

Course Syllabus

Copper Melting 201



Course Code 4-220	CEUs 1.0 CEUs
Course Length 1.5 days	

Course Introduction

This laboratory course introduces the principles and best practices of copper melting and pouring for use in producing premium quality castings. This course will examine the various processes involved in melt protection, oxidation and de-oxidation and degassing. Topics include furnace types and uses, charge materials, melting practices and tests for melt quality.

Benefits to Taking the Course

Benefits to taking this course include improved energy efficiency during melting as a result of reduced gas pick up and improved melt cleanliness, as well as enhanced productivity and quality control and reduced production costs resulting from use of appropriate oxidation-deoxidation and degassing practices, maintenance of proper furnace atmospheres, minimization of porosity and inclusions, and use of the correct melt quality assessments.

Learning Outcomes

At the end of this course, participants should be able to:

1. Describe the furnaces used for copper melting, as well as their advantages and disadvantages.
2. Explain the effects of various charge materials on copper melting.
3. Discuss oxidation-deoxidation and degassing practices for copper melting.
4. Identify proper PPE use in copper melting and pouring practices.
5. Describe the tests used for melt quality.
6. Explain considerations for making quality, high conductivity copper castings.

Lesson Outline

Module 1: Introduction

Module 2: Furnace Types & Uses

- Furnace Types used in Copper Melting
- Furnace Types & Uses

Module 3: Charge Materials

- Charge Material Types
- Charge Material Effects
- Foundry Safety in Copper Melting & Casting

Module 4: Melting Practices

- Furnace Atmosphere
- Additions for Copper Alloys
- Oxidation/De-oxidation/Gassing/De-gassing techniques
- Effects of Gas and Melt Contamination on Structures
- High Conductivity Copper Castings

Module 5: Tests for Melt Quality

- Melt Quality Test Types
- Mechanical Properties-Hardness Testing
- Chemical Analysis
- Tests for Gas

<ul style="list-style-type: none"> • Fracture Testing • Temperature Control
<p>Conclusion</p>
<p>Instructional Methods:</p> <ul style="list-style-type: none"> • Video • Group Discussions • Case Studies • Partner Activities • Mini Lectures • Games • Group Activities • Lab Demonstrations
<p>Assessment Methods:</p> <ul style="list-style-type: none"> • Case Study Debrief and Discussion • Group Presentations and Feedback • Group Activity Reviews • Facilitator Q&A
<p>Course Prerequisites, if any: It is recommended that you have taken <i>Copper 101</i> prior to taking this course.</p> <p>Recommended pre-requisite knowledge:</p> <ul style="list-style-type: none"> • Molding procedures • Basic gating and risering knowledge • Basic melting skills • Fundamental copper alloy knowledge
<p>Texts, Books or other Resources available for purchase:</p> <ul style="list-style-type: none"> • <u>Casting Copper-Base Alloys, 2nd Ed.</u>, AFS Publication
<p>Attendee Requirements to Earn CEUs:</p> <ol style="list-style-type: none"> 1. Present at least 8.5 hours of the total 9.5 hours of instructional time (90%), which does not include meals or breaks. 2. Active participation (can include asking questions, communicating with other attendees during and taking part in group activities, providing responses during whole class or group discussions). 3. Successful achievement of learning outcomes.
<p>Who Should Attend? The target audience for this course consists of individuals responsible for:</p> <ul style="list-style-type: none"> • melting • metallurgy • quality and/or process control • management/supervision