ATSM-2821: SPECIAL TOPICS IN INDUSTRIAL III FOOD SERVICE

Cuyahoga Community College

Viewing: ATSM-2821 : Special Topics in Industrial III Food Service

Academic Term:
Summer 2019

Subject Code
ATSM - Applied Ind Tech- Sheetmetal

Course Number:
2821

Title:
Special Topics in 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

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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

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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.

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

1. Type: Magnetic
a. Mechanical operations
b. UNS S43000
c. AISI 430
2. AISI 304H
a. Higher carbon content
b. Ductility
c. Mechanical housing
3. AISI 304L
a. Low carbon content
b. Better corrosive resistant
4. AISI 317LX
a. Highest non corrosive
b. Waste treatment plants
5. Properties of stainless steel
a. Composition
i. Carbon
ii. Manganese
iii. Silicone
iv. Chromium
v. Nickle
vi. Phosphorous
vii. Sulphur
viii. Molybdenum
b. Corrosive resistant
c. Ductability
d. Magnetic
e. Non magnetic
f. Hardness
6. Finishes and product types
a. #2B
i. Cold rolled
ii. Annealed
iii. Unpolished
iv. Smooth surface
b. #3

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

iii. Wire feed speed
iv. Polarity

e. Weld technique
i. Tacking
ii. Clamping
iii. Stitch weld
iv. Staggered weld/cooling
v. Neat and clean
vi. Peening weld
1. De-stressing/stretch weld
2. Eliminate material distortion

1. 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

1. USDA standards
a. Visual
b. Bacteria free
c. Strictly enforced
d. Constantly monitored

2. Cutting equipment for stainless steel
a. Plasma
i. Hand held
ii. Machine driven
b. Water jet
i. High pressure
ii. Flame free
c. Laser table
d. Computer numerical control (CNC)
e. Punches
f. Sheer
g. Hand operated
i. Unisheer
ii. Double cut
iii. Abrasive wheel

3. Job plan
a. Layout
i. Drawings
ii. Dimensions
b. Cutting
i. Tolerances
ii. Dimensions
iii. Procedure
c. Fit-up
d. Welding
i. Finish determination
ii. TIG
iii. MIG
iv. Stick
e. Fabrication
i. Food service
ii. Structural
iii. Fasteners

1. Removal
2. Non-removal
3. Stainless steel bolts

4. Tool capacity
   a. Manufacturers specifications
      i. Material gage capacity
      ii. Material type
      iii. Mild steel based
   b. Charts
      i. Punch
         1. Hole diameter
         2. Capacity of punch
         3. Material thickness
         4. Tool rating
      ii. Safety
         1. Hazard prevention
         2. Tool failure
         3. Personal injury
5. Mild steel versus stainless steel
   a. Mild steel
      i. High carbon content
      ii. Application
         1. More ductile
         2. Conveyor motors
         3. Cost reduction
         4. Non- food grade environment
   b. Stainless steel
      i. Low carbon
      ii. Application
         1. Food grade environment
         2. Corrosive environment
      iii. Work-ability
      iv. Weld ability
      v. Finishing
6. Food grade versus dairy grade
   a. Food grade
      i. Exposed seams
      ii. Exposed weld
      iii. Facility dependent
   b. Dairy grade
      i. No exposed seams/welds
      ii. Labor intensive
      iii. Dairy product manufacture
      iv. costly

1. 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

2. 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

3. 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
4. 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.

American welding society education department. *Welding Inspection Technology* . fifth edition. 2008.

American Welding Society. *AWS D9.1M/D9.12012 AWS D1.1 Sheet Metal Welding Code Book*. American Welding Society, Doral, Florida, 2015 .

Resources Other

http://www.weld (http://www.weldersuniversity.com/welding_symbols.html)ttp://www.metallicfusion.com/symbols_and_definitions.htmersuniversity.com/welding_symbols.html (http://www.weldersuniversity.com/welding_symbols.html)

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