

BEST PRACTICES OPERATION MANUAL



Portable Roll Former Equipment



OVERVIEW

The purpose of this manual is to familiarize personnel with the general knowledge, basic operation, safety, and maintenance procedures followed by standard trouble shooting suggestions for standard portable roll-forming processes. It is merely a general guideline. If questions arise about your specific portable roll-forming equipment and solutions cannot be found in this manual, contact the Original Equipment Manufacturer (OEM) of your roll former.

IMPORTANT NOTICE:

This document provides general guidelines for the operation, maintenance, and troubleshooting of portable roll-forming equipment in the manufacture of building wall and roof panels. In no case are these guidelines intended to supersede any specific recommendations or instructions from the roll-forming OEM.

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Portable Roll Forming: A General Overview

Definition: *Portable roll forming*, also spelled “rollforming” or “roll-forming,” is a continuous bending operation in which a strip of metal, typically coiled steel or aluminum, is passed through consecutive sets of rolls, or *stands*, each performing only an incremental part of the bend, until the desired cross-section profile is obtained. Portable roll forming is ideal for producing parts with long lengths or in large quantities and are designed to be moved easily to various locations or job sites.

As with fixed factory type roll formers, a variety of cross-section profiles can be produced with each profile requiring a carefully crafted set of roll tools. Design of the rolls starts with a *flower pattern* (see illustration below), which is the sequence of profile cross-sections, one for each stand of rolls. The roll contours are then derived from the profile contours. Because of the high cost of the roll sets, simulation is often used to validate the designed rolls and optimize the forming process to minimize the number of stands and material stresses in the final product.

Portable roll-forming machines are now being manufactured to produce many profiles from typical wall panels and standing seam roof panels to stud and track profiles. Some portable roll formers have been designed to easily change part width such as variable width standing seam profiles, and stud and track profiles via either spacer adjustment or a telescopic shaft that can be adjusted by a hand wheel mechanism.



Roll forming lines can be set up with multiple configurations to punch and cut off parts in a continuous operation. For cutting a part to length, production lines can be set up to use pre-cut blades where a single blank runs through the roll mill or post-cut blades and the profile is cutoff after the roll forming process. Although most portable roll formers are designed to simply cut the desired part to length, features may be added such as hole punching or notching.

These part features can also be done in a pre-punch operation (before roll forming starts), in a mid-line punching application (in the middle of a roll forming line/process), or a post punching application (after roll forming is done). Some roll forming lines incorporate only one of the above punch or cutoff applications while others incorporate some or all of the applications in one line.



WARNING:

To prevent serious injury, only individuals who have read this text thoroughly and comply with all the recommended safety guidelines are qualified to use, maintain, and operate this machine.

THINK FIRST, ACT SECOND!

SAFETY

Training

BASIC OPERATOR'S TRAINING

Basic operator training should include as a minimum:

- Knowledge of purpose and operation of each piece of equipment in the line
- Knowledge of hazards associated with the line and the placement and use of guards and other safety devices
- Knowledge of the line's sequence of operations, and normal start-up and shut-down procedures.
- Knowledge of emergency STOP procedures and how to recover from an emergency STOP
- How to detect machine malfunctions, equipment damage, and material jams or misfeeds
- Knowledge of employer specific instructions and safety rules required in performance of the job
- How to report any hazardous operation or condition
- Proper use of protective safety equipment (PPE) provided or needed on the job
- Operating machinery in the safest manner possible, paying strict attention to instructions and safeguarding systems
- Basic servicing and preventive maintenance

Before initial start-up, all personnel should be thoroughly instructed on the operation, maintenance, and safety precautions of this machine. Adequate training greatly enhances the safety of all operations.

ON THE JOB

Operator trainees should be instructed while on the job. Trainees should be initially assigned to work with an experienced and qualified operator or under the direct supervision of a knowledgeable person(s) until the trainee has gained sufficient familiarity to work independently. Operator trainees and maintenance personnel must observe all safety signs and procedures. All safety signs and procedures are for their protection and must be read, understood, and taken seriously.

To familiarize the trainee with the equipment, the following procedures should be followed.

TEACH THE OPERATOR TRAINEE

Provide for adequate opportunity to instruct the trainee through verbal and written procedures.

SHOW THE OPERATOR TRAINEE

Have the trainee observe equipment operation by a qualified operator.

LET THE OPERATOR TRAINEE DO IT

Under close supervision, let the trainee operate the equipment. Make any necessary recommendations or corrections.

BEHAVIOR

There is one very important procedure that operators and service personnel should always follow:

Whenever there is a problem or the potential for a problem, **STOP the equipment first**, then solve the problem using only safe procedures.

This may require the operator or service personnel to **STOP** and ask for help from someone who knows what to do. It could also require referral to the manual or calling the factory for help.

Some general indicators that may dictate a need for training or retraining include:

- Excessive waste or scrap
- A high labor turn-over rate
- An increase in the number of "near misses" which could have resulted in accidents
- A recent upswing in actual accident experiences
- A high injury and illness incident rate
- Expansion of business and/or new employment
- A change in manufacturing process(es) or introduction of a new process or machine
- Excessive equipment downtime or maintenance

RULES OF SAFE OPERATION

- Observe safety precautions when setting up, operating, or maintaining processing lines.
- Always operate machine with guards and covers closed or in place.
- Always operate machine with electrically interlocked guards properly connected.
- To jumper out or bypass interlocks is forbidden.
- Always read warning signs on every machine.
- Never operate or be in close proximity to any equipment while wearing loose articles of clothing, long hair, jewelry, etc.
- Always wear safety glasses and hearing protection when operating and/or maintaining equipment.
- Do not adjust any equipment while equipment is running or in motion.
- Do not stand on or reach across equipment during operation.
- Report any unsafe conditions immediately.

Note: This manual should be kept in a location that provides easy access and quick referral.

SAFETY

Inspection, Maintenance

The customer is responsible for the inspection and proper maintenance of this machine to ensure that all units, auxiliary equipment, and parts are in safe operating condition. Only **qualified** electrical, hydraulic, pneumatic, or mechanical personnel should work on this equipment or its circuitry.

Absolutely no welding should be done on the equipment without first contacting the OEM. Some welding may be authorized in certain areas (i.e. the outside of the rollformer base); however, it is strongly recommended to contact the OEM to insure welding or extreme heat does not jeopardize the design integrity of the equipment.

Only with OEM approval can personnel perform any welding. No welding should be done without first opening all electrical disconnect(s) and firmly affixing the welder ground lead near the welding area. Keep welding to a minimum.

SAFETY

Guidelines

The operation of this machine can vary depending on what is being processed through it and what type of peripheral equipment is used in conjunction with it. The range of material being processed also affects the operational safety. It must be understood that these guidelines are general in nature and should be used as a basis for preparing specific operating procedures related to this machine. In addition, hazards may be associated with any of the following topics.

GUARDS/BARRICADES

All safety guards and barricades **must be secured** in place before machine start-up. When any guards or barricades are removed for inspection, adjustments, or maintenance purposes, make sure the guard is replaced before resuming operation. Never place fingers or hands under or behind guards or barricades. Note that additional point-of-operation guarding, barricading, or supplemental safety precautions may be deemed necessary by conditions unforeseen by the OEM in the design and manufacture of the equipment.

PERSONNEL

Never operate this machine or any peripheral equipment until it has been established that no one is working on, removing material from, or standing near the equipment. Ensure that all personnel are in a safe location during system operation. Accidental actuation of any piece of equipment could cause bodily injury or death.

WORK AREA

Good housekeeping is an investment in safety. Areas surrounding machines should be kept clear of slip, trip, and fall hazards.

Make sure the area around this machine is free from work hazards (i.e. parts on the floor, lubricant on the floor, waste build-up in operating areas blocking emergency STOP push or pull buttons, etc.). Make sure there are no wrenches, tools, or pieces of material lying on the machine before start-up.

WORKING PRESSURES

The maximum anticipated working pressures in any pneumatic system (if present on the equipment) shall not exceed safe working pressures as recommended by the manufacturer of any components used in that system.

WORKING SURFACE

Level and stabilize the trailer using the four jacks located at the corners of the trailer.

The customer is responsible for the integrity and stability of the rollformer equipment.

ELECTRICAL

Close all electrical panels during machine operation to avoid possible shock or component damage. All wiring and connections must meet national and local electrical code standards that apply.

- Electrical ground must be connected at all times. Failure to ground can result in serious injury or death, and equipment damage.
- Open, lockout, and/or tagout the electrical disconnect before performing any maintenance on the equipment.

CAPACITY

Operate this machine within its designed and rated capacity. **Do not overload.**

SHUTDOWN

Turn off the main power disconnect (usually located on the right-hand side of the motor control center) prior to performing any maintenance, adjustments, or repairs. Follow the zero energy “Lock Out/Tag Out” procedures identified within this manual or in the equipment manufacturer’s literature and additionally as defined by your employer and/or local electrical safety code.

ON/OFF PROCEDURES

- Ensure press flywheel has come to a complete STOP before servicing die.
- Always close main air valve(s) and bleed off accumulated air before disconnecting air lines, filter, lubricator, or regulator.
- Always close main hydraulic valve(s) and bleed off accumulated pressure before disconnecting hydraulic lines, valves, or filters.
- Bleed pressure off hydraulic systems before checking hydraulic lines or hoses for leaks by hand. Pressurized hydraulic fluid can penetrate skin and cause serious injury. Hydraulic fluid may be hot.
- Do not adjust any equipment while equipment is running or in motion.
- Do not stand on or reach across equipment during operation.
- Report any unsafe conditions immediately.

Know the location of all operator controls used to start this machine to avoid accidentally actuation. When leaving the work area unattended, **turn OFF** all equipment controls so the machine cannot be accidentally actuated.

ATTIRE

Never operate or be in close proximity to any equipment while wearing loose articles of clothing, long hair, jewelry, etc.

SAFE CLOTHING AND EQUIPMENT

Restrain long hair when working around moving machinery. Jewelry such as rings, watches, and necklaces should not be worn. Long sleeves are required when working on or around equipment, and shirt tails should not hang loose.

Do not wear clothing or jewelry that could cause a hand, arm, or any part of the body to be dragged into moving machinery.

MACHINERY NOISE

Unnecessary or irregular noises usually indicate that the machine, or a component of the machine, is out of adjustment or has worn, loose, or broken parts. Repair or replace before operating again.

Eye and hearing protection should be worn at all times during operation.

ROTATING COMPONENTS

Gears, shafts, roller die tooling, chains, and sprockets can present hazardous areas. Ensure that all guards are in place and secure prior to operation.

MODIFICATION

Never modify, alter, or change the design of this machine, without first contacting the OEM. If the machine does not meet operational requirements, discontinue use immediately and contact the OEM or a reputable manufacturing equipment service company.

STOP CIRCUITRY

Know the location and operation of all normal STOP procedures. Small STOP push buttons de-energize the individual circuits only.

EMERGENCY STOP

Know the location of all emergency STOP controls and know all emergency STOP procedures. Emergency STOP red mushroom push or pull buttons (and any emergency STOP limit switches or cables) will interrupt power to the system and STOP all motion of the machine when actuated. However, control power is still present in the motor control center and individual components.

<u>SAFETY</u>	Safe Operation Cautions
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It is important to know the workings of this machine and why precautions (from physical guarding to knowledge of safe operating procedures) must always be observed.

ON-MACHINE GUARDING

- Always operate machine with guards and covers closed or in place.

Guarding is provided on this machine and any peripheral items to protect operators and other personnel from possible pinch and crush areas. **Under no circumstance** should a guard be removed and the machine operated. If maintenance must be performed and the removal of a guard is necessary, maintenance personnel should follow the zero energy procedures so the machine cannot be inadvertently actuated.

BARRICADES

Barricades and on-floor fences (if present) are used to cover large areas of the machine and protect the operator or maintenance personnel from possible crush areas that can injure. **Under no circumstance** should an operator go beyond the point of a barricade or fence when power is supplied to the machine, neither during normal operation or when the machine is paused. If maintenance must be performed and the removal of a barricade or fence is necessary, maintenance personnel should follow the zero energy procedures so the machine cannot be inadvertently actuated.

EXPOSED MOVING PARTS

Moving parts such as rollers are used to process the material. **Never** use these surfaces as steps and always be aware of their operation while standing near the roll former. **Do not** go beyond a barricade or fence.

SENSOR

The main line controller controls this machine. When the line (as a whole) is put into "line run" operation, this roll former will start. The machine stops only when the line is taken out of "line run" operation. Even though the line might not be in "line run" at the end of a batch when the last part is made and the line is automatically taken out of line run operation by the line controller, this machine usually still runs until a timer counts down. Also, if a mastic system is used with this machine there is usually a reflective photo eye mounted on the unit that controls the mastic applicator according to the leading and trailing ends of the panel. Be aware that if a mastic applicator is used, any interruption at the photo eye will cause the applicator to run. **Never** be on this machine or performing maintenance without following the zero energy procedures.

ELECTRICS AND ENCLOSURES

This machine has enclosures that house electrical items and a supply source. **Never** open an electrical enclosure or perform electrical maintenance without first following the zero energy procedures.

SAFETY

Technical File Preparation (Electrical)

The specifications listed below are in response to "Requirements for CE Conformity," Section II Electrical.

ZERO ENERGY PROCEDURES

If the roll former is used in a **post-cut application**

1. Remove all material from the roll former, rewind unused material onto the coil and band sufficiently.
2. Position the main disconnect switch handle in the **OFF** position.
3. Lock the main disconnect switch handle in the **OFF** position.

If the roll former is used in a **precut application**

1. Stop any upstream conveyor that is delivering material to the machine.
2. Remove all material from the roll former by allowing the material to run through the machine.
3. Turn off the upstream conveyor.
4. Position the main disconnect switch handle in the **OFF** position.
5. Lock the main disconnect switch handle in the **OFF** position.

INTERACTIVE SOFTWARE

Software varies by manufacturer. Please consult the equipment OEM for details related to software operation and training.

STATIC ENERGY

Static energy is not a concern with this equipment.

SAFETY

Warning References

This manual will indicate where caution should be observed at the machine. How the warning notes are used is listed below.



DANGER: This reference in the manual indicates an **imminently hazardous** situation that, if not avoided, will result in death or serious injury. The reference is displayed as follows:

DANGER: Text referring to situation written here.



WARNING: This reference in the manual indicates a **potentially hazardous** situation that, if not avoided, will result in death or serious injury. The reference is displayed as follows:

WARNING: Text referring to situation written here.



CAUTION: This reference in the manual indicates a **potentially hazardous** situation that, if not avoided, will result in injury or equipment damage. The reference is displayed as follows:

CAUTION: Text referring to situation written here.

NOTE: This reference in the manual relays information that is important to personnel, but is not safety related.

NOTE: Important information that is not safety related is written here.

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OPERATION



WARNING:

To prevent serious injury, only individuals who have read this text thoroughly and comply with all the recommended safety guidelines are qualified to use, maintain, and operate the roll-forming machine.

THINK FIRST, ACT SECOND!

OPERATION

Push Buttons

Roll-forming machines can be supplied with several types of control packages, from line controllers with touch screens or keyboard controls, to push button packages. The most common push button style controls are shown below.

E-STOP: This push or pull button (generally red in color) is used to disabled all the outputs of the electrical system and thereby **STOP** all machine action. There is an E-STOP button on the main console as well as all other control consoles.

WARNING: Even though the machine cannot operate with this button depressed, there will still be electrical power in the motor control center(s).

RESET: This reset button is featured in conjunction with the E-STOP. It is used to re-enable the outputs once the E-STOP button is pulled out.

LINE START: This push button (generally lit) is used to put the equipment into "Line Run" mode so the controller can take over and make the system produce parts. It may also be labeled **LINE RUN**. The line will only go into "Line Run" mode if all push buttons are lit.

LINE STOP: This push button is used to take the system out of LINE RUN mode. When depressed, the above LINE START push button's light will go off and the equipment will stop.

RF JOG FWD & REV: These two push buttons are used to jog the roll so material can be test fed or jogged when needed. These buttons only work if the unit is not in LINE RUN. If this is a stand-alone machine, the drive must also be enabled. The push buttons must be constantly pressed for the machine to operate.

OPTIONAL CONTROLS

IF WORKING WITH A STAND-ALONE MACHINE

ROLL FORMER ENABLE: This push button (generally lit) is used to enable the roll former drive and set the unit ready to run. The light illuminates to inform the operator that it is ready.

ROLL FORMER STOP: This push button (generally red) is used to disable the roll former drive. The light at the ROLL FORMER ENABLE button will go off when this button is depressed.

IN/OFF/OUT: This two-position, spring-return selector switch controls the lateral travel drive (when the option is provided). The switch must be held in place for the roll former to move. IN will make the machine travel toward the inboard (drive) side. OUT will make the machine travel toward the outboard (operator) side.

OPERATION	Basic Operation Steps
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In a post-cut application, the roll former is normally used with an uncoiler that feeds material directly to the entry guide. In a precut application, a cut-to-length system or sheet conveyor brings precut material to the unit. Before using the roll former, make sure the proper coil is loaded and secure, the uncoiler is ready for operation, and all upstream equipment is ready to run.

1. Verify that at the motor control center has been turned on.
2. Go to all consoles and make sure the E-STOP buttons are pulled out.
3. Depress any available RESET button.
4. Prepare all upstream equipment.
5. If this roll former has an ENABLE button, depress the ROLL FORMER ENABLE button so the green light will go on. If there is no button, skip this step.

Note: Always start the upstream equipment first and *then* the roll former. Some applications require that the roll former be interlocked for start-up in that order.

PROCEDURE FOR STRIP ALIGNMENT

Before material is fed into the entry guide of the roll former, or the entry guide of the cutoff equipment, the entry guide must be aligned square to the tooling and shafts on the roll former or the cutoff shear blades. Using a long straight edge or carpenters square, align the inboard entry guide square to the first forming pass. Place the square against the first pass shaft and adjust the entry until it just touches the square. Check that the entrance and exit are flush with the square. If not, reposition the entry guide to make it flush on the equipment exit and entrance and retighten the entry guide.

Check for parallelism between the inboard and outboard entry guide by measuring the distance separating the entrance and exit ends of the guide. The separating distance should be the same. Adjust the outboard guide parallel to the inboard guide if not parallel.

After adjusting for parallelism and squareness, adjust the height of the entry guide so that it is slightly lower than the lowest forming point of the first pass. The material should go up into pass one and not have to be forced down against the entry guide. This promotes a better flow of material into pass one and prevents buckling and other distortions of the panel entering the tooling.

OPERATION

Basic Operation Steps

THREADING UP THE MATERIAL

A: PRECUT APPLICATION

1. Bring material to the cutoff equipment from the uncoiler. Push material through the entry guide and adjust the table for that material. Jog material through the cutoff equipment and CROP the shear to zero out the line controller.
2. Program the equipment for the desired batch at the controller.
3. Make sure upstream equipment is in AUTOMATIC mode. Inspect the line and make sure it is clear of personnel.
4. Depress the LINE START button. The roll former will start and the line will now produce the programmed batch of parts.

B: POSTCUT APPLICATION

1. Bring material to the roll former from the uncoiler. Push material through the entry guide and adjust the table for that material. Jog material through the machine and into the first three forming passes so the roll former can pull material out of the material accumulation loop.
2. Jog the material through the roll former and into the cutoff equipment. Stop when material exits the shear about 6 in. (152 mm). Push the yellow EXIT CROP button to zero out the encoder.
3. Program the equipment for the desired batch at the controller.
4. Make sure the uncoiler is in AUTOMATIC. Inspect the line and make sure it is clear of personnel.
5. Depress the LINE START button. The line will now produce the programmed batch of parts.

GENERAL TOOLING SUGGESTIONS AND THINGS TO CHECK BEFORE OPERATION

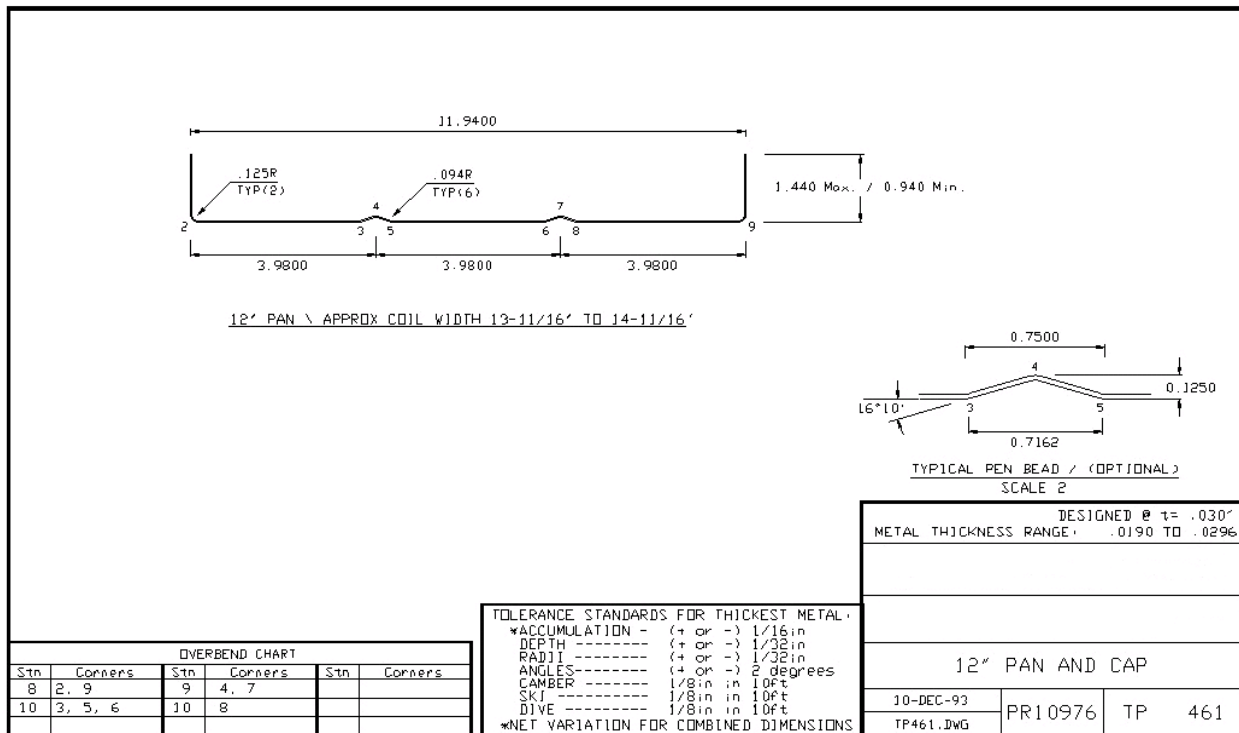
- Before tooling is installed on the shaft, the shaft should be cleaned and oiled to prevent rusting. This keeps tooling from seizing to the shaft. While installing tooling on the shaft, clean tooling bores and slides of any debris which can cause shaft to bounce when shaft nuts are tightened.
- After tooling is installed on shaft and the outboard stand is in place, tighten shaft nuts with minimum pressure. Over-tightening the shaft nuts will cause the shaft and tooling to bounce or run out of concentricity which may cause an oil-canning effect in the formed panels.
- The entry guides should be inspected for wear and cleaned of any debris that could cause excessive wear on the guide or damage the incoming material. If entry guides must be removed for proper inspection, cleaning, or repair, remove only one guide at a time, perform required maintenance, then reinstall the first guide before removing the adjacent guide. Following this procedure, the guide left in place can be used to help square the adjacent guide.
- After a period of production, the shaft adjustment assembly should be checked for excessive play or looseness. If not corrected, the gap between the upper and lower rolls will not be maintained properly and, in precut applications, the upper and lower rolls could run together ruining the surface finish of the rolls and, in turn, affecting the panel finish.
- If there is play in the adjustment assembly, remove the graduated dial and loosen the collar set screw. Tighten the collar to remove any he play and re-tighten the collar set screw. Adjust the material gap between rolls and replace graduated dials resetting to the decimal thickness of the material.
- The adjustment screw threads will wear over time, making it necessary to calibrate the gap after the lock nut is tightened rather than before it is tightened.
- When forming bare galvanized or galvalume material, utilize evaporative compounds with a 95% or higher volatile rate to lubricate the rolls to prevent material pickup on the rolls. Immediately remove any material pick up on the tooling to prevent galling of rolls and damage to the material being formed.
- Do **not** use lubricants that are non-evaporative in nature. This will introduce conditions that directly affect worker safety during handling and installation of roofing products.
- Galvalume material will run differently than galvanized material. Some galvanized material may have a clear acrylic coating which will cause it to behave similar to painted material. Acrylic coated galvanized material should not require an evaporative compound.
- Check for end play in the shaft which allows side to side misalignment of roll tooling. Upper inboard edge of rollspace (toolspace) should be in same plane to lower inboard edge of rollspace within 0.002 inches.
- Alignment from pass to pass of the inboard stands or edge of rollspace should be within 0.010 inches.

To be able to set the roll former up for any particular panel profile, it is important to first be able to understand the documentation that accompanies each set of roller die tooling. The following pages illustrate the different forms of documents that should be supplied, and provides instructions on how to adjust the roll former. The following example may or may not match your panel. It is provided for reference only. (Use only the values present in the tooling documents and not those shown in this manual.)

TOOLING PROFILE DRAWINGS

Tooling Profile drawings provide information based off the dimensional information provided on this sheet. Below is an example of TP461. Most of the information is self-explanatory except the coil width and overbend chart. Coil width is generally shown at the top of the main title block on the drawing. It states the coil width required to form this part at a particular material thickness. If this panel design is ordered in a metric format, the drawing would feature metric dimensions.

To understand the overbend chart, one must first understand what an overbend is. An *overbend* occurs when the panel corner is intentionally bent past the desired angle of the finished profile. This is done because metal has a certain "spring-back" property where it will actually bend back a small amount once it exits a forming pass. Bending past the finished angle ensures that, when the corner does bend back, the desired angle is reached.

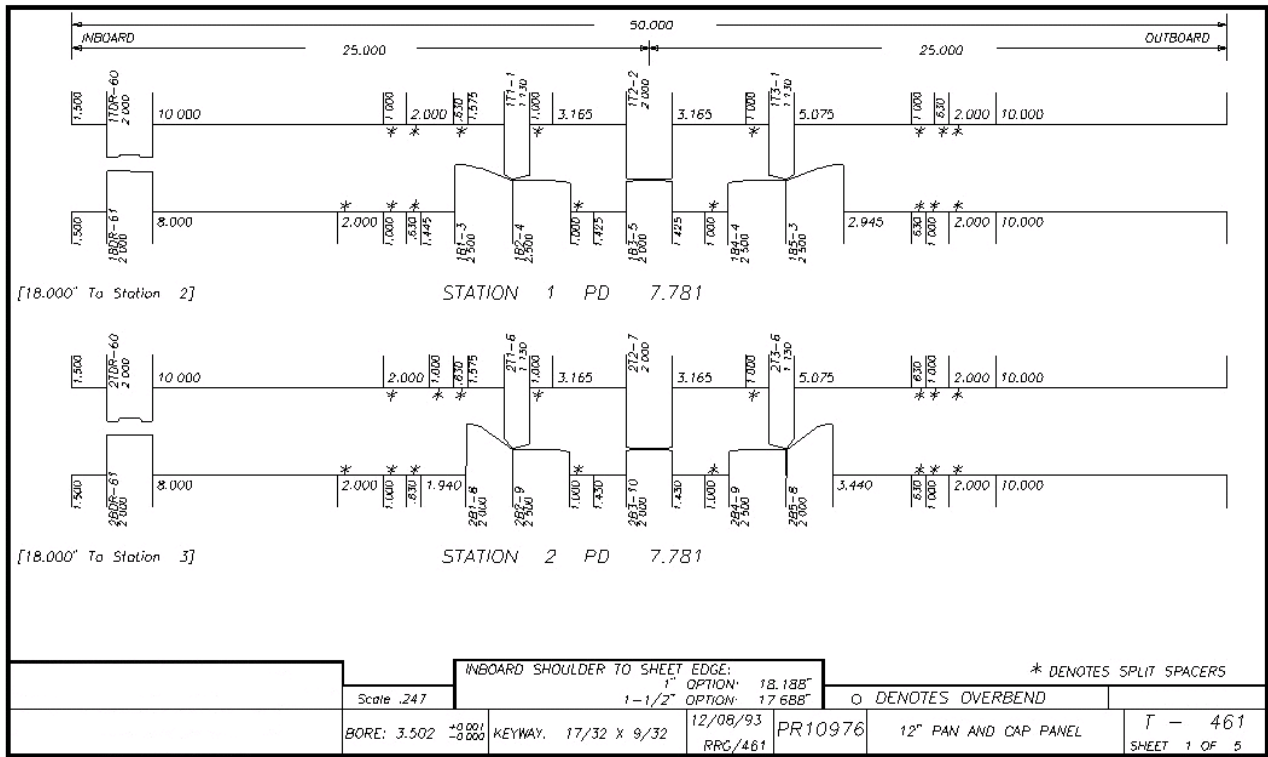


TOOLING DRAWINGS

Tooling drawings are the assembly drawings that the OEM provides for the roller die tooling. Shown below, they typically include two to three stations each and feature both the roller die tooling and the accompanying spacers. The actual roller die tooling always features a stamped identification number on its side (such as 1B1-3) to correspond with the number on the drawing. Spacers are stamped on their outside diameters to reflect their length.

Two items of importance are the INBOARD and OUTBOARD references. INBOARD is always the drive side of the roll former. OUTBOARD is always the operator side.

The dimensions shown at the top refer to specific values regarding the tooling position on the shaft in regard to shoulders and sleeves.



Also shown on the tooling drawing are corners where circles are present. These represent overbends. An overbend, as previously explained, occurs when a component's corner is intentionally bent past the desired angle of the finished profile. This is done so that the inherent "spring-back" properties of the metal will spread the corner back out and eventually end up at the correct angle. Overbends pointed out in the upper left illustration are for those occurring at forming pass 9. Overbends pointed out in the form on the tooling profile drawing.

Note: Overbends may also be shown using the symbol Δ.

**THOROUGHLY READ AND UNDERSTAND
ALL OPERATION AND MAINTENANCE INSTRUCTIONS
BEFORE ATTEMPTING TO OPERATE OR MAINTAIN MACHINERY.**



Following this schedule will help ensure the equipment produces to design tolerances and attains full design life.

The intervals for Level-One (50 hours), Level-Two (200 hours), and Level-Three (2,400 hours) maintenance activities are **maximum** intervals. Certain circumstances, such as factory environmental conditions, the type of material being run, or critical finished-product tolerances, may dictate shorter maintenance intervals.

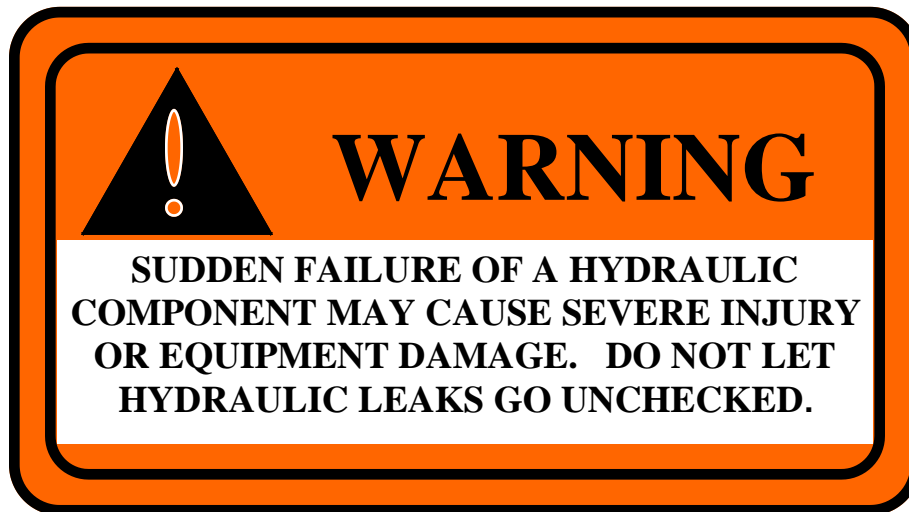
NOTE: These are guidelines only! For specific manufacturer’s maintenance and servicing recommendations refer to OEM manuals.

The processing line is equipped with an “operating hour meter” located on the main control console or the motor control enclosure. This meter records the time the line is running in the **automatic** mode. Use this meter to determine when to conduct the maintenance activities listed in this section.

An additional use for this meter is to help track the mean time between failures (MTBF) for components on the line. Please give the operating hours to the OEM’s Customer Service department when ordering replacement parts.

The following circumstances are cause for **immediate** line shutdown and correction.

- Excessive vibration or unusual noise from equipment or components. Causes of excessive vibration include equipment and components coming loose from foundation or fixtures, worn bearings or gears, or a lack of lubrication.
- Indication of excessive heat on bearings, motors, etc. Smoke or an unusual odor emanating from a component or discoloration of a component may be due to excessive heat.
- Excessive hydraulic oil leaks. Excessive leaks may indicate impending failure of a hydraulic component.



- Excessive air leaks in pneumatic system (any leak which is audible).
- Low lubrication or hydraulic oil levels.
- Loose, cracked, or broken tooling or dies.
- Loose or broken welds, bolts, nuts, etc., which may damage equipment.

The following circumstances are cause for operator attention during operation and correction when convenient:

- Minor, unusual vibration of equipment.
- Minor, unusual temperature increases on electric motors, bearings, tooling, etc.
- Small lubrication leaks between hydraulic fittings or around cylinder rods.
- Minor leaks in the hydraulic system or pneumatic system.
- Loose parts, nuts, bolts, etc., which are not an immediate threat to employees or equipment.



Post-Shift Maintenance

Your line should be equipped with a MAIN DISCONNECTION device for electrical power, located in the upper right hand corner of the Motor Control Enclosure. This will disconnect incoming power for the whole line. It has the capability to be locked out with a hasp and lock or tag. Follow company safety procedures for LOCKOUT/TAGOUT at all times when servicing, or operating this line.



Post-Shift Maintenance

Inspect the equipment for the following immediately after end-of-shift line shutdown:

1. Overheated bearings, particularly bearings on high RPM shafts or spindles. If an overheated bearing is found, check the lubrication system for proper functioning. Replace if necessary.
2. Investigate all oil leaks on floors, pits, and machinery. Pay particular attention to leaks appearing to come from hydraulic cylinders. Leaking cylinders may fail causing equipment to drop without warning.

3. Manually drain moisture from pneumatic system filter bowls.
4. Inspect any components which have been deferred for repair until the next hourly maintenance interval.
5. Lubricate all components in accordance with the lubrication schedule. (See the machine lubrication schedule in **Section VI** of the manuals.)
6. Remove all scrap and debris from between equipment and entire floor area and sweep up.

Replace or close any guards removed or opened to facilitate maintenance, servicing, or cleaning.

Reconnect electrical interlocks as required.



Level-One Maintenance

Level-one maintenance activities should be conducted at a **maximum interval** of every 50 operating hours.

1. Perform all “Post-Shift” maintenance activities.
2. Inspect for loose nuts, bolts, parts, etc. Repair or replace as necessary.
3. Service lubrication points in accordance with the lubrication schedule.
4. Fasteners on presses, shears, and other equipment subject to vibration should be inspected and tightened, as necessary.

Replace or close any guards removed or opened to facilitate maintenance, servicing, or cleaning.

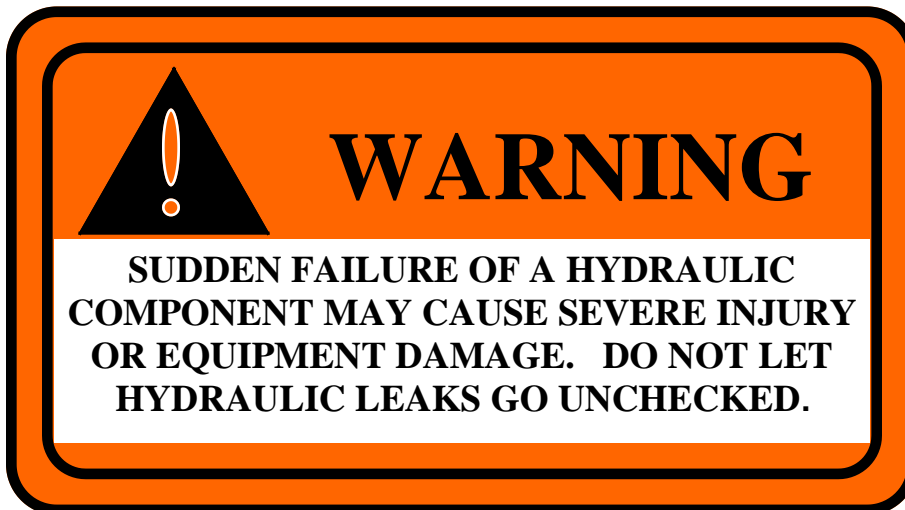
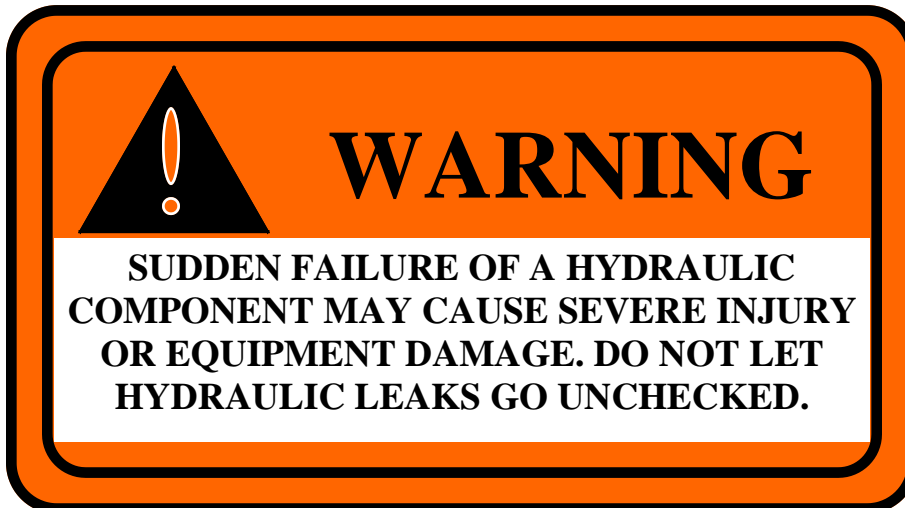
Reconnect electrical interlocks as needed.



Level-Two Maintenance

Level-two maintenance activities should be conducted at a **maximum interval** of every 200 operating hours.

1. Perform all post-shift maintenance activities.
2. Perform all level-one maintenance activities.
3. Inspect for loose or worn-out drive belts or chains. Repair or replace as necessary.
4. Remove, clean, or replace all air filters on electrical cabinets and forced air ventilated motors. This may need to be done more frequently depending on the operating environment.
5. Clean tooling, machined surfaces on rafted roll former bases and raft plates, feed rolls, straightener or leveler rolls, and lead-in guides.
6. Inspect roll tooling, dies, cut-off blades, feed rolls, straightener rolls, and leveler rolls for excessive wear or damage. Repair or replace as needed.
7. Inspect position transducers, limit switches, photo eyes for loose connections (mechanical and electrical) or damage. Repair or replace as needed.
8. Check fluid levels in hydraulic oil reservoirs, lubrication tanks, gearboxes, and oilers. Fill to proper levels as required.
9. Inspect all chain sprockets, chains, slide ways, threaded spindles, and racks and pinions for wear. Replace components as needed. Lubricate items in accordance with the lubrication schedule.
10. Inspect all gears under guard and in gear boxes equipped with inspection cover for unusual wear. Replace components as needed. Lubricate items in accordance with lubrication schedule.
11. Inspect lubricants from gearboxes, hydraulic oil tanks, lubrication containers, etc., for dirt or other contamination. If contaminated, the container must be drained, cleaned, flushed, and refilled with proper lubricant. Inspect items and systems for cause of contamination. Clean or replace filter cartridges before refilling with clean lubricant.
12. Inspect clutches and brakes for worn lining or discs, bronze wear strips, bushings, etc. Repair or replace as needed.
13. Inspect all air and hydraulic pipes and hoses for leaks or wear. Replace all parts found defective and pressure test the system before production. Filter all fluids to eliminate damage to components.



14. Inspect guarding for proper fit and function. Ensure all interlock and emergency STOP devices properly function.



CAUTION: Hydraulic fluid may be hot!

15. Inspect all control consoles for loose or broken buttons and switches, and missing labels. Repair or replace as needed.

16. Clean controller screens with a common glass cleaner and a soft cloth.

IMPORTANT: Do NOT clean the control screen while control power is on.

Level-Three Maintenance

Level-three maintenance activities should be conducted at a **maximum interval** of every 2,400 operating hours.

1. Perform all post-shift maintenance activities.
2. Perform all level-one maintenance activities.
3. Perform all “Level-Two” maintenance activities.

Drain, flush out, and clean all gear boxes, hydraulic oil tanks, lubrication containers, etc. Remove all suction, in line filters, or filter cartridges. Wash out or replace as necessary, and reinstall. Refill all tanks or containers using proper lubricant to a level indicated on the machine or in the supplier’s manual.

- Inspect all electrical cables, wires, starter, and relay contacts, and replace all damaged or worn out parts.
- Vacuum all electrical cabinets. Do **not** use compressed air.
- Vacuum electric motors and clean parts with dry compressed air. Clean the commutator and replace carbon brushes if necessary. Consult your electrical manual for more details.
- Repaint equipment with a good industrial paint if necessary. Original paint is a waterborne type and can be painted over with minimal preparation.

Replace or close any guards removed or opened to facilitate maintenance, servicing, or cleaning.

Reconnect electrical interlocks as needed.

Manual Lubrication Points

The lubrication charts provide lubrication information for your metal processing line. Charts are based on an 8-hour shift. If more than one shift is run per day, adjust frequency of lubrication accordingly. (See the machine lubrication schedule in **Section VI** of the manuals.)

Although the chart lists a particular manufacturer’s product, other products are acceptable providing their specifications are equivalent.

In addition to the listings on the chart, we recommend that manufacturer’s recommendations on purchased components (i.e., motors, gearboxes, gears) be followed. Refer to **section V**.

Prior to initial start-up, service all lubrication points. If the line has not been operated for more than 1 month, service all lubrication points prior to the next start-up.

NOTE: When lubricating machinery, watch for excess grease being expelled from the bearings cavity indicating the reservoir is full and introduction of grease should be stopped.

Refer to the individual machine maintenance manual for particular equipment lubrication requirements.

Automatic Lubrication Systems

On equipment with automatic lubrication systems, check the complete system as part of the regular maintenance on the machine. Check the reservoir to see that it is properly filled. Check all feed lines and fittings for leaks. Check all lubrication points to be sure they are being properly lubricated.

NOTE: Replace or close any guards removed or opened to facilitate maintenance, servicing. Order spare or replacement parts as needed.

When ordering machine parts, refer to the OEM’s manual for the respective machine serial number and part details. For purchased items contained on this equipment, refer to the respective manufacturer’s component manual.

Any question regarding parts and service should be addressed with the OEM’s customer service department.

1. Under roof storage is most desirable and should be used whenever practical. Jobsite storage time should be minimized.
2. Plastic tarps or shrouds should be placed over coils or flats in a manner that prevents good ventilation. The “humidity cabinet” effect of unventilated storage is well known. It creates higher interior temperatures, which causes the material to condensate and, along with other moisture that may be present, will lead to possible damage. Moisture can percolate under the paint and cause blistering which may cause paint failure.
3. Unloading shipments at jobsites should not be practiced while raining. If this is impractical, coils and flats should be kept covered at all times to prevent moisture from wetting or penetrating packaging. In the event a package becomes wet, it should be opened, dried and the coil or flats used at the earliest possible opportunity.
4. Jobsite stored coils and flats should be uncovered in good weather while working on the site to allow airflow around packages.

Remember: always cover coils and flats when leaving jobsite for the day or before any adverse weather approaches.

5. After any storm, tarps should be removed to allow air to circulate and dry any moisture that may have penetrated under the tarps.
6. Store coils and flats at jobsite to allow good drainage in case of adverse weather conditions. All coils and flats should be provided with a minimum 4 inches from ground contact so that moisture cannot damage the material from below. Tilt all coils and flats at an angle to allow for good drainage in the event of adverse weather.
7. Inspect each coil and flat package upon arrival and note any damage, corrosion, or moisture. Report all exceptions immediately and note the truck delivery receipt. All motor carriers are to be instructed on the proper handling, securing, and transit of coil and flat metal products. It is the consignee’s responsibility to note all visible quality exceptions at the time of delivery.
8. Other factors to consider when locating coils and flats for storage on a jobsite are droppings from trees, blowing sand or dust, emissions from factories or incinerators, and any other condition that may cause damage to coils and flats while stored at a jobsite.

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