Welding Inspection & Testing

Media Type: Video
Duration: 72 minutes

Goal: To describe the importance, types and processes associated with welding inspection and testing.

Description:
This presentation features Pete Stracener, Chairperson, Industrial Technology Department, Program Coordinator and Professor of Welding Technology at South Plains College. Follow along as he explains the importance and processes of welding inspection, types of welding defects and discontinuities, preparation of welder qualification test plates and performance of the guided bend tests on the test coupons.

Objectives:
1. To define welding inspection and quality control.
2. To describe weld discontinuities and defects.
3. To explain the process of preparing welder qualification test plates and coupons.
4. To demonstrate guided bend tests.

Common Core Standards

Agriculture, Food & Natural Resources Career Cluster (AG)

Cluster	Standard
Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources Career Pathways.	
Power Structural & Technical Systems Career Pathway (AG-PST)	Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.
	Operate and maintain AFNR mechanical equipment and power systems.
	Plan, build and maintain AFNR structures.

Architecture & Construction Career Cluster (AC)

Cluster	Standard
Use vocabulary, symbols and formulas common to architecture and construction.	
Use architecture and construction skills to create and manage a project.	
Describe career opportunities and means to achieve those opportunities in each of the Architecture & Construction Career Pathways.	
Construction Career Pathway (AC-CST)	Describe the approval procedures required for successful completion of a construction project.
	Implement testing and inspection procedures to ensure successful completion of a construction project.
	Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.

College & Career Readiness Anchor Standards for Reading

Reading Standards for Informational Text		
Key Ideas & Details	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.	
	9-10.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

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Common Core Standards

College & Career Readiness Anchor Standards for Writing

Writing Standards

Text Types & Purposes	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.	
	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.	
	9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
	9-10.3	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
	11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
Production & Distribution of Writing	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	
	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.	
	9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
	9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
Research to Build & Present Knowledge	Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.	
	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.	
	9-10.7	Conduct short as well as more sustained research projects to answer a question or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
	9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

College & Career Readiness Anchor Standards for Speaking and Listening

Speaking & Listening Standards

Comprehension & Collaboration	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.	
	9-10.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
	11-12.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

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Common Core Standards

College & Career Readiness Anchor Standards for Reading

Reading Standards for Literacy in Science & Technical Subjects		
Craft & Structure	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.	
	9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
	11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
Range of Reading & Level of Text Complexity	Read and comprehend complex literary and informational texts independently and proficiently.	
	9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
	11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

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Lesson Plan

Class 1: Distribute the *Welding Inspection & Testing Worksheet* and *Vocabulary Handout*. Show the *Welding Inspection & Testing - Introduction to Welding Inspection & Testing, Welding Inspection & Testing - Weld Joints & Positions* and *Welding Inspection & Testing - Codes, Standards & Specifications* segments. Assign students the *Code Requirements Project*.

13 min.

Class 2: Remind students to use their *Worksheet* and *Vocabulary Handouts* as references throughout the presentation. Show the *Welding Inspection & Testing - Discontinuities & Defects* and *Welding Inspection & Testing - Quality Control* segments. Distribute the *Discontinuities & Defects Identification Activity* for students to work on in class.

14 min.

Class 3: Present the *Welding Inspection & Testing - Destructive Testing* and *Welding Inspection & Testing - Non-Destructive Testing* segments. Have students follow along with the *Worksheet* and *Vocabulary Handout.* Allow students to turn in their papers from the *Code Requirement Project.* Review previous days materials with students and make sure all information is understood.

19 min.

Class 4: Show the *Welding Inspection & Testing - 2G Welding Certification Test Preparation*, *Welding Inspection & Testing - Coupon Preparation* and *Welding Inspection & Testing - Performing the Guided Bend Test* segments. Have students follow along with the *Worksheet* and Vocabulary Handout. Discuss any questions students may have, then assign the *Welder Qualification Test Project*. Coupon preparation will take several class periods.

26 min.

Class 5: Review with students and answer any questions they may have. Assign the *Word Search.* Once students have completed the *Word Search*, distribute the *Welding Inspection & Testing Assessment*. Distribute the *Destructive vs. Nondestructive Project* and allow the remainder of the class for students to work.

Class 6: Allow students time to complete their test plates and coupon preparation. Once coupons are complete, have students perform the *Visual Inspection Activity* with their peer's projects. If equipment is available, allow students to perform guided bend tests on their coupons. If equipment is not available, collect coupons and visually inspect all coupons.

Class 7: Allow the class for students to finish and turn in all *Projects* and *Activities*.

Lesson Links

American Welding Society
- http://aws.org

American Society of Mechanical Engineers
- http://www.asme.org

Career & Technical Student Organizations

FFA
- Agricultural Mechanics

Skills USA
- Welding
- Welding Fabrication
- Welding Sculpture Demo

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LESSON PLAN

Career Connections

Using the *Career Connections Activity*, allow students to explore the various careers associated with this lesson. See the *Activity* for more details. *If student licenses have been purchased:* Students will select the interviews to watch based on your directions. *If only a teacher license is purchased:* Show students all the career interviews and instruct them to only complete the interview form for the required number of interviews.

- iCEV50535, Mary Jo Emrick, Adjunct Welding Professor, Austin Community College
- iCEV50773, Dennis Klingman, Manager of Technical Training, Lincoln Electric Welding School
- iCEV50001, Howard Alford, Welder, Self-Employed

Lab Activities

Discontinuities & Defects Identification

Directions:

Using the *Discontinuity & Defects Identification Activity,* students will match the picture of the discontinuity or defect with the proper name. To add difficulty to the worksheet, instructor may require students to list the cause of the discontinuity as well.

Visual Inspections

Directions:

Once test coupons have been prepared, allow students to choose a test coupon to inspect. Students will evaluate the coupons for the presence of any visual defects or discontinuities. After inspection of the coupon, students will write down three pros and three cons about the coupon they inspected and turn it in along with the coupon they evaluated. If the student observes any discontinuities or defects, they should note it on the sheet, along with ideas as to what caused the defect or discontinuity and how it could be repaired. View the *Visual Inspections Activity Teacher Instruction Sheet*

Projects

Welder Qualification Test

Directions:

Students will preform a welder qualification test using a welding process available in the shop. Follow all instructions and have students cut test coupons as instructed, even if equipment is not available to perform guided bend tests. Have students number their test coupons with a number of their choosing. Make sure numbers are not repeated.

Code Requirements

Directions:

Welding codes are important not only to the welding industry, but to all people. Students will choose a career they wish to pursue in the future and write a short paper of two to three pages discussing the career they chose and at least two welding codes which pertain to their future career. Remind students to cite their sources and include a bibliography with their paper.

Destructive vs. Nondestructive

Directions:

Using the Internet, library or other available resources, students should research and write a report explaining the relationship between discontinuities and defects. Describe various examples of defects found in welded products. Also identify and explain both destructive and nondestructive tests used as quality control techniques to prevent manufacturing defects in welding. Compare and contrast these techniques and provide specific examples when they are most appropriately used.