

Recommended Grades:

Introductory Welding CTE
Classes - Grades 9-12

Estimated Time:

Varies - Lesson can be
broken up over multiple
days as shop time allows.

Kit Materials:

- Hanger Blueprint
- Hanger Consumables
- Career Exploration Guide
- PDF Facilitator Lesson
Guide
- Slideshow presentations

**Suggested YouTube
Videos:**

- [GDEB promotional video](#)
(2:02)
- [Smarter Every Day Life
Onboard a Los Angeles
Submarine](#) (29:24)
- [US Navy promotional
video](#) (2:44)

Questions or Feedback?

- Email our team at
SIBCommunityEducation
@gdeb.com

Production Instruction Lesson | CTE Welding

Objective |

This lesson will introduce students to the fundamentals of submarines, their role in national security, and how they are built. Students will use a blueprint to weld together a hanger, a common submarine component. Students will understand the importance of visual inspection on welded submarine components and practice this task on their welded structures. Additional lessons extensions, applications and activities are included.

**Introduction |**

The submarine manufacturing industry is expanding rapidly, with over 10,000 new hires expected annual nationwide for at least the next decade. These jobs will be sustained for decades to come, representing stable, meaningful employment. Submarine manufacturing is a high skilled profession, requiring significant training, and, as such, the Submarine Industrial Base (SIB) team is working with schools to cultivate student interested in and provide initial training on building submarines to fast-track participants into a growing industry.

Students should be able to answer the following questions by the end of this lesson:

1. Why are submarines important to the US Navy?
2. Where are submarines built, and how large is the industrial base?
3. What skills are necessary for submarine construction?
4. How does this welding activity translate to real world submarine construction?

Suggested Lesson Plan |

1. Distribute provided student handout.
2. Present the PowerPoint Part 1 - Fundamentals of Submarines and the Industrial base.
3. Optional - show students background videos (noted in the blue margin) on maritime careers.
4. Allow time for students to discuss questions they may have about their baseline understanding of the industrial base and interest in defense production.
5. Begin the welding activity.
6. Show students the provided PowerPoint Part 2 - Visual Inspection of a Welded Component.
7. Complete the welding activity and visual inspection process.
8. Optional extension activities: Have students showcase their projects and discuss what was learned at a community CTE night/open house; Have students practice welding at various angles; bring students on a local industry tour/field trip; perform Destructive Test on hanger if equipment is available.

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Pre-Lesson Discussion Questions:

1. What do you already know about submarines?
2. Do you have any family in the Navy?
3. How many companies do you think there are locally that are part of the submarine industrial base?
4. What are some important trades and skills for building submarines and why?

Slideshow 1 - Fundamentals of Submarines and the Industrial Base:

Use the following space to jot down any thoughts, questions, or notes while the slideshow is being presented:

Slideshow 2 - Visual Inspection of a Welded Component:

Jot down some notes during the presentation to help you remember the following weld attributes:

- Weld Completeness:
- Weld Fillet Size:
- Spatter:
- Shape of the Weld Face:
- Slag:
- Seal-Off/Wrap-Around:
- Arc Strikes, Gouges, Nicks:
- Porosity:
- Undercut:
- Cracks and Incomplete Fusion:
- Re-entrant Angle:
- Contour Grinding:

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Complete the following Visual Inspection Checklist on a Partner's Welded Hanger, then have your instructor do the same. (Refer to a printout of the Visual Inspection Slideshow if needed!):

Welder Name/ID #: _____

Date: _____

Inspect final weld for the following attributes:	Accept	Reject	Weld Instructor Accept	Weld Instructor Reject	Notes
1. Weld Completeness					
2. Shape of the Weld Face					
3. Arc Strikes, Gouges, Nicks					
4. Cracks and Incomplete Fusion					
5. Weld Fillet Size					
6. Slag					
7. Porosity					
8. Re-entrant Angle					
9. Spatter					
10. Seal-Off/Wrap Around					
11. Undercut					
12. Contour Grinding					

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Conclusion/Discussion Questions:

1. Why are submarines important to the US Navy?
 2. Where are submarines built, and how large is the industrial base?
 3. What skills are necessary for submarine construction?
 4. How did this welding activity translate to submarine construction?
 5. What is one takeaway piece of knowledge you gained from this project?
 6. What is a question you still have about this project or submarine production?
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We would love to hear how you are engaging learners with these resources in your classroom. If you have feedback, questions, suggestions for improvement, or inspirational stories to share with our team please contact us @ EBCommunityEducation@gdeb.com.

THANK YOU FOR ALL YOU DO!
