Paper Handling Area

Area Operations Guide Prepared for:

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Introduction

This guide is an **Overview** containing original instructions written to assist in the normal operations of the **Paper Handling Area**.

For detailed information, refer to the **Maintenance** manual specific to the equipment being maintained.

CAUTION: Personnel should undergo proper training before attempting to operate any piece of equipment.

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1 Safety Overview

This **Area Operations Guide** provides an overview only. For general safety information, read the **Gypsum Technologies Safety Overview** manual. For the safe operation and maintenance of specific equipment, read the **Gypsum Technologies Operation & Maintenance Manuals**.

All personnel must follow **Lockout** procedures (see Section: Lockout Procedures).

CAUTION: This section is NOT a complete safety procedure for performing maintenance or cleaning functions.

Important: Incorporate this information into your plant specific Lockout/Tagout procedure.

All personnel must operate in compliance with both company policies and local regulations.

CAUTION: Equipment has the potential to cause severe injury or even death.

Important: Before undertaking or performing any maintenance or clean out procedure, be sure to understand the safety concerns related to a piece of equipment. NEVER put yourself at risk.

Note: For any safety concerns, speak with your management prior to undertaking any work.

1.1 HMI Display

The **Human-Machine Interface (HMI)** provides valuable information and diagnostic tools, adding a level of safety. View status of all area safety devices on the **Safety Overview** screen.

Prior to working on any equipment, always confirm that system equipment is NOT operational by using the normal means of starting it (Operator Control Station or manual **Start**/**Test** button).

CAUTION: The HMI functions are NOT a replacement for physically isolating equipment.

Important: To avoid potentially hazardous situations, ALWAYS be alert and aware of your surroundings.

The **HMI** controls for each **Motor Drive** can be put into **Forward**, **Reverse**, **Off**, or **Auto**. Equipment runs continuously when a Drive is manually put in Forward or Reverse.

Note: For motors with a field-mounted **HOA** selector switch, the **HMI** controls are only for display.

1.2 PLC Controls

Safety relays and all safety devices are monitored by the **Programmable Logic Controller (PLC)**. When a problem occurs, the **HMI** identifies which hard-wired device has been activated, and then displays status to aid in rapid troubleshooting.

1.3 Shutdown Guidelines

General Safety Guidelines to follow during **Shutdown**, and before any maintenance or repair work is started on motor-driven equipment:

- Confirm that the relevant control switch is in **OFF** position, and remains in the **OFF** position.
- Confirm that power supply to equipment is shut off and Locked at:
  - The main control switch
  - The local safety switch to the respective motors
- Display a "**WORK IN PROGRESS**" sign on the equipment.
- NEVER make a by-pass connection of a **Safety** switch (not even if it's faulty) – Replace it!
- For any fault that could lead to personal injury, report this to the nearest person in responsibility.
- Keep locking keys to relay cabinets, etc. in a safe place accessible only to authorized personnel.

1.4 Lockout Procedures

It is your organization's responsibility to develop, implement, and enforce an energy control program in compliance with the **Occupational Safety & Health Service (OSH)** standard for **Lockout/Tagout (LOTO)**.

Equipment can store potential energy which can cause equipment to move or suddenly fall if pressure is removed. Examples are those held in a raised position by hydraulic or air pressure. Be aware that hazards can arise from equipment or material movement upstream or downstream of the machine that is Locked out.

CAUTION: Equipment may move or suddenly fall.

Important: Before performing equipment maintenance or cleaning functions, ALWAYS lock out motive power sources (electrical, hydraulic, compressed air, pneumatic, etc.).

Prior to performing any equipment maintenance or cleaning, this **LOTO** procedure must be followed:

1. Identify the equipment that needs to be locked out
2. Shutdown equipment
3. Confirm **Area/Zone** is turned **OFF**
4. Open the **Disconnect** switch
5. Place a personal **Lock** on the switch to prevent system from being re-energized
6. Confirm that no personnel are in the **Area/Zone**
7. Test the **Lockout** by putting equipment or motor into **Manual** mode for a few seconds to confirm that it will not start, then back to the **OFF** position

To continue operation after **LOTO**, remove **Lock** from the switch, then turn switch back to the **ON** position.

1.5 Electrical Disconnect

Electrical Disconnect switches are used to physically isolate Drives and remove power to a motor or series of motors. Electrical equipment can be disconnected at the **Electrical Panel** with a lockable switch that isolates all Drives in the corresponding Panel.

CAUTION: Equipment may automatically start.

Important: To prevent equipment from being re-energized after an Electrical Disconnect Switch has been opened, ALWAYS place a lock on the switch.

1.6 Air Disconnect

Equipment requiring compressed air will have an electronically controlled air dump solenoid coupled with a manual valve for lockout procedures. Under some circumstances air pressure is automatically dumped from a piece of equipment, and in others it may be necessary to manually dump air pressure by locating the manual Air Disconnect.

CAUTION: Equipment automatically dumps air pressure under some circumstances.

Important: Once air is dumped, ALWAYS ensure that air pressure has been isolated and locked out before servicing any piece of equipment.

1.7 Emergency Stop

A series of **Emergency Stop (E-Stop) Push Buttons (PBs)** located throughout the plant are for use in an emergency. To immediately stop equipment or an entire zone/area and remove power to **Drives**, press an E-Stop PB.

CAUTION: Use E-Stops only in an EMERGENCY Only – NOT for normal shutdown.

Important: Using E-Stop Push Buttons for normal shutdown can cause equipment damage.

To reset an **E-Stop**:

1. Pull the **E-Stop** PB back out.
2. Press the **E-Stop Reset** button and wait approximately 30 seconds for equipment to re-energize.
3. Restart the system from the **Operator Console.**

Note: For normal startup and shutdown procedures, see Section: 4 Operator Procedures.

1.8 Pull Cords

Emergency Stop **Pull Cords** are switches that can be pulled during hazardous situations to immediately Stop equipment and remove power to **Drives**.

CAUTION: Use Pull Cords ONLY in an EMERGENCY.

Important: Using Pull Cords for normal Shutdown can cause equipment damage.

To reset a **Pull Cord**:

1. Push the **Reset** button on the Pull Cord
2. Wait approximately 30 seconds for equipment to re-energize
3. Restart system from the **Operator Console**

Note: For normal startup and shutdown procedures, see Section: 4 Operator Procedures.

1.9 Safe Torque Off

Safe Torque Off (STO) is an integrated safety function of the **Variable Frequency Drive (VFD)** which ensures that no torque generating energy can be applied to a Motor, and prevents unintentional starting in accordance with machinery safety standard EN 60204-1.

CAUTION: The STO function does NOT electrically disconnect VFDs.

Important: The STO only halts torque in the motor – power is usually still connected to the VFD.

When the **STO** stops pulses at the insulated-gate bipolar transistor (IGBT), it secures a drive, qualifies against the EN 60204-1 code, and then the motor or machining actuator does not restart until STO has reset. For a Variable Frequency Drive (VFD**)** without the **Safe Torque Off** function, time is needed to properly discharge before power is restored.

The **STO** function along with **Safety Gates** allow safer equipment functionality when accessing equipment for housekeeping and clearing jams.

1.10 Safety Gates

Safety Gates help to prevent people from entering an area with hazardous energy sources running, stored or residual energy. Each Gate has a **Push Button (PB) Control Panel**.

CAUTION: Proper Lockout procedure must be followed to avoid hazards.

Important: A personal lock must be placed on the Safety Gate switch to prevent the gate from being locked behind a person.

1.10.1 Gate Access System

The **Gate Access System** is designed for incorporation into your **Lockout/Tagout (LOTO) Program**.

For **Gate Access**, from the **Gate Control Panel**, press the Yellow **REQUEST ACCESS** PB. The following sequence takes place:

1. PLC performs a controlled stop of the Zone
2. VFDs are put into STO
3. Automatic Safety Air Dump activates
4. Safety PLC verifies that all gate access prerequisites have been satisfied (STO and Air Pressure switch) and designated time delay expired
5. Gate Solenoid energizes to permit access to the zone
6. Safety Beacon slowly Blinks BLUE
7. Once the Safety Beacon becomes **Solid BLUE**, the Gate can be opened

Note: The Gate can be Locked in the **OPEN** position.

When the Gate is closed and the Safety Beacon slowly blinks **BLUE**, the Gate must be Locked by pressing the **BLUE Reset** PB on the control panel to reactive the Gate Solenoid. Once the Safety Beacon stops blinking and turns **OFF**, the Zone can be restarted by pressing the **WHITE Zone Start/Stop** PB.

1.10.2 Gate Control Panel

Each **Gate** has a **Push Button** control panel with lights that indicate if it is safe to unlock the gate.

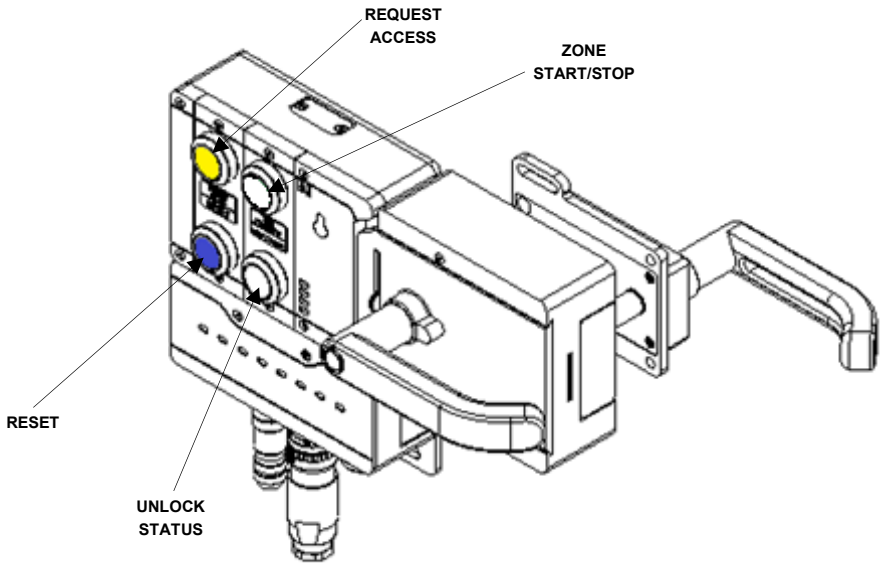

Figure 1.10.2.1 Gate Control Panel

Table 1.10.2.1 Gate Push Button Control Panel

Push Button	Color	When Pressed
REQUEST ACCESS	**Yellow**	Releases Gate Handle when conditions are met, allowing access to the Zone
ZONE START/STOP	**White**	Starts and Stops the Zone When the Zone is running, this button is illuminated **Green**
RESET	**Blue**	Returns gate to Locked state

UNLOCK STATUS	**White**	Gate Solenoid status

Table 1.10.2.2 Safety Beacon Gate Status

Beacon	Gate Status
OFF	Gate is **CLOSED**; Locked
SLOW BLINKING BLUE	Gate is **CLOSED**, **Unlocked** **Note**: RESET is required
SOLID BLUE	Gate is **OPEN**, **Unlocked**
FAST BLINKING BLUE	A **Safety Fault** condition exists **Note**: RESET on **HMI Safety** screen, a technician may be required

1.10.3 Safety Air Dump Valves

Each Zone has two Safety Air Dump Valves:

- **Manual**: With OPEN/CLOSED, lockable when in the CLOSED position
- **PLC (Automatic)**: Controlled by the Safety PLC, part of the Gate Access prerequisites for Zone Entry

2 Paper Handling Area Overview

The **Paper Handling Area** delivers paper for board formation to the **Mixing Forming Area** in two continuous streams referred to as **Paper Webs**. Before arriving at the Mixing area, paper travels from the **Roll Stands**, through the **Splicers**, through the **Paper Edge Heaters**, and then through the **Web Guides**.

The **Paper Handling Area** includes the following equipment:

- Roll Stands (2)
- Paper Splicers (2)
- Paper Floor Tracks (4)
- Paper Heater
- Web Guides (2)

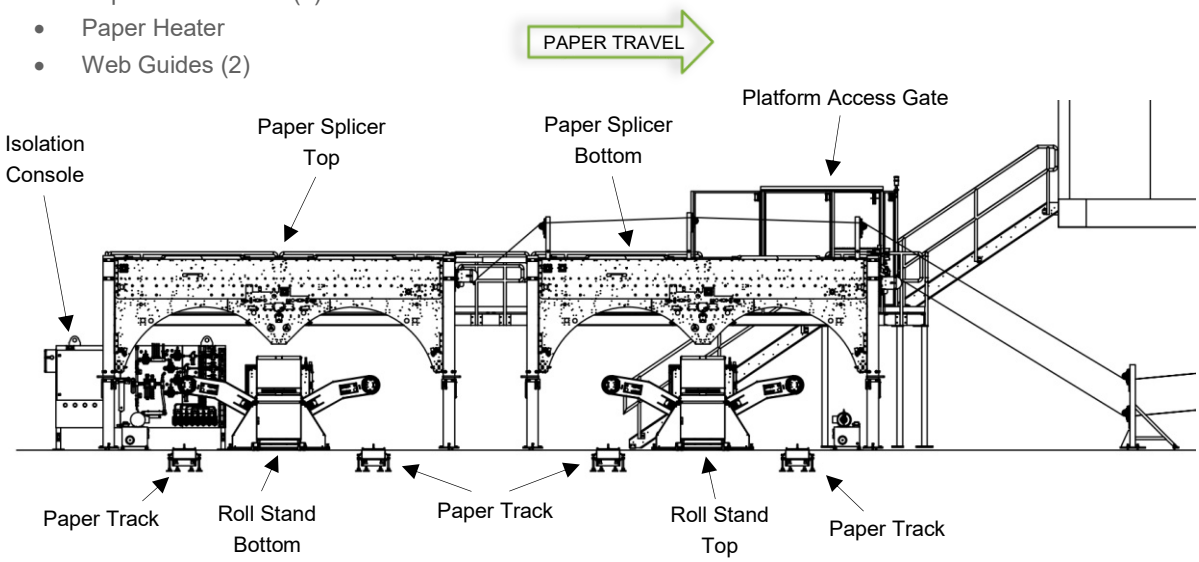

Figure 2.1 Paper Handling Area – Upstream

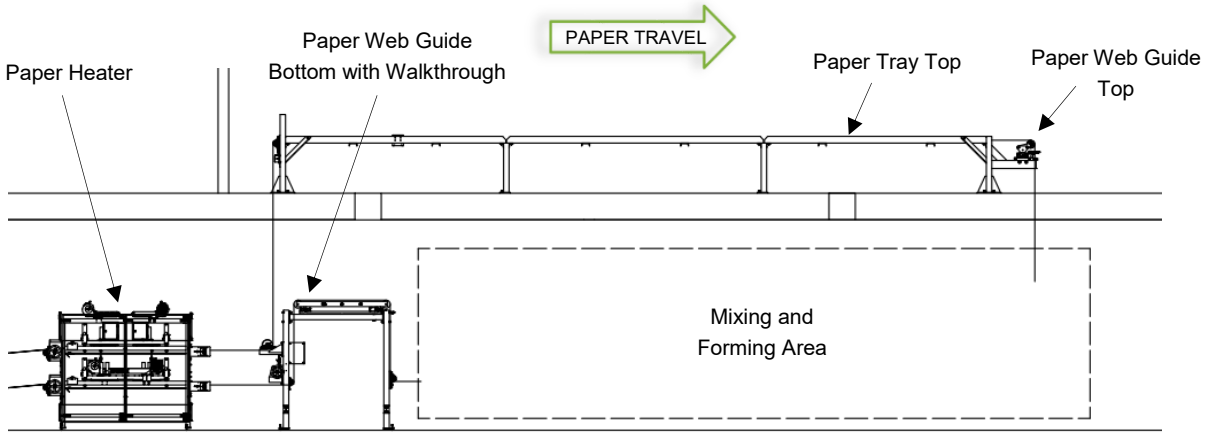

Figure 2.2 Paper Handling Area – Downstream

Paper Handling equipment works together to control the three main elements of the paper:

- Tension
- Moisture
- Alignment

Two **Paper Webs** (Board Paper layers) form a sandwich around stucco slurry from the **Mixer** area resulting in a continuous stream of Gypsum Board to the production line.

Board Paper layers are dispensed from **Paper Rolls**.

- **Face Paper**: The bottom layer of the Forming process, slurry flows out of the Mixer onto the Face Paper and forms the smooth front of the board
- **Back Paper**: The top layer of the Forming process, forms the coarser back of the board

3 Paper Handling System

The **Paper Handling** system is designed to minimize operator involvement while optimizing paper tension and splicing control. Paper splicing can be initiated manually, or automatically once a **Running Paper Roll** has been reduced to a predetermined diameter. Splices are made with a 5-inch-wide overlap and are capable of speeds over 560 feet-per-minute.

3.1 Operator Control Panel

All functions are manually completed at the main **Operator Control Panel** with Push Buttons.

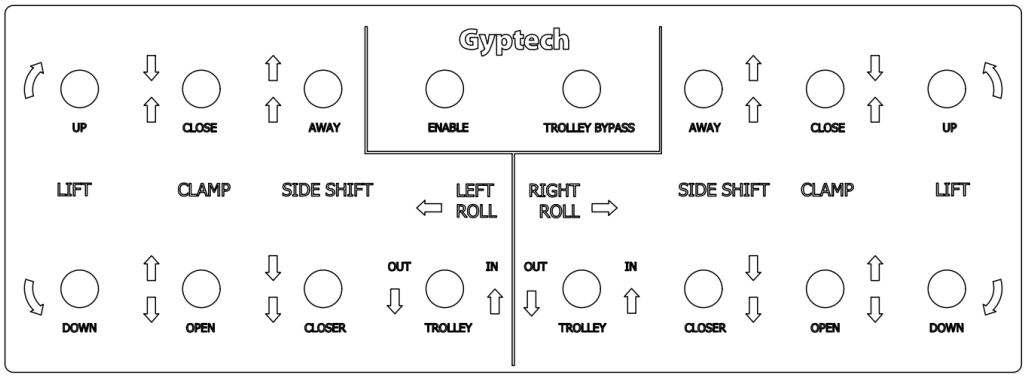

Figure 3.1 Operator Panel

3.2 Paper Floor Tracks

Paper Floor Tracks move **Paper Rolls** from the staging area into position at the **Paper Roll Stands**. Fork Trucks place Paper Rolls onto **Roll Trolleys** which are energized by pneumatic motors. The paper tracks are manually operated using switches on the operator panel while pressing the enable foot switch. To avoid driving a roll into the roll stand arms, the PLC will not allow movement of the paper tracks unless the arms are fully raised. This can be overridden with the trolley bypass button.

3.2.1 Roll Trolley

The **Roll Trolley** is a transport shuttle that moves **Paper Rolls** from the staging area to **Roll Stand Loading Arms**. This air-motor-driven Trolley System eliminates the need for electrical devices in the floor.

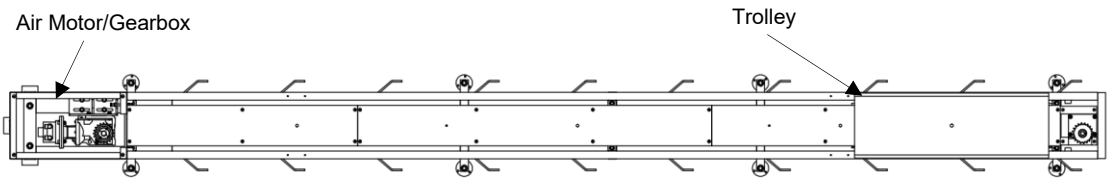

Figure 3.2.1 Paper Floor Track with Roll Trolley

3.3 Paper Roll Stands

Two shaftless **Paper Roll Stands** each hold and position a pair of **Paper Rolls** that rotate when the Chucks of opposing **Loading Arms** are inserted into the cylindrical hollow core of a Roll. Roll Stands have Brakes that control the rotation of the Chucks. Features include:

- Shaftless design that lessens the need to handle the Paper Rolls
- Operator Control Panel with HMI station integrated into each Stand
- Hydraulic cylinders for roll lifting, side shifting and arms closing/opening
- Torque-activated expansion Chucks mounted in anti-friction bearings that fit into the Roll Cores
- Interchangeable chuck sizes
- Pneumatic Disc Air Brakes controlled by the Programmable Logic Controller (PLC) to maintain consistent tension of Paper Webs

Table 3.3 Roll Stand Dimensions

Roll	Dimensions
Widths	600 mm to 1350 mm
Diameter	Up to 2.1 m
Weights	Up to 3,400 kg
Core Sizes	100 mm and 75 mm

3.3.1 Roll Stand Loading Arms

Roll Stand Loading Arms hold **Paper Rolls** above the ground. A **Roll Trolley** brings Rolls into position to be lifted by the Roll Stand. Paper is unwound from a Roll then wrapped around Web Rollers and a Dancer in the **Paper Splicer** before being dispensed to a **Board Line**.

Hydraulic cylinders and directional flow control solenoid valves control all **Roll Stand** movement. Hydraulic pressure is created by a **VFD**-driven motor pump. For each pair of Roll Stands, only one Arm can move at a time. This is interlocked in the program.

Any pair of **Roll Stand Arms** can move straight along the **Pivoting Beam** in the same direction which allows Arms to be manually positioned before **Chucks** are inserted into the hollow of a **Paper Roll**.
Push Buttons are used for **Loading Arms** to:

- Rotate together (a motor side arm and its opposing operator side arm) on the Pivoting Beam to an **Up** or **Down** position – A set of **Photo Eyes** on the Splicer Frame prevents an Arm holding a Roll from colliding with the splicer frame
- Move linearly along the Pivoting Beam in opposing directions allowing the Arms to remove or insert Chucks into the cylindrical hollow of a Paper Roll – A **Safety Interlock** button prevents accidental opening of the arms while a Roll is loaded

- Open by pressing the **Enable** button along with the **Open** button

Note: The **Enable** button on the **Main Operator Console** and **Arm Plate** are dual safety inputs to the **PLC**, which also enable the hydraulic pump.

Loading Arm movements:

- **Up/Down**
- **Open/Close**
- **Side Shift**
- **Away/Closer**

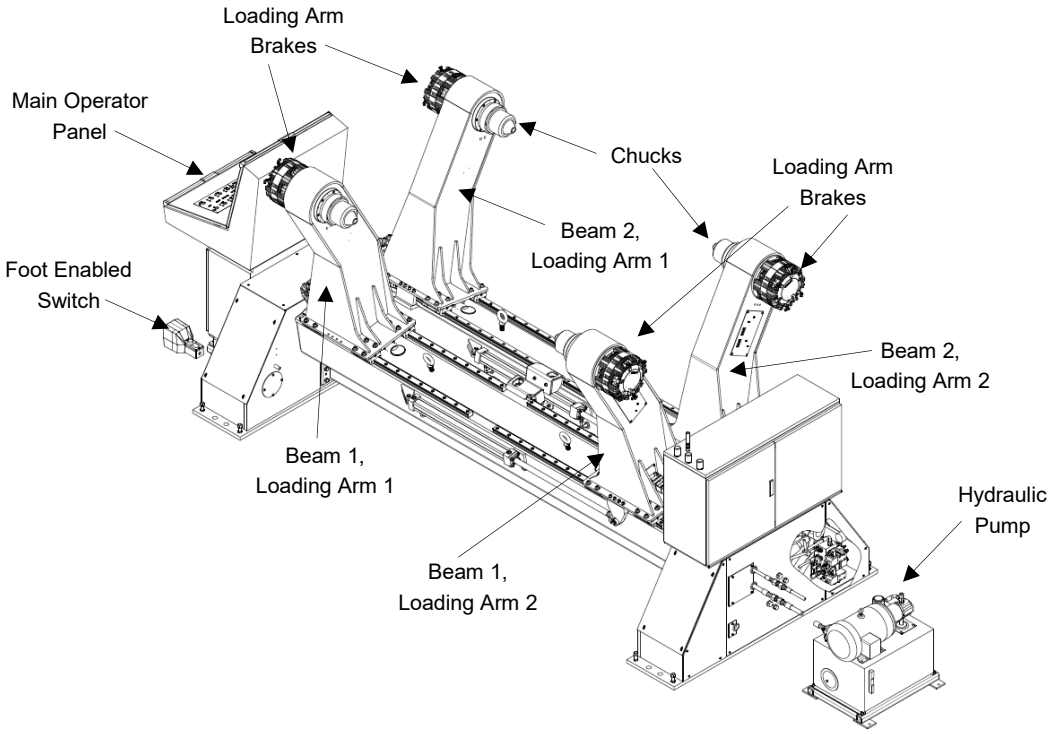

Figure 3.3.1 Paper Roll Stand

3.3.2 Paper Rolls

Paper Rolls that supply the production line are referred to as **Running Rolls**. When a Running Roll is used up, the **Paper Splicer** splices new Paper from a **Spare Roll** to the trailing end of the Running Roll. The **Splicer Arms** holding Rolls can be adjusted to align Rolls with the center of the **Board Line** or to the opposite roll. The Braking System helps to prevent stationary Rolls from unwinding.

3.3.3 Loading Arm Brakes

There are four **Loading Arm Brakes** for each **Roll Stand**. Depending on the situation, Brakes apply variable or full braking to the **Paper Roll**. On a **Running Roll**, braking is varied to maintain a constant **Web** tension and an adequate amount of storage on the Dancer for a splice.

The Brake for each **Chuck** allows control over Chuck rotation. To rotate a Roll in the Chucks, press the **Brake Release** Push Button (this is a toggle switch). To prevent unintended rotation when a **Spare Roll** (non-running) is in position for a splice, apply full Brakes.

3.4 Paper Splicers

Two independently operating **Paper Splicers** can handle all grades of wallboard paper and fiberglass mat. Features include:

- Splice preparation from the ground floor
- Variable Frequency Drive-controlled Rollers accelerate/decelerate paper to reduce splice time
- Full paper-width rubber nip roller system to improve friction and increase tape bond on splice joint
- Load Cells mounted internally on Rollers for tension feedback and monitoring
- Shaft-mounted Encoders to aid in alignment
- Pneumatic splicing unit and knife engagement
- Lower splice Nip with spring-actuated clamps for low maintenance
- Actuator Valves mounted externally for easy maintenance
- Splicer Head sensors that trigger maintenance alarms
- Direct contact Paper Break detector for immediate controlled shutdowns

Splicer Units are mounted directly over their respective **Roll Stands** on a common structural bridge. The **Paper Handling** area catwalk is connected to the **Mixer Mezzanine**. There are stairways for operator and maintenance access.

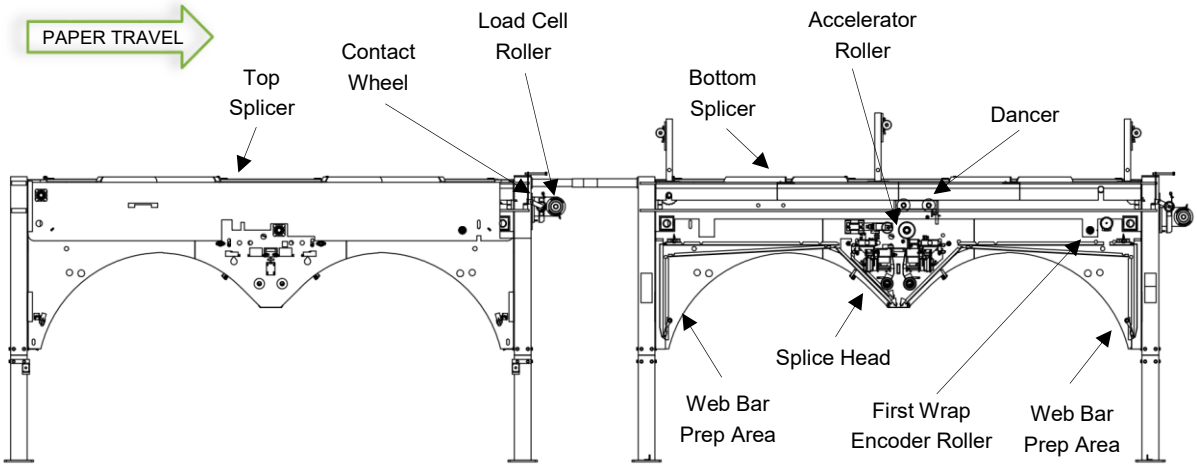

Figure 3.4 Paper Splicers

Splicers automatically calculate and display:

- Roll diameter
- Paper used per Roll
- Paper remaining on the Roll
- Time remaining until a Splice

3.4.1 Paper Webs

Splicing involves overlapping **Paper Webs** and joining them with a strip of double-faced adhesive tape. Paper is routed through a series of rollers where one Splicer unit splices the **Bottom Web** and the other unit splices the **Top Web**.

3.4.2 Web Bar, Plate, Sensors

A **Web Bar** carries the prepared end of a Paper from a newly mounted **Spare Roll** into position for splicing with the **Running Roll**. Each **Splicer** has two Web Bars, one for each **Paper Roll**. These Bars are controlled by an electric motor which in turn drives a chain drive system.

Encoders are installed to accurately position the Web Bar, both in the **Splicer Head** for accurate splicing and at the **Web Bar Plate** for splice preparation. A Home Sensor is used for homing the Web Bar.

Table 3.4.2 Web Bar States

State	Activity
In	The Web Bar is located at the Splicer Nip. Both web bars must be in this position for a splice to occur.
Out	Double-sided tape can be applied to the end of a Paper Roll and secured to the Web Bar (using a different tape) The Web Bar Plate can be in a **Forward** position to aid in attaching tape to the Paper while blocking Web Bar movement (and also a **Returned** position that does not block Web Bar movement) After a Splice, the Web Bar automatically travels out of the Splice Head and towards the **Out** state.
Transit	When the Web Bar is not in an **In** or **Out** state, it is assumed to be in a **Transit** state
Safety Zone	When the web bar is located in the safety zone (the vertical portion of its travel above the prep plates), the enable button and the selector switch must both be used to move the web bar.

The **Selector** switch on the **web bar operator pendant** is used to move the Web Bar between **In** and **Out** states. While the Web Bar is in **Transit**, the **Stop** button can be used to halt the web bar movement. When the Web Bar reaches the **In** or **Out** state, or enters the safety zone, the Bar is automatically stopped to prevent damage to the Splicer.

The ***Selector*** switch that controls **Web Bar** movement is disabled when:

- The Paper Roll associated with the Web Bar is the Running Roll
- If the Web Bar or Splice Head Nip is not in the **Returned** position (this prevents collision between the Bar and Nip)
- The web bar is in the safety zone and the enable button is not pressed

3.4.3 Splicer Head

The primary function of the **Splicer Head** is to splice the **Spare Roll** to the **Running Roll** of paper, and then cut off the tail of the old roll of paper. The Splicer Head assembly can splice paper rolls without affecting the constant flow of paper to the **Boardline**.

Before a splice is made, a **Spare Roll** of paper is prepared (see Section 4.6.1 Splice Preparation) and then positioned into the **Splicer Head** using the **Web Bar**. A built-in support frame routes paper through a series of rollers.

When a Splice occurs, the **Running Roll** of paper is slowed to a stop for the start of the Spare Roll to be adhered to it. During a Splice, both Paper Rolls are held stationary. A **Dancer** and a store of paper wrapped around rollers are temporarily used to supply paper to the Board Line. After a Splice, the Spare Roll then becomes the Running Roll.

3.4.4 Dancer

The **Dancer** is a horizontally-travelling assembly powered by a low-friction air cylinder that controls brakes on the **Roll Stands** and Web (paper) tension to the **Board Line**, and also stores enough Web to maintain a constant supply during a splice. Although splices are performed at zero Web speed, **Spare Rolls** are spliced on to **Running Rolls** without interrupting tension, Web speed, or continuous flow of Paper to the **Mixer**.

Paper is wrapped around the Web and Dancer Rollers before being supplied to the **Board Line**. When the board line is running, the Dancer moves until the tension of the running paper matches the pneumatic pressure. Acceleration of the Dancer indicates a mismatch between Paper tension and pneumatic pressure. Constant paper tension at the Board Line is required for consistent high quality Board.

3.4.5 Accelerator and Nip Rollers

Both the **Accelerator Roller** and **Nip Roller** help stop the **Running Roll**, compress the Splice joint, and accelerate the new **Running Roll** after a Splice. The Nip Roller Timer delays the Nip Roller from opening until the splice portion has passed through the Accelerator and Nip rollers to help compress the seamed section of the Paper to make the new splice stronger.

At the start of a **Splice Sequence**, the **Accelerator Roller** motor is given a reference speed of zero. The **Nip Roller** extends and pushes the Running Paper against the Accelerator Roller to help the Running paper slow. After the Splice, the Accelerator Roller ramps up to the **Board Line** speed (plus some additional speed to refill the dancer).

The Nip Roller has a sensor that detects whether or not it is in the Returned position. If the Nip Roller Solenoid is powered, but this Roller remains in the returned position after a certain amount of time, this indicates that the Paper has begun winding around the Accelerator Roller, preventing the Nip Roller from being driven forward.

3.5 Paper Heaters

Two sets of height-adjustable electric **Paper Heaters** can be moved in and out to accommodate different paper widths, and also angled to vary the application of heat. During the forming process, heaters reduce variations in moisture content across the face of the paper to remove ripples in the paper.

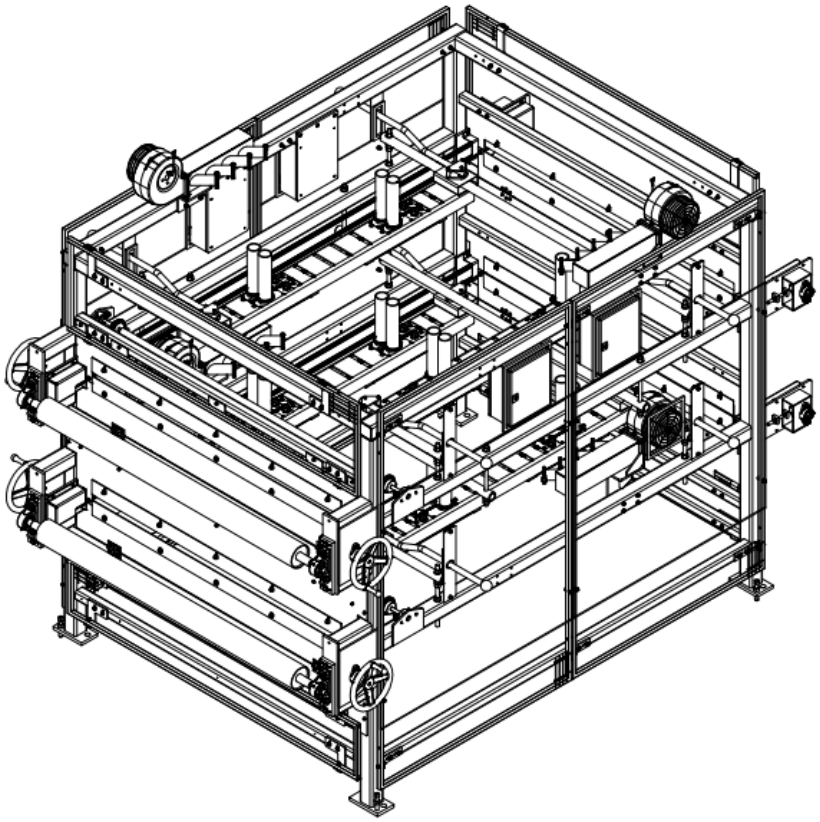

Figure 3.5: Paper Heater

Heaters can be started and stopped remotely with PLC controls. A Heater can also be stopped by pressing the **Machine Stop** and **E-stop** Push Buttons at the **Operator Control Panel**. A general alarm or fault is reset by pressing the **Reset** button. If Paper travel stops, the heat source automatically turns Off.

Hand wheel operated paper threaders are installed to aid in threading the paper through the heaters. To operate the threaders, the entrance and exit guard doors must be opened. Move the threader bar to the entrance, attach the paper to the bar using the clamps, and turn the hand wheel to pull the paper through the machine. While the paper heater is running, the threader bar should be stored on the exit end, on the outside of the machine, with the guard doors closed.

3.6 Paper Web Guides

Two electro-mechanical **Paper Web Guides** track paper into the **Forming Station**, one for the top paper and one for the bottom paper. Paper position is detected by the paper edge sensors, and the **Web Guides** steer the paper based on the sensor feedback. An offset can be applied to manually change the paper position. While operating, if a Guide senses a paper edge moving off track, it automatically steers the Guide to bring the Web back to the guide point.

Note: Reference *Vendor Operations Manuals* for full description of Guide functionality.

3.6.1 Top Web Guide

A **Kamberoller Steering Guide** located on a frame above the forming plate ensures very accurate **Top Web** alignment. A **Top Paper Tray** is provided to support the top paper path as it passes over the mixing/forming area.

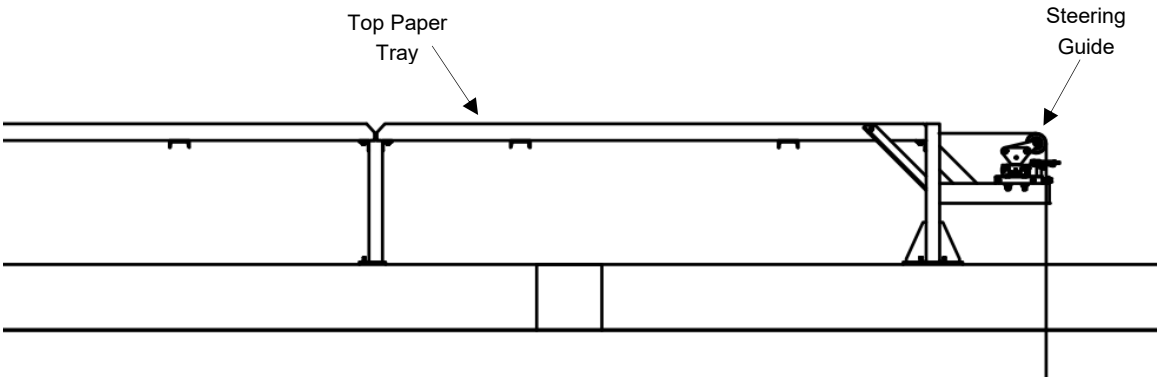

Figure 3.6.1 Top Web Guide

3.6.2 Bottom Web Guide

The **Bottom Web Guide** located immediately before the **Creaser** is an **Offset Pivot Guide** which ensures very accurate **Bottom Web** alignment so that paper creases are centered correctly. The **Operator Interface** for both web guides is mounted on the frame. The mounting frame also functions as a walkthrough. There is a hand wheel operated threading device mounted on the frame to pull the **Top Web** up to the mezzanine level from the ground floor.

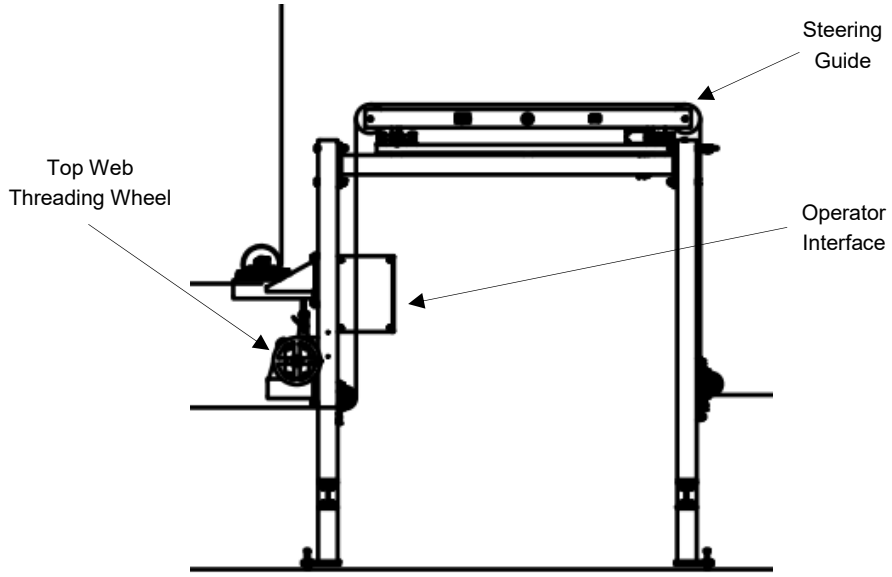

Figure 3.6.2 Bottom Web Guide

4 Operator Procedures

Before Starting any equipment in the **Paper Handling** area, confirm that:

- All Area Panel Disconnects are On
- All Air Valves are Open
- No Emergency Stop (E-Stop) buttons have been activated
- All Photo Eyes are clean and properly adjusted
- Paper is properly threaded through the equipment

4.1 Startup

Startup of a zone can be done by pressing the corresponding **Start/Stop** illuminated Push Button (PB) on the operator panel or the PB on the HMI screen to initiate the Area Start Sequence. A Start Delay timer is enabled and a horn is sounded to warn personnel that a zone is starting. When the delay passes, the area is On.

4.1.1 Zone Conditions

The illumination of buttons indicate zone conditions.

Table 4.1.1.1 Paper Handling Push Buttons

Push Button Light	Zone Condition
Off	Off
Slow Flashing	Starting
Rapid Flashing	On, but one or more devices are faulted
On	On and operating normally, no faults present

Table 4.1.1.2 Amber Alarm Beacon

Amber Flashing Interval	Zone Condition
0.25 sec	Top and Bottom paper splice is in progress
1.00 sec	Top and Bottom paper splice preparation warning
2.50 sec	Top and Bottom paper roll diameter warning

Table 4.1.1.3 Blue Safety Beacon

Blue Beacon Light	Zone Condition
Flashing	Safety relay is Not okay
On	E-Stop, Lockout, or Safety Contactors are Not okay

Table 4.1.1.4 Green Beacon

Green Beacon Light	Zone Condition
Flashing	Auto-splice is Not enabled
On	Auto-splice is ready

Table 4.1.1.5 Alarm Horn

Alarm Horn	Zone Condition
On for 5 sec	Paper Handling area Startup
On for 1.50 sec, 500 ms wave	Bottom Roll diameter falls below operator setpoint (HMI)
On for 1.50 sec, 1 sec wave	Top Roll diameter falls below operator setpoint (HMI)
On for 2.50 sec, continuous wave	Top Roll diameter OR bottom roll diameter falls below operator preparation setpoint (HMI)
On for duration of splice, 1.00 sec wave	Top or Bottom paper splice in progress
On for duration of trolley motion, 250 ms pulse	Any trolley in motion

Note: To activate the Paper Handling **Alarm Horn**, press the **Horn** button on the HMI.

4.1.2 Equipment Faults

Prior to starting a Zone, when any conditions in the below table: **Faults** are not met, or any of those conditions fail during operation, equipment automatically shuts down and the **HMI** displays the reason for shut down. Upstream equipment interlocks and automatically stops to prevent material buildup.

Table 4.1.2 Faults

Fault	Occurs When
Auto	Test button is pushed when the equipment is running
Aux	The drive or starter running signal is lost without a stop command being issued
Motion	The motion of conveyors equipped with zero speed switches is not detected when the motor is running

4.2 Shutdown

To Stop equipment and immediately turn off the **Paper Handling** area, press the **Start/Stop** Push Button (PB) on the control panel or the HMI to the area. Drives may remain powered and air pressure may remain. Before entering a zone to perform maintenance, it is still necessary to power down and lockout equipment. This is the controlled way to turn a zone off and is the preferred method of stopping a zone in a non-emergency situation. **E-Stop** PBs are not a normal means of stopping a zone.

4.3 Operation Modes

The **Paper Handling** area has numerous operation modes determined by both the physical state of the system, and signals sent from the **Mixer** PLC to the **Paper Handling** PLC.

Table 4.3 Paper Handling Operation Modes

Paper Handling Mode	Operation
Off	The system is in this mode when the zone is off.
Standby	This is the first operation mode after machine Startup. To change the running roll, press the **Roll Select** button on the HMI.

Paper Handling Mode	Operation
Hand Pull	Engaged when the Paper Handling area is in Standby mode and: • Paper Motion Wheel starts to move • Walker Wheels are Up • Board Line is Not moving **Note**: The Accelerator roll turns on at a low speed and brakes operate at a lower pressure to help with threading the line.
Wheel Pull	Engaged when: • Paper Motion Wheel is moving • Walker Wheels are Down • Board Line is running **Note**: Brakes operate at a lower pressure to help walk the paper on the Board Line in preparation for Startup.
Running, Startup Tension	Engaged when: • Walker Wheels are Down • Board Line is running • Mixer is making Board **Note**: The Dancer pressure is at a lower setting to prevent Board from slipping on the Board Line.
Running, Full Tension	Engaged when: • Walker Wheels are Up • Board Line is running • Mixer is making Board • Startup timer is done
Shutdown	Engaged when the area is Shutdown (mixer stops making board). This mode helps prolong the Running mode which helps maintain tension during a Shutdown.
Paper Break	Engaged when the system is running and the contact wheels stop detecting forward paper motion. The dancer pressure is dropped to zero to prevent paper from being pulled backwards. The system will exit this mode once forward motion is detected again by the contact wheels.
Web Up	Enabled from the HMI when the area is in Standby mode – The Web Up Solenoid opens and the Dancer slowly moves towards zero storage. This mode helps the operator thread-up the machine after a product Changeover or paper break.

Paper Handling Mode	Operation
Post Web Up, Refill	Enabled after an operator disables Web Up mode from the HMI. This mode sets a Refill pressure to slowly refill the Dancer to full storage.
Test	Enabled from the HMI, this mode allows maintenance personnel to manually turn on and off solenoids from the HMI, and for the I2P Transducers for the Brakes and Dancer to be tested. The system must be in standby mode to enter test mode. Permissives in the PLC logic and solenoid add-on-instructions (AOI) prevent the user from turning on solenoids in an order that could damage the equipment (e.g., both knives being fired at same time).

4.4 Roll Trolley Controls

A two-position, momentary **Selector** switch moves the **Trolley** into or out of the **Splicer** when held down in the desired direction for a **Paper Roll** to move. The floor mounted foot switch must also be pressed. This controls a dual solenoid valve that drives the air motor forward or reverse, and is only enabled if the **Roll Stand Arms** are in the **Up** position. To bypass the roll stand arms up requirement, press and hold the **TROLLEY BYPASS** Push Button (PB) and **Directional Selector** switch at the same time.

Table 4.4 Roll Trolley Functions

Machine	Function	Description	Automated or Manual
Roll Trolley	Linear Actuation	Actuation forward and backward is accomplished with a *Selector* switch and a Foot Pedal	Manual
	Enable Interlock	Roll Stand Loading Arms must make a Limit Switch in the Up position for automatic activation of Linear Actuation	Automated
	Enable foot switch	The enable foot switch must be pressed to move the trolley.	Manual
	Loading Arm Position Bypass	To override Enable Interlock, press and hold the Trolley Bypass button.	Manual
	Air Pressure Detection	If the Air Pressure is low, Linear Actuation is disabled	Automated

To center a **Roll** between the **Roll Stand Arms** after they have already been lowered, press the **TROLLEY BYPASS** PB on the Operator Control Panel to allow the Paper Trolley to ignore the **Arms Up** sensor if pressed.

There are no limit switches on the inward/outward movement of the trolley. If the Trolley reaches the end of its travel and the switch is still held in position, the air-driven motor will stall. Each Trolley has a separate air dump valve.

4.5 Paper Roll Stand Loading

4.5.1 Roll Stand Loading Arms

All **Loading Arm** movements can be done manually with Push Buttons (PB) through the main operator panel or the Loading Arm pendant located on each operator Side Arm. Functionality of the **Loading Arms** is hydraulic. The main power unit located on the back side of the **Roll Stand** supplies hydraulic pressure.

CAUTION: Do Not open Loading Arms unless the Roll is on the floor or Floor Trolley.

Important: Opening Loading Arms when a Paper Roll is lifted Up can cause personal injury or death, equipment or product damage.

Table 4.5.1 Loading Arm Movements

Loading Arm Movement	Main Operator Panel or Loading Arm Pendant
Raise	Press the **Up** PB **Note**: To avoid damage to the machine or Paper Roll when being raised, a set of Photo Eye Sensors prevent Loading Arms from rotating too high so that the Roll does not hit the Splicer. The **Photo Eyes** need to be kept clean or they may prevent Arms from lifting.
Lower	Press the **Down** PB
Open	Press the **Enable** button along with the **Open** PB simultaneously – Arms open until the buttons are released or the cylinders are fully extended. **Note**: The **Enable** button is a reminder that Loading Arms will open when a Paper Roll is loaded in the arm. **Do Not** open the arms while a roll is loaded and lifted off the ground.

Loading Arm Movement	Main Operator Panel or Loading Arm Pendant
Close	Press the **Close** PB until Arms are closed in on the Paper Roll **Notes**: The Arms are designed to clamp with a specific force so that they will not over-clamp the Roll and will stop moving once the cylinders are fully retracted. When the cylinders reach their limits, the pump continues to run. To minimize overheating oil in the system, Do Not hold buttons for excessive lengths of time.
Side Shift	Press the **Closer** PB or **Away** PB to move Loading Arms simultaneously in the same direction **Notes**: Use this movement to align the Paper Roll in the correct running location.

4.5.2 Loading Paper Rolls

1. Fully open the **Loading Arms** on the side of the **Roll Stand** to be loaded
2. move the Arms into the fully raised position. Arms must be in the full **Up** position for the Trolley to run forward.
3. Select the correct Paper Roll for loading (back or face paper).
4. Load the Roll onto the Floor Track ensuring it is centered and straight and oriented the correct way.
5. Move the Trolley in and center the Roll between the Loading Arms.
6. Visually check to make sure that the Chucks will not hit the Roll when the Arms are lowered.
7. Lower the Arms until the Chucks are aligned with the center of the Roll (arms are controlled at the main operator panel until the arms are at operator height, and then the Loading Arm Pendant can be used for easier control of the arms and viewing chuck positions).
8. Close the Arms to bring the Chucks into the center of the Roll being careful not to damage the core.
9. Release the **Close** button and the Arms will automatically open slightly for the roll to move freely.
10. Verify the Chucks on both sides are fully inserted.
11. Raise the Arms until the Paper Roll is 100-150 mm (4”-6”) above the floor (half rolls can be raised higher to aid in splice preparation).

4.5.3 Paper Web Setup

Initial setup before threading the paper web through the splicer:

1. Paper roll is loaded into the roll stand.
2. The Dancer is put in **Web Up** mode to assist in manual winding of the Web around Dancer and Web Rollers.
3. The Dancer moves as close to the end as it can go before being halted by the rubber end stops.
4. Press the **Brake Release** button to allow for the new roll to be easily unwound.

4.5.4 Paper Routing

To thread paper as required for initial machine setup and following a paper break, **Paper Routing** is done in **Web Up** mode. Paper Routing requires two people, one operator to thread the paper into the **Splice Head**, and a second operator on the platform to help pull the paper through the **Splicer**.

One Splicer is threaded with the **Top Paper** and the other Splicer with the **Bottom Paper**. Each Splicer must initially be loaded with a **Running Roll** and then a **Spare Roll** can be prepared later.

CAUTION: Before beginning Paper Routing, ensure that No personnel is within the Splicer area.

Important: Moving parts of the Roll Stands and Splicers can cause personal injury or death.

Paper Routing procedure:

1. On the **HMI** screen, press the **Web Up** button to move the Dancer to the minimum storage position.
2. Lock the machine out at both the electrical disconnect panel and the pneumatic lockout panel.
3. Prepare the Paper Web by folding it over diagonally so the web has a pointed end.
4. Thread the paper through the **splice head**. Ensure the paper is on the correct side of the **backup bar** (it should be on the side closer to the paper roll). Ensure the paper does not get wrapped around the **web bar**. A Grabber handle is very helpful here.
5. Wrap the paper around the **accelerator roll** (it should pass between the accelerator roll and the nip roller).
6. Wrap the paper around the **First Wrap Roller.**
7. Thread the paper through the **Dancer**.
8. Thread the paper around the **Exit Roller**, and through any remaining rollers.
9. Exit the mezzanine and close the gate. Remove locks from the electrical and pneumatic disconnects, and restart the machine.
10. Push the web up button to take the splicer out of web up mode. The dancer will slowly return to the full storage position. It is important that someone holds the lose end of the paper while this is happening or the dancer will pull that end back into the machine, instead of pulling paper from the roll.
11. Continue threading paper through the paper heaters and web guides. When motion is detected around the first Idler Paper Roller, the Accelerator Roller automatically begins rotating at low speed for threading paper through the Splicer, helping pull paper off the roll.
12. The paper needs to be threaded through the Forming Plate and down to the first Board Line where it can be clamped into place using the Board Line Walking Wheels.

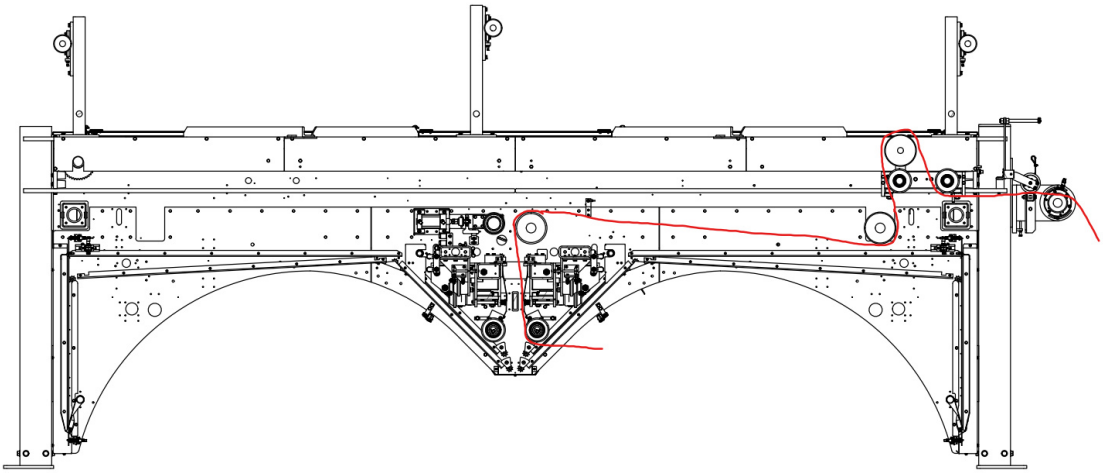

Figure 4.5.4 Splicer Threading (Bottom Splicer Shown)

4.6 Paper Roll Stand Brakes

Paper Roll Stand Brakes have different **Modes** of operation that depend on what the system is doing.

4.6.1 Manual Release Mode

The **Manual Release Mode** is triggered by the **Brake Release** button on columns near the **Web Bar Plates** and cannot be toggled for the **Running Roll**. If the Brake Release is left engaged and the system changes to **Running** mode, this Release disables itself.

4.6.2 Auto Release Mode

Auto Release Mode automatically releases **Brakes**:

- When the Dancer is in **Web Up** mode, however, this is not done through the Release Mode Auto Bit and done directly on the Brake Release Solenoids.
- To help the Accelerator to accelerate a Roll quickly and refill Dancer storage during a **Splice** sequence, right after the **Nip** heads have retracted.
- During **Zero Brake Delay** to help refill Dancer storage in the event of Dancer falling and storage less than 80%.

4.6.3 Tension Control

Brake pressure is varied on the **Running Roll** to maintain a certain amount of storage on the **Dancer.** This pressure varies according to how much paper is left on the Roll (roll diameter), Dancer position, and velocity.

Roll diameter is calculated based on a count from an Encoder on the first wrap roller and a pulse sensor located on the roll stand spindle. This is supplemented by a laser sensor pointed at the roll center. As the diameter of a Roll decreases, lower braking torque is required to maintain the same amount of tension on the web. This means that the torque driving the unwind shaft must decrease at a linear ratio relative to Roll diameter to keep tension constant as an unwound roll decreases in size.

4.6.4 Brake Stops

When a **Splice** occurs, **Brakes** decelerate the **Running Roll** to a **Stop**. A **Full Stop** is completed for large diameter Rolls, and for high speed Board Lines when the inertia requires a longer time for the Roll to stop.

During a **Ramp Stop**, the Brake pressure applied varies according to the Roll diameter size. For small diameter Rolls, this prevents jerking paper. A **Brake Ramp Factor** is determined based on the Running Roll diameter, multiplied by the Brake pressure every 100 ms until the Brake value has exceeded the maximum (clamped to 500 kPa).

The brake functions are summarized in the table below:

Table 4.6.4 Roll Stand Functions

Function	Description	Automated or Manual
Pressure Control	When a Roll is dispensing to a Board Line, Brakes that correspond to the Roll automatically vary depending on Roll diameter and Dancer position.	Automated
Low Air Pressure Switchover	As the roll size decreases and required brake pressure decreases, eventually the pressure becomes low enough that the braking torque generated is not consistent. At this point, Sets of brake calipers are disabled, allowing the pressure on the remaining calipers to be increased while keeping the braking torque constant.	Automated
Hold Pressure Control	The Roll that is not currently dispensing to the Board Line is automatically put on full Brakes.	Automated
Release	Brakes can be manually released for the standby roll by pressing the brake release PB.	Manual
Release Disable	When a Roll is dispensing to Board Line, Brake Release is automatically disabled.	Automated
Auto Start	When Board Line goes from an Offline to an Online state, all Brakes are automatically activated.	Automated
Splicer Initiation	When a Splice occurs, Brakes are automatically applied to the running roll. The pressure depends on Roll diameter.	Automated
Speed Detection	If the Paper Break Detector determines that Running Roll speed has slowed below threshold, signal is sent to Mixer and full Roll Stand Brakes are applied.	Automated

4.7 Paper Roll Splicing

For a continuous, uninterrupted flow of paper, **Spare Paper Rolls** must be spliced into **Running Paper Rolls**. The majority of Splice preparation work is performed manually from the ground floor.

4.7.1 Splice Preparation

To prepare a splice:

1. Verify that the new Paper Roll is loaded properly on the Loading Arms and rotates in the correct direction.
2. Inspect the outer edge of the Roll and strip off any damaged paper.
3. Use the **Side Shift** controls to visually align the edge of the Roll with the Running Roll edge.
4. If necessary, move the Web Bar out of the Splice Head using the **Web Bar** selector switch and **Enable** button.
5. Release the Brake to allow the roll to rotate freely (the brake release function is disabled on the running roll side).
6. For splice joints larger than 2 in. (50 mm), pull the **Prep Plate** up into place against the Web Bar and lock into place.
7. Pull the Paper over the top of the **Prep Plate** and beyond the Web Bar.
8. Reapply the Brake to hold the roll in place.
9. Ensure the paper is square with the Roll and pulled tight, then use two magnets or clamps to hold the paper in place.
10. Run a knife in the Web Bar groove to trim off the excess paper.
11. Using narrow masking tape approximately ¼ in. (6 mm) wide, adhere paper to the Web Bar every 8-10 in. (200-250 mm). The masking tape should be kept 6 in. (150 mm) from the edges of the paper and must not wrap onto the back of the Web Bar.
12. Apply double-sided tape along the cut edge of the paper to form a 2 in. (50 mm) typical joint width with a maximum 6 in. (150 mm) joint width if required. Creating a joint wider than 6 in. (150 mm) may leave tape exposed after the splicing process and will wrap paper on rollers down the line.

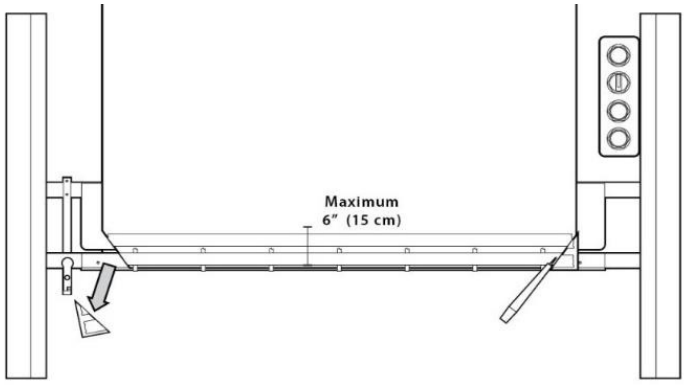

Figure 4.7.1 Paper Splicing

13. Taper the ends of the paper to about 1 in. (25 mm) wide and the height of the double-sided tape.
14. Remove the paper backing on the double-sided tape to expose the glue.
15. Remove the magnets or clamps holding the paper to the Web Bar.
16. Unlatch the **Prep Plate** and drop it down.

17. Release the Brake and unwind the Splice Roll to generate enough slack and allow the Web Bar to reach the **Splice Head**.
18. On the **Push Button (PB)** pendant, press the **Web Bar In** and **Enable** PBs to manually move the Web Bar until it is clear of the prep zone. After clearing the prep zone, the Web Bar begins automatic movement until it reaches the Splice position in the Splice Head.
19. The Splice Head Nip moves in slowly and automatically clamps the splice in place.
20. Rewind the roll to remove any slack from the paper.
21. Re-enable the brakes on the roll to hold it in place. It is critical that there is no slack between the new Roll and the Splice Head. Failure to remove the slack may result in a failed splice attempt.
22. The **HMI Splice Ready** light should be illuminated. The Splice sequence can now be activated automatically based on the Running Roll diameter or manually spliced at any time.

4.7.2 Splice Sequence

Splice Sequence:

1. **Splice not ready/Idle**: System not ready.
2. **Web Bar moves into Splice Head**: The Web Bar moves into the Splice Head with the prepared Splice (non-running side).
3. **Web Bar in delay**: The delay is for one second after the Web Bar has moved in (non-running side).
4. **Secure Paper**: The Nip Head on the non-running side is turned on to prevent the Paper from pulling out of the Splice Head, slack on the Roll is removed, and Brakes re-engaged.
5. **Ready to Splice**: Press the manual Splice button, or if Auto-Splice is enabled, the Splice will engage once the diameter is below the diameter Setpoint.
6. **Wait for coordinated signal**: A delay occurs to wait for a coordinated Splice signal from the wet end. If this feature is not enabled, the coordinated splice timer preset can be set to zero (0).
7. **Brake Running Roll**: The Brakes on the Roll Stand and rotation of the Accelerator Roller decelerate the Running Roll to a stop.
8. **Move Nip Roller in**: This occurs 100 ms after Brakes are initiated so the Brakes can pull out all the slack in the Splice Head and ensures no slack between the Paper Roll and Nip Roller.
9. **Move Nip Head in**: After the running roll slows beyond the predetermined threshold, or the Dancer moves beyond a certain position, or a timeout occurs, the running side Splicer Nip head is driven forward by the low pressure pneumatic line.
10. **Increase pressure**: After a timer expires, high pressure solenoids are enabled to increase pressure on the Nip Head. The upper Splicer Nip pushes paper prepared with double-sided tape against the Running Roll. Lower Nips push both the Spare Roll and Running Roll Paper against the Knife backup bar to prepare a high tension area between the upper and lower Splicer Nips for cutting.
11. **Fire Knife**: The Knife valve on the running side is activated and forces the Knife through the Web against the Knife back-up bar, then cuts the Splice of the Running Roll.
12. **Retract Knife**: The Knife is given a predetermined time to retract
13. **Retract Nip Heads**: The Splice Nip Heads retract to their Returned position, and the Brake on the Running Roll is released with the new Web securely joined to the old Web. The excess old Web is cut at the Splice Joint and the new Paper Roll is ready for the Acceleration phase.
14. **Start Accelerator Roll (Running mode)**: The Running Roll is switched to the new roll and the Accelerator system ramps the Paper Roll up to Board Line speed by pressing the Nip Roller in against the Accelerator Roller. During this process the Dancer moves towards the Mixer end maintaining a constant exit speed on the running paper. Once the new Paper Roll is up to speed, the Dancer gradually returns to running position and automatic Tension Control resumes.

15. **Start Accelerator Roll (Static mode)**: The Running Roll is switched to the new roll and the Accelerator system ramps the Paper Roll up to a preset speed by pressing the Nip Roller in against the Accelerator Roller. Static mode keeps the Accelerator on for only 2.5 seconds since the machine is currently not being used for production.
16. **Splice complete**: Signal is automatically sent to move the Web Bar on the non-running Roll outside of the Splice Head and the Nip Track Spray solenoid is engaged.

4.7.3 Automatic Splice

During normal running conditions the **Splicer** runs the **Automatic Splice** function based on a pre-set splice diameter. For an Automatic Splice:

- Check that the **Splice Ready** button on the **HMI** panel is illuminated
- Check that the **Auto Splice** indicator light on the **HMI** panel is illuminated
- Modify the **Auto Splice** Setpoint on the **HMI** panel if necessary

Note: Depending on plant specifications, the **Horn** may be configured to alert personnel of an impending splice or that a splice is in progress.

4.7.4 Manual Splice

An immediate Manual Splice is made using any of the **Manual Splice** push buttons located on the equipment. The splice activates immediately, although there can be a few seconds delay. For a Manual Splice:

1. On the **HMI** screen, check that the **Splice Ready** button is illuminated
2. Press any of the **Manual Splice** buttons

4.7.5 Splice Inspection

On the **HMI** screen, press the **Inspect Splice** button. This automatically retracts the **Splice Head Nip** and runs the **Web Bar** out to the splice preparation area. If the splice preparation looks okay, press the **Web Bar In** button and follow the last few instructions on the Preparing a Splice section. If the splice preparation is incorrect, the operator can start over on the preparation.

4.7.6 Splicer Component Functions

Table 4.7.6.1 Web Bar Component Functions

Machine	Function	Description	Automated or Manual
Web Bar	In and Out Positions	To move the Web Bar between the **In** and **Out** positions, use the HMI ***Selector*** switch or the **In/Out** selector switch in the splice prep areas. The web bar will continue to move after the switch is released.	Manual
	Web Bar Prep Area Movement	While the web bar is in the prep area, the **enable** button must be pressed in addition to the **In/Out** selector switch.	Manual

Machine	Function	Description	Automated or Manual
	Stop	To stop the Web Bar, press the **Stop** button.	Manual
	Disable Web Bar Plate	If the Web Bar Plate for preparation is not in its **Returned** position, the HMI ***Selector*** switch for **In** and **Out** positions is disabled to prevent collision.	Automated
	Disable Web Bar	If the Splicer Head Nip is not in its **Returned** position, the HMI ***Selector*** switch for **In** and **Out** positions is disabled to prevent collision.	Automated

Table 4.7.6.2 Splice Head Component Functions

Machine Part	Function	Description	Automated or Manual
Nip	Splicer Head Nip Preparation on non-running side	If both Web Bars are at the **In** position and one of the Web Bars has recently moved, the Splicer Head Nip on the non-running side with low pressure line is automatically driven to prepare for a Splice.	Automated
	Nip track spray	After each Splice, Nip Track Sprayers are activated to clean the Nip Tracks.	Automated
Splicer Head	Automated Paper Splice	Splice is automatically initiated after the Paper Roll diameter reaches a threshold.	Automated
	Disable Automated Paper Splice	Automatic Paper Splicing can be turned off at the HMI.	Manual
	Manual Paper Splice	A manual Paper Splice is initiated by pressing a button.	Manual
Accelerator Roller and Nip Roller	Start Splice Sequence	At the start of the Splice Sequence, the Accelerator Roller is set to zero speed. The Nip Roller is engaged and extends to push Running Paper against the Accelerator Roller.	Automated
	Detect Paper Wrap-around	If the Nip Roller Solenoid is powered, but after a certain time the Nip Roller is still in the **Return** position, this indicates that the Running Paper has wrapped around Accelerator Roller.	Automated

Machine Part	Function	Description	Automated or Manual
Nip Roller	Iron Splice	The Nip Roller does not go to **Return** position after a splice until it has rolled over the section of paper that was spliced.	Automated
Accelerator Roller	Ramp Speed	After a Splice, the Accelerator Roller ramps up to Board Line speed.	Automated
Dancer	Encoder Reset	Each time a Splice occurs, a sensor is activated that indicates the Dancer has reached a pre-calibrated position. The encoder is reset to this position to prevent gradual accumulation of errors.	Automated
	Velocity Calculations	Dancer encoder values are used in the Roll Stand Brake control.	Automated
	Startup	To move the Dancer into position for winding Paper through the Rollers on Startup, press button for **Web-up** mode. **Note**: Roll Stand Brakes are released for this mode.	Manual

5 Troubleshooting

This section outlines mechanical approaches to problem solving for equipment that is not functioning properly. It is up to the end user to define the line at which operators stop troubleshooting and maintenance personnel become involved with each unique situation.

Note: Reference *Vendor Operations Manuals* for further Troubleshooting details.

5.1 Loading Arms Troubleshooting

Table 5.1 Loading Arms Solutions

If…	And…	Then…
Loading Arms do not move	Zone is Off	Turn Paper Handling zone On
	Hydraulic Pump is not turning On	Check VFD, wiring, motor
	There is Mechanical binding	Inspect linear rails and bearings, hydraulic cylinders
	Valves are not opening or turning On	Check electrical signal, solenoid coil, valve
	Oil level in tank is too low	Fill tank until level is readable on site glass
	Photo Eye mounted on the Splicer unit is triggered	Arms stop raising – the **Arms Up** proximity switch on the Roll Stand can also cause this. Clean the photo eye mounted on the splicer.
Loading Arms do not fully clamp Paper Roll	Paper Roll has damaged core	Cut out damaged cardboard to create room for Chucks – If too much of the Core is removed, Chucks can slip during operation resulting in incorrect paper tension
	Chucks do not collapse properly	Internal mechanism of the chucks must be cleaned out.

5.2 Floor Trolley Troubleshooting

Table 5.2 Floor Trolley Solutions

If…	And…	Then…
Floor Trolley does not move	Zone is Off	Turn Paper Handling zone On
	Air pressure low	Adjust regulator
	Mechanical binding	Check chains, trolley wheels, gearbox, air motor, track surface
	Valves are not opening or turning On	Check electrical signal, solenoid coil, valve
	Loading Arms are lowered	Raise Arms until upper limit is reached – when staging a new Paper Roll with an existing Roll on the Arms, press the **Trolley Bypass** button

5.3 Dancer Troubleshooting

Table 5.3 Dancer Solutions

If…	And…	Then…
Dancer is unstable	There is an uneven roll of Paper	Check for Paper quality – flat spots on the Paper Roll, varying loose and tight winding can cause surges in Paper movement
	Mechanical binding	Check the Dancer chains, cylinder, wheels, sprockets
Dancer location is abnormal	Braking is too low or high	See Section 5.4 Braking Troubleshooting
	Dancer encoder position feedback is incorrect	Check the encoder mounted on the end of the Dancer drive shaft for missing counts

If…	And…	Then…
	Dancer cylinder air pressure problem	Verify air pressure on cylinder matches the Dancer pressure value in program – non-matching values indicate an issue with the I-to-P transducer

5.4 Brake Troubleshooting

Table 5.4 Brake Solutions

If…	And…	Then…
There is Brake loss	An issue with Brake pads	Check pads for wear, failure, foreign lubrication, binding
	Brake pads have been changed	Check new pads – a different coefficient of friction affects braking characteristics
	Loss of proper air pressure	Confirm air pressure on Brake line matches Brake pressure value in program - non-matching values indicate issue with I-to-P transducer
	Incorrect Paper Roll diameter calculated	Program is calculating too small of a roll diameter. Check the encoder mounted on the first turn idler roller and the pulse sensor on the roll stand spindle. (They may be missing counts)
	Not enough Brake Pads actuated	Confirm that all manual Brake releases are closed (mounted on caliper housing) – some brake valves may not be functioning properly
Brakes are squealing	Brake pads or rotors overheating	Check that cooling fan is operational (if applicable), inspect wear on pads and rotors
	Contamination of Brake pad surface	Use compressed air (if permissible by end user) – Do Not apply any lubrication to the brake pads

If…	And…	Then…
Braking is excessive	Brake pads have been changed	New pads with a different coefficient of friction affect the braking characteristics
	Incorrect Paper Roll Diameter calculated	Program is calculating too large of a roll diameter. Check the encoder mounted on the first turn idler roller and the pulse sensor on the roll stand spindle. (They may be missing counts)
	Too many Brake pads are actuated	Some Brake valves may not be functioning properly causing additional Pads to become actuated

5.5 Splice Troubleshooting

Table 5.5 Splice Solutions

If…	And…	Then…
Splice is not ready	Web Bar is not in Splice Head	Check to ensure that both Web Bars are physically in the Splice Head
	Web Bar in position not reached	Check the Web Bar servo motors for faults. Ensure the web bars are homed.
	Nip Forward sensor not made	Check the sensor setup for the non-running role nip forward sensor.
Splice failed	There is a Tape adhering issue	• Verify backing on double-sided tape was removed • Tape may have been exposed to air born contaminants – can occur if the tape backing is removed too early before a splice • Not enough double-sided tape was used • the tape was applied incorrectly • Improper double-sided tape used.
	There is mechanical binding of Splice Head	Check for cleanliness on Splice Head tracks, worn cam followers or issue with air actuators

If…	And…	Then…
	Web Bar(s) not moving to correct positions	Web bars require homing. If problem persists, check web bar home sensor setup.
	Web Bar(s) are no longer straight or have been modified	Correct Web Bar(s) straightness so that Splice Head properly presses the joint together during a splice sequence
	Air pressure in system too low	Correct air pressure so that enough force is applied on the joint during a splice sequence
	Torn splice joint or paper	• Too much or too wide of masking tape used during splice preparation. • Masking tape may have been wrapped around back side of web bar • Paper slack between splice head and new roll of paper may not have been removed. • The new paper may have been cut or torn during preparation • Paper may tear if prepared on an angle • If dancer falls to zero storage, paper will break. • Can be a result of a braking issue or problems with the accelerator roller

5.6 Web Bar Troubleshooting

Table 5.6 Web Bar Solutions

If…	And…	Then…
Web Bar does not move	Web Bar is in the prep zone	Confirm that the **Enable** button is pressed in conjunction with the ***Direction*** selector switch – this allows the Web Bar to move when in the prep zone
	Web bar safety sensors out of alignment	Ensure the send and receive sensors are in alignment with each other, and nothing other than the web bar is blocking the beam

If…	And…	Then…
	Web Bar is on the Running Roll side	Only the non-running Roll Web Bar can be moved
	Motor is not turning	Check HMI for faults, Check if homing is required, Check VFD, wiring, motor
	There is mechanical binding	Confirm that the Web Bar is free and not caught up on equipment or twisted, and inspect chains, sprockets – one chain may have jumped teeth on the drive sprocket
	Limit switch is made	Check If either of the Web Bar sensors are turned on – the Web Bar will not travel any further in that direction
	Draw Bar is not returned	Check that the Draw Bar at the splice preparation area is in the return position (sensor made)
	There is severe weather (temperature)	If temperature in plant is too cold, the VFD may fault due to stiffness of the gearbox, chains, sprockets

END OF DOCUMENT

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