Owner's Manual

Fuel-Fired Conveyor Ovens

MODEL: _____

SERIAL NUMBER: _____

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LEWCO, Inc.

Warranty

Industrial Oven Products

1. Unless separately agreed to otherwise, Warranty is for one (1) year, 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 Conveyor Oven. 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 equipment 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 Conveyor Oven, please contact our Industrial Oven department by phone at (419) 502-2780 or by email at 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.

Manual Specific Safety Symbols Definitions	
	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.
DANGER	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.
WARNING	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.
CAUTION	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.
NOTICE	Is used to describe preferred to address practices not related to personal injury.

Equipment Specific Safety Sign Definitions	
	**DANGER:** Hazardous voltage will cause severe injury or death. LOCK OUT POWER before servicing.
	**WARNING:** Potential arc flash hazard.
	**CAUTION:** Hot surface. Do not touch.
	**WARNING:** servicing moving or energized equipment can cause severe injury. LOCK OUT POWER before servicing.
	**WARNING:** Moving equipment may cause severe injury. Keep Away.
	**DANGER:** 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.

Class A Oven: Ovens that can be utilized in processes with solvents present, volatile materials or other flammable or combustible contents. NFPA 86 cites several materials requiring the Class A rating, specifically including:

- Paints, powders, inks and adhesives from finishing processes such as dipped, coated, sprayed and impregnated materials
- The substrate material
- Wood, paper and plastic pallets, spacers or packaging materials
- Polymerization or other molecular arrangements. Potentially flammable materials such as quench oils, waterborne finishes, cooling oil, or cooking oils that present a hazard are ventilated according to Class A standards.

Class B Oven: Oven and furnaces in which no flammable volatiles or combustible materials are present in the work space.

Combustion Blower**:** A blower used to force air into the burner for combustion when mixed with a fuel gas.

Differential Flow Switch: A switch that is activated by the flow of a gaseous or liquid fluid. This flow is detected by measuring pressure at two different points to produce a pressure differential across the sensor.

Equipment Isolation Valve: A manual shutoff valve for shutoff of the fuel to each piece of equipment.

Exhaust Fan: A fan used to remove air with contaminants from the work space through a duct to outside of the plant. This air may also include products of combustion.

Flame Rod: A flame rod is a simple piece of heat-resistant metal (nichrome, inconel, etc.) in contact with a flame. A flame consists of ionized particles undergoing chemical reactions and therefore is conductive. The flame rod takes advantage of that fact. The rod has a small potential on it and when the flame touches it, a small current flows from the rod through the flame to ground. This current is detected and uses to "prove" the flame.

Heater Box: The insulated box containing the burner or heating elements and circulating fan(s). The heater box is USUALLY found on top of the workspace. No material may be placed in the heater box.

High Fuel Pressure Switch: A pressure activated switch arranged to enact a safety shutdown of the burner system in the event of abnormally high fuel pressure.

Interlocks: Are devices for preventing a mechanism from being set into action when another mechanism is in such a position that the two operating simultaneously might produce undesirable results.

Limit Switch: A switch that actuates when an operating limit has been reached.

Low Fuel Pressure Switch: A pressure activated switch arranged to enact a safety shutdown of the burner system in the event of abnormally low fuel pressure

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 oven to revert to a safe condition in the event of equipment failure or other hazardous event.

Safety Shutoff Valve: Two, solenoid actuated normally closed valves in series that closes automatically to shut off the fuel in the event of abnormal conditions.

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

Trial for Ignition Period: The interval of time during light-off that a safety control circuit allows the fuel safety shutoff valve to remain open before the combustion safeguard is required to supervise the flame.

UV SCANNER: A UV or Ultra Violet scanner is a scanner that has a high sensitivity ultraviolet (UV) sensor for monitoring gas or oil flames. When UV light is detected, a signal is sent from the scanner to the flame safety.

SECTION 1 – GENERAL INFORMATION

1-1 PRODUCT DESCRIPTION

This conveyor oven is a natural gas or LPG direct fuel-fired heating system. The burner is mounted in the heater box which is directly attached to the unit. The flame is not in the workspace; however, the products of combustion are present. The casing is an insulated mild steel shell. When possible, all of the combustion system components are installed directly onto the oven heater box. Temperature is controlled by thermocouple actuated electronic temperature controllers.

Combustion air is provided by means of a high pressure blower. The gas train is comprised of a gas regulator, high and low pressure switches and a dual blocking Safety Shutoff Valve combination. Some systems may have a proof of closure indicator on the bottom of one of the Safety Shutoff Valves. The gas then flows through an automatic gas modulating valve.

Flame is monitored through a flame rod or ultraviolet (UV) scanner mounted on the burner and a flame supervision system in the control cabinet.

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. Oven 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 conveyor oven 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

- Explosion or fire may result from misapplication of this equipment. Know the properties of the materials you are putting into the oven and be sure they can be heated safely at elevated temperature. Applications that may introduce flammable solvents or combustible materials into an oven require special nonstandard safety features. The National Fire Protection Association (NFPA) designates these as “Class A” Ovens.

- Materials with auto-ignition temperatures below the oven operating temperature should never be introduced into the oven.
- This equipment is 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 stand in front of explosion relief areas.

WARNING

- Do not operate the oven above its rated maximum temperature.
- Do not store contents or materials on top of, or directly against, the unit. Fire may result.

CAUTION

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

- Use caution when standing near the entrance/ exit openings of the unit to avoid breathing air from inside the oven. Heated air can burn lungs.
- Do not breathe air from exhaust vent.
- This equipment is to be operated by trained personnel only. Do not operate without training.
- The oven’s outer skin and conveying surface 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.
- 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, ride, or climb on moving conveyor.
- Always check surroundings to ensure that all personnel are clear of the conveyor prior to starting.
- Do not walk under or near a moving conveyor. Products falling from the conveyor can cause serious injury.
- Do not load the conveyor beyond its rated capacity.
- Make sure all power is OFF prior to performing any maintenance on the conveyor. Shut off the conveyor before attempting to remove jammed objects.
- Ensure that starting and stopping controls are free from obstructions.
- Instruct personnel working at or near the conveyor of their locations.
- Keep the area around the loading and unloading points free from obstructions.

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

- Do not operate conveyor with drive guards or covers removed. Disconnect and lockout power before removing covers and guards.
- Do not touch moving conveyor parts.
- Do not allow long hair or loose clothing near the moving conveyor. Long hair and clothing can become entangled in the equipment and cause serious injury.

To reduce the possibility of injury to personnel operating, or in the vicinity of the conveyor oven, 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 oven. 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 oven or its process should require foot protection aside from the loading and unloading of the material from the oven. 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 oven 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

Lifting lugs are provided at the top (4) corners of most LEWCO Conveyor Ovens. 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.

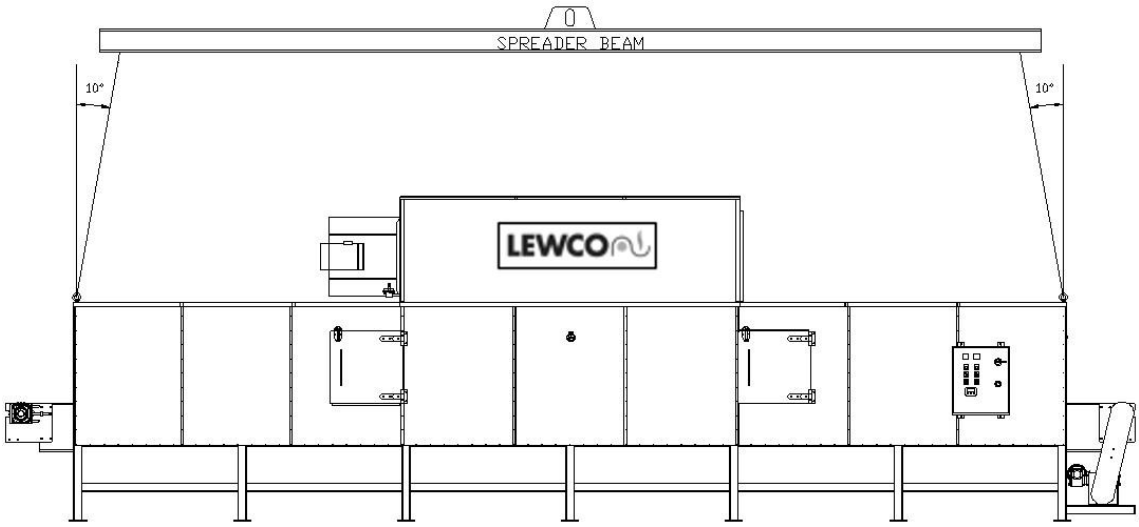

Figure 1: *Typical Rigging*

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 industrial ovens.

2-1 LOCATION

Standard LEWCO conveyor ovens 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 oven'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 conveyor oven 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 conveyor oven 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 controls, thermocouples, filters, heaters, and side access doors, if applicable. 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 oven 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 conveyor oven 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. Anchor the conveyor oven with expansion anchors through the holes provided. Use anchors 1/8" smaller than the holes provided.

2-3 EXHAUSTING & VENTING

If the conveyor oven was purchased with a vent option, a number of acceptable connection methods are available to exhaust the oven. 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.

Conveyor ovens may be equipped with a powered exhaust fan. The exhaust fan may also be required to remove flammable vapors in the case of NFPA 86 Class A ovens. The fan outlet must be connected to an exhaust stack of adequate size for discharge to an outside location. Exhaust stacks are to be installed in accordance with applicable state and local codes and regulations. The shortest and most direct path should always be used. Stack temperatures are the same as oven temperatures and care must therefore be taken to protect building materials from the hot exhaust stack. Stacks passing through combustible walls or roof must be insulated. Stacks must be constructed of sheet metal or stove pipe with tight seams and laps in the direction of air flow. Never install dampers or restrictions that can impede flow. Stacks installed lower than 8 feet off the floor must be insulated to protect personnel. For Class A ovens handling flammable solvents, the exhaust rate must be checked against the minimum safe exhaust rate shown on the oven data plate.

NOTE: Oven will not achieve rated temperature if exhaust stack and venting system are not installed properly.

2-4 FUEL GAS CONNECTIONS

Fuel gas piping to the conveyor oven must be installed by qualified personnel in accordance with local codes and should comply with NFPA 54, National Fuel Gas Code.

A remotely located emergency manual shut-off valve is required to allow the fuel gas supply to the conveyor oven to be turned off in an emergency and shall be located so that fire or explosion at the unit does not prevent access to the valve. This valve is usually a manual valve installed at the upstream end of the gas train before shipping. Operators should be knowledgeable as to the location and operation of this valve and have access to shut-off fuel flow in an emergency. Valve shall have permanently affixed visual indication of position and operable without tools.

It is the owner’s responsibility to provide an individual gas regulator properly sized to supply the pressure and volume required. As standard, the oven installation requires 2 psig at the oven connection and a minimum gas line size the same as the conveyor oven’s fuel gas connection inlet. Refer to the appropriate drawings (or oven nameplate) for additional information on fuel requirements and burner capacity.

Conveyor ovens shipped disassembled due to size may require additional fuel gas piping. Refer to installation drawings as applicable. Upon completion of the installation, the owner is responsible to complete

a thorough leak test of all fuel gas piping. Leak tests should be conducted at least annually and immediately if the smell of fuel gas is present.

Prior to start-up, purge or “bleed” the gas line piping at the union nearest the burner to remove air from the line thereby assuring an uninterrupted fuel supply per NFPA 54 guidelines. Purged gas must be vented to an approved location outside the building.

2-5 ELECTRICAL INSTALLATION

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

Conveyor ovens shipped as single units are 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.

Check the fan(s) for proper rotation direction. An arrow on each blower 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.

Conveyor ovens shipped disassembled due to size may require additional field wiring. Refer to installation and wiring drawings at the end of this manual as applicable.

Verify the settings on any pressure switches and the outputs from any regulators agree with the site settings listed on the appropriate drawings and component literature. Be sure to correct any settings before attempting to ignite the oven. After igniting the oven, be sure to follow the component manufacturer’s documentation for setting up the burner. Fuel composition, elevation and other site specific parameters may change characteristics of combustion and require some slight changes in the combustion settings for optimal performance and efficiency.

2-6 PRIOR TO START-UP

Prior to releasing the oven to production, all safety systems MUST be inspected and tested for function and operation. Safeties installed on your LEWCO oven include, but may not be limited to, a High-Limit Temperature Controller, a differential air pressure switch, and high and low gas pressure switches. To check operation of a safety circuit, force the input criteria into a failure state and verify the oven reacts correctly.

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

Example: Low Gas Pressure switch – Connect a meter capable of reading + .1 ohms to the NO and COM contacts which should be made. If the resistance is more than 1 ohms remove the switch from service. Verify the switch changes state when pressure is changes past the current setting on the switch. This may also be done with an ohm meter as the circuit should open as the switch changes state. To cause the switch to change state, turn the switch setting counterclockwise until the switch trips. Allow the burner to go through a

startup sequence and verify that the burner faults and is not allowed to light. Close all test taps and down upstream ball valve. When finished close all pressure test points.

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. Documentation of this information and annual inspection of the system is required per NFPA 86.

2-6.1 CONVEYOR PRE-START CHECKS

- The conveyor drive gear box should be checked prior to initial field runs to insure proper oil level.
- MOST speed reducers are shipped with oil; however always check for proper oil level before operating the conveyor.
- Check for REDUCER VENT PLUG and INSTALL if necessary (s*ee Figure 2.1*). To install, remove the solid plug and replace with vent plug.
- Remove drive chain guard and inspect drive chain and sprockets.
- Chain should have sag on the slack side (*see Figure 2.2*). Measure the sag half way between the two sprockets.
- Sag should be ¼" or 2% of the sprocket center distance.
- Inspect drive sprocket and pulley set screws. These should be tight against the reducer and pulley shafts. Using a straight edge check to assure the sprockets are aligned by placing the straight edge flush against the sprocket flanges.
- Re-install chain guard after inspection.

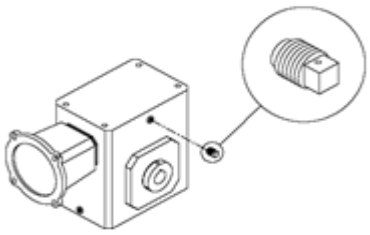

FIGURE 2.1
Reducer Vent Plug Installation

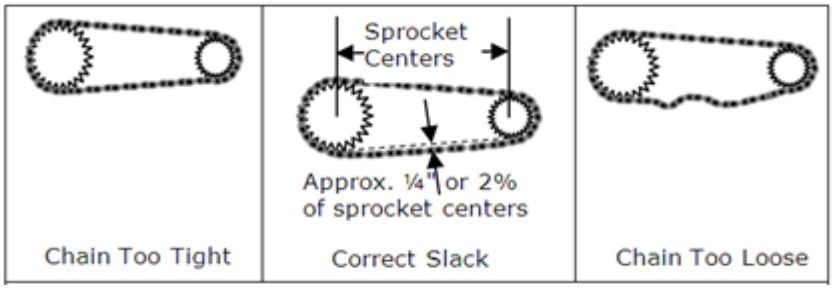

FIGURE 2.2 Drive Chain Sag

SECTION 3 – OPERATION & USE

3-1 GENERAL OPERATING PROCEDURES

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

For optimum performance, do not overload the oven. Restricted airflow caused by too densely, or improperly packed parts will adversely affect temperature uniformity. If possible, stagger parts in order to minimize dead spots in the airflow pattern.

For safety, temperature uniformity, and operating efficiency, proper balance of exhaust and fresh air are essential. If applicable, adjust intake and exhaust damper(s) enough to prevent fouling of the work. For Class A ovens handling solvents, the exhaust rate must be confirmed to be at least the minimum listed on the data plate. If the process generates significant amounts of smoke or moisture, it is necessary to exhaust enough air to remove these materials. When exhaust is increased fresh air intake must also be increased. Failure to provide adequate fresh air will result in air being drawn into the oven, thus creating cold spots within the oven workspace. Excessive exhaust or inadequate fresh air intake can also create negative pressure in the oven.

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

NOTE: Minimum operating temperature for standard models is 200°F (93°C). Temperature control below this this minimum may be erratic. Consult LEWCO for applications requiring operation below minimum.

3-2 EMERGENCY SHUT-DOWN

Your LEWCO, Inc. oven 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 restricted, turn off the electrical disconnect providing power to the unit.
2. Close the Equipment Isolation Valve cutting fuel to the oven.
3. Depending on the severity of the issue, evacuate or restrict access to the area until the issue has been resolved.
4. 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 conveyor oven. 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.

NOTE: Maintenance items should only be completed by a qualified technician. All verified data and settings should be documented at least annually.

Maintenance Items	Frequency			
	Daily	Monthly	6 Months	Annual
Inspect the workspace, and if applicable, the circulating fan(s), ductwork, and vent stack for accumulation of foreign matter. Clean as required.	■			
Inspect oven door gaskets or strip curtains for wear and tear. Replace as needed.	■			
Inspect conveyor belt, chain, or rollers for proper function. Replace as needed.	■			
Turn “ON” conveyor and listen for unusual sounds such as squealing, rattling, thumping, or rubbing - any of which could indicate a problem. Turn OFF conveyor immediately if any unusual sounds are heard. Inspect for cause.	■			
Test and calibrate all L.E.L. (lower explosive limit) monitors.		■		
Check for a misaligned shaft or a sprocket off center. Check shaft bearing set screws.		■		
Lubricate the drive chain with SAE-30 oil. Lubricate more frequently under extreme ambient conditions. Rinse chain in solvent before lubricating.		■		
Check all rollers for tightness. All rollers must rotate freely. If roller does not turn freely check for dirt accumulation in bearing area and clean.		■		
Inspect electrical connections and components periodically for tightness and signs of wear.		■		
Inspect the flame sensing devices for good condition and cleanliness. Test for proper operation.		■		
Verify proper gas pressures.		■		
Inspect and clean igniter(s).		■		
Oil the pivot joint and apply grease to the latch spring and cam on the door(s).		■		

Maintenance Item	Frequency			
	Daily	Monthly	6 Months	Annual
Inspect circulating and exhaust fan(s). Tighten set-screws between bearings and shaft, and also wheel set-screws on all circulating and exhaust fans.		■		
Check for belt tension and wear on belt driven fans. Replace belt as needed.		■		
Lubricate fan(s) shaft bearings every 500 hours of operation. As standard, no special heat resistant grease is required.		■		
Remove drive chain guard. Inspect drive chain and sprockets.		■		
Make sure reducer is filled to the proper level with oil and the vent plug is removed.		■		
Grease all flange type bearings that have grease fittings. Use a NLGI Grade 2 Lithium base grease, Shell Alvania EP2, or equal. Snub roller, return rollers, and take-up roller are lubed-for life.		■		
Test pressure switch settings by checking the switch movements against pressure settings and comparing these with the actual impulse pressure.		■		
Motors should be lubricated at least every 5,500 hours of service. Reference component literature.			■	
Confirm exhaust rate at the stack outlet with the oven nameplate or drawing attached hereto. Inspect exhaust stack for cleanliness and integrity.			■	
Inspect underside of conveyor belt for dirt, oils, abrasives, or other chemicals. Clean as necessary.			■	
Remove chain guard. Inspect drive sprocket and pulley set screws. These should be tight against the reducer and pulley shafts. Check to assure that the sprockets are aligned by placing a straight edge flush against the sprocket flanges. Re-install the chain guard after inspection.			■	
Test fuel-gas shutoff valves and gas train piping for leakage.			■	
Visually check the igniter cable and connectors.			■	
Adjust combustion settings per original manufacturer's settings.				■
Leak test the Safety Shutoff Valves for tightness of closure.				■
Test the pressure switch settings by checking the switch movements against pressure settings and comparing these with the actual impulse pressure.				■
Test all equipment isolation valves and emergency shutoff valves for proper movement.				■
Verify high & low gas pressure switches.				■
All pressure and explosion relief devices must be visually inspected to ensure they are unobstructed and properly labeled.				■
All safety interlocks should be tested for proper function. Refer to schematics.				■
Verify proper function of Limit Controller (High-Limit Temperature Controller).				■
Calibrate recording devices per component literature.				■
Validate all thermocouples / 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*. Please be prepared to provide both your SERIAL NUMBER and MODEL NUMBER when ordering. A list of replacement parts may be found in the Appendix, section 6-3.

SECTION 5 – TROUBLESHOOTING

PROBLEM	CAUSE(S)	SOLUTION
Control panel does not have power	No power supplied to the control panel	Verify main disconnect switch is on
	Blown fuse(s) in the control panel	Verify continuity of the fuses before and after the main transformer
	Emergency Stop button has been engaged	Verify the initial reason for the E-Stop activation. If reason has been corrected, release the E-Stop.
Safety interlock will not prove ***(Interlock Proven light not illuminated)***	Circulating or exhaust fan(s) airflow switches are not making contact	Check the inputs to and output from switches
		Check air filter if applicable
		Verify direction of fan rotation against fan label
	High-temperature limit controller alarm active	Temperature is above designated high temperature limit set-point
		Reset limit controller
		If controller wont reset after temperature falls below set-point, replace controller
	High or low limit gas pressure switches are faulted	Confirm the pressure to the furnace is within the rage of the gas pressure switches
	High or low gas pressure switches have activated	Check incoming gas pressure, adjust as necessary
		Check pressure switch setting and operation
Oven purges, but does not try to ignite	Loss of purge flow	Ensure adequate purge flow
	Heat is disabled	Press the "Heat Enable" button
	No Ignition:	
	Attempting to ignite at inputs greater than 60%	Reduce gas flow, verify control circuit
	Weak or non-existent spark	Verify ignition transformer is a 6,000 – 8,000 volt transformer (Not half wave)
	No power to the ignition transformer	Restore the power to the ignition transformer
	Open circuit between the ignition transformer and the igniter	Repair or replace the wiring to the igniter
	Igniter needs cleaning	Clean the igniter
	The igniter is not correctly grounded to the burner	Clean the threads on the igniter and burner. Do not apply grease when reassembling
	Igniter is grounding out	Inspect the igniter and replace if broken
	Not Enough Gas:	

	The gas flow into the burner is too low	Check the startup settings and adjust if necessary
	Gas valve does not open	Check the wiring to the automatic gas shut off valve
		Check output from the flame safeguard
		Open manual gas cock

PROBLEM	CAUSE(S)	SOLUTION
Oven purges, but does not try to ignite	**No Flame Signal:**	
	Dirty or broken flame rod	Replace or clean as necessary
	Flame rod grounding out	Verify the flame rod is installed correctly and is the correct length
The low fire flame is weak or unstable	Not enough gas	Check start-up settings and adjust to increase gas flow
	Incorrect air flow setting	Check air pressure drop across the burner and adjust
The burner does not go to high fire	Not enough gas pressure out of the main gas regulator	Adjust pressure regulator to proper setting
	Gas pressure drops as input is increased	Check for clogging of valves and regulators in gas line. Replace if necessary
	Loss of 4-20mA Signal	Check signal, wire and connections
	Main gas control valve is not functioning	Check actuator and linkage
Burner does not achieve capacity	Main gas control valve is not functioning	Check actuator linkage
	Burner is firing below rated input	Check gas pressure differential. Adjust main gas pressure regulator as necessary
	Burner gas holes are plugged	Inspect gas holes for dirt or lint as needed
Main flame is uneven along the length of the burner	Air pressure drop/velocity is too low	Increase air pressure drop
	Poor air distribution in duct	Check profiling and duct obstructions
	Air wings are dirty, holes are clogged	Inspect and clean air wings if necessary
Main flame is yellow and long at high fire	Gas pressure too high at burner inlet	Check gas pressure against design. Adjust main gas pressure regulator.
	Air wings are dirty, holes are clogged	Inspect and clean air wings if necessary
	Air pressure drop /velocity too low	Open air damper on combustion air blower
CO Emission is too high	Burner operating outside specified ratings	Adjust burner settings
	Process air velocity exceeds limits given	Bring velocity within limits, adjust process air blower
Oven will not heat, heats slow, or will not reach set temperature	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/contactor or SCR while controller is calling for heat. If full voltage is present on all phases, check heaters for open circuit.

PROBLEM	CAUSE(S)	SOLUTION
Oven will not heat, heats slow, or will not reach set temperature	Thermocouple burned out	Replace thermocouple
	Blown fuses	Check all heater fuses. Replace as necessary.
	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.
	Exhaust stack and venting system improperly installed, undersized, restricted, or missing.	1. Confirm proper installation of exhaust stack and venting. 2. Verify the exhaust stack size, configuration, and termination meet specified minimum requirements for natural draft and combustion products evacuation. 3. Inspect vent path for bends, restrictions, debris, or compressions that could impede air flow. 4. Correct any installation deviations; consult flue design criteria and applicable codes.
	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.
Oven exceeds desired temperature (overheats)	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.
Limit Controller High-Temp. Alarm will not turn off	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
Circulating fan/ combustion blower will not start	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 AI - 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.
PROBLEM	**CAUSE(S)**	**SOLUTION**
Circulating fan/ Combustion blower running slow & sluggish	Phase missing	Check fuses. Replace if needed.
		Check for balanced three-phase power from source and correct as necessary.

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

Also included with this manual:

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