



# Owner's Manual

## Drum Heating Tunnels Electric Models

MODEL: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_

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**LEWCO, Inc.**

# Warranty

**Drum & Tote Heating Products**

1. Unless separately agreed to otherwise, Warranty is for three (3) years, free from defects of faulty material or workmanship, effective from Buyer's receipt of goods and services.
2. Warranty does not include maintenance items (door gaskets, fan belts, thermocouples, etc.).
3. LEWCO, Inc. will replace or repair equipment proving defective in material or workmanship. Defective parts need to be shipped back to LEWCO, Inc. for inspection, at Buyers cost.
4. Failure due to abuse, overloading, maintenance neglect, exposure to corrosive or abrasive materials, operation under any degree of dampness, or improper use shall not be subject to this warranty.
5. Any modification to equipment or systems without LEWCO, Inc.'s written consent voids this warranty.
6. Standard warranty does not include labor to remove and/or install defective equipment.
7. If LEWCO, Inc.'s service is required for assistance on a warranty claim, labor will be charged at prevailing rate plus travel expenses.
8. LEWCO, Inc. shall not be liable for loss of profits, delays or expenses incurred by failure of said parts, whether incidental or consequential.
9. LEWCO, Inc. shall not be liable for failure of the goods to comply with federal, state or local laws.
10. LEWCO, Inc.'s warranty becomes null and void if payment in full is not received for goods and services.
11. See LEWCO, Inc.'s **GENERAL TERMS AND CONDITIONS** for additional warranty detail.



## INTRODUCTION

Thank you for choosing LEWCO, Inc. for your process heating needs. This manual has been prepared by LEWCO engineers for use in familiarizing personnel with the design, installation, operation and maintenance of your LEWCO Drum Heating Tunnel. Information presented herein should be given careful consideration to assure safe, optimum performance of the equipment. This manual should always be accessible to the operators for quick reference.

This heating tunnel has been designed and manufactured in accordance with applicable National Codes and Standards in effect as of the date of manufacture. It is the responsibility of the end user to update equipment as necessary to comply with future code changes or revisions.

This manual should be used in conjunction with the drawing(s), data sheets, and component manufacturer's literature attached hereto that clarify specific features, installation, utility connections, operation, etc.

If you have any questions regarding this manual or the use of your LEWCO Heating Tunnel, please contact our Industrial Oven department by phone at (419) 502-2780 or by email at [ovensales@lewcoinc.com](mailto:ovensales@lewcoinc.com).

**NOTE:** The information in this manual is subject to change without notice and does not represent an obligation on the part of LEWCO, Inc. LEWCO does not assume any responsibility for any errors that may appear in this manual and under no circumstances will LEWCO be held liable for technical or editorial omissions made herein, nor for direct, indirect, special, incidental, or consequential damages resulting from the use or defect of this manual.



**NOTICE:** No installation or operation of this equipment should take place until this manual has been studied and understood by the person(s) responsible.

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<b>Manual Specific Safety Symbols Definitions</b>	
	Safety Instruction where an electrical hazard is involved.
	Safety instruction where non-compliance would affect safety.
	Safety instruction where non-compliance could potentially cause an explosion.
	Safety instruction where non-compliance could potentially cause a fire.
	Safety instruction relating to safe operation of the equipment (ATTENTION).
	Safety instruction where non-compliance could potentially result in a pinch point or a description of a known existing pinch point.
	Safety instruction where non-compliance could potentially result in a pinch point or a description of a known existing pinch point.
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The signal word "DANGER" is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.
	Is used to describe preferred to address practices not related to personal injury.
<b>Equipment Specific Safety Definitions</b>	
	<b>DANGER:</b> Hazardous voltage will cause severe injury or death. LOCK OUT POWER before servicing.
	<b>WARNING:</b> Potential arc flash hazard.
	<b>CAUTION:</b> Hot surface. Do not touch.
	<b>WARNING:</b> Servicing moving or energized equipment can cause severe injury. LOCK OUT POWER before servicing.
	<b>WARNING:</b> Moving equipment may cause severe injury. Keep Away.
	<b>DANGER:</b> Climbing, sitting, walking or riding on conveyor at any time will cause severe injury or death. Keep Off.

## CONTENT DEFINITIONS:

Arc Flash: An arc flash is a phenomenon where a flashover of electric current leaves its intended path and travels through the air from one conductor to another, or to ground. The results are often violent and when a human is in close proximity to the arc flash, serious injury and even death can occur.

Circulating Fan: The fan used to “move” the air around the workspace in order to more evenly distribute and more efficiently transfer the heat from the heat source to the material.

Heater Box: The insulated box containing the heating elements and circulation blowers. The heater box is USUALLY found on top of the workspace. No material may be placed in the heater box.

SCR: Silicone Control Rectifier, used to control output to the heating elements.

Safety Device: An instrument, a control or other equipment that acts, or initiates action, to cause the unit to revert to a safe condition in the event of equipment failure or other hazardous event.

Temperature Controller: A device that measures the temperature and automatically controls the input of heat into the heating tunnel.

## SECTION 1 – GENERAL INFORMATION

### 1-1 PRODUCT DESCRIPTION

The heating tunnel is an electrically heated system. Resistance electric heating elements are mounted in the heater box located on top of the tunnel. The casing is an insulated mild steel shell. Temperature is controlled by thermocouple actuated electronic temperature controllers.

Process heating applications involve a combination of time and temperature to achieve desired material properties. Although the process can sometimes be pre-determined based on heat transfer calculations and empirical data, these values are an engineering estimate at best. The precise combination of time and temperature, for a specific application, is best determined through actual trial use. By accurately monitoring time, temperature, and material properties closely, in a controlled environment, optimum process parameters can be safely and accurately determined.

### 1-2 SAFETY



**WARNING:** Only properly trained and qualified operators may use this equipment. Improper use may cause equipment damage, injury or death. The control systems are designed to react to system and operator input. Be sure to understand the system reaction before making any system adjustments.

Typically, a heating tunnel is purchased for a specific application. If the application for this equipment has changed, or you have reason to doubt the adequacy of the equipment for the application, consult your LEWCO, Inc. representative for proper use.



## DANGER



- Materials with auto-ignition temperatures below the heating tunnel operating temperature should never be introduced into the tunnel. For some applications, such as those involving solvents, additional nonstandard safety features are required.



- Electric heating tunnels are NOT suitable for heating flammable or combustible materials. Explosion or fire may result from misapplication of this equipment.
- Electric heating tunnels are NOT suitable for installations in electrically classified hazardous areas.



- Disconnect and lockout electrical power and all other sources of energy before performing maintenance. Know where arc flash is possible and take proper precautions.



- Be sure any fan shafts have stopped rotating. Keep body, hands and foreign objects away from the inlet and outlet, and the other moving parts of the fan such as shafts, belts and pulleys.
- Do not walk, ride, or climb on moving conveyor.



## WARNING



- Prior to placing drums in the heating tunnel, loosen the bung fittings to relieve pressure that may build during heating.



- Standard heating tunnels are not suitable for operation above 300°F (150°C). Do not exceed this maximum temperature.
- Do not store contents or materials on top of, or directly against, the unit. Fire may result.



- Do not operate fans without belt & bearing guards in place as bodily injury may result. Always disconnect and lockout power before removing covers or guards.
- Do not walk under or near a moving conveyor. Products falling from the conveyor can cause serious injury.



- Pinch points may exist at door(s). Keep hands and arms clear.
- Vertical lift doors must be blocked before entering the workspace.



## CAUTION



- Do not leave the unit in operation unattended. Property damage or injury to personnel may result.
- **Maintain cleanliness inside and around the unit.** Spill containment may be subjected to a build-up of flammable deposits, fluid, or combustible debris that may be **fire hazards**.



- Use caution when opening doors to avoid breathing air from inside the unit. Heated air can burn lungs.
- Do not breathe air from exhaust vent.
- This equipment is to be operated by trained personnel only.
- The heating tunnel's outer skin may be hot and burns could result. Use caution.
- When heating materials that generate hazardous vapors, venting or exhausting of the unit is required.
- This equipment may create a confined space hazard. The user is responsible for analyzing the installation in order to make a determination, posting warnings and complying with applicable OSHA standards pertaining to confined space hazards.
- Keep the area around the loading and unloading points free from obstructions.
- Do not load the conveyor beyond its rated capacity.

To reduce the possibility of injury to personnel operating, or in the vicinity of the heating tunnel, warning signs are posted at potential hazard points on the equipment. Examine the equipment and become familiar with potential hazard areas. Instruct all personnel to be aware of these areas and to heed all posted caution and warning signs.

Properly rated fire extinguishers should be located near the heating tunnel. Extinguishers should be inspected periodically in accordance with NFPA 10, "Standard for Portable Fire Extinguishers."

After complete installation of the equipment, a safety study should be made of the application and additional guards and warnings should be installed and posted as necessary. Any code requirements are the responsibility of the user and not that of LEWCO, Inc. Violation of the above safety rules hereby removes all product liability claims from LEWCO, Inc.



**NOTICE:** It is the responsibility of the owner to comply with all safety standards, including OSHA and other Federal, State, and Local codes or regulations.

### 1-3 PPE (PERSONAL PROTECTIVE EQUIPMENT)

PPE (Personal Protective Equipment) required will be site and process specific. LEWCO, Inc. recommends conducting a detailed study of your installation and process to determine what PPE will be required for safe operation.

Hearing Protection: According to OSHA protection against the effects of noise exposure shall be provided when the sound levels exceed those determined as unsafe.

Safety Glasses: It is never recommended to enter the workspace with the circulating fan(s) running. However, if anyone must do so for any reason, safety glasses **MUST** be worn.

Steel Toe Boots (Metatarsals): Nothing inherent to the heating tunnel or its process should require foot protection, aside from the loading and unloading of the unit. Use proper plant safety considerations for material handling and PPE.

Gloves/Sleeves: If unloading hot material always wear high temperature gloves. If the material being loaded/unloaded is sharp, protective gloves should be worn.

Temperature/Flame Resistant Clothing: If the material is being unloaded hot, wear the appropriate clothing. This may include temperature resistant sleeves, jacket, pants or any combination of the aforementioned clothing.

Fall Protection: Normal operation of the unit will not require the operator to be on top of the equipment, however, some maintenance and troubleshooting may require personnel to be more than 6' off of the ground. If this is the case, proper fall protection must be used at all times.

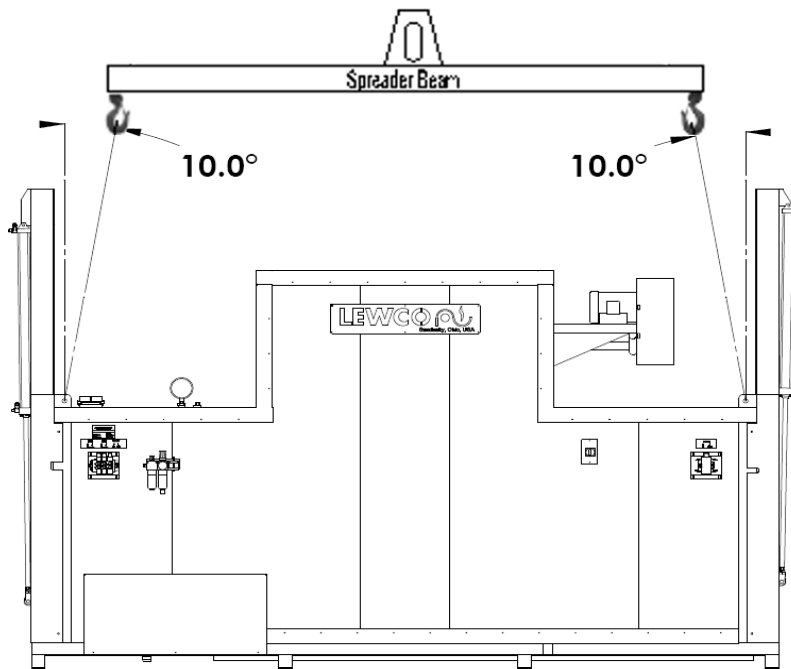


## 1- 4 RECEIVING & HANDLING

Special care must be taken in handling this equipment due to its configuration, size, and weight.

### 1- 4.1 RIGGING

In most cases, lifting lugs are provided at the top (4) corners of the unit. It is important to note that rigging cables or chains must not exceed a maximum angle of 10 degrees from vertical (see *Figure 1*). Use a spreader beam, or rigging of adequate length, to avoid damage to the equipment. Please refer to any assembly drawings for specific assembly and rigging instructions.



*Figure 1: Typical Rigging*

### 1- 4.2 RECEIVING INSPECTION

Before removing banding and/or packaging materials, locate the packing slip. The packing slip contains a complete list of all materials shipped. Verify completeness of shipment against packing slip for each item. Inspect each item for damage that could have occurred during shipment.

On collect shipments, all claims for shipping damage must be made against the carrier by the purchaser. All shipments received “short or damaged” must be noted on the freight bill when signed by the receiver. The delivering carrier may deny a claim if not noted on the freight bill when signed by the receiver. However, if damage is concealed, and not discovered at the time of delivery, an inspection must be requested to the delivering carrier within 24 hours.

All claims for shortages against the packing list must be made against LEWCO, Inc. within 48 hours of receipt. Claims for replacement materials and equipment submitted after 48 hours of receipt will be invoiced to the customer.

## SECTION 2 – INSTALLATION

Prior to installation, the owner should consult their insurance underwriters for recommendations and requirements regarding the installation and maintenance of drum heating tunnels.

### 2-1 LOCATION

Standard drum heating tunnels are designed for indoor use only. Installation in unheated areas or areas without climate control may result in non-uniform temperatures or the inability to attain desired temperature. Condensation may also occur, which could damage the unit.

Due to the inherent hazards of heat processing equipment, including the possibility of fire, property damage, and personal injury, selection of the heating tunnel's location must be carefully planned. In planning the location, consideration should be given to the following:

#### PERSONNEL SAFETY:



**CAUTION:** Avoid installations near exits or main aisles to minimize the risk to personnel associated with fire, explosion, or asphyxiation.

**FLOOR:** The heating tunnel should always be placed on a non-combustible surface with adequate load capacity. Consideration must be given to the weight of the equipment and the weight of the materials being processed.

#### PROXIMITY:



**DANGER:** Do not locate the heating tunnel against walls. To protect adjacent structures and equipment from excessive temperatures, provide an air space of approximately 12" around the unit. If 12" cannot be achieved, LEWCO requires a minimum airspace of at least 4". Ensure there is adequate space for loading/ unloading. Consider maintenance access to control valves, steam trap(s), thermocouples, filters, and steam piping. Consideration should also be given to the proximity of adjacent storage areas, particularly those that may include flammable liquids or gasses, or combustible materials as these vapors or materials may be drawn into the heating tunnel through circulating fan(s) or exhaust vent(s).

**VENTILATION:** The unit should be located so that air circulation around the equipment is not restricted. Do not block fresh air inlets or exhaust outlets. Particular consideration should also be given to all fans and motors. Avoid installations in basements or other areas with restricted fresh air.

### 2-2 LEVELING & ANCHORING

Set the heating tunnel on a level, non-combustible, surface. The unit should be leveled both side to side and front to back in reference to the base of the unit. If necessary, shim or grout the unit. Leveling of the tunnel is important to ensure product flow on inclined gravity rollers, as well as for condensation drainage. Anchor the tunnel with expansion anchors through the holes provided. Use anchors 1/8" smaller than the holes provided.

## 2-3 EXHAUSTING & VENTING

If the tunnel was purchased with a vent option, a number of acceptable connection methods are available to exhaust the unit. To avoid exposure to operating personnel, the owner must determine a suitable vent/exhaust method based on the toxicity, amount, and weight of vapor being generated. Consult local stack emission restrictions if the vapors being exhausted may affect air quality.

Connection to an existing plant fume removal system is the preferred vent connection method. The vent connection is 5" OD duct. A sheet metal slip-on, draw band connection is adequate. At installations where a plant exhaust system is unavailable, a "chimney" connection is also an acceptable method to remove lower concentrations of lighter vapors. An outdoor vertical section of duct, of adequate height to produce a chimney effect, has proven successful in many applications. A rain cap is required on outdoor stacks.

Use the blast gate provided to attain an optimum combination of vapor exhaust and unit temperature. This may be especially important when trying to attain relative operating temperatures.

## 2-4 ELECTRICAL INSTALLATION

If electronic controls were included, electrical connections should be made by a qualified electrician in accordance with NFPA 70, "National Electric Code." The installation must also meet the requirements of any applicable state and local codes.

All standard model heating tunnels are shipped factory wired complete. Connect power to the main disconnect switch using wire of adequate size to carry the full load current rating of this device. Secure all connections and ground the unit adequately. A grounding lug is provided in the main control panel.

After wiring is complete, make a final check of all electrical connections to confirm that none have vibrated loose in transit from LEWCO. Tight power connections will reduce component failure due to poor contact.

**NOTE:** If the equipment was purchased with an explosion proof fan motor, sealing fittings must be filled with the appropriate sealing compound prior to turning power on to the fan.

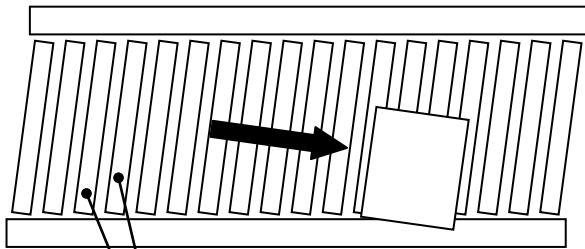
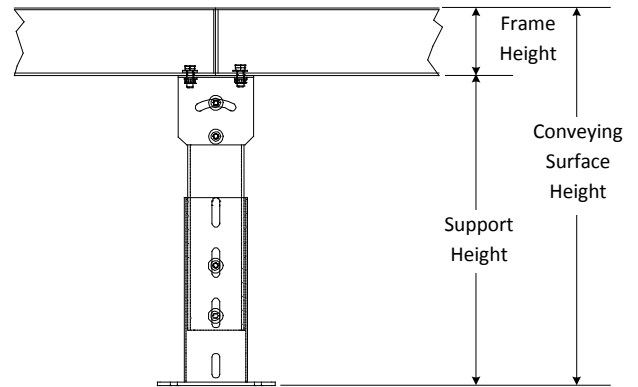
Check the circulating fan for proper rotation direction. An arrow on the fans housing indicates proper direction of rotation. The installer should also verify that the fan drive components (belt and pulleys) have not become misaligned or loose during shipment. Excessive noise and/or vibration may be the result of loose or misaligned drive components. As standard, proper rotation produces an airflow pattern that draws air into the fan inlet at the bottom of the tunnel and discharges air back into the top of the tunnel.

## 2-5 CONVEYOR INSTALLATION

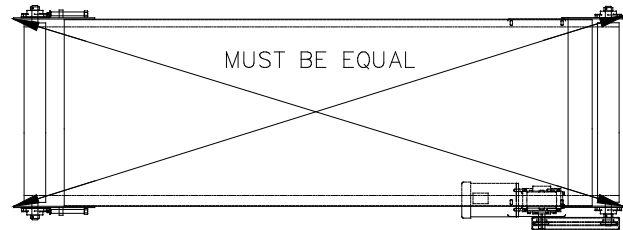
Gravity roller conveyor is located at each end of the drum tunnel to allow for loading/ unloading. Conveyor is purposely set on an incline to ensure product flow. Refer to the supplied drawings for location and details.

- Bolts for attaching the supports to the conveyor bed sections are shipped in a bag with the supports.
- Support height: subtract frame height dimension from desired conveying surface. See *Figure 2*. Adjust the supports to this dimension by sliding inner and outer legs and tighten bolts.
- Mark a chalk line on floor to locate center of the conveyor.
- Check for level across both width and length of the conveyor. Adjust supports if necessary.
- Check all bed sections for square. See *Figures 3.1* and *3.2*. Use a measuring tape stretched from opposing corners at edge of bed to aid in straightening conveyor. Ensure that both dimensions are the same. Adjust or shim supports as necessary. Both sides of the conveyor must be in the same plane (bed not twisted).
- Tighten support mounting bolts and lag conveyor to floor.

**Figure 2: Support Height Adjustment**



**Figure 3.1:**  
Rollers not square with frame



**Figure 3.2: Check the bed for square**

## 2-6 PRIOR TO START-UP

Prior to releasing the heating tunnel to production, all safety systems **MUST** be inspected and tested for function and operation. To check operation of a safety circuit, force the input criteria into a failure state and verify the heating tunnel reacts correctly.

*Example:* High-Limit Temperature Controller – While the drum tunnel is operating, adjust the high-limit setting to a temperature lower than the current tunnel temperature. The heating circuit for the tunnel should be disabled immediately.

Once the safety systems have been checked and proper operation verified, document all component settings for the unit. These settings should be kept with your operating instructions for reference during maintenance and annual safety inspections.

## **SECTION 3 – OPERATION & USE**

### **3-1 GENERAL OPERATING PROCEDURES**

Operators must be adequately trained in start-up and shut-down procedures, as well as the heating tunnel's safety features. It is the owner's responsibility to insure that operators are also familiar with the tunnel's intended application and aware of the design limitations of the equipment in order to avoid misapplication

Operating instructions specific to this equipment are detailed in the **Appendix, section 6-1**.

**NOTE:** Minimum operating temperature for standard models is 125°F (52°C). Temperature control below this minimum may be erratic. Consult LEWCO for applications requiring operation below minimum.

### **3-2 EMERGENCY SHUT DOWN**

Your LEWCO, Inc. heating tunnel has been engineered and built to the highest industry standards. Only in the unlikely event of equipment malfunction or emergency, should the following steps be performed:

1. Press the red "Emergency Stop" button. If access to the emergency stop button is limited, or the unit does not have an emergency stop button, turn off the electrical disconnect providing power to the unit.
2. Depending on the severity of the issue, evacuate or restrict access to the area until the issue has been resolved.
3. When it is deemed safe to resume operation, twist the red emergency stop button to release it. The button should "pop-up" indicating its disengagement. Then follow normal start-up procedures.

## **SECTION 4 - MAINTENANCE**

### **4-1 GENERAL**

Industry experience indicates that improper maintenance is another leading cause of equipment failure, often resulting in property damage or injury to personnel. To maximize service life and assure safe, optimum, performance of this equipment, the owner should develop and follow a preventative maintenance program.



**WARNING:** Do not attempt any maintenance on this equipment unless all sources of energy are disconnected and locked out. Before performing work on fan(s), special caution must also be taken to secure the wheel.

### **4-2 MAINTENANCE ITEMS**

This list of maintenance items is a general overview of the minimum items that may need to be addressed on your LEWCO Drum Heating Tunnel. The actual list may vary depending on the specific equipment provided. The owner should make the final determination on maintenance intervals and tasks to be performed while considering the working environment. Please review the supplied component literature for further detail and potential additional maintenance items.

Maintenance Items	Frequency			
	Daily	Monthly	6 Months	Annual
Inspect the tunnel workspace, and if applicable, the circulating fan(s), ductwork, and vent stack for accumulation of foreign matter. Clean as required.	■			
Inspect tunnel doors for gasket wear and tear. Replace as needed.	■			
Check all rollers for tightness and proper function. All rollers must rotate freely. If roller does not turn freely, check for dirt accumulation in bearing area and clean. Replace as needed.		■		
Inspect electrical connections and components periodically for tightness and signs of wear.		■		
Inspect circulating fan(s). Tighten set-screws between bearings and shaft, and also wheel set-screws on all circulating fans.		■		
Check for belt tension and wear on belt driven fans. Replace belt as needed.		■		
Lubricate circulation fan(s) shaft bearings every 500 hours of operation. As standard, no special heat resistant grease is required.		■		
Motors should be lubricated at least every 5,500 hours of service.			■	
Confirm exhaust rate at the stack outlet with nameplate or drawing. Inspect exhaust stack for cleanliness and integrity.			■	
Inspect filter/ regulator/ lubricator to ensure appropriate air pressure setting.				■
Cycle air valves to operate tunnel doors and drum escapement claws. Verify that doors remain in "mid position" if hand valve is released (door should not drift shut).				■
Inspect air hoses and fittings for leakage. Replace as required.				■
Inspect cylinder clevis and jam nut to ensure threads are fully engaged.				■
Test all safety devices for proper function.				■
Verify proper function of Limit Controller (High-Limit Temperature Controller).				■
Measure full load amperage on each heater leg and compare to the schematic.				■
Calibrate recording devices. Refer to component literature.				■
Validate all thermocouple(s) / RTD's. Replace as necessary.				■
Conduct operator training course or refresher course.				■

**NOTE:** Air streams containing particulate or chemicals can cause abrasion or corrosion of fan parts. When such wear is discovered, a decision must be made as to whether to rebalance or replace the wheel.

### 4-3 SERVICE & REPLACEMENT PARTS

For service or replacements parts, please contact LEWCO's Customer Service Department by calling 419-625-4014, ext. 4012 or emailing [customerservice@lewcoinc.com](mailto:customerservice@lewcoinc.com). Please be prepared to provide both your MODEL and SERIAL NUMBER when ordering. A list of replacement parts may be found in the Appendix, section 6-3.

## SECTION 5 – TROUBLESHOOTING

PROBLEM	CAUSE(S)	SOLUTION
<b>Control panel does not have power</b>	No power supplied to the control panel	Verify main disconnect switch is on
	Blown fuse(s)	Verify continuity of the fuses before and after the main transformer
	Emergency Stop button is engaged	Verify the initial reason for the Emergency stop. If reason has been corrected, release the Emergency Stop.
<b>Tunnel will not heat, heats slow, or will not reach set temperature</b>	Power loss	Check incoming power to control panel from source. If line voltage is not present, check and make necessary corrections at source.
		Check voltage on load side of fuses and replace if needed.
		Check voltage on load side of heater relay/contactors or SCR while controller is calling for heat. If full voltage is present on all phases, check heaters for open circuit.
	Control power loss	Check input to heater relay/contactors or SCR. When temperature controller calls for heat, contactor or relay coils should have 120V control voltage across the coil. SCR's should have 4--20mA. Refer to schematic.
		Replace heater relay/contactors or SCR if above-cited control power is available and line side voltages appear while load side voltages do not appear.
	Thermocouple burned out	Replace thermocouple
	Open heaters	Check heater resistances with ohm meter and replace open heaters.
	Blown fuses	Check all heater fuses. Replace as necessary.
	Open phase	Check three-phase power at load end of heater relay/contactors or SCR.
	Failed or damaged heater elements	Replace heater elements
	Circulating fan(s) rotating in wrong direction	Verify fan rotation against fan direction label. If fan is rotating in the wrong direction, there is an incorrect phase sequence. To correct, reverse any two leads anywhere from source to fan motor.
	Temperature Controller	Check temperature controller for error messages and adjustments. Refer to temperature controller manual.
If known, set P, I, D, constants on Temperature Controller. If unknown, initiate auto tune sequence. Refer to temperature controller manual for auto tune instructions.		
Check output of temperature controller to see if it cycles. If output power is continuously present when controller does not call for power, replace temperature controller.		
Door switch	If door is not securely closed, door switch will disable heat - close door. If door is closed, inspect door switch for proper function. Replace if necessary.	

PROBLEM	CAUSE(S)	SOLUTION
<b>Tunnel exceeds desired temperature (overheats)</b>	Temperature Controller	Check temperature controller for error messages and adjustments. Refer to temperature controller manual.
		If known, set P, I, D, constants on Temperature Controller. If unknown, initiate auto tune sequence. Refer to temperature controller manual for auto tune instructions.
		Check output of temperature controller to see if it cycles. If output power is continuously present when controller does not call for power, replace temperature controller.
	Heater control failure	Check heater relay, contactor, or SCR for shorted or welded contacts. Fix or replace as necessary.
<b>Limit Controller High-Temp. Alarm will not turn off</b>	High-Temp. condition exists	Wait for temperature to go below high-temp. set-point
	Limit Controller	Reset Limit Controller. If temperature is below set-point and alarm will not turn off when manually reset, replace Limit Controller.
	Hysteresis value	Hysteresis value is factory set at 20. Temperature must go 20°F. below Limit Controller set-point, before high-limit alarm can be rest. Verify Hysteresis value hasn't been changed.
	Limit Controller set wrong	Verify parameters and correct as necessary.
	Thermocouple	Inspect thermocouple. Replace if necessary
<b>Circulating fan will not start</b>	Motor failure or control power loss	Check fuses. Replace if needed.
		Check load side voltages on overload relay with fan control on. If three-phase imbalance voltage appears, service fan motor.
		Check 120V power across starter coil A1 - A2 with fan control on. If power appears and starter does not energize, replace starter.
	Faulty Circulating Fan Start Switch	Inspect wiring to switch. Verify all connections are secure. Tighten as necessary. If all wiring is secure, replace switch.
<b>Circulating fan running slow &amp; sluggish</b>	Phase missing	Check fuses. Replace if needed.
		Check for balanced three-phase power from source and correct as necessary.
<b>Excessive fan noise or vibration</b>	Loose mounting bolts, setscrews, bearings or couplings.	Tighten hardware to the proper torque
	Fan shaft bearings	Lubricate or replace
	Fan motor	Lubricate motor
	Misaligned or excessive wear of couplings, bearings or misaligned or unbalanced motor.	Replace couplings and bearings, and realign balanced shaft and wheel.
	Accumulation of foreign matter on the wheel or wear/erosion of the wheel.	Clean or replace fan wheel depending on extent of damage



## **SECTION 6 – APPENDIX**

The Appendix of this manual contains installation and operation specific information. If your installation requires non-standard information requirements, such as calibration certifications or equipment specific data, it will be found at the end of this section.

### **6-1 OPERATING INSTRUCTIONS**

### **6-2 OPTIONAL EQUIPMENT**

### **6-3 REPLACEMENT PARTS**

### **6-4 GENERAL CONTROL INSTRUCTIONS**

#### **Also included with this manual:**

- 1. DRAWINGS**
- 2. ELECTRICAL SCHEMATICS**
- 3. COMPONENT LITERATURE**