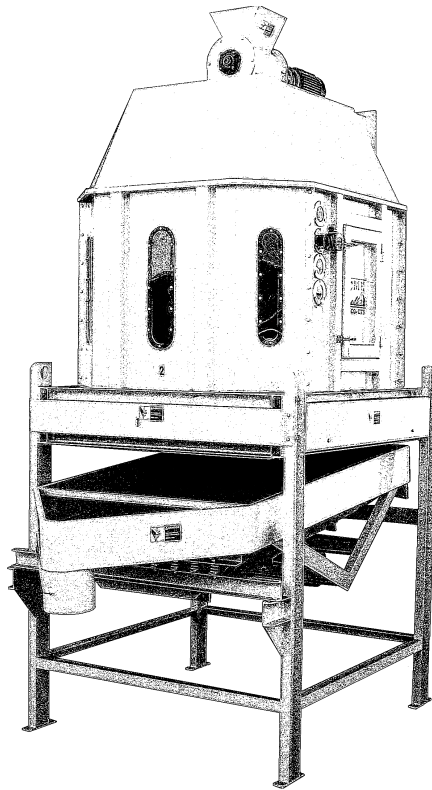




**CME**

# **Colorado Mill Equipment C-Series Counterflow Cooler Manual**



This machine may be covered under one or more U.S. Patents.  
All rights reserved.

All personnel operating and maintaining this machine must first read this manual to ensure proper, safe and efficient operation and maintenance.

Please keep this manual for future reference.

**COLORADO MILL EQUIPMENT, LLC**  
Canon City, CO 81212 • Phone: 719 275-1081 • Fax: 866 759-5894  
[www.coloradomillequipment.com](http://www.coloradomillequipment.com)

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## C-Series Pre-Shipping Checklist

Model No. \_\_\_\_\_ Serial No. \_\_\_\_\_

Job No. \_\_\_\_\_ Customer \_\_\_\_\_ Voltage \_\_\_\_\_

Cooling Chamber

Test installed on base and holes align                       Sensors mounted

Rotary valve tested (Amps \_\_\_\_\_)    Gear reducer lubricated

Gate and Base

Guards installed     Gate limit switch installed

Gate tested (Amps \_\_\_\_\_)                       Gear reducer lubricated

Screener removed     Hopper installed

Air System

Test assembled     Rotary valve tested (Amps \_\_\_\_\_)

Blower tested (Amps \_\_\_\_\_)                       Flow valve functional

Ready to ship

Safety stickers     CME name plate (Serial \_\_\_\_\_)

Paint     Hardware included

Invoice verified     Tech Initials \_\_\_\_\_

Comments:

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## **1.1 General Safety Precautions**

COLORADO MILL EQUIPMENT, LLC ASSUMES NO RESPONSIBILITY FOR INJURIES TO PERSONNEL, OR DAMAGE RESULTING FROM CARELESS, IMPROPER, OR UNSAFE USE OF THIS EQUIPMENT.

IN ADDITION TO THE FEDERAL, STATE, AND LOCAL REGULATIONS, ALL OPERATORS AND MAINTENANCE PERSONNEL MUST BE TRAINED IN THE FOLLOWING SAFETY PROCEDURES TO AVOID THE RISK OF SERIOUS INJURY OR DEATH. IT IS EXTREMELY IMPORTANT THAT ALL MACHINE OPERATORS, OWNERS AND SUPERVISORS READ AND UNDERSTAND ALL THE SAFETY PRECAUTIONS LISTED IN THIS MANUAL

- Before performing any work on this equipment, it must be placed on a level surface and securely fastened.
- All the electrical connections to this equipment must be performed by a trained and authorized electrician, familiar with the national and local electrical codes.
- All electrical power disconnects and means of material flow to this equipment shall be locked out with an OSHA approved lock-out/tag-out device whenever maintenance, cleaning, adjustments, or service is performed on this equipment.
- If the disconnect is not in clear sight of the employee. A "Do Not Start" tag as described in Code of Federal Regulations, Title 29, Section 1910.145(f)(3), shall be affixed to any and all operating controls.
- Where more than one employee is engaged in working on machinery or equipment, each employee shall affix the employee's individual lockout device or lock to the disconnect switch or power supply.
- Only trained and designated employees shall operate, maintain or repair this equipment.
- Do not remove any guards or bypass any safety devices while the machine is in operation.
- Any rotating parts and mechanisms must be securely blocked before reaching into the machine to perform maintenance or cleaning.
- Do not put hands or tools into any openings on this equipment while in operation.
- If steam is used for product conditioning, all the federal, state and local codes and procedure must be followed.

## **WARNING!**

**FAILURE TO READ AND UNDERSTAND THIS MANUAL BY OWNERS, OPERATORS, SUPERVISORS, AND MAINTENANCE PERSONNEL IS A MISUSE OF THIS EQUIPMENT!**

## **1.2 Cooler Safety Specifications**

**Before powering up the machine** – Do not attempt to power up this equipment or make any modifications or adjustments before reading and understanding the warnings and instructions contained in this manual. Check the unit for any physical damage, and any loose hardware or components. A qualified and authorized electrician can help you determine the power requirements, make the electrical connections required, power up and test your machine.

**While operating the equipment**– Severe injuries to persons operating the cooler can occur from reaching into the running machine. Do not operate the equipment with the safety guards removed and/or the cooling chamber door opened.

**While performing preventative maintenance** – Do not attempt to reach into the machine or perform any preventive maintenance before disconnecting the machine from the power supply. An OSHA approved power lock-out/tag-out device must be used to prevent accidental and unintended machine power up.

**Equipment cleaning** – Do not attempt to perform any of these procedures before disconnecting the machine from the power supply. An OSHA approved power lock-out/tagout device must be used to prevent accidental and unintended machine power up.

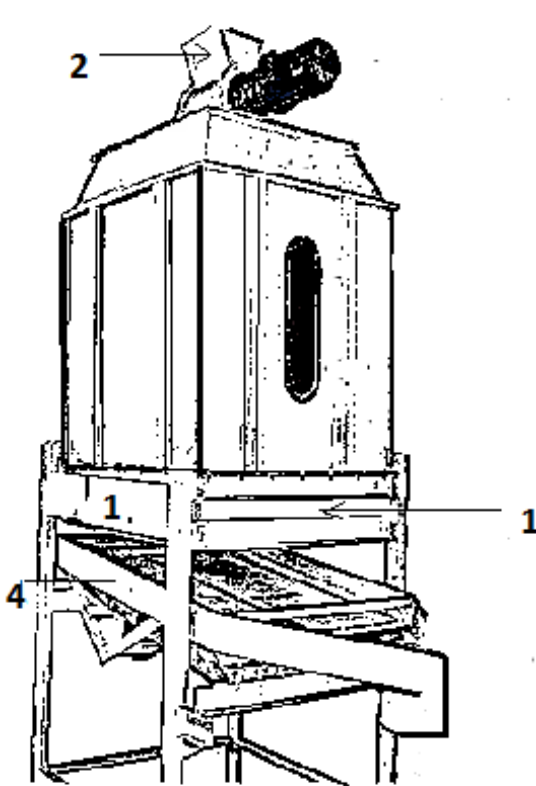
**Electrical wiring** – All electrical connections and wiring must be approved and performed by a licensed electrician familiar with all local, state, and national electrical codes and procedures.

### **EXTREMELY IMPORTANT**

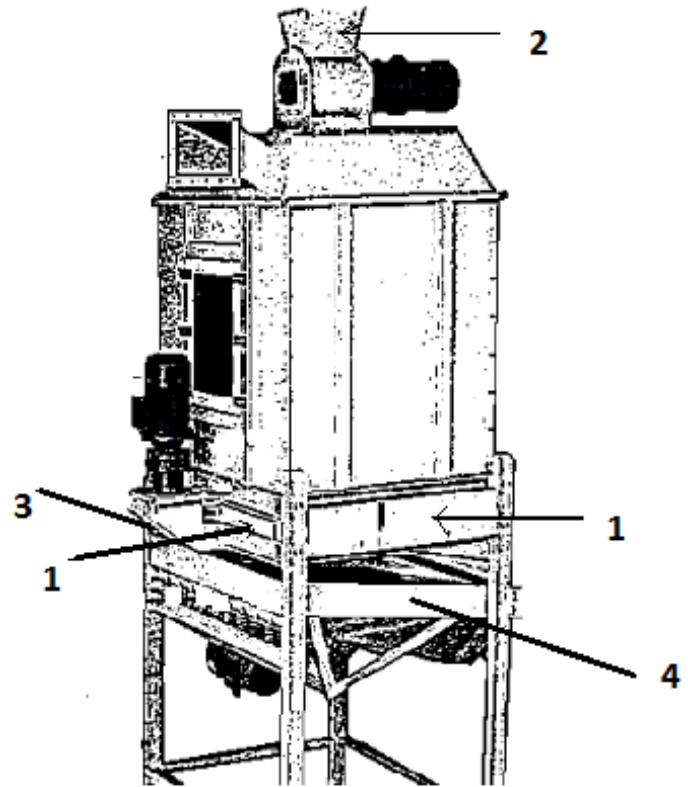
The words “DANGER”, “WARNING” and “CAUTION” are used throughout this manual to designate the hazard level.

- **DANGER**: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices or potential damage to machine.

### 1.3 Safety Labels



1.



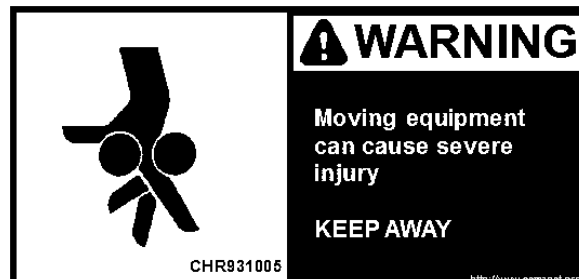
2.



3.



4.





**Section 2 – Application and Description**

**2.1 C-Series Counterflow Cooler, Screener, and Air System  
Electrical Specifications**

<b>MODEL NUMBER</b>	<b>FEED VALVE MOTOR</b>	<b>GRID MOTOR</b>	<b>SCREENER VIBRATOR MOTOR*</b>	<b>AIR LOCK VALVE*</b>	<b>BLOWER MOTOR*</b>
C3	1 HP; 1800 RPM 208-230/460VAC 3.8-3.4/1.7 Amps 143TC Frame	1 HP; 1800RPM 208-230/460VAC 3.8-3.4/1.7 Amps 143TC Frame	230/460VAC .25 KW .7 AMPS	1 HP ; 1800 RPM 208-230/460VAC 3.8-3.4/1.7 Amps 143TC Frame	7.5 HP; 3600 RPM 230/460VAC 19.7-17.7-8.9 AMPS 213T Frame
Gear Reducer	CLEVELAND M2613C1H40CBS	CLEVELAND M3213 CAH60CBS	N/A	CLEVELAND M2613C1H40CBS	N/A
C5	1HP; 1800 RPM 208-230/460 VAC 3.8-3.4/1.7 AMPS 143TC Frame	2HP; 1800 RPM 208-230/460 VAC 6.4-5.8/2.9 AMPS 143TC Frame	120 VAC or 230/460 VAC .4 KW 2.8/1.4 AMPS	1HP; 1800 RPM 208-230/460 VAC 3.8-3.4/1.7 AMPS 143TC Frame	15HP; 3600 RPM 208-230/460 VAC 86.7-35.2/7.6 AMPS 254T Frame
Gear Reducer	CLEVELAND M2613C1H40CBS	CLEVELAND M3213CAH60CBS	N/A	CLEVELAND M2613C1H40CBS	N/A
C10	2HP; 1800 RPM 208-230/460VAC 6.4-5.8/2.9A MPS 145C Frame	2HP; 1800 RPM 208-230/460VAC 6.4-5.8/2.9AMPS 145C Frame	N/A	2HP; 1800 RPM 208-230/460VAC 6.4-5.8/2.9AMPS 145C Frame	25HP; 3550RPM 208-230/460VAC 63.2- 57.5/28.7AMPS 284T Frame
Gear Reducer	CLEVELAND M2613C1H40CBS	CLEVELAND M3213CAH60CBS (Heavy Duty Only: M5213CAH60CBS)	N/A	CLEVELAND M2613C1H40CBS	N/A

**Rotary Level Switch (if used):**

Manufacturer: EMA  
Model: SR1000C380  
Supply: 220-240 VAC

**Capacity Proximity Sensor Set:**

Manufacturer: Maoda  
Model: CJM30M-15A1 - NO  
Manufacturer: Maoda  
Model: CJM30M-15A2 – NC  
AECO SC30SP-AE25 - NO/NC

## **2.2 Technical Specifications**

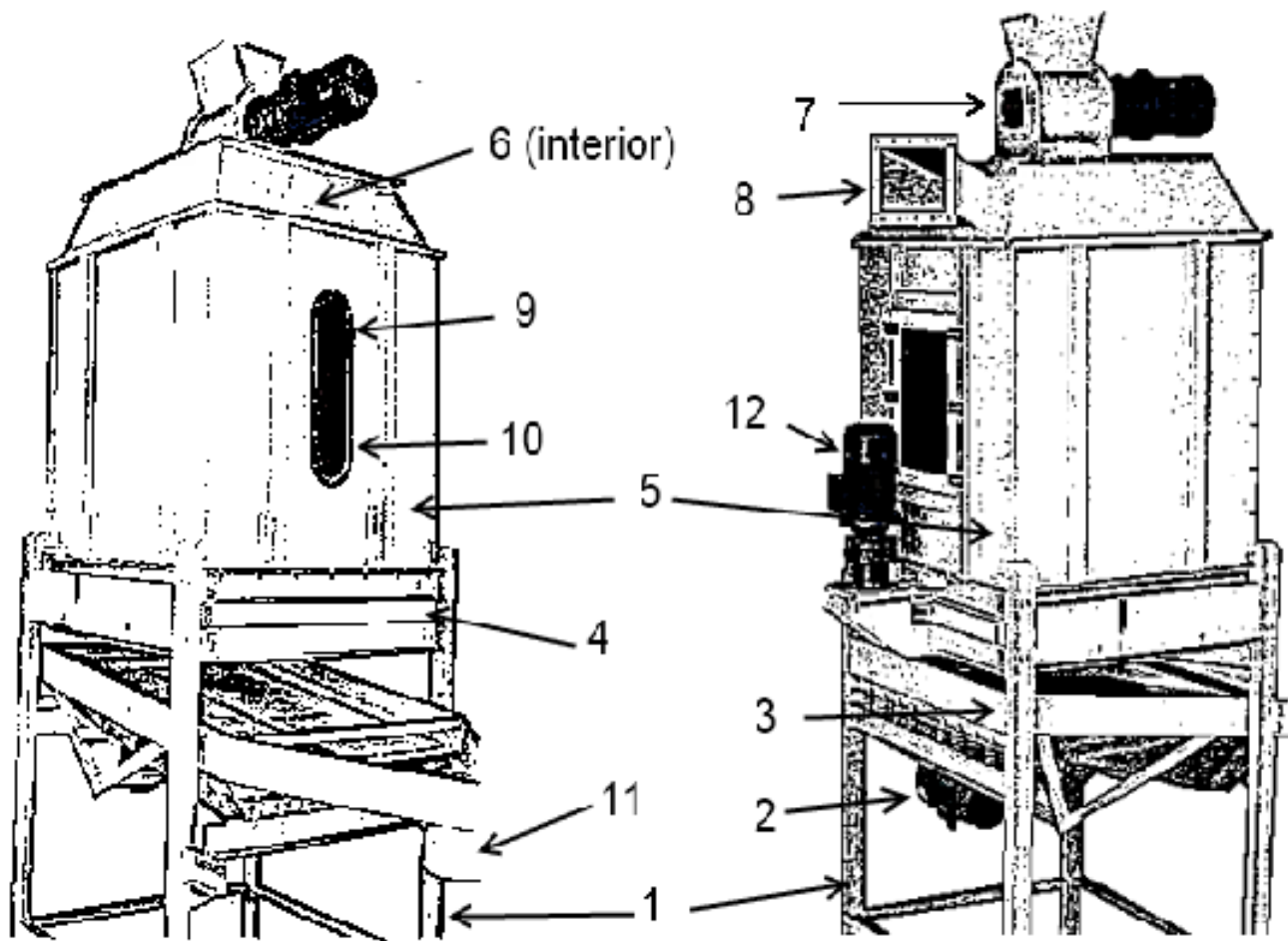
<b>Model</b>	<b>Production Capacity</b>	<b>Cooling Time</b>	<b>Post-Cooling Temp.</b>
C3	1.5 to 3 tons/hr	10-15 min.	Approx. room temp.
C5	4 to 5 tons/hr	10-15 min.	Approx. room temp.
C10	5-10 tons/hr	10-15 min.	Approx. room temp.

## **2.3 General Description**

The C-series counter-flow coolers are constructed to meet the needs for pellet cooling in virtually any manufacturing process that produces pellets. When sized and operated correctly, the C-series coolers will cool the product to approximately 10 degrees Fahrenheit of ambient temperature, while removing moisture from the product. Quickly cooling the pellets makes them ready to package, store or transport in a short time. The amount of heat and moisture removed from the product is dependent on the following:

- Initial pellet temperature – incoming pellet temperature
- Initial pellet moisture – incoming pellet moisture content
- Retention time – the time the pellets are allowed in the cooling chamber
- Air flow rate – determined by air damper position
- Pellet size – larger pellets require longer retention time
- Ambient air humidity – high ambient humidity will remove less moisture from pellets

## 2.4 C-Series Cooler Main Components



**Figure 1**

- |                        |                            |                       |
|------------------------|----------------------------|-----------------------|
| 1. Machine Frame       | 2. Screener Vibrator Motor | 3. Screener           |
| 4. Discharge Grid      | 5. Cooling Chamber         | 6. Pellet Distributor |
| 7. Rotary Feeder Valve | 8. Air Discharge           | 9. Upper Level Sensor |
| 10. Lower Level Sensor | 11. Screener Discharge     | 12. Grid Motor        |

### **3.1 Operating Principles**

Hot pellets enter the cooling chamber through the rotary feed valve mounted on top on top of the cooler, and collect inside the cooling chamber. Ambient air is drawn through the pellets vertically from bottom to top (see Figure one). As the air is drawn through the bottom of the chamber it cools the pellets at the bottom of the chamber first. Gradually the entire mass of pellets inside the chamber is cooled with the coolest pellets being at the bottom. This method of cooling makes the most efficient use of the cooling air as it passes through the entire mass of pellets and absorbs the maximum amount of heat from the pellets.

The cooling chamber design allows for cooling air to be drawn throughout the entire base. This allows the air to flow through the entire mass of the pellets thereby producing uniform cooling.

As the pellets descend through the cooling chamber they are cooled by increasingly cooler air until they reach the bottom of the chamber where they are cooled by room-temperature air. As the air is drawn through the pellets it absorbs the heat from the pellets. This gradually heats the air coming in contact with the pellets as it flows up through the mass of pellets. As a result, the pellets encounter near-milling-temperature air as they enter the chamber. With this method of cooling, pellet quality is achieved by avoiding damage to the pellets from excessive temperature changes.

### **3.2 Sequence of Operation**

- 1.** Hot pellets enter the cooling chamber through the rotary lock valve at the top of the cooler. With the cooling chamber grid closed, pellets begin to collect on the bottom of the chamber, gradually filling it up. Ambient temperature air is drawn up through the discharge grid, by means of the suction blower, through the accumulated pellets, and out through the air discharge port near the top and side of the cooling chamber.
- 2.** As the pellets fills the cooling chamber, constant air flow generated by the suction blower remove heat and moisture causing the pellets to cool. When the pellets reach a preset level, determined by the position of the upper level sensor it sends a signal for the grid motor to turn on.
- 3.** The grid drive motor and gear reducer is designed to operate at low RPM and upon reaching the open position discharges the pellets, through the oscillating grid to the screening deck (optional) or discharge bin mounted bellow. When the pellets level falls below the low product level sensor, the motor stops with the grid in a closed position. This cycle is repeated for as long as product is fed into the chamber.

### **3.3 Single Product Sensor Sequence of Operation**

1. With the discharge grid in the closed position, and the rotary valve turned on, product starts filling up the cooling chamber.
2. Once the product high limit sensor is reached, it initiates the discharge grid cycle and at the same time it sends a signal to the discharge timer to start timing.
3. The grid continues to cycle until the discharge timer reaches it's preset limit (times out).
4. Once the timer times out it sends a signal to the grid motor to stop cycling.
5. The grid motor will continue to cycle until the closed position limit switch is actuated and will turn off ending the discharge cycle.
6. With the product still being fed into the cooler, cooling chamber will keep filling up until the high limit switch is reached starting the discharge cycle again.
7. This process will continue for as long as pellets are fed into the cooling chamber.

### **3.4 Operation**

**Warning: Before operating equipment, ensure all guards and safety mechanisms are in place.**

#### **1. Start-up in automatic mode**

- a) Ensure there are means to collect pellets once they are discharged from the screener deck.
- b) Switch on power to the control panel.
- c) Switch the grid-control switch to the AUTOMATIC position.
- d) Ensure cooling-chamber-discharge grid is in the closed position. (OPEN light off)
- e) Start the pellet feeder motor, cooling air motor, and screener vibrator motor.
- f) Supply pellets to the pellet feeder inlet.
- g) The system should operate automatically, however do not leave it unattended.

#### **2. Start-up in manual mode**

- a) Ensure there is a means to collect the pellets once they are discharged from the screener deck.
- b) Switch on power to the control panel.

- c) Switch the grid-control switch to the MANUAL position.
- d) Ensure cooling-chamber-discharge grid is in the closed position. (OPEN light off)
- e) Start the pellet feeder motor, cooling air motor, and screener vibrator motor.
- f) Supply milled pellets to the pellet feeder inlet.
- g) Once the pellets have reached the upper-level sensor, press the cooling-chamber DISCHARGE button on the control panel.
- h) The cooling chamber discharge grid should cycle continuously.
- i) When the cooling chamber has emptied of pellets to the lower-level sensor, push the cooling chamber CLOSE button on the control panel.
- j) The cooling-chamber-discharge grid should continue to cycle until it is in the closed position.
- k) Repeat steps g through j as long as necessary.

### **3. Emergency Shutdown**

- a) In an emergency press the red EMERGENCY STOP button to stop the system immediately.

### **4. Normal Shutdown**

- a) Ensure there are no pellets being fed to the pellet feeder inlet.
- b) Switch the grid-control switch to the MANUAL position.
- c) Push the cooling-chamber DISCHARGE button on the control panel.
- d) The cooling-chamber-discharge grid should cycle continuously.
- e) Allow the grid to cycle until no more pellets are discharging from the cooling-chamber.
- f) Push the cooling-chamber CLOSE button on the control panel.
- g) The cooling-chamber-discharge grid should continue to cycle until it is in the closed position.
- h) Ensure the screener deck is cleared of pellets.
- i) Push the red STOP buttons for the pellet feeder motor, screener vibrator motor, and cooling air motor.
- j) Switch off power to the control panel.

## **4.1 Maintenance**

**Warning: System motors must be de-energized and locked out before attempting repair or maintenance.**

- Check all hardware, and tighten any loose bolts daily
- Clean any material build-up from all motors to allow for unobstructed air cooling daily
- Check equipment for any unusual vibration or noise daily
- Check discharge grid for damage weekly
- Check eccentric grid coupling for loose hardware weekly
- Check gear reducer oil level monthly
- Lubricate air lock valves bearings monthly
- Replace gear reducer oil per manufacturer maintenance schedule
- Check all bearings and lubricate with a quality high temperature grease every six months

## **4.2 Adjustments**

### **1. Cooling-chamber pellet level sensors – Sensitivity adjustment**

- a) Switch on power to the control panel.
- b) There should be no material within approximately three inches in front of the pellet-level sensors.
- c) On the back (cable end) of the sensor turn the sensitivity adjusting screw clockwise until the light just comes on.
- d) Turn the sensitivity adjusting screw counter-clockwise until the light just goes out.
- e) Switch off power to the control panel.

### **2. Screener vibration amplitude adjustment**

- a) Remove the covers from each end of the screener vibrator motor.
- b) Loosen the clamp bolts on the outermost eccentric block on each end of the motor shaft.
- c) To increase the amplitude of the vibrations, rotate the outside blocks so that they overlap the inside blocks further.
- d) To decrease the amplitude of the vibrations, rotate the outside blocks so that they overlap the inside blocks less.
- e) The outside blocks on each end must overlap the inside blocks equally. Failure to ensure that they are equally overlapped will cause damage to the motor and motor mount. Use the aligning marks on the inside blocks to ensure equal overlap.
- f) Tighten clamp bolts.
- g) Reinstall motor end-covers.



### **4.3 Lubrication**

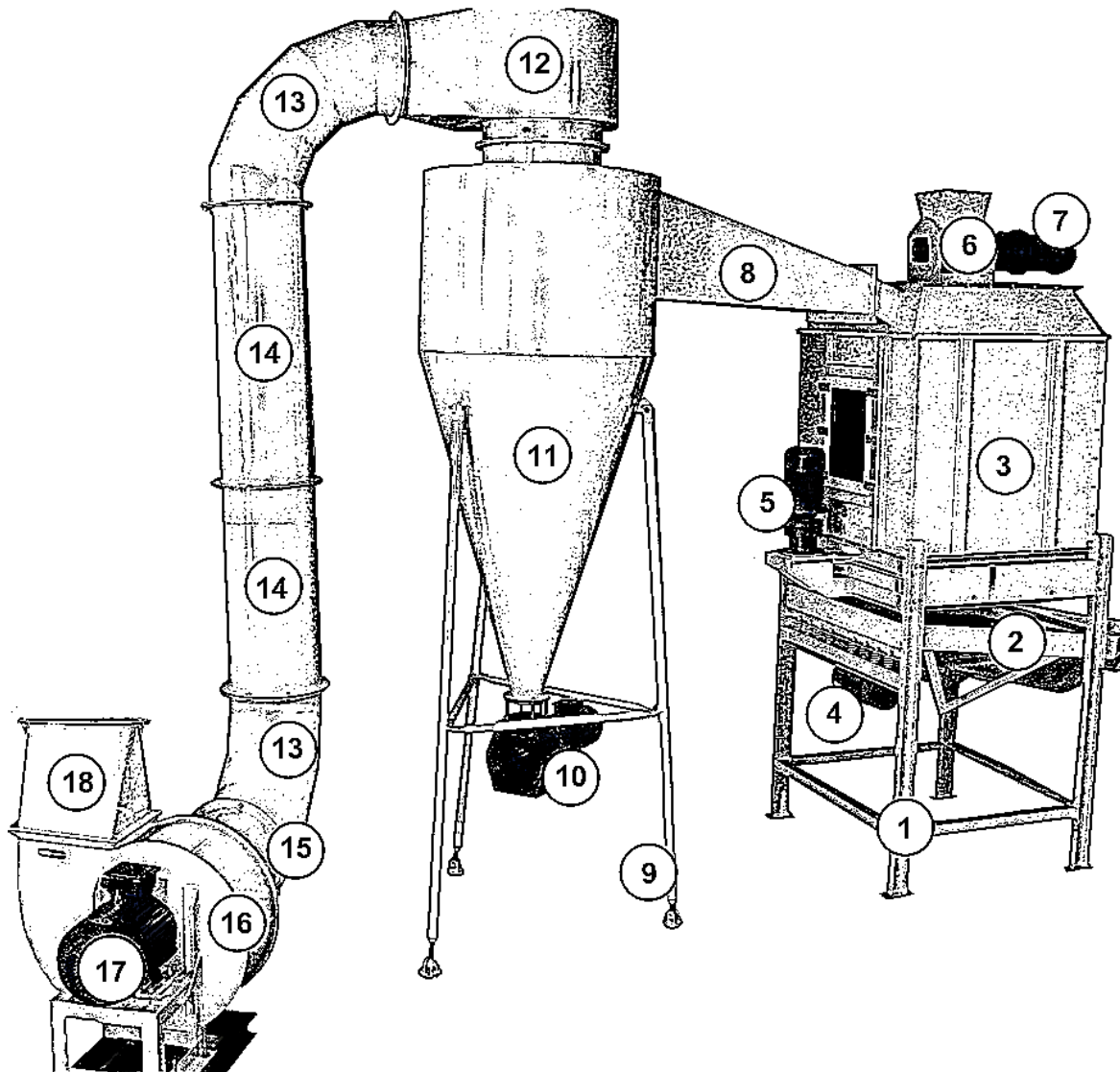
<b>Pellet feeder bearings</b>	Weekly	High-temp Lithium grease
<b>Cooling-Chamber-Discharge-grid rollers</b>	Weekly	Oil
<b>Discharge-grid-to-Motor bearing</b>	Weekly	Grease

### **4.4 Inspection**

#### **Screener**

Inspect the springs daily. Ensure that they are not broken or damaged. Check the bolts to ensure they are tight.

**5.1 C-Series System Main Components**



- |                     |                              |                               |
|---------------------|------------------------------|-------------------------------|
| 1. Cooler Base      | 2. Screener                  | 3. Cooler Chamber             |
| 4. Screener Motor   | 5. Grid Motor                | 6. Feed Valve                 |
| 7. Feed Valve Motor | 8. Cooler to Cyclone Adapter | 9. Cyclone Stand              |
| 10. Airlock Valve   | 11. Cyclone                  | 12. Cyclone to Blower Adapter |
| 13. 90 degree elbow | 14. Duct                     | 15. Air Damper Valve          |
| 16. Blower          | 17. Blower Motor             | 18. Exhaust Adapter           |

## 5.2 C-Series System Parts List

\*IMPORTANT: WHEN ORDERING PARTS, USE THE PART NUMBER FOLLOWED BY COOLER MODEL NO. (i.e -3 for C3)

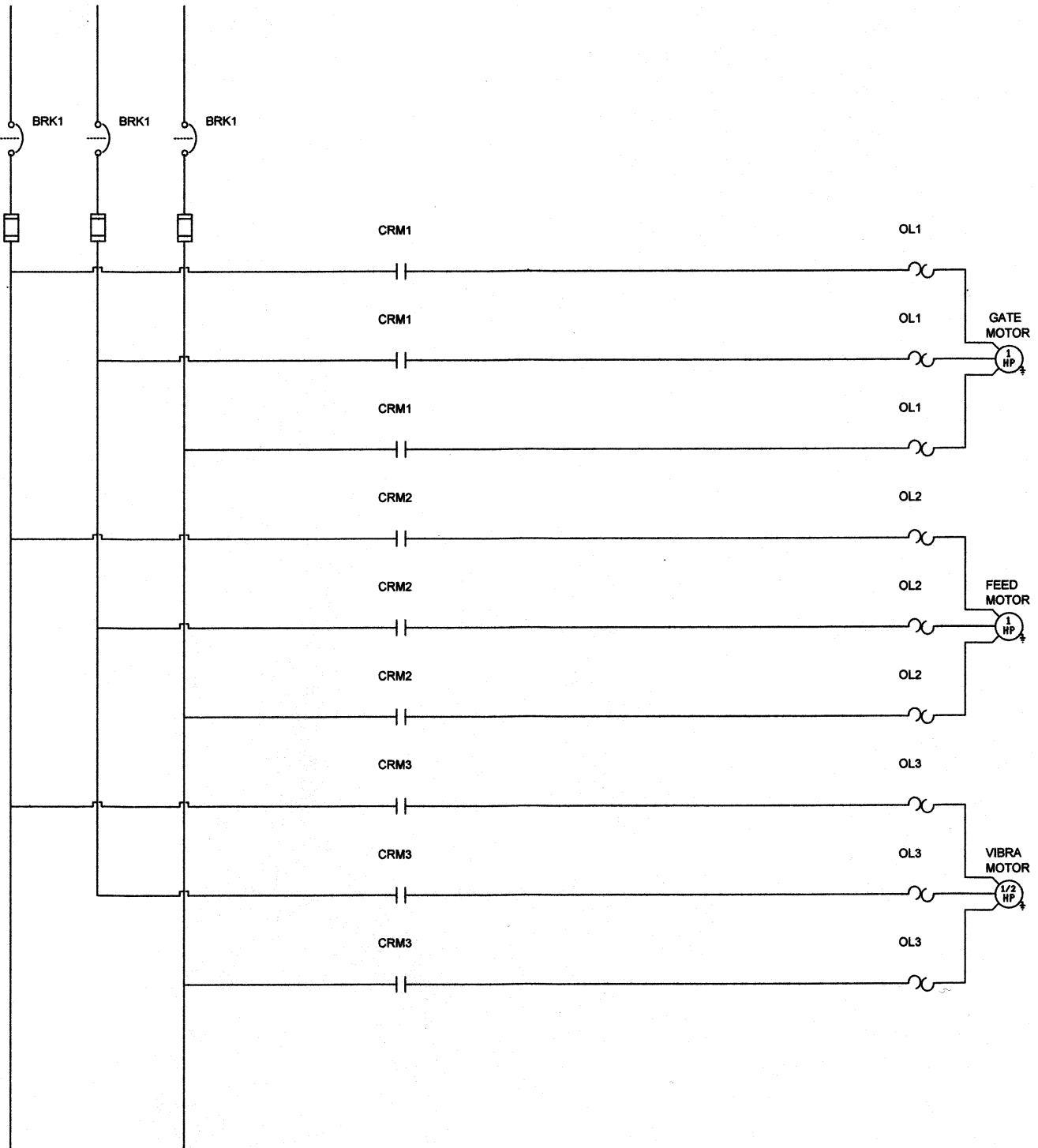
Item #	Part #*	Description	Quantity Required	Notes
1	1000	Cooler Base Assembly	1	Includes base, grid, and drive mounting plate
2	1001	Cooler Base	1	*Use 1001-3 for C3 model
3	1002	Cooler Grid	1	
4	1003	Right Side Grid Safety Guard	1	
5	1004	Left Side Grid Safety Guard	1	
6	1005A	Front Side Grid Safety Guard	1	
7	1005B	Rear Grid Safety Guard (2 pc)	1	
8	1006	Grid Eccentric Coupling	1	Includes locking bolt/nut and set screw, lock washer and nut
9	1007	Grid Coupling Linkage	1	
10	1008	Grid Coupling Linkage Bearing	2	20 x 42 x 12 Sealed Ball Bearing
11	1009	Grid Coupling Linkage Snap Ring	4	
12	1010	Grid Drive Motor	1	
13	1011	Grid Drive Motor Key	1	
14	1012	Grid Drive Gear Reducer	1	
15	1013	Grid Drive Gear Reducer Key	1	
16	1014	Grid Drive Assembly Mounting Plate	1	
17	2000	Cooling Chamber Assembly	1	Includes L,R,F,B panel, hinged door, and top
18	2001	Cooling Chamber Door	1	
19	2002	Cooling Chamber Door Latch	2*	*C5 and C10 only
20	2003	Cooling Chamber Level Sensor	2 (1)	C3 uses 2 capacitive proximity sw. C5 uses 1 rotary level sw.
21	2004	Level Sensor Mounting Bracket	1	C3 only
22	2005	Level Sensor Mounting Flange	1	C3 and
23	2006	Plenum		
24				
25				
26				
27				
28				
29				
30				

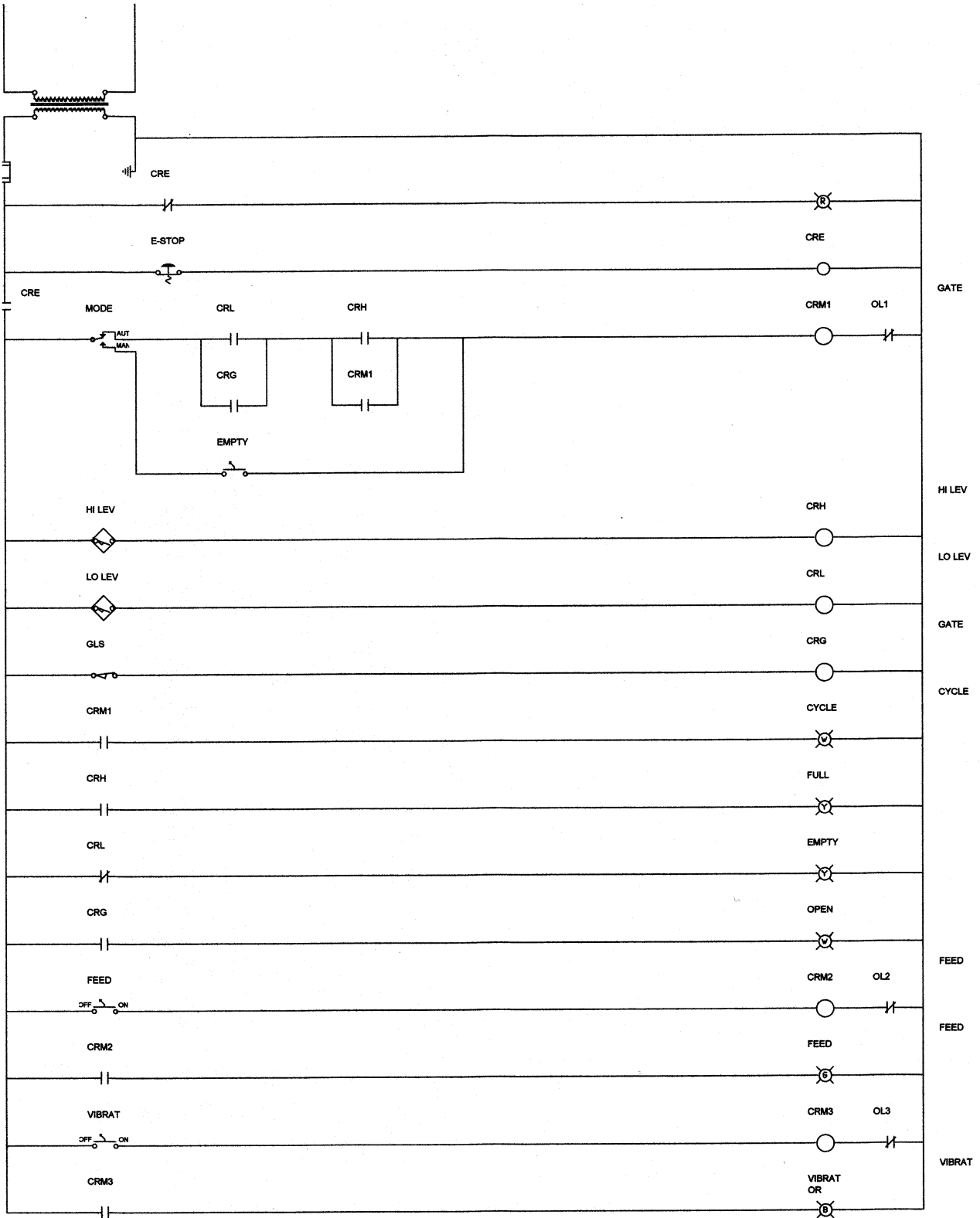


## 5.3 Electrical Schematics

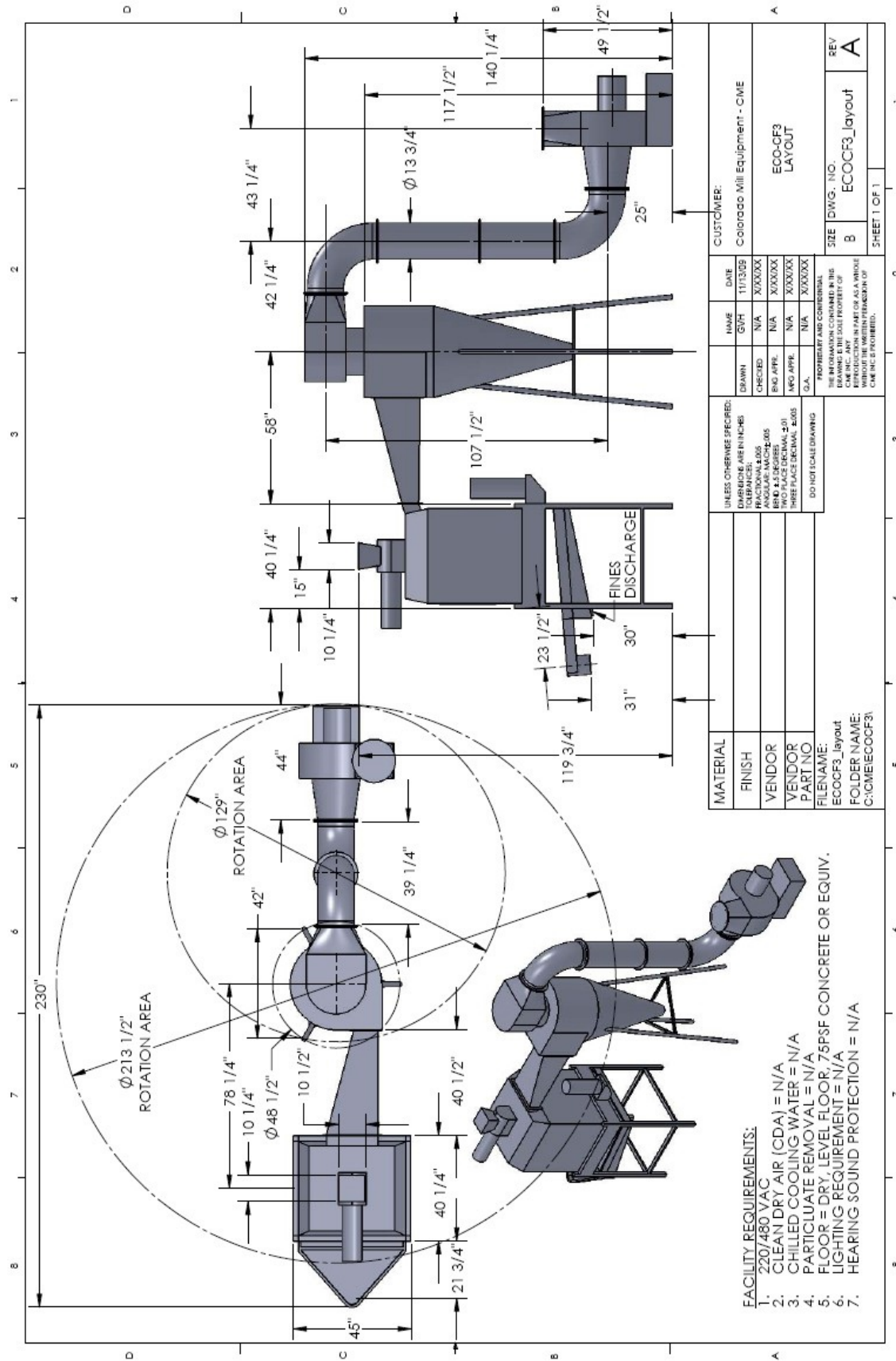
**DISCLAIMER:** These schematics are provided for reference only.

All the electrical connections to this equipment must be performed by a trained and authorized electrician, familiar with the national, state and local electrical codes.





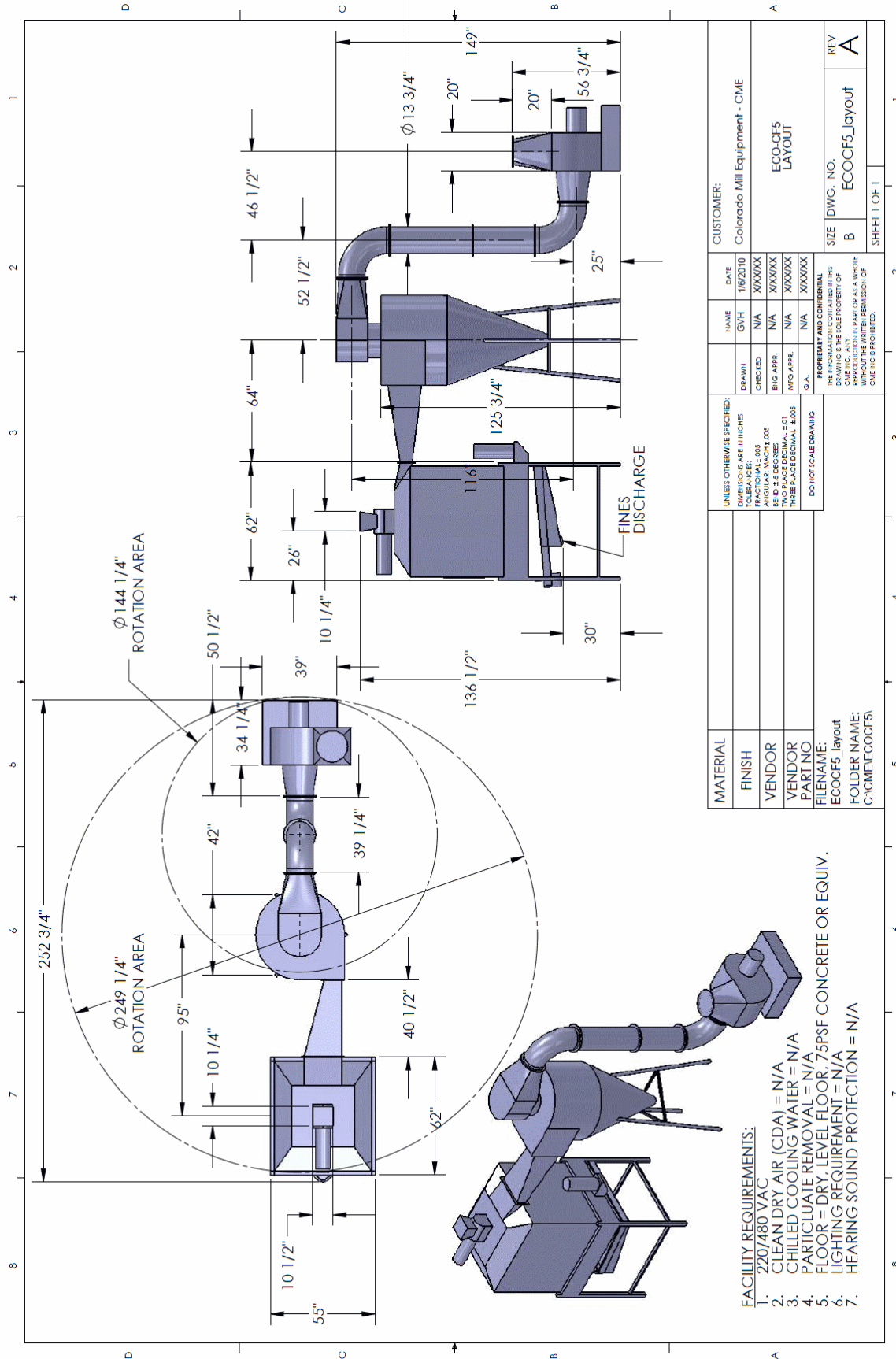
6.1 C3 System Layout Options



MATERIAL		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONAL DIMENSIONS END PLACES TWO PLACE DECIMAL, 3:1 THREE PLACE DECIMAL, 4:1 DO NOT SCALE DRAWING		NAME	DATE	CUSTOMER:
FINISH		CHECKED	DATE	GUY	11/13/09	Colorado Mill Equipment - CME
VENDOR		END APPR.		N/A	XXXXXX	ECC-CF3 LAYOUT
VENDOR PART NO.		END APPR.		N/A	XXXXXX	
FILE NAME:	ECCCF3_layout	END APPR.		N/A	XXXXXX	
FOLDER NAME:	ECCCF3	PROPERTY AND COPYRIGHT RESERVED BY THE DRAWING ENGINEER. ALL RIGHTS RESERVED. CME INC. IS NOT RESPONSIBLE FOR REPRODUCTION OF THIS DRAWING WITHOUT THE WRITTEN PERMISSION OF CME INC. IS PROHIBITED.		SIZE		REV
C:\CME\ECCCF3				B		A
				5 SHEET 1 OF 1		

- FACILITY REQUIREMENTS:**
- 220/480 VAC
  - CLEAN DRY AIR (CDA) = N/A
  - CHILLED COOLING WATER = N/A
  - PARTICULATE REMOVAL = N/A
  - FLOOR = DRY, LEVEL FLOOR, 75PSF CONCRETE OR EQUIV.
  - LIGHTING REQUIREMENT = N/A
  - HEARING SOUND PROTECTION = N/A

# 6.2 C5 System Layout Options

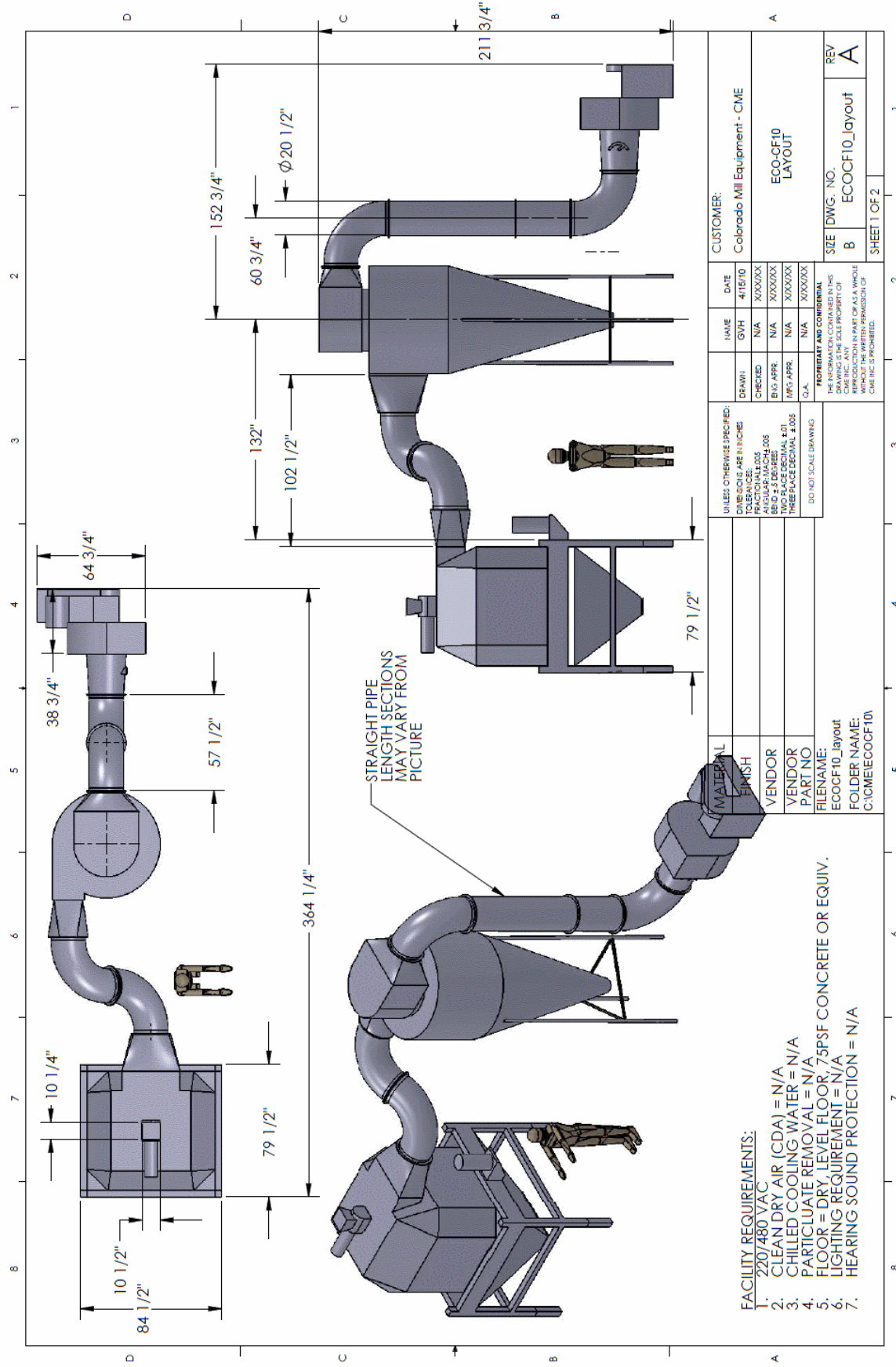


- FACILITY REQUIREMENTS:**
- 220/480 VAC
  - CLEAN DRY AIR (CDA) = N/A
  - CHILLED COOLING WATER = N/A
  - PARTICULATE REMOVAL = N/A
  - FLOOR = DRY, LEVEL FLOOR, 75PSF CONCRETE OR EQUIV.
  - LIGHTING REQUIREMENT = N/A
  - HEARING SOUND PROTECTION = N/A

MATERIAL	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES		NAME	DATE	CUSTOMER:
FINISH	TOLERANCES:	1/16" & 1/32"	GVH	1/6/2010	Colorado Mill Equipment - CME
VENDOR	ANGLES:	30°, 45°, 60°, 90°	CHECKED	N/A	XXXXXX
PART NO	BEVELS:	1:2	DESIGNED	N/A	XXXXXX
FILENAME:	DECIMALS:	2	APP'D	N/A	XXXXXX
FOLDER NAME:	THREE PLACE DECIMAL:	2.000	DATE	N/A	XXXXXX
C:\CME\ECOCF5\	DO NOT SCALE DRAWING		PROPRIETARY AND CONFIDENTIAL DRAWING IS THE SOLE PROPERTY OF CME INC. ANY REUSE OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF CME INC IS PROHIBITED.		
					SIZE DWG. NO. REV
					B ECOCF5_layout A
					SHEET 1 OF 1



# 6.3 C10 System Layout Options



UNLESS OTHERWISE SPECIFIED:	NAME	DATE	CUSTOMER:
DIMENSIONS ARE IN INCHES	GVH	4/16/10	Colorado Mill Equipment - CME
TOLERANCE:	CHECKED	N/A	ECO-CF10 LAYOUT
FINISH: MILL	ENG. APPR.	N/A	
ALCOHOL: N/A	MFG. APPR.	N/A	
BE @ ± 0.0625"	D.A.	N/A	
THIRD ANGLE PROJECTION	FOR RELEASE AND CONSTRUCTION		SIZE DWG. NO. B
DO NOT SCALE DRAWING	THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF CME INC. AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE WRITTEN PERMISSION OF CME INC. IS PROHIBITED.		REV A
			SHEET 1 OF 2

MATERIAL
FINISH
VENDOR
PART NO
FILENAME: ECOCF10_layout
FOLDER NAME: C:\CME\ECOCF10