ATPL-1801: SPECIAL TOPICS: SIGNAL CERTIFICATION

Cuyahoga Community College

Viewing: ATPL-1801 : Special Topics: Signal Certification

Academic Term:

Fall 2019

Subject Code

ATPL - Applied Ind Tech - Plumbers

Course Number:

1801

Title:

Special Topics: Signal Certification

Catalog Description:

Certification course for a pipe trades member of the United Association covering the certification standards with respect to regulations established by the Occupational Health and Safety Administration OSHA and the American Society of Mechanical Engineers ASME. Course covers crane operations including crane limitations and procedures for general lifting and specific requirements for hoisting personnel.

Credit Hour(s):

1

Lecture Hour(s):

1

Requisites

Prerequisite and Corequisite

Departmental approval and/or a member of the U/A union.

Outcomes

Course Outcome(s):

Discuss the purpose of National Commission for Certification of Crane Operators NCOO certification, the standards that regulate the crane industry and demonstrate the ability to provide correct hand signals for the U/A worker construction sites.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. List and define the terms related to NCOO certification.
2. Explain the purpose of NCOO certification for U/A tradespeople.
3. Differentiate between Occupational Health and Safety Administration OSHA and the American Society of Mechanical Engineers ASME safety standards for crane signaling.
4. List the regulations that govern safe crane signaling.
5. Demonstrate the ability to properly provide basic hand signals for safe lifts using different cranes.

Course Outcome(s):

Discuss crane operations/limitations with respect to manufacturer's specifications covering different characteristics to avoid equipment failure and jobsite accidents.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. List and explain the different crane limitations and operation characteristics.
2. Explain the consequences of improper signaling.
3. Explain how increases crane radius affects crane capacity.
4. Describe dynamic loading/unloading and explain how crane stability is affected.
5. Identify the crane quadrants of operation and describe the effect on crane capacity resulting from lifts made from respective quadrants.
6. Explain the importance of maintaining crane tempo to control drift, swing and environmental factors.

Course Outcome(s):

Identify and explain the safety regulations, as prescribed by OSHA and ASME, required for signal persons on jobsites, different delivery modes and specific standards for working near energized power lines.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Explain the different delivery modes for signaling cranes.
2. List the safety requirements for the signal person on jobsites
3. Explain the requirements for hand signal charts on jobsites and state the posting location with respect to lifting vicinity
4. Describe energized power lines with respect to voltage, during operation and underline travel.
5. State the crane operation requirement as prescribed by OSHA during crane operation within encroachment limits.

Course Outcome(s):

Discuss the lifting requirements as prescribed by OSHA for hoisting personnel on jobsites including equipment and platform criterion, testing practices and worker protection procedures.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Identify the OSHA regulations that govern the hoisting of workers on jobsites when worksite conditions and/or project structure design prevent conventional means of access.
2. Identify the inherent dangers related to equipment set-up and operation.
3. List and explain the criterion related to the personal platform used in lifting of workers.
4. Explain the attachment and rigging requirements including hooks and other detachment devices and related gigging hardware for use in platform attachment.
5. Perform trial lifts, inspection and proof testing of personnel platforms as required by safety standards.
6. Identify safe work practices when working from personnel hoisting equipment.
7. Conduct a pre lift meeting to review the lift plan for workers using personal platform equipment.

Methods of Evaluation:

1. Class participation
2. Quizzes
3. Tests
4. Student must demonstrate proper signalling for crane operations in compliance with safety standards addressed in course

Course Content Outline:

1. Hand signals for cranes
    a. Terminology
        i. Signal
        ii. Hoist
        iii. Auxiliary hoist
        iv. Load
        v. Lift

vi. Swing
vii. Dog everything
viii. Crawler crane
ix. Boom
x. Telescoping boom
xi. Trolley travel
xii. Tower crane
xiii. Whip line
xiv. Stop
xv. Travel
xvi. Swing radius
xvii. Crane tempo

b. Certification
   i. Purpose
      1. Job procurement
      2. OSHA/ASME required
   ii. Conditions
      1. Job assignment
      2. Worker qualified

c. OSHA versus ASME
   i. OSHA
      1. Worker safety
      2. Standard 1926.14.19
         a. Subpart CC
         b. Appendix A
   ii. ASME
      1. B 30.5
         a. Mobile crane
         b. Track travel wheel
      2. B 30.3
         a. Tower crane
         b. Derricks

d. Regulations
   i. Hand signal certification
   ii. Qualified signal person
   iii. Operations and limitations
   iv. Hoisting personal
   v. Certificated signal person

e. Basic hand signals
   i. Communication
      1. Signal person/operator
      2. Signal review
      3. Jobsite positioning
   ii. Signal identification
      1. Hoist
      2. Lower
      3. Use whip line
      4. Use main hoist
      5. Raise boom
      6. Lower boom
      7. Move slowly
      8. Lower boom/raise load
      9. Raise boom/lower load
      10. Swing
      11. Stop
      12. Emergency stop
      13. Travel
      14. Dog everything
      15. Travel track machine

        a. Both tracks
        b. Single track
    16. Extend boom
    17. Retract boom
    18. Extend boom one handed
    19. Trolley travel
2. Operations and Limitations
    a. Limitations
        i. Drift
            1. Load swing
                a. Boom drift
                b. Swing drift
                c. Trolley drift
            2. Load misalignment with respect to boom
        ii. Deflection
            1. Correction
                a. boom adjustment
                b. Hoist line/perpendicular to boom
        iii. Dynamic loading
            1. Rapid lift acceleration
            2. Abrupt lowering
        iv. Dynamic unloading
            1. Sudden load release
            2. Improper rigging
            3. Rigging failure
        v. Side loading
            1. Improper load placement
            2. Effects
                a. Boom integrity failure
                b. Side stress
        vi. Two locking
    b. Operations
        i. Crane radius
            1. Boom movement
            2. Telescoping
            3. Boom angle
        ii. Boom
            1. Up
            2. Down
            3. Extraction/retraction
    c. Improper signaling
        i. Cause
            1. Improper training
            2. Distractions
        ii. Consequences
            1. Crane damage
            2. Worker injury
            3. Property damage
    d. Crane radius and capacity
        i. Increased radius/decreased capacity
            1. Boom angle
            2. Swing drift
            3. Telescoping boom

1. Smaller radius/increased capacity
    a. Load/center of gravity
    b. Increased radius/greater ground pressure
2. Dynamic loading/unloading: stability
    a. Rapid acceleration
        i. Structural integrity affected
        ii. Load shift

   b. Sudden stopping
      i. Crane stress
      ii. Cable stress
   c. Unloading
      i. Causes
         1. Improper rigging
         2. Rigging failure
      ii. Effects
         1. Loss of stability
         2. Crane tip
3. Quadrants of operation
   a. Quad #1: Over the front
   b. Quad #2: Over the rear
   c. Quad #3: Over the sides
   d. Capacity effect
      i. Quad #1
         1. Limited lifting
         2. Specific crane: crawler, rough terrain
      ii. Quad #2
         1. Highest capacity
         2. Truck mounted
      iii. Quad#3
         1. Reduced capacity
         2. Decreased radius required
         3. Least stable
4. Crane tempo
   a. Swing speed
   b. Slow and steady movement
   c. Controls
      i. Drift
      ii. Swing
      iii. Dynamic loading
      iv. Side loading
   d. Signal person driven

1. Signal person requirements
   a. Delivery modes
      i. Hand signals
         1. OSHA 1926.1419
         2. ASME B 30.3 and 30.5
      ii. Voice
         1. OSHA 1926.1421
         2. ASME B 30.3 30.5.3.3.3.5
         3. Delivery elements
            a. Function and direction
            b. Distance and/or speed
            c. Function stop
         4. Transmission
            a. Radio (dedicated channel)
            b. Telephone
            c. Electronic
            d. Person to person
            e. Hand free
      iii. Audible travel
         1. Stop
         2. Go ahead
         3. Back-up
   b. Signal person requirements
      i. Qualifications
         1. Third party evaluator
         2. Employee qualified

   ii. Documentation
   iii. Knowledge of signals
   iv. Ability to deliver
   v. Crane operation limitations
c. Hand signal chart
   i. Proper posting
   ii. Lifting parameters
   iii. Posting locations
      1. Equipment
      2. Lifting operation vicinity

1. Energized power lines
   a. Kilovolt
      i. 0-50 KV
      ii. 50KV-200KV
      iii. 200KV-350KV
      iv. 350KV-500KV
      v. 500KV-750KV
      vi. 750KV-1000KV
      vii. Greater than 1000KV
   b. Work zone identification
      i. Dedicated boundary
      ii. Circular boundary with regards to equipment maximum radius
   c. Working distance encroachment limits
   d. Chart reference
   e. Requirements
      i. Utility owner/operator
      ii. Response time
   f. Crane travel/power line requirements
      i. Dedicated spotter
         1. Clearance gage distance
         2. Continuous communication
         3. Timely distance report
      ii. Minimum clearance distance
         1. Chart interpretation
         2. Crane adjustment

1. Hoisting personnel
   a. OSHA regulation 1926.1431
      i. Equipment set-up
      ii. Platform criterion
      iii. Attachment and rigging
      iv. Trial lifts, inspections and proof testing
      v. Work practices
      vi. Pre-lift meeting

1. Inherent dangers
   a. Basket tipping
   b. Tube blocking
   c. Falling
   d. Rigging failure
   e. Platform controls
2. Personal platform criterion
   a. Relative level +/- ten degrees
   b. Structure integrity
      i. Steel construction
      ii. Toe, mid, and top rail
      iii. Grab rail
      iv. Inward opening gate
      v. Adequate headroom
      vi. Load capacity marking
      vii. Floor construction: perforated

    c. Loading
        i. Personnel
        ii. Tools
        iii. Minimum material
3. Rigging requirements
    a. Hooks
        i. Closed
        ii. Locked
        iii. Elimination of hook openings
    b. Shackle
        i. Alloy anchor
            1. Bolt, nut, and retainer pin
            2. Screw pin
        ii. Opening prevention
        iii. Support requirements
            1. Five times maximum load
            2. Design without failure
    c. Sling
        i. Wire rope
            1. Thimble eye construction
            2. Restricted use: personnel lifting only
        ii. Ten times intended load rating

1. Trial lifts
    a. Inspection
        i. Unoccupied
        ii. Anticipated weight load
        iii. Prior to each shift
        iv. Equipment relocation
        v. Lift route change
        vi. Lifting capacity : 50% of rated radius
    b. Radius determination
    c. Proof test
        i. Performed at each jobsite
        ii. 125% of rated capacity
        iii. Five minute suspension minimum
        iv. Competent person
2. Safe work practices
    a. Operating function
        i. Slow
        ii. Controlled
        iii. Cautious
        iv. Without sudden movement
    b. Occupant requirement
        i. Body parts remain within equipment
        ii. Platform standing only
        iii. Movement with crane
    c. Platform access
        i. Ground level only
        ii. Secured basket
            1. Tag line
            2. Structure tie-off
    d. Environmental
        i. Wind speed
        ii. Competent person contact
        iii. Lighting
        iv. Weather fronts
    e. Communication

   i. Crane operator
   ii. Signal person
  f. Fall protection
1. Pre-lift meeting
  a. Prior to actual personnel lift
  b. Attendees
     i. Equipment operator
     ii. Signal person
     iii. Hoisted personnel
     iv. Competent person
  c. Conditions
     i. New work location
     ii. New employee

Resources

ETS Equipment Training Solutions ,. *Signal Person Training Course*. current. Signal Person Training Course Published by ETS Equipment Training Solutions , 2012.

International Pipe Trades Joint Training Committee, Inc. *Rigging* . current. Published by International Pipe Trades Joint Training Committee, Inc., 2015.

Resources Other

https://www.cranerental.com/hand-signals-need-know-crane-operations/ (https://www.google.com/url/?sa=t&rct=j&q=&esrc=s&source=web&cd=11&cad=rja&uact=8&ved=2ahUKEwjK8PHxwsXhAhWl34MKHS9NCHQQFjAKegQIAxAB&url=https%3A%2F%2Fwww.cranerental.com%2Fhand-signals-need-know-crane-operations%2F&usg=AOvVaw3R-ldrfM40Dkcn71dhOTZV)

www.cicb.com/crane-operator-signal-person-what-are-the-requirements/ (https://www.google.com/url/?sa=t&rct=j&q=&esrc=s&source=web&cd=12&cad=rja&uact=8&ved=2ahUKEwjK8PHxwsXhAhWl34MKHS9NCHQQFjALegQIBhAB&url=http%3A%2F%2Fwww.cicb.com%2Fcrane-operator-signal-person-what-are-the-requirements%2F&usg=AOvVaw2XD36ctbVZsxiFX-NsLDQo)

https://www.agc-ca.org/uploadedFiles/Member.../SignalpersonReference0810_2.pdf (https://www.google.com/url/?sa=t&rct=j&q=&esrc=s&source=web&cd=14&ved=2ahUKEwjK8PHxwsXhAhWl34MKHS9NCHQQFjANegQIABAC&url=https%3A%2F%2Fwww.agc-ca.org%2FuploadedFiles%2FMember_Services%2FSafety-Health%2FSignalpersonReference0810_2.pdf&usg=AOvVaw0yirwuNgA3p94OJUtDhw4-)

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