



LESSON PACKET

Copper Tubing Bending & Installation Techniques

TMM Academics – Sealed System Training

◆ Lesson Overview

This lesson explains how to properly bend copper tubing using tubing benders and how to duplicate existing refrigeration lines. It focuses on accuracy, direction control, and professional installation techniques that improve system performance and reduce vibration and noise.

◆ 1. Why Tubing Bends Matter

Tubing in a sealed system is not just for routing refrigerant.

👉 It also:

- Reduces vibration
 - Prevents noise transfer
 - Protects connections from stress
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Example:

Loops in suction lines act like springs to absorb compressor vibration

◆ 2. When You Need to Bend Tubing

You will commonly bend tubing when:

- Replacing a compressor
- Using aftermarket parts

- Repairing damaged lines
 - Re-routing tubing
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👉 Proper bending = proper fit and function

◆ 3. Types of Tubing Benders

90° Bender

- Creates large sweeping bends
 - Used for standard turns
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180° Bender

- Creates tight radius bends
 - Used for loops and compact layouts
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👉 Different tools = different bend radius and control

◆ 4. Tubing Sizes

Common refrigeration tubing sizes:

- 1/4 inch
 - 5/16 inch
 - 3/8 inch
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👉 Always match tubing size to bender groove

◆ 5. Key Bending Principles

DO NOT pre-cut tubing too short

👉 Tubing changes length during bending:

- Inside compresses
 - Outside stretches
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Best Practice:

👉 Bend first → cut last

◆ 6. Marking the Tube

To duplicate a pipe:

- Align old pipe with new pipe
 - Mark **outside of each bend**
 - Mark all the way around tube
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👉 Full marking makes alignment easier during bending

◆ 7. Direction Control (MOST IMPORTANT SKILL)

Biggest challenge:

👉 Which way will the tube bend?

Rule:

Before bending:

- ✓ Hold tool in position
 - ✓ Visualize bend direction
 - ✓ Double-check orientation
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👉 Think BEFORE you bend

◆ 8. Making the Bend

Steps:

1. Insert tubing into correct groove
 2. Align mark with bending point
 3. Hold tool in correct direction
 4. Bend slowly to desired angle
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Common Angles:

- 45°
 - 90°
 - 180°
-
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◆ 9. Comparing to Original Tube

After each bend:

- Compare to original
 - Adjust slightly by hand if needed
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👉 Small corrections are normal

◆ 10. Professional Appearance

Clean tubing = professional work

Avoid:

- ✗ Sharp kinks
 - ✗ Uneven bends
 - ✗ Burn marks
 - ✗ Poor routing
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👉 Clean work builds customer confidence

◆ 11. Common Mistakes

- ✗ Bending wrong direction
 - ✗ Cutting tubing too short
 - ✗ Not marking tube
 - ✗ Using wrong size bender
 - ✗ Rushing bends
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◆ 12. Field Insight

Even if tubing works:

👉 If it looks unprofessional → customer loses confidence

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- ✓ Clean bends
 - ✓ Proper routing
 - ✓ Correct alignment
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13. HANDS-ON APPLICATION (STUDENT TASK)

Follow the Video & Recreate the Tubing

Objective:

Duplicate a multi-bend copper tube similar to the one demonstrated in the video.

Tools Required

- Tubing bender (90° and/or 180°)
 - Copper tubing (3/8" recommended)
 - Marker
 - Tape measure (optional)
 - Reference pipe (or image from video)
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Tubing Layout (From Video)

Students should recreate a pipe with:

- Multiple 90° bends
- One 180° bend
- One 45° bend
- Offset and directional changes

👉 Focus on:

- Direction of bends
 - Alignment
 - Smooth curves
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Procedure

1. Lay tubing next to reference image or sample
 2. Mark each bend location
 3. Confirm bend direction BEFORE bending
 4. Make each bend step-by-step
 5. Compare to reference after each bend
 6. Adjust as needed
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Reference Image (FROM VIDEO)

👉 Use a screenshot from your video showing:

- Final completed tubing
 - Or mid-process layout
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(You will insert this image here in your PDF)

Evaluation Criteria

Student tubing should:

- ✓ Match general shape
- ✓ Have smooth bends

- ✓ Follow correct direction
 - ✓ Fit without stress
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Review Questions

Multiple Choice

1. What is the purpose of tubing bends near the compressor?
 - A. Decoration
 - B. Reduce vibration
 - C. Increase pressure
 - D. Store refrigerant
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2. When should tubing be cut?
 - A. Before bending
 - B. After bending
 - C. During bending
 - D. Never
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3. What is the most important step before bending?
 - A. Cutting tubing
 - B. Heating tubing
 - C. Checking direction
 - D. Measuring pressure
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Short Answer

4. Why should tubing be marked all the way around?
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5. What happens if tubing is cut too short?
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Scenario

6. A bend is made in the wrong direction. What should you do?

7. Tubing looks messy but functions correctly. Why is this still a problem?



Answer Key

1. B – Reduce vibration
 2. B – After bending
 3. C – Checking direction
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4. So it can be seen from any angle during bending

5. You may not have enough length to complete the bends

6. Re-bend if possible or restart with new tubing

7. It appears unprofessional and may reduce customer confidence