

# ATIW-1400: PRINCIPLE OF REINFORCING STEEL

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## Cuyahoga Community College

**Viewing: ATIW-1400 : Principle of Reinforcing Steel**

**Board of Trustees:**

January 2020

**Academic Term:**

Fall 2020

**Subject Code**

ATIW - Appld Indus Tech - Ironworking

**Course Number:**

1400

**Title:**

Principle of Reinforcing Steel

**Catalog Description:**

Basic principles of reinforcing steel, using tools and methods necessary for layout and fabrication, according to engineering and placing drawings. Application of basic structural building forms to reinforce concrete structures, including structural value of footings and use of beam and slab design; history of reinforced concrete and manufacturing process of reinforcing steel; and basic types of highway structures.

**Credit Hour(s):**

2

**Lecture Hour(s):**

2

## Requisites

**Prerequisite and Corequisite**

ATIW-1300 Structural Steel Concepts or concurrent enrollment, and ATIW-1310 Safety for Ironworkers or concurrent enrollment; or departmental approval.

## Outcomes

**Course Outcome(s):**

Describe basic principles of reinforcing steel.

**Objective(s):**

1. Identify shear points on the structure and determine whether it is a single, vertical, or horizontal shear.
2. Identify tension points in a structure and whether it is diagonal or bending tension.
3. Identify different types of reinforcing structures: beams, walls, stair landings, columns, slabs and footings and where they are used.

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**Course Outcome(s):**

Explain the history of reinforced concrete.

**Objective(s):**

1. Describe the early history of reinforced concrete.
2. Describe the relationship of concrete and steel.
3. Explain the advantages of reinforced concrete.

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**Course Outcome(s):**

Describe the manufacturing process of reinforcing steel.

**Objective(s):**

1. Describe the characteristics of reinforcing bars by types and grades of steel.
  2. Identify bar sizes.
  3. Locate the identification marks for all types of rebar and mesh.
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**Course Outcome(s):**

Demonstrate use of tools required to perform the placing of reinforcing steel.

**Objective(s):**

1. Identify the tools required for a reinforcing Ironworker.
  2. Identify the five different types of ties used by the reinforcing Ironworker.
  3. Be able to state the general principles of tying bars.
  4. Demonstrate safety while conducting job responsibilities.
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**Course Outcome(s):**

Apply basic structural building forms to reinforced concrete structures.

**Objective(s):**

1. Describe how the main elements of reinforced concrete buildings are constructed.
  2. Identify types of reinforced concrete roof construction.
  3. Describe how reinforcing is used in the construction of bins and tanks.
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**Course Outcome(s):**

Utilize math for reinforcing steel.

**Objective(s):**

1. Calculate bar spacing equations for lay out.
  2. Calculate number of bars needed and caisson layout.
  3. Utilize conversion formulas.
  4. Determine diameter splices.
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**Course Outcome(s):**

Identify the basic types of highway structures.

**Objective(s):**

1. Distinguish between the various types of bridges.
  2. Identify the different components to those bridges.
  3. Identify the different components to a box culvert.
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**Course Outcome(s):**

Layout and fabricate reinforcing steel, according to engineering and placing drawings.

**Objective(s):**

1. Describe the process of manufacturing and fabricating reinforcing steel.
  2. Identify standard bar bends and hooks.
  3. Determine fabrication tolerances and prepare for fabrication.
  4. Identify diameters of bars and bundle and tag bars.
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**Methods of Evaluation:**

1. Quizzes
2. Exams
3. Classroom participation
4. Demonstration of project assignments

**Course Content Outline:**

1. Basic principles of reinforcing steel
  - a. Purpose
  - b. Location
  - c. Fabrication
    - i. typical bar bends
    - ii. hooks and bends
    - iii. tolerances
    - iv. drawings
  - d. Layout
    - i. calculations
      1. lengths
      2. tie dimensions
    - ii. bars
    - iii. stirrups
    - iv. hook bars
    - v. bundling and tagging
    - vi. marking system
    - vii. highway structures
    - viii. drawings
2. Reinforced concrete
  - a. History
  - b. Definitions
  - c. Advantages
  - d. Characteristics
3. Reinforcing steel
  - a. Manufacturing process
    - i. materials
    - ii. bars
      1. grade
      2. size
      3. identification marks
  - b. Placement
    - i. tools
      1. pliers
      2. measuring devices
      3. marking devices
      4. belts
      5. lanyards/harnesses
      6. wire holders
      7. burning and cutting devices
      8. bending devices
    - ii. types of ties
    - iii. safety equipment
  - c. Types of footings
    - i. dowel bars
    - ii. selection of foundation
  - d. Beams
    - i. types
    - ii. uses
    - iii. reinforcing elements
    - iv. requirements
  - e. Slabs
    - i. types
    - ii. uses
    - iii. reinforcing elements
    - iv. requirements
  - f. Engineering and placing drawings

- i. layout
- ii. fabrication
- 4. Types of highway structures
- 5. Basic structural building forms

## Resources

Dobrowolski, Joseph A. *Concrete Construction Handbook*. 4th ed. New York: McGraw Hill, 1998.

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Everard, Noel J. *Schaum's Outline of Theory and Problems of Reinforced Concrete Design*. 3rd ed. New York: McGraw-Hill, 1993.

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International Association of Bridge, Structural and Ornamental Iron Workers. *Reinforcing Manual for Ironworkers VII, Volume 1*. Washington, D.C.: AFL-CIO, 1999.

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## Resources Other

International Association of Bridge, Structural, Ornamental and Reinforcing IronWorkers, Instructor Materials. <http://www.ironworkers.org/training/for-instructors>

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