📘 LESSON PACKET

Tubing Preparation & Brazing Setup Fundamentals

TMM Academics – Sealed System Training

📌 Lesson Overview

This lesson explains the essential preparation steps required before brazing refrigeration tubing. Students will learn how to properly cut, ream, clean, and prepare tubing to prevent restrictions, leaks, and contamination. Proper preparation is the foundation of every successful sealed system repair.

🔹 Section 1: Understanding Tubing Preparation

Before brazing, tubing must be properly prepared. Even if the brazing technique is correct, poor preparation will result in weak joints or leaks.

Preparation includes cutting, reaming, cleaning, and ensuring proper fit between tubing sections.

Key Point:
Preparation is more important than the actual brazing process.

🔹 Section 2: Swaging Tubing

Swaging is the process of expanding one tube so another tube can fit inside it.

This creates a proper connection between two pieces of tubing without the need for additional fittings. Copper and aluminum tubing can be swaged, but steel cannot.

🔹 Section 3: Cutting and Reaming Tubing

When tubing is cut, the inside diameter becomes restricted.

A reaming tool must be used to remove the internal burr and restore proper flow. If this step is skipped, a partial restriction is created, which affects system pressures and performance.

Section 4: Preventing Contamination

When reaming tubing, metal shavings can be created.

The tubing should always be held in a position that prevents debris from falling inside. Contamination inside the system can lead to restrictions and long-term failure.

Section 5: Cleaning the Tubing

After cutting and reaming, tubing must be cleaned.

Sanding the tubing removes oxidation, dirt, and oil, exposing clean, shiny metal. This allows the solder to properly bond to the surface.

Section 6: Avoiding Moisture and Oil

Technicians must avoid contaminating tubing during preparation.

- Do not blow into tubing (introduces moisture)
- Do not touch cleaned surfaces with hands
- Keep tubing clean and dry

Moisture and oil prevent proper bonding and can damage the sealed system.

Section 7: Importance of Proper Fit

Tubing should fit together properly before brazing.

If the joint is too tight, solder may not flow properly. If the gap is too large, excessive solder may be used, which can create restrictions.

Proper fit ensures a strong and sealed connection.

Section 8: Capillary Action in Brazing

Brazing relies on capillary action, where heat draws the solder into the joint.

The actual seal is formed inside the joint, not just on the outside surface. A smooth outer appearance helps confirm a proper seal.

Key Point:
A good-looking joint does not guarantee a proper internal seal, but it is a strong indicator.

Section 9: Nitrogen Pressure Testing

After brazing, nitrogen is used to check for leaks.

Pressurizing the system allows leaks to be detected externally. This is preferred over pulling a vacuum first, which can draw moisture into the system if a leak exists.

Section 10: Why Not Skip Nitrogen Testing

If a vacuum is pulled on a leaking system, outside air and moisture will be drawn into the system.

This contaminates the system and can lead to future failures. Nitrogen testing ensures the system is sealed before evacuation.

Section 11: Flux and Its Purpose

Flux is used to improve brazing performance, especially when working with dissimilar metals like copper and steel.

It helps:

- Reduce oxidation
- Improve solder flow
- Create stronger bonds

Flux is not always required for copper-to-copper, but it can still be used.

🔹 Section 12: Heat Control and Oxidation

Excessive heat increases oxidation inside the tubing.

The longer the tubing is heated, the more contamination is created. Proper technique involves heating quickly and completing the joint efficiently.

🔹 Section 13: Real-World Service Impact

Poor preparation leads to:

- Refrigerant leaks
- System contamination
- Repeat service calls

Technicians must take the time to properly prepare tubing, especially when performing high-cost repairs.

🔹 Section 14: Final Understanding

Preparation is the foundation of sealed system work.

Even the best brazing technique cannot compensate for poor preparation. Taking extra time during setup ensures long-term system reliability.

📝 Review Questions

Multiple Choice

1. What is the purpose of reaming tubing?
   A. Increase pressure
   B. Remove internal restriction

C. Add refrigerant
D. Clean oil

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2. Why should tubing not be blown out with your mouth?
   A. It cools the pipe
   B. It introduces moisture
   C. It removes debris faster
   D. It increases pressure

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3. What does capillary action do in brazing?
   A. Pushes refrigerant
   B. Draws solder into the joint
   C. Increases heat
   D. Reduces pressure

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4. Why is nitrogen used before pulling a vacuum?
   A. Increase pressure
   B. Remove refrigerant
   C. Check for leaks
   D. Cool the system

Short Answer

5. Why is proper tubing cleaning important before brazing?
6. What can happen if metal shavings enter the system?

Scenario-Based

7. A technician skips reaming after cutting tubing and completes the repair. What issue is likely to occur and why?

✅ Answer Key

1. B – Remove internal restriction
2. B – It introduces moisture
3. B – Draws solder into the joint
4. C – Check for leaks
5. To ensure proper bonding and prevent leaks
6. They can cause restrictions and system failure
7. A restriction will form, affecting system performance and pressures