

ATLB-2220: PLASTIC PIPE FUSION II

Cuyahoga Community College

Viewing: ATLB-2220 : Plastic Pipe Fusion II

Board of Trustees:

May 2021

Academic Term:

Fall 2021

Subject Code

ATLB - AIT-Construct/Hazard Material

Course Number:

2220

Title:

Plastic Pipe Fusion II

Catalog Description:

Advanced US Department of Transportation (USDOT) qualification course covering polyethylene pipe, types, uses and installation techniques. Included are various pipe connections using heat and electro fusion.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Departmental approval: admission to Construction Tending and Hazardous Materials Abatement apprenticeship program and/or a member in good standing with the Ohio Laborers Union.

Outcomes

Course Outcome(s):

I. Discuss the various types of plastic pipe and pipe fittings and joints that are used, and the industry standards required for installation.

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. Review the USDOT standards for installation of plastic pipe and explain requirement for worker qualification.
2. Define the terms used in plastic pipe fusion.
3. List the different types of plastic pipe including grade, size and different fittings.
4. Differentiate between high and medium density pipe.
5. Identify the different methods used to join plastic pipe and pipe fittings.
6. List the different uses for plastic pipe.
7. Identify the different equipment used for plastic pipe fusion.

Course Outcome(s):

II. Discuss the operation of the Hydraulic Butt Fusion Machine including the different models available, the pre-operational checks, and respective clamping inserts with respect to pipe diameters.

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 Hydraulic Butt Fusion Machines and state the application of each.
2. Identify the components of the Butt Fusion Machine and explain the function of each.
3. Describe the operation of the machine and explain the importance of matching the correct clamping inserts with the respective pipe diameter.
4. Differentiate between the Hydraulic Butt Fusion Machine and the Manual Butt Fusion Machine.
5. Explain the importance of pre-operational checks and list the different inspection points.
6. Discuss maintenance procedures for the Butt Fusion Machine and identify wear points.

Course Outcome(s):

III. Demonstrate the ability to join plastic pipe using different fusion techniques and equipment.

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. Differentiate between butt and electro fusion joining procedures.
2. Discuss the set up and operation of the respective equipment.
3. List the procedural steps required for each technique.
4. Identify the different clamping techniques and equipment that are used.
5. Discuss fusion preparation procedures including pipe cleaning, alignment and positioning.
6. Discuss the safety hazards related to pipe fusion including heat and electrical dangers and physical concerns.
7. Set-up and inspect the carriage unit of the Butt Fusing Machine used for joining plastic pipe.
8. Position plastic pipe for joining and verify compatibility and alignment.
9. Follow pipe manufacturer and owner specifications for proper fusion.
10. Fuse the plastic pipe creating proper double roll back bead.
11. Pressurize and service plastic pipe after specified cooling time.

Methods of Evaluation:

1. Quizzes
2. Tests
3. Class participation
4. Student must demonstrate the ability to fuse plastic pipe in accordance with industry standards.

Course Content Outline:

1. Plastic pipe and USDOT standards
 - a. USDOT standards
 - i. Qualifying joining procedures
 - ii. Qualified worker
 - iii. Joint inspection
 1. Bend test
 2. Visual
 - iv. Test conditions
 1. Pressures
 2. Pipe type
 3. Hazardous leaks
 4. Thermoplastic temperature
 - v. Qualified person
 1. Training and experience
 2. Testing
 3. Requalification's
- b. Terminology

- i. Polyethylene
- ii. Butt fusion
- iii. Medium density
- iv. High density
- v. Standard dimension ratio
- vi. Copper tubing size
- vii. Electrofusion
- viii. Iron pipe size
- ix. Ductile
- x. Wall thickness
- xi. Mechanical joints
- xii. Socket fusion
- xiii. Saddle fusion
- xiv. Maximum allowance operating pressure
- xv. Squeeze off
- c. Types of plastic pipe
 - i. Grade
 - 1. High density
 - 2. Medium density
 - ii. Size
 - 1. Diameter
 - 2. Wall thickness
 - 3. Coiled
 - 4. Stick
 - iii. Fittings
 - 1. Couplings
 - 2. Saddle
 - 3. Tees
- d. Pipe density
 - i. High
 - 1. Temperature
 - 2. Pressure
 - ii. Medium
 - 1. Uses
 - 2. Limitations
- e. Joining methods
 - i. Butt fusion
 - ii. Adhesives
 - iii. Electro fusion
 - iv. Mechanical fittings
- f. Plastic pipe transmissions
 - i. Gas
 - ii. Liquids
 - iii. Storm and waste water
- g. Equipment
 - i. Clamping
 - ii. Pipe preparation
 - iii. Alignment
 - iv. Heater plates
 - v. Electro fusion unit
 - vi. Pyrometer
- 2. Butt Fusion Machine
 - a. Models
 - i. McElroy 28
 - 1. Pipe diameter range 2" to 8"
 - 2. High or low force cylinder
 - ii. McElroy 412
 - 1. Pipe diameter range 4" to 12"
 - 2. High, medium or low force cylinder

- iii. Trasstac 28
 - 1. Track travel
 - 2. 2" to 8" diameter
- b. Components
 - i. Clamp inserts
 - ii. Facer
 - iii. Heater plate
 - iv. Hydraulic selector valves
 - v. Carriage control
- c. Machine operation
 - i. Pipe installation to assembly
 - ii. Secure pipe
 - iii. Pipe facing
 - iv. Heating operation
 - v. Join pipe with required force
 - vi. Maintain pipe position per manufacturer specification
- d. Hydraulic vs. manual
 - i. Hydraulic
 - 1. Carriage unit –automatic
 - 2. Permanent attachment of facing component
 - 3. Hydraulic force
 - 4. Expensive
 - 5. Pre-designated pressure
 - 6. Quality pipe joint
 - ii. Manual
 - 1. Economical
 - 2. Electrically operated
 - 3. Time intensive
- e. Pre-operational check
 - i. Electrical supply
 - 1. Adequate voltage/amperage
 - 2. Grounded
 - ii. Machine set-up
 - 1. Safe location
 - 2. Free from environmental danger
 - iii. Clean
 - 1. Free of contaminates
 - 2. Operational efficiency
 - iv. Clamping inserts
 - 1. Proper size
 - 2. Secured position
- f. Maintenance
 - i. Wear points
 - 1. Hydraulics
 - 2. Braking
 - 3. Tires
 - 4. Clamping
 - ii. Hydraulics
 - 1. Hose
 - 2. Fittings
 - 3. Fluids
 - iii. Clamping inserts
 - 1. Size
 - 2. Free from foreign matter/contaminates
 - iv. Braking system
 - 1. Lubrication
 - 2. Locking mechanism
 - v. Tires

1. Proper inflation
 2. Nicks, gauges, damage
 3. Tread quality
3. Plastic pipe fusion
 - a. Butt versus electro fusion
 - i. Advantages
 - ii. Costs
 - iii. Ambient temperatures
 - b. Equipment/butt fusion
 - i. Clamping jaws
 - ii. Heater plate
 - iii. Facing machine adjustments
 - iv. Maintenance
 - c. Electro fusion equipment set up
 - i. Clamping
 - ii. Power source
 - iii. Positioning
 - iv. Equipment programing
 - v. Temperature controls
 - d. Clamping equipment
 - i. Positioning
 - ii. Pipe diameter
 - e. Pipe preparation
 - i. Cleaning
 - ii. Scraping
 - iii. Squaring
 - iv. Alignment
 - f. Safety hazards
 - i. Electrocution
 - ii. Fire
 - iii. Cuts
 - iv. Burns
 - g. Carriage unit: set-up and inspection
 - i. Set-up
 1. Location
 - a. In trench
 - b. Outside trench
 - c. Atmosphere condition
 - d. Pipe proximity
 - e. Component attachment
 - f. Clamping inserts
 - ii. Inspection
 1. Machine cleanliness
 2. Heater plate
 3. Proper electrical
 - a. Amperage
 - b. Voltage
 4. Clamping inserts
 5. Lubrications
 6. Tire and tracks
 7. Free movement
 - h. Pipe positioning
 - i. Compatibility
 1. Matching wall thickness
 2. Pipe density
 - ii. Alignment
 1. Pipe diameter
 2. Square face
 3. High/low adjustment

- i. Fusion
 - i. Pipe manufacturer specification
 - 1. Temperature range
 - a. Greater than 400 degrees F
 - b. Less than 450 degrees F
 - 2. Heat/soak cycle
 - 3. Open/close time
 - 4. Cooling time
 - 5. Pressure testing
 - ii. Owner specification
 - 1. Designated pipe
 - 2. Joining method
 - a. Butt
 - b. Manual
 - c. Mechanical
 - d. Electro
 - e. Socket
 - f. Saddle
 - iii. Equipment type
- j. Pipe fusion
 - i. Heat
 - ii. Bead
 - iii. Inspection
- k. Pipe pressurization and service
 - i. Pressurization
 - 1. Air
 - 2. Water
 - 3. Cooling
 - 4. Test
 - a. Air
 - b. Hydrostatic
 - ii. Service
 - 1. Final inspection
 - 2. Air purging
 - a. Verification
 - b. Natural gas presence

Resources

Drexel J. Thrash Training Center. *Plastic Pipe Fusion Manual*. Howard, Ohio; Drexel J. Thrash Training Center, 2010.

Plastic Pipe Institute. *Handbook of PE Pipe*. second edition. Irving, Texas: Plastic Pipe Institute, 2008.

Michael Maskrey. *The City and Guilds Textbook: Plumbing Book I*. current. London UK; Hodder Education, 2019.

Thomas W. Frankland. *The Pipefitters and Pipe Welders Handbook*. Second edition. London, UK; Bailey Bros and Swinfen, LTD, 1985.

Resources Other

<https://www.law.cornell.edu/cfr/text/49/192.283>

<https://www.ferguson.com/content/jobsite-solutions/pipe-fusion-training> (<https://www.ferguson.com/content/jobsite-solutions/pipe-fusion-training/>)

<https://isco-pipe.com/wp-content/uploads/2019/08/...>

Top of page

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