sea-NC

## CNC Machine

## Career & Skill Set Connections

# Lighthouse Engineer/Maritime Engineer

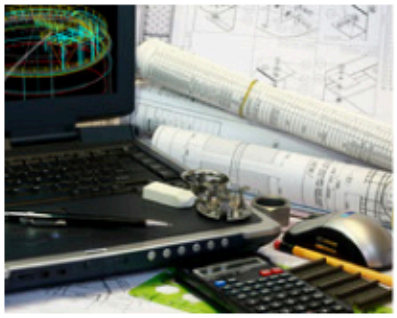
A lighthouse or maritime engineer is responsible for designing, constructing, and maintaining lighthouses and other maritime structures.

### Essential Skills

*Technical and Creative
*IT Skills (CAD)
*Mechanical
*Attention to detail
*Spatial awareness

### Academic Pathway

High School Diploma
and
Community College/Certification
or
Bachelor's degree



## Aligned VDOE CTE Course(s) and Competencies

Workplace Readiness Skills & Work-Based Learning Opportunities & Examine All Aspects of an Industry

### Architectural Drawing and Design

Exploring Architectural Design Foundations

Research existing designs

Apply architectural principles to drawings, annotations, and dimensioning

Introducing the Design Process

Apply the elements and principles of design in the architectural design process to create a solution

Build a scaled physical presentation model

### Materials and Processes Technology

Working with Polymers

Use separating techniques on polymers

Apply polymeric materials and processes to a problem, product design, or prototype

Working with Wood

Use separating techniques on wood

Apply wood materials and processes to a problem, product design, or prototype

Exploring Additive and Subtractive Manufacturing

Generate models to be converted into machine-compatible digital files

Create a product using computer-driven additive or subtractive processes

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# Project Management Plan

Team Member Roles

Team Goals & Timelines

Team Member Tasking

# Sketches & Design Planning