

# ATLT-1020: INTRODUCTION TO LIFTING & RIGGING

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## Cuyahoga Community College

**Viewing: ATLT-1020 : Introduction to Lifting & Rigging**

**Board of Trustees:**

2015-12-03

**Academic Term:**

Spring 2019

**Subject Code**

ATLT - AIT-Lifting Technologies

**Course Number:**

1020

**Title:**

Introduction to Lifting & Rigging

**Catalog Description:**

Introductory course into the Lifting and Rigging Industry, the applied practices and applications of slings. Introduces various types of rigging gear in use, rigging hardware proper use and pre-use inspection. Explore loads, sling angle stresses, and common rigging applications and practices.

**Credit Hour(s):**

2

**Lecture Hour(s):**

2

## Requisites

**Prerequisite and Corequisite**

Departmental approval: admission to Lifting Technologies apprenticeship program.

## Outcomes

**Course Outcome(s):**

Discuss the principle of rigging gear, including the applied standards and regulations and selection and applications for safe lifting operations.

**Objective(s):**

1. List and define the terms used with respect to the lifting industry.
2. List and explain the various configurations of rigging gear used in industry applications.
3. Identify the general types of lifting gear.
4. List and explain the specific standards and regulations for the rigging gear.
5. Assess restrictions for lifting applications for the selection of proper rigging gear.
6. Identify the various applications for lifting.

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**Course Outcome(s):**

Describe the features and differences between Load Rated vs. Non-Load Rated rigging gear and the specific applications used by manufacturing and construction industries.

**Objective(s):**

1. Describe and identify component markings and working load limits related to Load Rated vs. Non-Load Rated rigging gear.
  2. Describe Load Rated rigging gear and non-Load Rated rigging gear.
  3. Identify the difference between lifting, pulling and Tie-Downs
  4. Identify characteristics of an engineered lifting device.
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**Course Outcome(s):**

Discuss the principle of rigging gear, including the applied standards and regulations and selection and applications for safe lifting operations.

**Objective(s):**

1. Describe the required information related to working load limits and capacities of various types of lifting gear.
2. Expand and define the four terms of how rigging gear is designed, constructed and rated for use.
3. Explain design factors required for safe lifting applications.
4. Utilize rigging capacity charts to calculate and determine safe rigging gear configuration.
5. Incorporating sling angles and their effects on ratings.

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**Course Outcome(s):**

Demonstrate the ability to properly perform a rigging gear inspection including inspection methods, communication, record keeping and reporting findings.

**Objective(s):**

1. Conduct a pre-inspection meeting to define scope of work, work area safety and procedure.
2. Review the Inspection forms for rigging gear inspections.
3. Perform a rigging gear inspection of various lifting gear.
4. Identify and determine the degree of component damage of rigging gear in accordance with industry standards.
5. Identify wear, environmental and specific damage of rigging gear.
6. Apply measurements of rigging gear and assess components for elongation and deformation.
7. Prepare written reports for end users and communicate results with facility management.

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**Methods of Evaluation:**

1. Participation
2. Assignments
3. Quizzes & Exams
4. Practical application projects

**Course Content Outline:**

1. Rigging Gear
  - a. Terminology
    - i. Rigging Gear
    - ii. Sling
    - iii. Working Load Limit
    - iv. Breaking Strength
    - v. Proof Test
    - vi. Rigging Hardware
    - vii. Wire Rope
    - viii. Chain
    - ix. Synthetics
    - x. Engineered Lifting Device
  - b. Configurations
    - i. Straight line pull
    - ii. Double, Triple and Quad Leg
    - iii. Vertical
    - iv. Choker
    - v. Basket
    - vi. Double Basket
  - c. Types
    - i. Slings
      1. Wire Rope Types & Construction
      2. Chain Grades and Applications
      3. Mesh Slings
      4. Synthetic Rope (Cordage)
      5. Web Sling and Round Slings
    - ii. Engineered Lifting Devices

1. Spreader beam
2. Lifting beams
3. Hooks
4. Clamps
5. C hooks
6. Blocks
- iii. Rigging Hardware
  1. Shackles
  2. Hooks
  3. Links
  4. Turn buckles
  5. Sheaves
- d. Standards & Regulations
  - i. OSHA
    1. 29CFR, Part 1910 (General Industry), Subpart H
    2. 29CFR, Part 1926 (Construction), Subpart H
  - ii. ASME American Society of Mechanical Engineers
    1. ANSI/ASME B30.9 Slings
    2. ANSI/ASME B30.10 Hooks
    3. ANSI/ASME B30.16 Overhead Hoist
    4. ANSI/ASME B30.20 Below the Hook Lifting Devices
  - iii. WRTB Wire Rope Technical Board
    1. Wire Rope User's Manual
    2. Wire Rope Sling User's Manual
  - iv. WSTDA Web Sling & Tie-Down Association
    1. WSTDA WS-1
    2. WSTDA RS-1
- e. Lifting Considerations
  - i. Rigging Applications
  - ii. Restricted headroom
  - iii. Load Slippage
  - iv. Sharp Edges
  - v. Load Protection
  - vi. Load leveling
  - vii. Load Rigidity
  - viii. Environmental Considerations
2. Load Rated vs. Non-Load Rated
  - a. Rigging Gear
    - i. Load Rated
      1. Engineered
      2. Markings
      3. Proof load tested
    - ii. Non-load rated
      1. Pulling applications
      2. Tie down applications
  - b. Characteristics
    - i. Load Rated
    - ii. Engineered for overhead lifting
    - iii. Design Factors that increase lifting safety
    - iv. Hoisting as primary purpose
    - v. Proof load tested
  - c. Non-Load Rated
    - i. Not engineered for overhead lifting
    - ii. Not fabricated to industry standards
    - iii. Not proof load tested
    - iv. Commonly associated with pulling or tie-down
  - d. Component Identification
    - i. Markings
    - ii. Labels / Tags

- iii. Rated capacity
- iv. Breaking Strength
- v. Manufacturer responsibilities
- e. Ratings
  - i. Load rated
  - ii. Non-load rated
- 3. Rigging Capacities & Considerations
  - a. Lifting Gear Types
    - i. Working load limits
      - 1. Safe working load
      - 2. Rated load
      - 3. Design factor
    - ii. Capacities
      - 1. Breaking strength
      - 2. Yield strength
      - 3. Maximum allowable stress
  - b. Criteria
    - i. Yield
    - ii. Breaking strength
    - iii. Design factor
    - iv. Rated
  - c. Design factors
    - i. Wire rope slings
    - ii. Chain slings
    - iii. Synthetic slings
    - iv. Metal mesh
    - v. Below the hook lifters
  - d. Capacity charts
    - i. Calculations
      - 1. Angles
      - 2. Center of gravity
      - 3. Number of lift points
    - ii. Charts
      - 1. Vertical, choker & basket
      - 2. Material construction & characteristics
      - 3. Angles
      - 4. Rated capacity
      - 5. Multiple leg capacities
  - e. Sling angles
    - i. 30, 45, 60 degrees
    - ii. Effects
      - 1. Decrease working load limits
      - 2. Increase stresses
      - 3. Overloading conditions
      - 4. Uniform loading
      - 5. Load distribution
      - 6. Load configuration
- 4. Inspection
  - a. Pre-inspection
    - i. Scope of work
    - ii. Work safety
    - iii. Procedure
  - b. Inspection forms
    - i. Review
    - ii. Inspection application
  - c. Rigging gear inspection
    - i. Broken wires
    - ii. Elongation
    - iii. Wear

- iv. Heat damage
- v. Corrosion
- vi. Tagging and identification
- vii. Cuts, snags, burns
- d. Rigging gear damage
  - i. Industry standards and requirements
    - 1. ASME
    - 2. OSHA
    - 3. WSTDA
  - ii. Manufacturers recommendations
  - iii. End-user requirement
- e. Measurement
  - i. Component assessment
    - 1. Allowances
      - a. Wire rope
      - b. Chain
    - 2. Elongation
    - 3. Deformation
  - ii. Component failure
    - 1. Removal criteria
      - a. Broken wires
      - b. Wear
      - c. Cuts
      - d. Burns
    - 2. Environmental
      - a. Corrosion
      - b. Acids & Alkali
- f. Reporting
  - i. Documentation
    - 1. Forms
    - 2. Tagging
  - ii. Communication
    - 1. Report/Results
    - 2. Presentations/outcomes
    - 3. Follow up

## Resources

Wire Rope Technical Board. *Wire Rope Users Manual*. 4th ed. Alexandria: VA: Wire Rope Technical Publishing, 2005.

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Wire Rope Technical Board. *Wire Rope Sling User's Manual*. 3rd ed. Alexandria: Wire Rope Technical Publishing, 2007.

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Riggs, Mike. *The Complete Rigger's Reference Handbook A Practical Reference Tool for the Rigger and Crane Operator*. Knoxville, TN: RigSafe Solutions, 2009.

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## Resources Other

1. <http://www.mazzellalifting.com/>
2. [http://energy.gov/sites/prod/files/2014/01/f6/HoistingRigging\\_Fundamentals.pdf](http://energy.gov/sites/prod/files/2014/01/f6/HoistingRigging_Fundamentals.pdf) (<http://www.iti.com/riggingengineering/>)
3. <http://www.iti.com/riggingengineering> (<https://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-load-lifting-rigging/rigging-load-lifting-acop.pdf>)
4. <https://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-load-lifting-rigging/rigging-load-lifting-acop.pdf>

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