

ATSM-2160: INDUSTRIAL III FOOD SERVICE

Cuyahoga Community College

Viewing: ATSM-2160 : Industrial III Food Service

Board of Trustees:

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Academic Term:

Fall 2021

Subject Code

ATSM - Applied Ind Tech- Sheetmetal

Course Number:

2160

Title:

Industrial III Food Service

Catalog Description:

Advanced sheet metal and welding course covering all aspects of stainless steel applications in the commercial food industry. Included are specialized fabrication procedures and assembly techniques required for food grade sanitary environments. Specific welding processes required seam finishes are presented and practiced to meet strict industry standards. Also, regulations related to grease duct fabrication, including elimination of pocket forming grease traps are explained and emphasized.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

Departmental approval and a member in good standing of the Sheet Metal Workers Union

Outcomes

Course Outcome(s):

Discuss the various applications of the Food Service Industry and Stainless Steel Fabrications and welding techniques including finishes and bending allowances

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 the Food Service Industry and Stainless Steel Fabrication.
2. Identify the different industrial applications of stainless steel including food industry equipment.
3. Identify the various types and finishes of stainless steel with respect to the American Society of Testing Materials (ASTM)
4. Describe the properties of stainless steel with respect to the composition of the material.
5. Compare the respective finishes of stainless steel with respect to the product types.
6. Explain the importance of accurate inside and outside bend radii.
7. Calculate inside and outside bend radii with respect to material thickness to establish cut list.
8. Explain butt weld joint and finish using TIG welding
9. Demonstrate the ability to properly fit-up, tack, and TIG weld butt joints using stainless steel

Course Outcome(s):

Discuss the quality of welding finishes required for food grade sanitary environments including fabrication and cutting techniques.

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 characteristic of dairy grade welding finishes
2. Explain the application of standards enforced by the United States Department of Agriculture (USDA) regarding food and dairy finishes.
3. List the various types of equipment used for cutting stainless steel.
4. Explain the process of creating a job plan for stainless steel that includes layout, cutting, welding, and fabricating material used in food service.
5. Interpret manufacturer specifications and charts used in determining tool capacity for stainless steel.
6. Differentiate between mild steel and stainless steel.
7. Explain the difference between food grade and dairy grade finishes used in the stainless steel industry.

Course Outcome(s):

Discuss the importance of accuracy and attention to detail when working with food service equipment and components.

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 general layout techniques employed in food service industry construction.
2. Explain the importance of grain continuity in stainless and discuss methods of maintaining it.
3. Discuss bend allowance and explain its relevance in layout procedures.
4. Define "square", "acute" and "radius" and discuss layout procedures and techniques used to establish them.
5. Describe the procedures used to create round corners in stainless steel.
6. Establish patterns used in laying out sheet metal components and articulate the need.
7. Describe how to weld seams and edges with respect to specified finishes

Course Outcome(s):

Select the proper bases on job specifications, establish the correct die length and adjust the welding equipment for structural welding, required for fabricating power press punches used in food service.

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 the different power press punches and materials used in power punch fabrication.
2. Identify the various radii used in punch fabrication and match with the respective stainless gauges.
3. Interpret drawing profiles to establish layout specifications.
4. Match shelf profiles with required power punch and die lengths.
5. Center flat and round bar for correct fit-up.
6. Tack weld punch materials to hold components in correct position during welding.
7. Stitch weld the assembly in accordance with structural specifications.
8. Finish the welded assembly to be weld spatter free.

Course Outcome(s):

Discuss the operations employed in weld cleaning and passivation of stainless steel joints and describe the equipment and materials used, demonstrating practical applications of the operations

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 terms used specific to weld cleaning operations.
2. Describe the specialized equipment used to perform weld cleaning and passivation operations for stainless steel.
3. Differentiate between weld cleaning and passivation.
4. Identify the chemical solvents used in weld cleaning.
5. Explain the operation of the specialized equipment used in weld cleaning.

Course Outcome(s):

Identify the various building standards related to grease duct fabrication and discuss the importance of careful pre-fabrication planning to eliminate potential pocket forming grease traps resulting from excessive connection joints.

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 general requirements for grease duct installation as prescribed by the industry standards and the Sheet Metal Air Conditioners Contractors National Association. (SMACNA)
2. Explain the function of the kitchen exhaust duct and describe the installation procedures required.
3. Discuss special considerations for interconnecting ductwork including hoods and penetrations.
4. List and explain the types of grease duct enclosures required to comply with safety standards.
5. Explain the conditions required for access openings.
6. Explain the function of Air Pollution Control. (APCU)

Methods of Evaluation:

1. Quizzes
2. Tests
3. Class participation
4. Welding operations
5. Students must demonstrate the ability to perform welding operations as stated in the outcomes and objections of this course and in accord with industry standards.

Course Content Outline:

1. Food Service: Applications and Welding
 - a. Terminology
 - i. Food service
 - ii. Bending allowance
 - iii. Material allowance
 - iv. Stainless steel
 - v. Austenic
 - vi. Impermeable
 - vii. Chromium
 - viii. Annealed
 - ix. Bend deduction
 - x. Bend dimensions
 - xi. Outside dimension
 - xii. Inside dimension
 - xiii. Bend angle
 - xiv. Acute angle bend
 - xv. Fit-up
 - xvi. Stretch-out
 - xvii. Finishing
 - b. Applications
 - i. Food industry
 1. Tables
 2. Counters
 3. Cook kettle

4. Fryers
5. Walls
6. Doors
- ii. Industrial
 1. Corrosive
 - a. High
 - b. Moderate
 2. Mechanical
 - a. Flexible
 - b. Ductile
 3. Shaker tables
 4. 400 series
- iii. General purpose
 1. Non-corrosive
 2. Longevity
- c. Stainless steel
 - i. Type: standard
 1. Unified numbering system UNS S30400
 2. AISI 304
 - ii. Type: corrosive areas
 1. UNS S31600
 2. AISI 316
 - iii. Type: Magnetic
 1. Mechanical operations
 2. UNS S43000
 3. AISI 430
 - iv. AISI 304H
 1. Higher carbon content
 2. Ductility
 3. Mechanical housing
 - v. AISI 304L
 1. Low carbon content
 2. Better corrosive resistant
 - vi. AISI 317LX
 1. Highest non corrosive
 2. Waste treatment plants
- d. Properties of stainless steel
 - i. Composition
 1. Carbon
 2. Manganese
 3. Silicone
 4. Chromium
 5. Nickle
 6. Phosphorous
 7. Sulphur
 8. Molybdenum
 - ii. Corrosive resistant
 - iii. Ductability
 - iv. Magnetic
 - v. Non magnetic
 - vi. Hardness
- e. Finishes and product types
 - i. #2B
 1. Cold rolled
 2. Annealed
 3. Unpolished
 4. Smooth surface
 - ii. #3

1. Polished
2. Coarse
- iii. #4
 1. Bright satin finish
 2. Polished
 3. Grained
- iv. #7
 1. Bright finish
 2. Chrome highlighted
- v. #8
 1. Mirror appearance
 2. Buffed
- f. Bend radii significance
 - i. Custom fit
 - ii. Bend allowance
 - iii. Radii dimensions
 1. Inside
 2. Outside
- g. Radii calculation and layout
 - i. Finish dimension
 - ii. Layout
 1. Inside
 2. Outside
 - iii. Mean diameter
 1. Center dimension
 2. Material thickness
 - iv. Bend allowance: $\pi(R+T)$ (A/180)
 1. $\pi = 3.14$
 2. R=bend radius
 3. T=plate thickness
 4. A=bend angle
 - v. Square bends
 1. Leaf brake
 2. Press brake
 - vi. Acute angle bends
 - vii. Parallel line development
 - viii. Round corner layout
- h. Butt weld joint and finish
 - i. Fit-up
 1. Root opening determination
 2. Material thickness/full penetration
 - ii. Tacking
 1. Clamping
 2. Number required/material thickness
 - iii. Finish
 1. Small tack
 2. Cleanest finish weld
 3. Re-align tack as required
- i. TIG weld/Butt joint
 - i. Material
 1. Stainless finished
 2. Stainless non finished
 - ii. Wire selection
 1. Alloy
 2. Wire diameter
 - iii. Fit-up and tack
 - iv. Equipment set up
 1. Amperage
 2. Voltage

- 3. Wire feed speed
 - 4. Polarity
 - v. Weld technique
 - 1. Tacking
 - 2. Clamping
 - 3. Stitch weld
 - 4. Staggered weld/cooling
 - 5. Neat and clean
 - 6. Peening weld
 - a. De-stressing/stretch weld
 - b. Eliminate material distortion
2. Welding finishes: fabrication and cutting
- a. Dairy grade finish
 - i. Inclusion free
 - ii. Perfect finish
 - iii. Food contact
 - iv. High polish
 - v. Warp free
 - vi. Ponding free
 - b. USDA standards
 - i. Visual
 - ii. Bacteria free
 - iii. Strictly enforced
 - iv. Constantly monitored
 - c. Cutting equipment for stainless steel
 - i. Plasma
 - 1. Hand held
 - 2. Machine driven
 - ii. Water jet
 - 1. High pressure
 - 2. Flame free
 - iii. Laser table
 - iv. Computer numerical control (CNC)
 - v. Punches
 - vi. Sheer
 - vii. Hand operated
 - 1. Unisheer
 - 2. Double cut
 - 3. Abrasive wheel
 - d. Job plan
 - i. Layout
 - 1. Drawings
 - 2. Dimensions
 - ii. Cutting
 - 1. Tolerances
 - 2. Dimensions
 - 3. Procedure
 - iii. Fit-up
 - iv. Welding
 - 1. Finish determination
 - 2. TIG
 - 3. MIG
 - 4. Stick
 - v. Fabrication
 - 1. Food service
 - 2. Structural
 - 3. Fasteners

- a. Removal
 - b. Non-removal
 - c. Stainless steel bolts
- e. Tool capacity
 - i. Manufacturers specifications
 - 1. Material gage capacity
 - 2. Material type
 - 3. Mild steel based
 - ii. Charts
 - 1. Punch
 - a. Hole diameter
 - b. Capacity of punch
 - c. Material thickness
 - d. Tool rating
 - 2. Safety
 - a. Hazard prevention
 - b. Tool failure
 - c. Personal injury
- f. Mild steel versus stainless steel
 - i. Mild steel
 - 1. High carbon content
 - 2. Application
 - a. More ductile
 - b. Conveyor motors
 - c. Cost reduction
 - d. Non- food grade environment
 - ii. Stainless steel
 - 1. Low carbon
 - 2. Application
 - a. Food grade environment
 - b. Corrosive environment
 - 3. Work-ability
 - 4. Weld ability
 - 5. Finishing
- g. Food grade versus dairy grade
 - i. Food grade
 - 1. Exposed seams
 - 2. Exposed weld
 - 3. Facility dependent
 - ii. Dairy grade
 - 1. No exposed seams/welds
 - 2. Labor intensive
 - 3. Dairy product manufacture
 - 4. costly
- 3. Food Service: accuracy and detail
 - a. Layout techniques
 - i. Interpret technical drawings
 - 1. Dimensions
 - 2. Cut sizes
 - 3. Material identification
 - 4. Weld requirements
 - 5. Finish requirements
 - a. Food grade
 - b. Dairy grade
 - c. Unfinished
 - 6. Seam location
 - ii. Manual
 - 1. Mark
 - 2. Square
 - 3. Dimension transfer

- 4. Finished component size
- 5. Tools
 - a. Square
 - b. Scratch awl
 - c. Punch
 - d. Fine marker
 - e. Divider
 - f. Tape, ruler, scale
 - g. Soap stone
- iii. Electronically generated
 - 1. Computer aided drawing (CAD)
 - a. Layout transfer
 - b. Dimension calculated
 - 2. Plasma table
- iv. Hole pattern
- b. Grain continuity
 - i. Type
 - 1. Bright
 - 2. Bright satin
 - 3. Dull
 - 4. Mirror
 - ii. Seam location and limitations
- iii. Weld
 - 1. Finish
 - 2. Re-grain to match
- iv. Appearance
- v. Sanitary
- vi. Alignment
- vii. Maintenance of grain
 - 1. Backing material
 - 2. Protection
- c. Bend allowance
 - i. Material thickness
 - ii. Die and punch
 - 1. Die opening equal to eight times material thickness
 - 2. Punch capacity rating
 - iii. Fit-up importance
 - iv. Accuracy and appearance
- d. Square, Acute, and Radius
 - i. Square
 - 1. Sharp corners
 - 2. Material thickness consideration
 - 3. Inside dimension
 - 4. Outside dimension
 - ii. Acute
 - 1. Less than 90 degrees
 - 2. Angle adjustment
 - iii. Radius
 - 1. Commonly used
 - 2. Girth of bend
 - 3. Stretch-out radius bend
 - 4. Neutral diameter
- e. Round corner layout
 - i. Circumference divided by 4
 - ii. Girth equals circumference divided by 4 equals stretch-out
 - iii. Die line
 - 1. Center of die
 - 2. Stretch-out
 - iv. Pre-manufactured corner

- f. Layout patterns and need
 - i. Bends
 - ii. Bends allowance
 - iii. Holes
 - iv. Multi use
 - v. Articulated need
 - 1. Accuracy
 - 2. Efficiency
 - 3. Productivity
- g. Weld: seam and finish
 - i. Industry application
 - ii. Per job requirements
 - iii. Contract documents and details
- 4. Power Punch Press
 - a. Materials
 - i. Flat stock
 - 1. One-half inch
 - 2. Three quarters inch
 - ii. Round stock
 - 1. One and one quarter inch common
 - 2. Varies
 - b. Radius round stock and stainless gauge
 - i. One-quarter inch thru one inch
 - ii. Gauge of stainless chart
 - c. Drawing profiles
 - i. Stretch out measurements
 - ii. Width
 - iii. Length
 - iv. Finish dimensions
 - v. Inside/outside radius
 - vi. Inside/outside dimensions
 - vii. Cut size
 - d. Punch profile and punch length
 - i. Drawing specifications
 - ii. Profile finish length
 - iii. Material lengths
 - e. Punch fabrication
 - i. Fit-up
 - ii. Clamping
 - iii. Center alignment
 - f. Tack weld
 - i. Secure material
 - ii. Component alignment
 - g. Stitch weld
 - i. Stagger for distortion control
 - ii. Cooling between welds
 - iii. Structural integrity
 - h. Weld finishes
 - i. Spatter free
 - ii. Sand and buff
 - iii. De-burr
- 5. Weld cleaning and passivation
 - a. Terminology
 - i. Weld cleaning
 - ii. Passivation
 - iii. Mechanical procedure
 - iv. Chemical cleaning
 - v. Surface contaminate
 - vi. Chromium

- vii. Ferric oxide
- viii. Neutralize
- ix. Non-woven surface disc
- x. Residual
- b. Weld cleaning equipment
 - i. Ground clamp
 - ii. Electrical wand
 - iii. Brush tip
 - iv. Power supply
 - v. Cleaning cloth
 - vi. Converter box
- c. Weld cleaning and passivation
 - i. Weld cleaning
 - 1. Decontaminating weld
 - 2. Electro cleaning
 - 3. Decolorizing weld
 - ii. Passivation
 - 1. Chromium restoration
 - 2. Removes ferric oxide
 - 3. Allows chromium layer to form
 - iii. Chemical solvents
 - 1. Neutralize
 - 2. Electro-pickler
- d. Specialized equipment operator
 - i. Ground clamp
 - ii. Generate charge
 - iii. Saturate felt
 - iv. Weld treatment
 - v. Neutralize acid
 - vi. Clean and buff
- 6. Grease ducts
 - a. General requirements, local codes
 - i. Clearance to combustibles
 - ii. Access
 - 1. Inspection
 - 2. Maintenance
 - iii. Dimensional stability
 - 1. Limited welding
 - 2. Distortion control
 - iv. Air containment
 - 1. Leakage control
 - 2. Air-tight weld
 - v. Vibration and noise
 - 1. Isolation barriers
 - 2. Pads
 - 3. Insulation
 - vi. Exposure
 - 1. Damage
 - 2. Weather
 - 3. Temperature extremes
 - vii. Support reinforcement
 - 1. Seams
 - 2. Flanges
 - 3. Hangers
 - 4. Bracing
 - 5. Structural components
 - 6. Job specific
 - 7. Seismic restraint
 - 8. Thermo conductivity

- a. Heat gain
- b. Heat loss
- c. Condensation control
- b. Duct installation
 - i. Exhaust to exterior
 - 1. Cooking heat
 - 2. Grease vapor
 - ii. Type I hoods
 - 1. Continuously welded
 - 2. Liquid tight
 - 3. Properly sized
 - iii. Grease build-up prevention
 - 1. Fire resistant
 - 2. Material thickness
 - a. Sixteen gauge steel
 - b. Eighteen gauge stainless steel
 - c. Non-penetrating suspension
 - d. Installation ponding free
 - e. Rectangular duct fabrication
- c. Interconnecting ductwork
 - i. Hoods
 - 1. Supply air
 - a. Sealed
 - b. Pressure control
 - 2. Grease filters
 - 3. Fresh air
 - 4. Exhaust air
 - ii. Limited number of turns
- d. Duct enclosures
 - i. Gypsum board
 - ii. Plaster
 - iii. Ceramic tile flue
- e. Access openings
 - i. Tight fitting
 - ii. Fire resistant rating
 - iii. Local codes
- f. APCU
 - i. Function/removal
 - 1. Oil vapor
 - 2. Grease particles
 - 3. Smoke
 - 4. Odors
 - ii. Clean/scrub air

Resources

International Training Institute. *Industrial Sheet Metal and Welding* . 2007 . International Training Institute: Fairfax, Virginia, 2014.

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Resources Other

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