Rock Handling Area

Area Operations Guide Prepared for:

Carmit Mister Fix Ltd.

40 m/min Wallboard Factory

Caesarea, Israel

מיסטר פיקס®

כרמית מקבוצת אינרום תעשיות בנייה

Gyptech

Proven Technology Worldwide

Revision Date: 9 May 2025

Introduction

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

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

For Safety information, consult the **Safety Overview** manual.

CAUTION: To avoid injury, personnel should complete formal safety training before operating any piece of equipment.

KEY: All personnel must follow **Lockout/Tagout (LOTO)** procedures, and operate in compliance with both their company policy and local regulations.

CONTENTS

1 Rock Handling Area Overview

The **Rock Handling Area** contains two major operational systems:

- **Rock Receiving and Preparation**
- **End Trim Dust Collection**

1.1 Rock Receiving and Preparation System

The purpose of rock receiving, and preparation system is to receive natural gypsum rocks from transport trucks, crush them to smaller particles **(<= 35mm)** and transport them to the Rock Silo in the mill area. To achieve the above-mentioned function, following equipment are used in the rock receiving and preparation system:

- Rock hopper (by customer)
- Rock vibrating feeder
- Rock belt conveyor
- Rock belt conveyor magnet
- Rock belt conveyor metal detector
- Impact crusher
- Impact crusher discharge belt conveyor
- Rock bucket elevator
- Rock silo feed screw
- Rock handling dust collector
- Rock handling DC screw
- Rock handling DC manual slide gate
- Rock handling DC rotary valve
- Rock handling DC blower

Material to be transported	
Material	Natural gypsum
Mass flow approx.	50 t/h
Grain size	150 mm
Bulk density	1.2-1.4 t/m^3
Temperature	30 °C
Moisture content (max.)	5-7 %

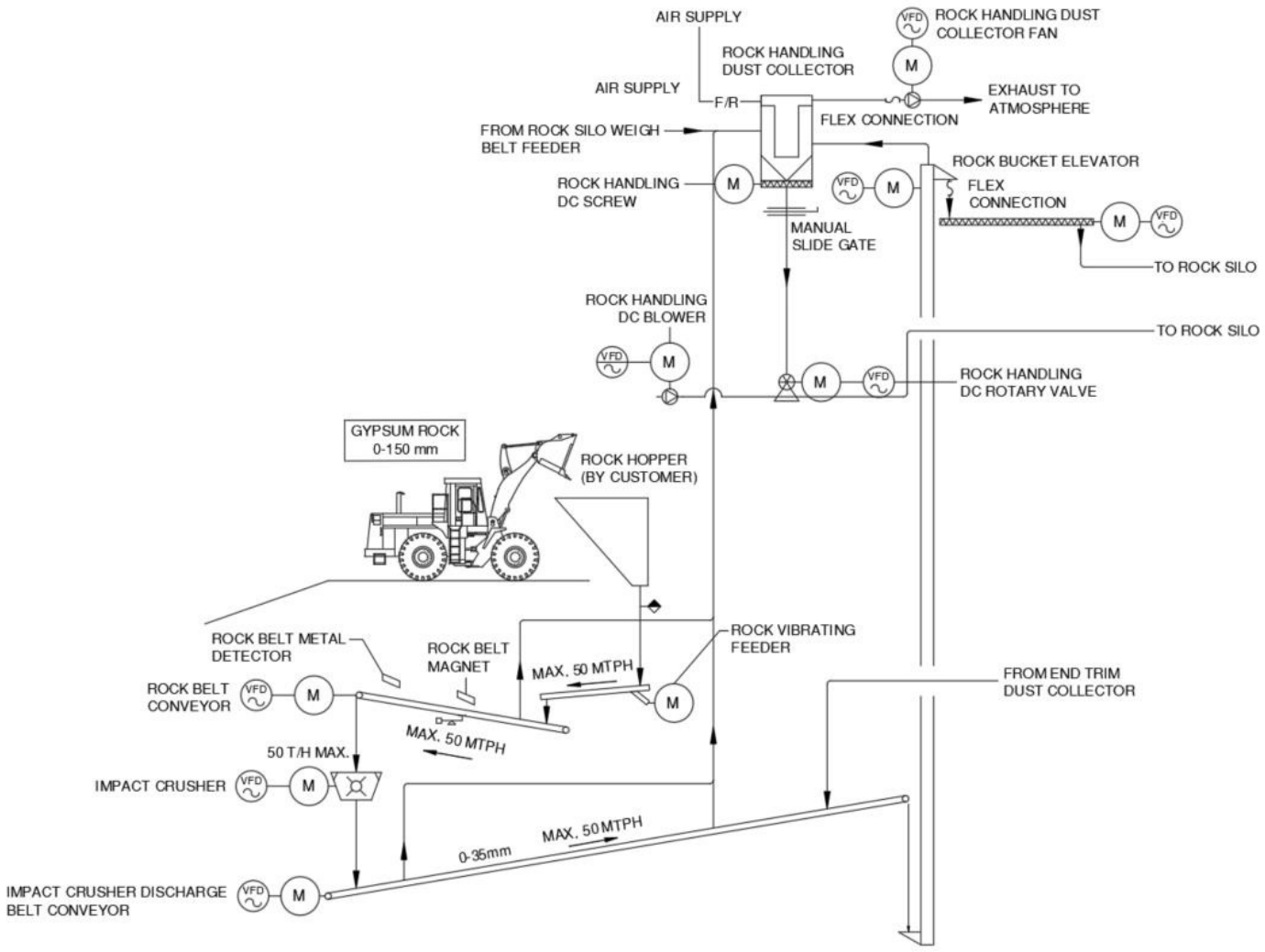

Figure 1.1 Rock Receiving and Preparation System Overview

1.1.1 Rock Vibrating Feeder

The material from customer supplied hopper is conveyed by the vibrating type feeder using focused vibrations produced by an electromagnetic drive.

A conveyor trough, bracket, suspension components, and a magnetic drive that causes the trough to vibrate are the main components of the vibrating through type feeder.

The material moves along tiny aerodynamic paths (micro throw principle) because of these vibrations, creating a continuous material flow.

1.1.2 Rock Belt Conveyor

The rock belt conveyor transfers rock to the horizontal shaft impact crusher at a maximum feed rate of 50 MTPH. This belt has weigh-scale, and safety devices (e.g., tracking switches, emergency pull cords). Belt length is about 15 m and inclined at 17°.

1.1.3 Rock Belt Conveyor Magnet

The rock belt conveyor magnet is mounted over the rock belt conveyor. This Magnet reduces the risk of metal entering the system and damaging equipment. Iron removal from a rolling bed of material is accomplished with the use of heavy-duty, suspended permanent magnet separators. Powerful magnetic fields are created by the placement of permanently magnet material blocks inside the devices. Magnetic circuit configuration depends on block organization. A small conveyor belt is constructed around the assembly to allow for automatic removal of any unwanted metal pieces.

1.1.4 Rock Belt Conveyor Metal Detector

Upon detection of metal, the rock belt conveyor metal detector alarms and stops the belt.

1.1.5 Impact Crusher

The horizontal shaft impact crusher crushes incoming quarry rock from max. 150mm minus down to 35mm minus at up to 50 t/h throughput rate. This crusher has a single 55 kW motor designed for the 30 t/h required. Crushed rock is transferred to impact crusher discharge belt conveyor.

1.1.6 Impact Crusher Discharge Belt Conveyor

The impact crusher discharge belt conveyor transfers crushed rock to the rock bucket elevator at a maximum feed rate of 50 MTPH. This belt has safety devices (e.g., belt tracking switches, emergency pull cords). Belt length is about 9m and inclined at 15°.

1.1.7 Rock Bucket Elevator

The rock bucket elevator transfers rock (mineral gypsum from the impact crusher discharge belt conveyor to rock silo feed screw. The rock bucket elevator runs continuously while it is enabled. The conveying capacity is 50 t/h with lifting speed of 1159 m/s for bulk density 1.2-1.4 t/m^3.

1.1.8 Rock Silo Feed Screw

The rock silo feed screw transfers rock from bucket elevator to rock silo in mill area at nominal flow rate of 50 t/h. Material travel length in the feed screw from inlet to outlet is 2.2m.

1.1.9 Rock Handling Dust Collector, Screw, Rotary Valve

The rock handling dust collector controls dust off the rock silo weigh belt feeder, rock belt conveyor, impact crusher discharge belt conveyor, rock bucket elevator and transfer points ventilating the conveyor systems. It is designed for 11,000 Am^3/h and has a walk-in maintenance platform consists of attendance stage with tubular handrailing around top and ladder with safety gate. The hopper has a screw conveyor live bottom that discharges dust through a rotary valve back to the rock silo in mill area.

1.1.10 Rock Handling Dust Collector Manual Slide Gate

The manual slide gate is used for maintenance or to isolate equipment.

1.1.11 Rock Handling Dust Collector Blower

The blower pneumatically conveys collected dust powder from dust collector back to the rock silo.

1.2 End Trim Dust Collection System

The purpose of the end trim dust collection system is to collect the dust created from cutting the wallboards to the size at center cut saw and end trim saw. From the collected dust, gypsum powder is either transported back to impact crusher discharge belt conveyor for reuse or to the waste dump hopper for removal. The remaining air from the dust is released to the atmosphere. End trim dust collection system contains the following equipment:

- End trim dust collector & fan
- End trim dust collector booster fan
- End trim dust collector discharge screw, manual slide gates & rotary valves

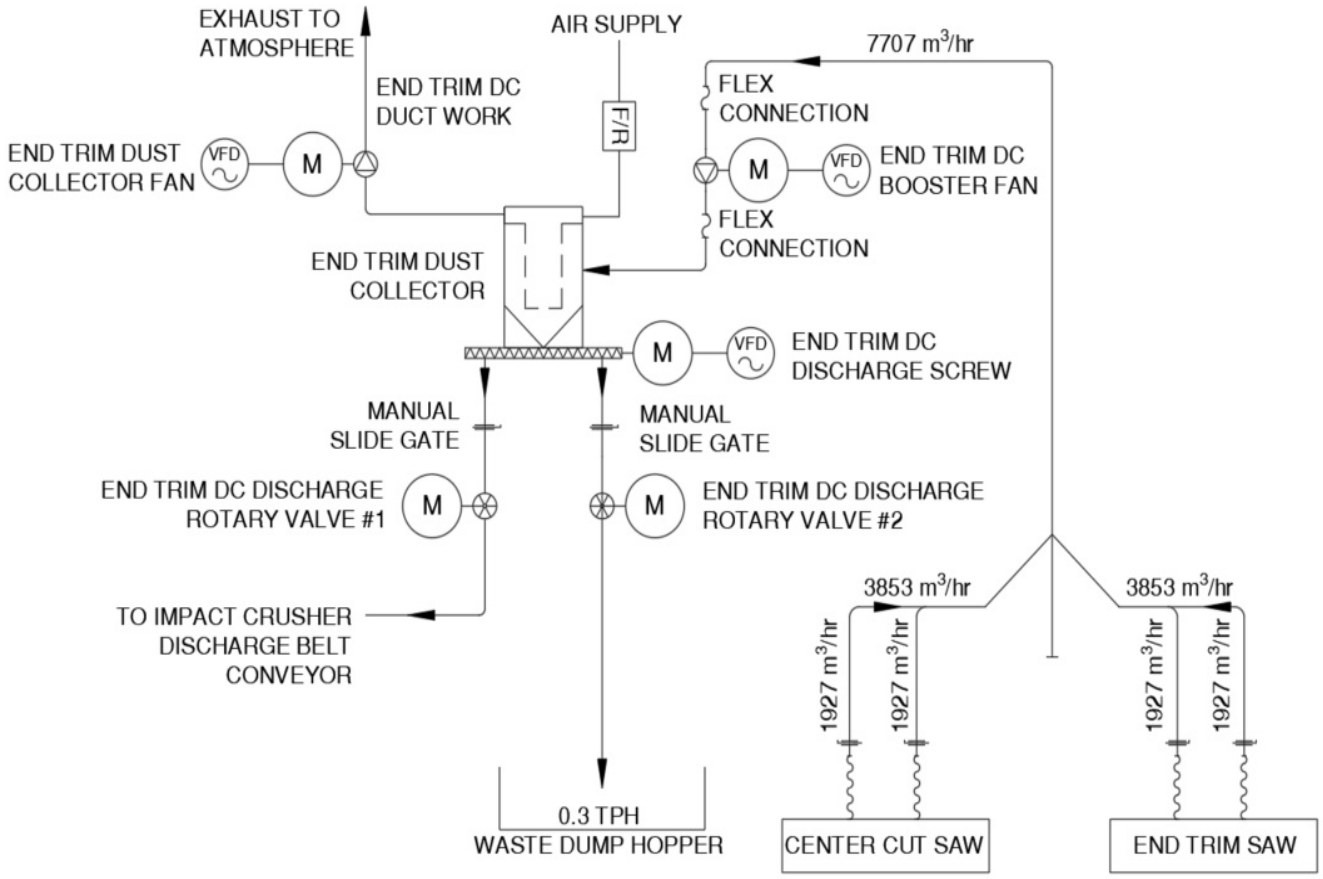

Figure 1.2 End Trim Dust Collection System Overview

1.2.1 End Trim Dust Collector

The function of the end trim dust collector is to collect dust from the center cut saw and end trim saw. The DC hopper has a screw conveyor live bottom that discharges dust to either end trim DC discharge rotary valve 1 or 2. The end trim DC discharge rotary valve 1 feeds the stucco powder back to impact crusher discharge belt conveyor for reuse. The end trim DC discharge rotary valve 2 discharges unwanted material to waste dump hopper.

The end trim DC controller individually pulses many rows of bags using compressed air and solenoid valves. Rows are not pulsed one after the other, for example, pulse one row, skip two rows. Solenoid valve pulse and dwell times are controlled so that dust does not get knocked onto adjacent rows of bags. This also allows the header air pressure to recover before pulsing again.

A differential pressure transmitter monitors dust collector loading by measuring the pressure across the DC from clean-side to dirty-side. The DC starts a cleaning cycle at the **High** setpoint (inches water column), pulsing through all the bags in the system until differential pressure is below the **Low** setpoint, then the cleaning cycle stops.

Table 1.2.1 Dust Collector Pressure

If…	Then…
Differential pressure reaches 5-in.	A pulsing cycle begins and continues until the differential pressure is 3-in.
Pressure does not drop after an attempted pulse of a bag row	The PLC flags that row as not pulsing and triggers an alarm
Pressure drops but does not recover after a pulse	The PLC flags the valve in that row as not closing and triggers an alarm
Header Pressure is too low	The PLC alarms the operator

In the dust collection zone, a High-level switch monitors the level in the DC hopper. When the level is above this switch, an alarm is generated. If the switch is not cleared by a predetermined time set by programmer or maintenance personnel, stops pulsing its bags and the DC fan stops.

1.2.2 End Trim Dust Collector Fan

The function of the end trim dust collector fan is to create a vacuum in the end trim dust collector to pull the cut end trim material into the end trim dust collector housing for filtration. The fan exhausts outside the mill tower.

1.2.3 End Trim Dust Collector Booster Fan

The function of the end trim booster fan is to create a vacuum in the end trim ducting and to compensate for the associated pressure losses in the ducting up to its location.

1.2.4 End Trim Dust Collector Discharge Screw

The function of the end trim dust collector discharge screw is to convey the collected end trim material from the bottom of end trim dust collector to either rotary valve 1 or 2 via manual slide gate.

1.2.5 End Trim Dust Collector Manual Slide Gates

The manual slide gates are used for maintenance or to isolate equipment or to direct the flow of material either towards the impact crusher discharge belt conveyor or towards the waste dump hopper.

1.2.6 End Trim Dust Collector Discharge Rotary Valves

The function of the end trim dust collector discharge rotary valve is to create an air lock on the end trim dust collector and discharge material at a controlled rate.

2 Sequencing

2.1 Equipment Faults

Prior to starting a system, when any conditions in **Table 3.1 Faults** are not met, or any of those conditions fail during operation, equipment automatically shuts down and the HMI displays the reason for Shutdown. Upstream equipment interlocks and automatically stops to prevent material buildup.

Table 2.1 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
Others	Certain pieces of equipment displayed on the HMI when the fault occurs

2.2 Rock Receiving and Preparation System Start/Stop

Several conditions must be met before attempting to start the system:

- Confirm rock silo is ready to fill.
- All disconnects in the zone must be closed
- All circuit breakers must be closed
- Confirm no E-stop or pull cords pulled conditions exist
- All selector switches must be in AUTO mode
- Confirm no faults or alarms exist with the equipment

The equipment will run in the following sequence (with time delays after each equipment has started):

1. Starting Horn
2. Rock Handling DC Blower
3. Rock Handling DC Rotary Valve
4. Rock Handling DC Screw
5. Rock Handling DC Fan
6. Rock Silo Feed Screw
7. Rock Bucket Elevator
8. Impact Crusher Discharge Belt Conveyor
9. Impact Crusher
10. Rock Belt Conveyor

11. Rock Belt Metal Detector
12. Rock Belt Magnet
13. Rock Vibrating Feeder

In auto mode, if the request to run signal from the rock silo is lost or off, a 10-minute timer will begin. After 10 minutes the rock receiving and preparation system will initiate the stop sequence. The equipment will stop in the following sequence (with time delays to allow for material to empty the area):

1. Rock Vibrating Feeder
2. Rock Belt Magnet
3. Rock Belt Metal Detector
4. Rock Belt Conveyor
5. Impact Crusher
6. Impact Crusher Discharge Belt Conveyor
7. Rock Bucket Elevator
8. Rock Silo Feed Screw
9. Rock Handling DC Fan
10. Rock Handling DC Screw
11. Rock Handling DC Rotary Valve
12. Rock Handling DC Blower

2.2.1 Rock Handling Dust Collector Blower

The rock handling DC blower will be controlled by a PID loop to maintain a pressure setpoint whenever the blower is running.

2.3 End Trim Dust Collection System Start/Stop

Several conditions must be met before attempting to start the system:

- Confirm either waste dump hopper or rock silo or both are ready to fill
- Select either rock silo or waste dump hopper for discharge, make sure that the manual slide gate for unselected discharge path is closed.
- In auto mode, if there is a request to run signal (via peer to peer) to start the End Trim Dust Collection system (from takeoff area).
- All disconnects in the zone must be closed
- All circuit breakers must be closed
- Confirm no E-stop or pull cords pulled conditions exist
- All selector switches must be in AUTO mode
- Confirm no faults or alarms exist with the equipment

The HMI will show the system to be ‘ready’. Click on the status box will bring up an equipment status screen will show what device/equipment is not in ready state. If any of the above conditions fails during operation,

the affected motor will automatically shut down, and the reason for the shutdown will be displayed on the HMI. The equipment will start in the following sequence:

1. Starting Horn
2. Rock Silo Feed Screw (for rock silo)
3. Rock Bucket Elevator (for rock silo)
4. Impact Crusher Discharge Belt Conveyor (for rock silo)
5. End Trim DC Discharge Rotary Valve 2 (for waste dump hopper) or Rotary Valve 1 (for rock silo)
6. End Trim DC Discharge Screw
7. End Trim DC Fan
8. End Trim DC Booster Fan
9. Center Cut and End Trim Saws

In auto mode, if the request to run signal from the takeoff is lost or off, a 10-minute timer will begin. After 10 minutes the end trim dust collection system will initiate the stop sequence. The equipment will stop in the following sequence (with time delays to allow for material to empty the area or get vacuumed out of the area):

1. Center Cut and End Trim Saws
2. End Trim DC Booster Fan
3. End Trim DC Fan
4. End Trim DC Discharge Screw
5. End Trim DC Discharge Rotary Valve 2 (for waste dump hopper) or Rotary Valve 1 (for rock silo)
6. Impact Crusher Discharge Belt Conveyor (for rock silo)
7. Rock Bucket Elevator (for rock silo)
8. Rock Silo Feed Screw (for rock silo)

3 Operator Procedures

3.1 Motor Controls

Each motor in the End Trim Area has its own panel mounted control. A Jog button allows the motor to start manually as long as it is held.

General Mode Selection:
Test Setting: When held, the motor will get out of Auto mode, and manually start as long as the button is held down by the operator.

The normal operating position is AUTO mode. In this mode, the equipment responds appropriately to line starting and stopping requests. In JOG mode, the equipment runs continuously. This mode is used only for maintenance purposes. When doing equipment maintenance or cleaning, the motor disconnect should be turned off and locked out. **Also, for safety reasons, the operator should press the JOG button mode for a few seconds after the disconnect switch is opened, to ensure that the motor will not start.**

3.2 Motor Alarms

Each motor is programmed to generate alarm codes that are specific to the features and functions of the motor. Some of the alarm codes will shut down the motor and others will generate warnings. The alarm and warning messages are shown on the HMI and saved in the alarm history file.

Once a motor alarm has been set:

1. A popup message on HMI overview will attract operator attention
2. Check the alarm code in the HMI and correct the issue
3. Re-set the motor using the HMI touch screen (put the motor back into auto)

4 Troubleshooting

Set-up regular **Cleaning**, **Inspection**, and **Maintenance** schedules. For more detailed **Troubleshooting** information, consult the **Maintenance** manual specific to the machine/equipment.

4.1 Dust Collectors

Table 4.1 Dust Collector Troubleshooting

If…	And…	Then…
Loss of suction	Filter bags are clogged with material	Inspect bags and clean if necessary
	Fan is not turning on or operating correctly	Check that Solenoids are pulsing air
	Build up in duct work	Refer to maintenance manual
	Moisture from compressed air	If fan does not turn on when refill door of rock silo opens, check door sensors to ensure they are unobstructed

4.2 Fans

Table 4.2 Fan Troubleshooting

If…	And…	Then…
Rated output flow is not achieved	Dampers in ducting are not set up correctly	Check that that positions of all Dampers are correct
	There is a deformed or leaking duct	Check for leaks or clogs in ducting system
Excessive vibration	There is a Fan rotor imbalance, bearing or shaft damage	Contact Maintenance

4.3 Screw Conveyors

Table 4.3 Screw Conveyor Troubleshooting

If…	And…	Then…
Material is leaking from trough to ends	Seals are worn	Contact Maintenance to replace seals
	Screw is loaded past the recommended level	Decrease Screw fill percentage to recommended level

Screw is plugged with material	Materials may be out of specification	Perform drop test to check material properties
	Screw is loaded past the recommended level	Remove all material from Screw, then decrease Screw fill percentage to recommended level
	Condensation causing material build up	If material properties are out of specification notify supervisor
	Worn augers	Remove all material from screw and decrease screw fill percentage to recommended level

4.4 Belt Conveyors

Table 4.4 Belt Conveyor Troubleshooting

If…	And…	Then…
Belt is new	Belt does not straighten out	If belt does not break-in properly, replace the Belt
	Belt is bowed	Replace the Belt, avoid telescoping Belt rolls and storage in damp locations
	Belt is strained to one side	Remove strained section, then splice in new piece
Belt issue	Belt sags	Recalculate take-up tension and reduce Idler spacing
	Belt rolls back after Shutdown	Repair belt holdback or brake
Fastener issue	Incorrect fasteners are used	Use correct fasteners, then after running for a short time, retighten
Splice issue	Belt is not spliced correctly	Remove Belt, then make new splice
Counterweight Issue	Counterweight is too heavy	Recalculate the weight required and adjust, then reduce the take up tension to point of slip and tighten slightly
	Counterweight is too light	Recalculate the weight required and adjust the counterweight or take-up accordingly
Edge is worn	Or Edge has an out-of-square section	Remove worn or out-of-square section, then splice in new piece
Idler issue	Idlers are frozen	Free the Idlers, then lubricate **Note**: Do not over-lubricate!

	Idlers are not loading properly and spilling	Realign Idlers
	Idlers are not placed properly	Relocate Idlers
Pulley issue	Pulley lagging is worn	Replace Pulley lagging, tighten loose and protruding bolts
	Material is between Belt and Pulley	Remove accumulation and improve maintenance
	Not enough traction between Belt and Pulley	Increase wrap with snub Pulleys, Lag drive Pulley

END OF DOCUMENT

Gypsum Technologies Inc.
578 King Forest Court
Burlington, Ontario
Canada L7P 5C1
Tel: +1 (905) 567-2000
Fax: +1 (289) 288-0570
info@gyptech.ca

Gyptech AB
Norrgatan 15
Växjö SE-352 31
Sweden
Tel: +46 470 705640
Fax: +46 470 705650
info@gyptech.se

Gyptech GmbH
Eulatalstrasse 31
86633 Neuburg/Donau
Germany
Tel: +49 8431 5387 0
Fax: +49 8431 5387 20
info@gyptech.de